

SIR AUREL STEIN'S EXPEDITION IN CENTRAL ASIA.*

AFTER a short and busy stay at Kashgar, where the ever effective help of my old friend and host, Sir George Macartney, K.C.I.E., our Consul-General for Chinese Turkestan, greatly facilitated the organization of my caravan. I started on October 9 for my first winter's work in the desert. Its main goal was the region around Lop-nor, at the other extremity of the Tarim basin, and various considerations obliged me to travel there *viâ* Khotan. Much of the long journey was bound to take me over ground already familiar from my previous expeditions, and this made me doubly eager to use whatever chance of new routes there was on my way to Khotan.

With this object I first moved to Maralbashi along the foot of the southernmost range of the Tien-shan, which in this portion had hitherto remained largely unsurveyed. Indications previously collected pointed to the existence of an old route, now but vaguely remembered in local lore, which during early periods of Chinese domination had led along the foot of these barren mountains and considerably to the north of the present high road connecting Kashgar with Aksu. The accurate survey now effected fully confirmed that tradition and revealed a succession of ruined sites, going back to the pre-Muhammadan epoch and echeloned along a line of some 160 miles. Most of this desert ground is now wholly devoid of water, and this fact, along with other physical observations of interest, furnishes distinct proof of desiccation within historical times.

After surveying some ruined Buddhist shrines in the vicinity of Maralbashi, I wished to make my way to the desert hills of the Mazar-tagh on the lower Khotan river. Our surveys of 1908 had shown reason for the belief that in geological structure they formed part of an ancient range which started at an angle from the outermost Tien-shan and once extended across the Taklamakan in a south-easterly direction. After surveying the bold island-like hills into which erosion, mainly æolian, has broken up this range east of Maralbashi, we reached the southernmost of them, known as Chöktagh. From a desert lake near this, Hedin, in 1896, had started eastward on that memorable journey which ended with the destruction of his caravan and his own narrow escape.

Following a south-easterly course we forced our way for three trying marches across the mighty ridges of sand which, closely packed and soon reaching 200-300 feet in height, blocked the route in the intended direction. It was by far the most forbidding ground I had ever encountered in the Taklamakan. Careful levels taken along our track showed an aggregate ascent of some 400 feet over a single mile's distance, with corresponding descents even more trying to the camels. When the hired camels intended as a "supporting party" showed signs of exhaustion I

* Communication from Sir Aurel Stein, dated Camp Ch'ien-fu-dung, April 7, 1914. See *Geographical Journal*, vol. 42, p. 540.

was forced to turn northward in order to avoid needless sacrifice of our own brave camels which were to be the mainstay of our transport for the winter's explorations.

Two interesting discoveries had rewarded the effort. Again and again we came between the high dunes upon patches covered with minute but easily recognizable rock fragments of the wind-eroded hill range, once extending right through to the Khotan river. Elsewhere, fully 30 miles from the Tarim, a small area of eroded ground displayed abundant remains of the stone age, proving occupation by a palæolithic settlement of what is now absolutely lifeless desert.

Crossing the Tarim and subsequently taking a short cut through the desert, we gained the delta of the Khotan river by a route hitherto unsurveyed. It showed us the great change which has recently taken place in the river's terminal course. Then I hurried south to the Mazar-tagħ hill, where interesting archæological results rewarded resumed spadework at the ruined fort. Apart from additional written records of the Tibetan period, there came to light remains of a Buddhist shrine immediately below the alleged Muhammadan saints' tombs, which account for the present name of the hill. This discovery supplies a particularly striking instance of that continuity of local worship, so important a feature in the religious history of Central Asia.

Only a brief halt was possible at Khotan towards the close of November, and I used it to gather such antiques as local friends in my old haunts had collected from the site of the ancient Khotan capital and from "treasure-seeking" operations in the desert. Close on 700 miles marching distance still separated me from Lop-nor, and I knew well the importance of reaching it in time while the severe winter of the desert lasted. But I could not forego altogether the opportunities for archæological work which familiar sites *en route* still held out. Thus by rapid excavation amongst the tamarisk-covered sandcones in the vicinity of Hsüan-tsang's Pi-mo (Marco Polo's Pein), I recovered some interesting fresco remains of a Buddhist shrine.

Then, hurrying on to Niya, I revisited the important sand-buried settlement northward, abandoned to the desert in the third century A.D. It did not disappoint me now either. A close search of previously unexplored ground to the south revealed more ruined dwellings of the same early period. Digging with a large number of men, we recovered numerous documents on wood—written in the Indian language and script which prevailed in official use from Khotan to Lop-nor during the first centuries of our era—furniture, household implements, etc. Particularly curious was the discovery among the dunes of a large and remarkably well-preserved dead orchard, in which the arrangements for the growing of the various fruit trees, the trellis-carried vines, etc., could be studied in almost uncanny clearness. It was hard to tear myself away from this modest sand-buried Pompeii after a week's incessant work.

Its extension to new ground was greatly facilitated here, as elsewhere, by the devoted energy of the two Indian assistants secured for this journey, Naik Shams Din, a capable N.C.O. of the First (K.G.O.) Sappers and Miners, and Mian Afraz Gul, of the Khyber Rifles, who, after having been trained as a military surveyor, had gained practical experience during my recent archæological explorations on the Indian north-west frontier.

My renewed visit to this ground, after seven years' interval, gave opportunities also for observations of direct geographical interest, concerning changes in the terminal cause of the dying Niya river, etc. Among such, I may mention the instructive fact that cultivation in the small colony established at the latter was found to have recently receded, not from want of water, but, on the contrary, owing to a succession of ample summer floods which destroyed the canal-head, and with which the locally available labour could not cope.

After leaving the Niya site I struck a new route through unknown desert to the Endere river. Exceptionally clear weather compensated us for the bitter cold of December, and allowed the snow-clad main Kun-lun range south to be sighted day after day. With the help of the numerous peaks there previously triangulated, Surveyor Muhammad Yakub Khan could map our route to Charchan, and thence towards Lop far more accurately than had been possible before.

Already, in September, I had detached R. B. Lal Singh ahead, in order that he might resume triangulation along the main Kun-lun range, from where, in 1906, we had been obliged to stop it. With his often-proved zeal, my indefatigable old travel companion had pushed on, and started triangulation from near Kapa by the middle of October. In spite of the hardships implied by work at great elevations and on ground devoid of all resources, he succeeded in extending his system of triangles eastward for over five degrees of longitude before excessive cold and heavy snowfall obliged him to stop it. Thus a net connected with the Indian Trigonometrical Survey has now been carried beyond the actual Lop-nor. Lal Singh then continued work with the plane-table towards Tun-huang, taking special care to obtain many height observations by mercurial barometer, etc., along his route through the snow-covered mountains. It was a great relief when he safely rejoined me soon after my own arrival at Charklik on January 8.

It was at this small place, the only settlement of any importance in the Lop region, that I had to secure the supplies, labour, and extra transport needed by our several parties for the next two and a half months of exploration work in the desert between Lop-nor and Tun-huang. The difficulties of the task were greatly increased by local disturbances which had cost the life of the Chinese district magistrate shortly before my arrival. Tungan troops from Kara-shahr had repressed this outbreak of Chinese "revolutionaries." But their passage nearly exhausted the slender resources of Charklik, and, in the absence of any Chinese civil authority,

little effective help could be expected from the easy-going Lopliks. It thus cost the anxious efforts of weeks to raise what was needed in food for men and beasts, together with the additional camels upon which we should have to depend for the transport of water, *recte* ice.

Fortunately, I was able to use my six days' stay at Charklik for profitable archæological labour. While executions of captured rebels, etc., kept the little oasis in unwonted animation, I managed to clear two small sites in the vicinity which had previously escaped me. There ruins of Buddhist shrines yielded small but interesting remains of Sanscrit manuscripts on birchbark, palm-leaf, and silk, suggesting import from India by the direct route which still leads across the Tibetan plateaus to the south.

I then moved eastwards to Miran, where, in 1907, I had excavated important ruins, marking the site of the earliest capital of the "kingdom of Shan-shan or Lou-lan." In two of its Buddhist shrines there had then come to light wall paintings of great artistic interest, showing closest approach to the Græco-Buddhist art of Gandhara and some almost Hellenistic in character. Owing to want of time and subsequently to the tragic fate which struck my old assistant Naik Ram Singh with blindness at this very place, I had then been able to remove only one of these remarkable fresco series. The recovery of what was left proved a delicate task of considerable technical difficulty, and the icy blasts to which we were almost continuously exposed made the work still more trying. But in the end it was safely accomplished. I also succeeded in recovering sculptural remains of interest from the shattered ruins of two Buddhist shrines of somewhat later date.

Simultaneously preparations were pushed on for the explorations which our several parties were to make into the waterless desert north and north-east of Lop-nor. On January 23, I started R. B. Lal Singh northward for an exact survey of the ancient river-bed and its branches by which the waters of the Konche-darya once reached the area, now all desert, south of the Kuruk-tagh, where Hedin, in 1900, had made his important discovery of the ruins of the "Lou-lan site." Eight days later, I set out myself into the desert north of the terminal lagoons of the Tarim, while Surveyor Muhammad Yakub Khan was sent off to work at the eastern end of the great salt-encrusted lake-bed marking the ancient Lop-nor. My own party included a relatively large number of labourers for intended excavations. What with big loads of ice sufficient to assure minimum allowances of water for thirty-five people during at least one month, and with food supplies to last my own men for two months, I found the thirty camels raised by no means too many. Of course, everybody had to walk.

My immediate goal was a large ruined fort which Tokhta Akhun, my old Loplik follower, had first come upon, apparently in 1910, when returning from the visit which Mr. Tachibana then had paid to the "Lou-lan site." We find it situated in wind-eroded desert, four marches

from the terminal Tarim course. The clearing of the substantial dwellings within furnished numerous finds of coins, architectural wood carvings, implements, etc., which clearly showed that the period of occupation was the same as that of the "Lou-lan site," closing early in the fourth century A.D. The well-marked dry river course near which the fort rises, clearly revealed itself by its direction as a southern branch of the ancient "Kuruk-darya," once carrying water to the "Lou-lan site."

Following its course we subsequently discovered a second and smaller fort, and north of this an extensive settlement. Its dwellings had all suffered badly through wind erosion. But their remains and the refuse heaps near them furnished numerous ancient records on wood and paper in Chinese and early Indian scripts as well as in early Sogdian, besides many interesting and well-preserved articles of household use, personal equipment, etc. Their evidence proves that this settlement, too, was abandoned about the beginning of the fourth century A.D.

The antiquarian finds and physical observations here made throw fresh light on various questions of the hydrography and early occupation of this part of the Lop basin during historical times and those immediately preceding them. Finds of neolithic stone implements abounded near these ruins and on most of the wind-eroded ground which we subsequently crossed to the "Lou-lan site." During two long marches a succession of ancient river-beds was met, all clearly recognizable by their direction as having branched off from the "dry river," skirting the foot of the Kuruk-tagh. A considerable delta existed here during early historical times, and our surveys have shown how far it extended to the south and south-east.

The old Chinese station marked by the chief ruins of the "Lou-lan site" served as our base camp for the reconnaissances pushed into the unknown desert to the east and north-east. My hope of finding more ruins near what I conjectured to have been the line of the earliest Chinese route connecting the extreme west of Kan-su with the Tarim basin was not disappointed. We discovered quite a series of small ruined sites, leaving no doubt as to the direction followed by that route within the once inhabited area. Their remains strikingly illustrated both the conditions of life prevailing among the local population during the first centuries of our era and the character and importance of the traffic which passed here since Chinese expansion westwards, political and commercial, commenced about 120 B.C.

It is impossible at present to go into details. But I may mention at least that among the antiquities brought to light, relics abounded of that silk trade which we know to have been a chief factor in opening this earliest route for China's direct intercourse with Central Asia and the distant West. These fabrics show the perfection reached by decorative textile art in China during Han times.

Of special importance was the discovery of a large well-built fort

which had served as a *point d'appui* for Chinese missions and troops, where they first reached Lou-lan territory after crossing the desert north of the salt-encrusted dry lake-bed. The constructive features of its walls, built with layers of clay and carefully secured reed fascines and remarkably well preserved after two thousand years' exposure, agreed in every detail with those observed in the westernmost extension of the Chinese Great Wall, with which my explorations of 1907 in the desert near Tun-huang had rendered me so familiar. There could be no doubt that it dated like the Tun-huang *Limes* itself, from the first military advance into the Tarim basin, about 104 B.C., and finds of Chinese records on wood have confirmed this.

I had thus secured a safe starting-point for the difficult task still before us, that of tracing the line of that famous ancient route through the forbidding desert eastwards. Incessant hard work under the trying conditions of the waterless desert had exhausted our Loplik labourers, and when the last digging had been done under the blasts of the season's initial sand-storm I was glad to let them return to the world of the living. Lal Singh had safely joined me after accomplishing his tasks in the west. Together we moved then north to the Kuruk-tagh by a new route in order to let our hard-ried camels have a few days' rest with water and grazing at the salt springs of Altmish-bulak. Then we separated for our respective tasks. While Lal Singh was to survey the unknown north-east shores of the salt-encrusted dry lake-bed and the barren hills of the Kuruk-tagh encircling them, I proposed to track the ancient route right through to where it was likely to have diverged from the desert track still used south of the great dried-up lake-bed.

It was a task after my own taste, but one attended by serious difficulties and by risks too. No water could be hoped for before striking the Tun-huang route, a matter of some ten days' hard marching for the heavily laden camels—fuel besides ice had to be carried. There was a limit to the endurance of our hardy camels, and it was impossible to foresee what physical obstacles might delay us.

They soon presented themselves when we had to make our way south through and across a perfect maze of steep clay terraces of unusual height, all carved by wind erosion. Having regained the vicinity of the early Chinese stronghold previously mentioned, we soon reached the extreme eastern limit of the area to which the waters of the Kuruk-darya had once carried life. Beyond there were no ruins to guide us. The desert eastwards was already in ancient times as devoid of plant or animal life of any sort as it now is. We were passing from the land of the dead into ground that never knew life—except on the route to be tracked.

It would be too long to relate here how the task was accomplished. Indications deduced from topographical and archæological observations afforded some clue from the start, and kindly Chance helped with

guidance such as I could scarcely have hoped. Again and again finds of coins, small metal objects and the like, assured us that we were still near the ancient track by which troops and traders had toiled for centuries through this lifeless wilderness of clay and salt. With the exception of one day spent in crossing a bay of the ancient lake bed with its hard crumpled-up salt crust, such finds cropped up on every one of the eight long marches which brought us from the extreme edge of the dead delta to the well of Kum-kuduk.

There were thrilling incidents, such as when for a short distance we found the ancient track plainly marked by hundreds of early Chinese copper coins and unused bronze arrowheads strewing the ground. They had evidently dropped unobserved from some convoy of stores in Han times, perhaps moving at night time. Notwithstanding the fatigues and anxieties caused by the often very difficult ground it was a fascinating time of work. How those patient old Chinese organizers of transport maintained traffic along this route without water, fuel, or grazing, is an interesting problem.

Relief came when we had reached, without loss, the first scanty vegetation where the ancient track, here in places still plainly visible in the salt-encrusted ground, skirts the foot of the cliffs overlooking the extreme eastern bay of the dry lake bed. Two days later our parties reunited at Kum-kuduk. A successfully arranged concentration brought there also our heavy baggage from Miran, and allowed us to move on towards Tun-huang without loss of time. Leaving the caravan track, we then continued to explore the ground close to the foot of the Kuruk-tagh, where the ancient route had passed, and further east the geographically very interesting desert area around the present terminal basin of the Su-lo Ho river. There I picked up Surveyor Muhammad Yakub Khan, who had carried a carefully measured line of levels all the way up from the ancient dry lake-bed. Its result, along with other observations, has confirmed the belief that the waters of the Su-lo Ho at a relatively recent period drained into the Lop-nor basin. Percolating the sandy soil at the foot of the Kuru-tagh, within a few feet from the surface, they reach it in fact even now.

Arrived at the western end of the ancient "Great Wall," successfully explored in 1907, I could clear up some supplementary archaeological questions. Then, near Lake Khara-nor, I resumed the detailed exploration of the Tun-huang *Limes* where circumstances had before obliged me to leave a gap in my survey. During the last week before my arrival at Tun-huang by the end of March, we succeeded in searching all the ruined watch stations along this remaining portion of the line. Ample finds of Chinese records on wood, and of other interesting relics going back to Han times, rewarded the clearing. A short halt at Tun-huang refreshed men and beasts, and now, after a renewed visit to the "Halls of the Thousand Buddhas," I am starting to move into Kan-su for the work of the spring.

Wilde on his return in September, 1674, are noted in the 'Catalogue of Pepysian Manuscripts' (vol. 2); and one of these contains a reference to some "draughts" which the captain was finishing for presentation to the Duke of York. Here is another proof of his predilection for such work, and, bearing in mind that his ship, as shown by the correspondence, had certainly been at Cadiz, we may conclude that the charts of that and other Spanish ports appearing in *Additional Manuscript* 15,737, are based on drawings made during that voyage. In January, 1678, King Charles gave Wilde the command of the *Mary Rose*; and three months later he was promoted to the *St. Michael*. We then hear nothing of him until June, 1683, when he was made captain of the *Oxford*. This vessel formed part of the fleet sent out under Lord Dartmouth to arrange for the abandonment of Tangier, and among the Dartmouth Papers is a long report on the celebrated Mole, signed amongst others by Wilde. This is our last trace of him; but there could not in any case be much more to record, for in the list of naval officers given in vol. 1 (p. 316) of the 'Catalogue of Pepysian Manuscripts,' he is shown as dead in 1688.

The history of the volume of charts, after it left Wilde's hands, cannot now be fully elucidated. On fo. 7, however, will be found a pencil note signed A. D.—the well-known monogram of Alexander Dalrymple, Hydrographer to the Admiralty; while at the end is a further note in the same handwriting ("9 April, 1796, Simcoe, 18s."), showing the date when Dalrymple purchased the volume, the seller, and the price given for it. He had already utilized in his well-known charts two of the sketches in Wilde's 1650-52 journal; and he now included in the same series two from his new acquisition (though apparently without recognizing the authorship of the latter). These were the charts of the north-west coast of Madagascar (issued in 1798) and that of the Straits of Singapore (1805), and they were described in the one case as "from an old English MS." and in the other as "from an old book of English MSS." Evidently Dalrymple left the volume behind him at the Admiralty, for (as a note in the front informs us) it was presented by the Lords of the Admiralty to the British Museum in January, 1844.

THE COALFIELDS OF INDIA.*

Extent of the Coalbearing Rocks.—In 1873, Mr. T. W. H. Hughes † put forward the following estimate of the extent of the known coal-bearing rocks of India:—

* Abstracted from 'The Coalfields of India.' By the late Prof. V. Ball, C.B., LL.D., F.R.S. Entirely revised and largely re-written by R. R. Simpson, M.Sc., Inspector of Mines, formerly Mining Specialist to the Geological Survey of India. *Memoirs of the Geological Survey of India*, vol. 41, 1913.

† *Rec., Geol. Surv. India*, vol. 6, 1873.