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Explorations in Central Asia, 1906-8

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hold the Society's conversazioni in our own house, which would be preferable to the Natural History Museum, attractive as that building undoubtedly is.

In connection with this discussion as to the enlargement of our premises, a suggestion has been made that a hall should be built by the Society, which would serve a double purpose. In the first place, it would serve as the meeting-place for the Society, with the various advantages which I have just suggested. In the second place—and this is the point to which I wish more especially to draw your attention—if it were suitably designed and decorated, it might also serve to commemorate the deeds of great British explorers and geographers to whom not only science, but our nation owes so much. By drawing attention to the combined effects of the lives of these discoverers, such a hall would tend to enhance the value placed on each individual performance. Many noble names are not now adequately appreciated by the public, and it is a fitting object for the Society to show that these great countrymen of ours are still duly honoured in their own country. To erect an Explorers' Hall, as it might be called, is, therefore, an idea which must appeal to many sympathizers with geographical science throughout the Empire. We are frequently visited by foreign geographers, and surprise has often been expressed that the greatest geographical society in the world, as they sometimes describe it, should be lodged in such comparatively poor premises. I submit that the time has come for the Society both to set its house in order and at the same time to fitly memorialize those deeds which have for several centuries forced the universal acknowledgment that this country has been second to none in the race for geographical discovery.

EXPLORATIONS IN CENTRAL ASIA, 1906-8.*

By Dr. M. AUREL STEIN.

EVER since, in 1901, I had returned from my first journey into Chinese Turkestan happy recollections of congenial labour spent in its mountains and deserts had made me long for a chance of fresh explorations. There was reason to hope that the ruins of sites long ago abandoned to the desert would yield more relics of that ancient civilization which, as the joint product of Indian, Chinese, and classical influences, had once flourished in the oases fringing the Tarim Basin, and upon which it had been my good fortune to throw light by my former excavations. But the scientific elaboration of the results then secured cost time and great efforts, having to be carried on largely by the side of exacting official duties, and it was not until the summer of 1904 that I was able to

* Read at the Royal Geographical Society, March 8, 1909. A map will be issued in a later number of the *Journal*.

submit to the Government of India detailed proposals about another journey which was to carry me back to my old archæological hunting-grounds around the Taklamakan desert and thence much further eastwards, to Lop-nor and the Great Wall of China.

Owing to the kind interest shown by Lord Curzon, then Viceroy of India, and the help of devoted friends able to realize the close bearing of further explorations upon the antiquarian and historical interests of India, my scheme obtained already in 1905 the approval of the Indian Government. Its favourable decision was facilitated by the generous offer of the Trustees of the British Museum to contribute two-fifths of the estimated cost of the expedition, against a corresponding share in the prospective "archæological proceeds," as official language styles them.

From the very first I was resolved to use every possible opportunity for geographical exploration. Even if all my personal tastes and instincts had not drawn me so forcibly towards this additional task, there would have been for it the fullest possible justification in the fact that nowhere probably in Asia is the dependence of historical development on physical conditions so strikingly marked, and on the other hand the secular changes of these conditions so clearly traceable by archæological evidence. The Survey of India Department, now under the direction of Colonel F. B. Longe, R.E., was as willing as ever to assist me in the execution of my geographical tasks, and agreed to depute with me one of its trained native surveyors and to bear all costs arising from his employment. But quite as valuable for my geographical work was the moral support which, in addition to the loan of a number of instruments, the Royal Geographical Society gave me. Those who like myself have to struggle hard for chances of serving their scientific aims in life, will understand and appreciate the encouragement which I derived from the Society's generous recognition of the results of my first Turkestan explorations. Whether preparing for my second journey in the course of solitary official tours along the Indo-Afghan border, or when launched at last upon the lonely desert plains and high ranges of Central Asia, I always felt the vivifying touch of the friendly interest and unfailing sympathy which the letters of your incomparable secretary, Dr. Keltie, conveyed to me. My gratitude for this help and advice will be lifelong.

I had originally tried hard for permission to start during the summer of 1905. But the freedom from official routine work which I needed for the completion of my Detailed Report on the previous journey, itself an indispensable preliminary to fresh work, could not be secured until the following autumn and winter. So it was only in April, 1906, that I could set out from Kashmir, where by six months' incessant desk work, more fatiguing to me than any hard marching or digging, I had managed to finish, and even to see through the press in distant Oxford, those two stout quarto volumes of *Ancient Khotan*.

For my entry into Chinese Turkestan I had chosen this time a route singularly interesting for the student of early geography and ethnography, but practically closed now to the European traveller. It was to take me from the Peshawar district, on the Indian administrative border, through the independent tribal territory of Swat and Dir, into Chitral, and thence across the Baroghil to the Upper Oxus valley and the Afghan Pamirs. My lamented late chief, Sir Harold Deane, K.C.S.I., that truly great Warden of the Marches, then Chief Commissioner of the North-West Frontier Province, had readily agreed to my project. H.M. the Amir of Afghanistan, too, had granted me permission to cross a portion of his territory not visited by any European since the days of the Pamir Boundary Commission, with a promptness I had scarcely ventured to hope for. But the apprehensions entertained locally as to the possibility of safely crossing with baggage the difficult Lowarai pass, then deeply buried under snow, still interposed a formidable barrier. The official correspondence on the subject grew quite imposing.

But in the end a hint from His Excellency the present Viceroy, Lord Minto, who favoured me with an interview at Peshawar, and who subsequently followed my travels with the kindest interest, helped to clear the way for me, and on April 28, 1906, I was able to leave Fort Chakdarra, the scene of much hard fighting during the last great tribal rising. In the meantime I had been joined by my Indian assistants, Rai Ram Singh, the excellent native Surveyor who had accompanied me on my former journey, and by worthy Naik Ram Singh, a corporal of the First (Bengal) Sappers and Miners, who through effective special training provided by his regimental authorities had qualified to assist me in photographic work, making of plans, and similar tasks requiring a "handy man." With the Rai Sahib came Jasvant Singh, the wiry little Rajput, who had acted as his cook on my previous journey, and who in the meantime had enlarged his extensive practical experience of Central Asia by crossing Tibet on Major Ryder's expedition. Never have I seen an Indian follower so reliable in character and so gentlemanly in manners, and how often have I regretted that his high caste precluded his giving to myself the benefit of his ministrations. Our small party besides included my faithful old Yarkandi caravan man, Muhammadju, who had braved the wintry passes in order to join me, and had narrowly escaped with his life early in the month, when an avalanche swept away and buried half a dozen of his fellow travellers on the Burzil, and an Indian Muhammadan, who was supposed to act as my cook, and about whose qualities, professional and personal, the less said the better. Taking into account that our equipment comprised a considerable quantity of scientific instruments, several thousands of photographic glass plates, a raft floated by numerous goatskins which were to be utilized also for transport of water in the desert, and indispensable stores of all kinds, likely to last

for two and a half years, I had reason to feel satisfied at fourteen mules sufficing for the whole baggage.

My journey was to take me not to distant regions alone, but also far back in the ages. So it was doubly appropriate that its first stages should lead through trans-border valleys which twenty-two centuries ago had seen the columns of the conquering Macedonian pass by, and where now the possibility of fanatical outbreaks still obliges the European officer to move with tribal escort and armed. There were ruins of Buddhist times to be surveyed and interesting ethnographic observations to be gathered already on the rapid marches which carried me up to Dir. But how could I stop for details if this paper is to give, be it only in barest outline, a survey of travels so protracted? May 3 found us at the foot of the dreaded Lowarai pass (circ. 10,200 feet), and our crossing effected before daybreak through gorges deeply choked with the snows of avalanches, some quite recent, showed that the difficulties had scarcely been exaggerated. Over fifty stout tribesmen, started in several detachments to lessen risks, were needed for the transport of our belongings. With this obstacle once safely taken, I could rapidly push up the deep-cut valley of the Chitral river to Fort Drosh, where the hospitality of the officers of the 39th Garhwal Rifles holding this northernmost outpost of British power in India made me readily forget that my eyes had seen no sleep practically for the last forty hours.

A long double march next day by the river past lofty slopes of rock and detritus, and with the huge icy mass of the Tirich-mir peak (about 25,000 feet) in full view northward, carried me to the Chitral capital, a charming little oasis in this maze of barren steep mountains. During the few days of halt there the kind help of my friend, Captain Knollys, Assistant Political Agent for Chitral, enabled me to gather an ample anthropometrical harvest. In its autochthon population Chitral holds an important branch of that 'Dard' race which by its antiquity and ethnic and linguistic affinities may well claim the special interest of the historical student and ethnographer. But the mountain fastnesses of Chitral have again and again offered shelter also to remnants of tribes unable to hold their own elsewhere, and thus it came that among the many exact anthropological measurements I was able to take with my assistants, those of Iranian-speaking hill-men from across the Hindu-kush and of wild-looking immigrants from Kafirstan (Fig. 1) were also largely represented. The physical affinity between these tribes, all approximating the *Homo Alpinus* type as seen more or less purely in the inhabitants of the high valleys drained by the Oxus, seems marked, and this helps to throw light on more than one problem connected with the early ethnology of Central Asia and the Indian North-West.

The survival of much ancient lore in customs, traditions, crafts, and even in domestic architecture makes Chitral and the adjacent valleys a fascinating field for the student of early Indian civilization. It



FIG. 1.—KAFIRS AT CHITRAL.

was with regret, therefore, that I yielded to a variety of cogent practical reasons urging me onwards, to the Oxus and the "Roof of the World." But rapid as my marches up the Yarkhun river and through Mastuj had to be I was able, thanks to local information carefully collected before, to trace and survey an interesting series of early Buddhist rock carvings, sites of pre-Muhammadan forts, etc. It was curious to note how often local tradition connected the latter with dimly remembered periods of Chinese over-lordship—a significant fact in view of what the Chinese Annals tell us of the temporary extension of imperial power under the T'ang dynasty right across the Pamirs and even to the south of the Hindu-kush. The accuracy of these records with regard to local topography was strikingly illustrated by the discovery that a large stretch of arable land now almost completely waste but showing ample evidence of ancient cultivation in the shape of terraced fields, stone enclosures, etc., still bears the name of *Shuyist*, the Chinese reproduction of which is applied by the T'ang Annals to the chief place of the territory of Shang-mi or Mastuj in the eighth century A.D. It is true that this tract, far larger than any other actually cultivated area in Mastuj, seems at present not exactly inviting, its elevation, circ. 10,500 feet above the sea, probably in combination with the recent advance of a huge glacier in the side valley opposite, making its climate distinctly cold. But whether or not this part of the Mastuj valley has been affected by important climatic changes during the last twelve hundred years, there remains the interesting fact that since the British pacification of the country the incipient pressure of population is now leading to the re-occupation of this as well as other but smaller areas, where cultivation had ceased for centuries.

But it was on far more interesting ground that I was soon able to verify the accuracy of those Chinese annalists who are our chief guides in the early history and geography of Central Asia. Reasons which cannot be set forth here in detail had years before led me to assume that the route by which, in 749 A.D., a Chinese army coming from Kashgar and across the Pamirs had successfully invaded the territories of Yasin and Gilgit, then held by the Tibetans, led over the Baroghil and Darkot passes. I was naturally very anxious to trace on the actual ground the route of this remarkable exploit, the only recorded instance of an organized force of relatively large size, having surmounted the formidable natural barriers which the Pamirs and Hindu-kush present to military action. The ascent of the Darkot pass, circ. 15,400 feet above the sea, undertaken with this object on May 17, proved a very trying affair; for the miles of magnificent glacier over which the ascent led from the north were still covered by deep masses of snow, and only after nine hours of toil in soft snow hiding much-crevassed ice did we reach the top of the pass. Even my hardy Mastuji and Wakhi guides had held it to be inaccessible at this early season. The observations

gathered there, and subsequently on the marshes across the Baroghil to the Oxus, fully bore out the exactness of the topographical indications furnished by the official account of Kao-hsien-chih's expedition. As I stood on the glittering expanse of snow marking the top of the pass and looked down the precipitous slopes leading some 6000 feet below to the head of the Yasin valley, I felt sorry that there was no likelihood of a monument ever rising for the brave Corean general who had succeeded in moving thousands of men across the inhospitable Pamirs and over such passes.

On May 19 we crossed the Hindu-kush main range over its lowest depression, the Baroghil, circ. 12,400 feet above sea. Owing to the abnormally heavy snowfall of that year, the masses of snow covering this otherwise easy saddle were so great, and their condition so bad, that but for the timely assistance sent from the Afghan side, it would have been quite impossible to get our loads across. It was delightful for me to reach once more the headwaters of the Oxus, and to feel that I had got again a step nearer to the fascinating regions lower down its course, upon which my eyes had been fixed since my early youth. Access to them was still barred for me, as it has been since many years for all Europeans. But for my progress eastwards to the Chinese border on the Pamirs every help which the scanty resources of barren upper Wakhan would permit of had been provided for under H.M. the Amir's orders.

At Sarhad, the highest village on the Oxus, and a place of ancient occupation, the kindest reception awaited me. Colonel Shirin-dil Khan, commanding the Afghan frontier garrisons from Badakhshan upwards, had been sent up weeks before with an imposing escort. The presence of this delightful old warrior, who had fought through all the troubled times preceding and immediately following Amir Abdurrahman's accession, would alone have been an inducement to tarry by the Oxus; for I found him not only full of interesting information about ancient remains in Badakhshan and old Bactra—goals still, alas! inaccessible to me—but himself also, as it were, a fascinating historical record. Was it not like being shifted back many centuries, to find myself listening to this amiable and gentlemanly old soldier, who in his younger days had helped to build up pyramids of rebel heads just to establish order in the time-honoured fashion of Central Asia? But regard for the hardships already too long undergone by my military hosts—and touching applications of the peaceful Wakhi villagers, upon whom they were largely subsisting—urged me onwards, yet not before I had surveyed interesting ruins of fortifications intended to guard the route leading from the Baroghil, and probably of early Chinese origin.

Our marches up the Oxus were exceptionally trying, owing to the fact that the winter route in the Oxus bed was already closed by the flooded river, while impracticable masses of snow still covered

the high summer track. It was wonderful to watch the agility with which our Badakhshi ponies scrambled up and down precipitous rock slopes; but I confess the pleasure would have been greater without having to take one's share in these acrobatic performances. Again and again only the incessant watchfulness of our Afghan escort saved the baggage from bounding down into the river. A bitterly cold day spent at the Kirghiz camp of Bozai-Gumbaz enabled me to visit the Little Pamir lake and observe the geographically curious bifurcation by which one of its feeders, coming from the Chilap Jilga, discharges its waters partly towards the Murghab draining the lake and partly into the Ab-i-Panja. It was the uppermost course of the latter which brought us on May 27 to the foot of the Wakhjir pass (circ. 16,200 feet) and the glaciers where Lord Curzon has placed, I think rightly, the true source of the Oxus. Of the long day of toil which saw us crossing the pass, and with it the Afghan-Chinese border, I cannot attempt a description here. We started by 3 a.m., after a hearty farewell to the kindly Afghan colonel, who remained camped at the foot to make sure that our Wakbi transport would not desert halfway. Enormous masses of snow still covered the Wakhjir, and in spite of a minimum temperature of 25 degrees of frost in the morning, their surface grew soon so soft that the powerful Kirghiz yaks had to be abandoned. Fear alone of our Afghan protectors induced the Wakhis and Kirghiz to persevere in the efforts of carrying our baggage across. But it was not until midnight that I found rest at the first point on the Chinese side, where fuel and a dry spot to lie down on were available.

Moving down the Taghdumbash Pamir, I found myself once more on the ancient route which Hsüan-tsang, the great Chinese pilgrim, had followed when returning about 642 A.D. from his long travels in India. I had traced his footprints before to so many sacred Buddhist sites, and was now setting out to follow them up so much further to the east, that I felt special gratification at being definitely able to identify here the ruined rock fastness where a curious local legend related by the pilgrim supposed an imperial princess from China to have been imprisoned in ancient days. The fortifications which I traced on the top of the almost completely isolated rock spur of *Kiz-kurghan*, "the princess's tower," rising with precipitous crags fully 500 feet above a gloomy defile of the Taghdumbash river, must have been long in ruins already in Hsüan-tsang's days. Yet such is the dryness of the climate in these high valleys that the walls defending the only possible approach to this ancient place of refuge could still be clearly traced in spite of the material being mere sun-dried bricks with regular layers of juniper twigs embedded between their courses.

At Tash-kurghan, where I revisited the site of the old capital of Sarikol as described by Hsüan-tsang, I divided our party. Rai Ram Singh was to carry on survey work in the eastern portion of the

Muztagh-ata range, supplementary to our labours of 1900, while I myself moved on to Kashgar by the direct route across the high Chichiklik Dawan and a succession of minor passes. Rapid as my marches had to be—I covered the distance of close on 180 miles in six days in spite of serious difficulties on account of melting snows and flooded streams—I was able to ascertain by unmistakable topographical evidence that the route was the same which my Chinese guide and patron-saint, Hsüan-tsang, had followed more than twelve centuries ago.

At Kashgar, which I reached on the night of June 8, after a 60 miles' ride fittingly closing with a duststorm, my old friend, Mr. G. Macartney, C.I.E., then the political representative of the Indian Government and now H.M.'s Consul, offered me the kindest welcome. The fortnight I passed under his hospitable roof was pleasant indeed, yet a time of much hard work. A host of practical tasks connected with the organization of my caravan, the purchase of transport animals, etc., kept me busy from morning till evening, not to mention the late hours of night spent over voluminous batches of proof-sheets which had followed me all the way from Oxford. Mr. Macartney's kind offices, supported by his personal influence and to some extent also by a recollection of my previous archaeological labours about Khotan, were of great help in securing the goodwill of the provincial Chinese Government for my fresh explorations.

But it was a service of quite as great importance, and one which I shall always remember most gratefully, when he recommended to me a qualified Chinese secretary in the person of Chiang-ssü-yieh. For the tasks before me the help of a Chinese scholar had appeared from the first indispensable. Having always had to carry on my scholarly labours amidst struggles for leisure, I had never had a chance of adding to my philological equipment by a serious study of Chinese, however much I realized its importance. It was a piece of real good fortune which gave me in Chiang-ssü-yieh not merely an excellent teacher and secretary, but a devoted helpmate ever ready to face hardships for the sake of my scientific interests. Chiang's exceedingly slight knowledge of Turki counted for little in the lessons I used to take in the saddle while doing long desert marches, or else in camp whenever it was pitched early enough in the evening. But once I had mastered the rudiments of conversational practice in Chinese, his ever-cheerful companionship was a great resource during long months of lonely travel and exertion. With the true historical sense innate in every educated Chinese, he took to archaeological work like a young duck to the water, and whether the remains to be explored were Chinese or foreign in origin, he watched and recorded everything with the same unflinching care and thoroughness. Slight and yet wiry of body, he bore the privations and discomforts of desert life with a cheerful indifference quite surprising in a *litteratus* accustomed during all his life to work near the fleshpots of the Yaméns.

And with all his interest in remains dead and buried, the faithful companion of my labours had a keen eye for things and people of this world and an inexhaustible stock of humorous observations. How often have I longed since we parted for my ever alert and devoted Chinese comrade!

When on June 23 I started from Kashgar refreshed by the busy days spent under friendly shelter, Khotan was my goal. But owing to the great summer heat of the plains the work of exploring ancient sites in the desert, which I wished to begin from there, could not be thought of until September. So I was free in the mean time to turn my attention to geographical and other tasks. During a few days' halt at Yarkand needed for the completion of my caravan, in men as well as animals, I was joined by Rai Ram Singh, who had in the mean time carried a systematic survey by theodolite and plane-table along the eastern slopes of the Muztagh-ata range. In the course of it he had penetrated through a difficult and previously unexplored portion of the Tash-kurghan river gorge.

We then turned eastwards, and made our way through hitherto unsurveyed ground along the right bank of the Tiznaf river to the outer Kun-lun hills about K k-yar. There, with my tent sheltered in a shady garden of the small oasis, with the barren mountains around assuring relative coolness, and yet near enough to the desert to receive almost daily a steady rain of fine dust carried up by the winds from the dunes and deposited here to form fresh loess, I worked hard for a fortnight. Besides finishing off the last literary tasks which bound me to Europe, I found my hands fully occupied with collecting anthropological measurements and data about the little-known people of Pakpo. It was no easy matter to get hold of these interesting hill nomads. At first they fought terribly shy of leaving their high valleys, just as if real live heads were to have been taken instead of mere measurements and photographs with perfectly harmless instruments. But the trouble was amply repaid by the evidence that this small tribe in its alpine isolation had preserved remarkably well the main physical features of that race, represented by the present Galchas of the Pamir region and probably like these of Iranian speech, which in ancient times appears to have extended right through to Khotan and even further east.

It is impossible to spare space here for details concerning the little-known route leading through the barren outer hills by which I made my way to Khotan by the close of July. Nor can I do more than just mention the remarkable exploit of Rai Ram Singh, whom I had despatched two weeks earlier for a survey of the snowy range towards the Kara-kash river. After reaching the latter under great difficulties, he successfully pushed over the Hindu-tash pass (circ. 17,400 feet), closed since many years by the advance of a great glacier. He thus gained access to the last bit of *terra incognita* in the difficult mountain

region between the middle courses of the two great Khotan rivers, the Yurung-kash and Kara-kash, and after crossing a series of deep-cut side valleys of the latter under serious risks from floods rejoined me at Khotan. Glad as I had been myself to return after over five years' absence to my old haunts in this flourishing great oasis, I could spare but a few days for putting myself into touch with the local Chinese authorities, and setting on foot through Turki friends inquiries likely to guide me in my subsequent archaeological search. There remained just four weeks for the task I had in view of supplementing our surveys of 1900 in the high Kun-lun range south of Khotan by ampler topographical details about the great glaciers which feed the headwaters of the Yurung-kash. Pushing up rapidly by the route over the Ulughat-Dawan and Brinjak pass discovered in 1900, we reached the Nissa valley after the middle of August, and were soon busily engaged mapping the huge ice-streams which descend towards its head both from the main Kun-lun watershed, and great side spurs thrown out by it northward.

The effects of far-advanced disintegration of rocks, due evidently to extremes of temperatures, were everywhere most striking. The precipitous ridges we had to climb for the sake of survey stations were composed on their crests of nothing but enormous rock fragments heaped up as by the hands of Titans, and quite bare of detritus from circ. 14,000 feet upwards (Fig. 2). Enormous masses of rock *débris* sent down from these ridges almost smothered the ice-streams below, and made their surface look for miles like that of huge dark torrents suddenly petrified in their wild course. Big ice falls and gaping crevasses showed indeed that these accumulations of *débris* were being steadily carried onwards by the irresistible force of the glacier beneath. But even there the exposed ice surface looked almost black, and when on the Otrughul glacier I had under serious difficulties clambered up for some 5 miles from the snout to an elevation of circ. 16,000 feet, the reaches of clear ice and snow descending in sharp curves from the highest buttresses of a peak over 23,000 feet high seemed still as far away as ever (Fig. 3).

The rate at which these glaciers discharge at their foot the products of such exceptionally rapid decomposition as appears to proceed along the high slopes of this part of the Kun-lun where permanent snow does not protect them, was brought home to me by the almost constant rumble of boulders sliding down the ice wall at the snouts whenever the sun shone through long enough to loosen the grip of the surface ice. Old moraines of huge size could be traced clearly at the head of the Nissa valley down for over 3 miles below the present foot of the Kashkul glacier, at circ. 13,300 feet elevation. Thick layers of loess deposited since ages by heavy clouds of dust such as we saw again and again swept up by the north wind from the great desert plains north had charitably covered up these ancient terminal moraines.



FIG. 2.—KASHKUL GLACIER ABOVE NISSA VALLEY.

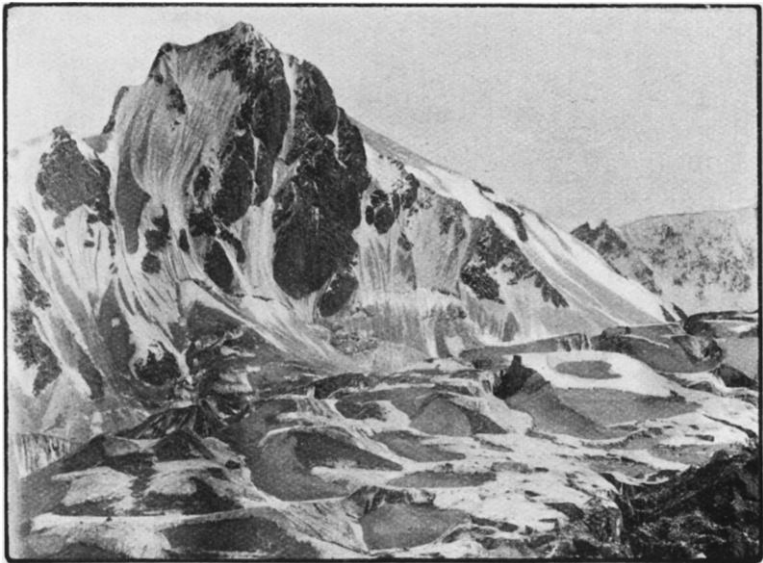


FIG. 3.—VIEW EASTWARDS FROM OTRUGHUL GLACIER.

On them alone, at an elevation between 12,500 and 13,000 feet, where moisture seems to be less deficient than elsewhere in these forbidding mountains, could I refresh my eyes by the sight of real green grass and a few alpine flowers. The barrenness of the valleys below, even at the relatively high elevation of 8000 to 11,000 feet, was great, and the bleak steep slopes of rock or detritus told plainly the story of rapidly progressing erosion.

The melting of the glacier ice was still proceeding at a great rate, and the flooded condition of the streams was a great source of trouble and risk in the deep-cut gorges. I shall not easily forget our experience in crossing the Kash river near Karanghu-tagh, the only permanently inhabited place of this desolate mountain region. The river was utterly unfordable for laden animals, and the only *soi-disant* bridge spanning its tossing waters at a point where they debouch from a rock defile narrowing to circ. 70 feet was equally impracticable for load-carrying men. The three rudely joined timber pieces composing it had parted company years before, and one rickety beam alone offered foothold. In trying our raft of inflated skins for effecting the passage, the half inch twisted wire rope, from which the raft hung by a travelling pulley, snapped under the great strain of the current. Luckily the men on shore holding the guiding ropes clung to them for life, though nearly dragged off the rocky banks, and Musa, my young Yarkandi pony-man, who was on the raft with the waves breaking over him, was saved after anxious minutes. The loads, including my lively little fox terrier "Dash," the devoted comrade of my whole journey, were in the end safely slung across by the repaired wire rope, while we humans cautiously transferred ourselves over the rickety beam still in position.

But the difficulties we had to face were not entirely those of nature. For our supplies, transport, and guides we had to depend on the small settlement of semi-nomadic hillmen and select malefactors exiled from Khotan, who, counting probably less than two hundred souls, form the only population in this desolate mountain region. Their dread of participating in our glacier expeditions was genuine, and greater still their fear that they might be made to reveal to us the difficult route across the main Kun-lun range, by which communication with Ladak was maintained for a few years during the short-lived rule of the rebel Habibullah (1863-66), and which has long ago become completely closed and forgotten. So all means of obstruction were tried in succession by these wily hillmen, culminating at last, after miserable days spent under driving rain and snow right under the big glaciers of the Busat valley, in attempts at open resistance to Islam Beg, my faithful old Darogha, who accompanied us under the authority of the Amban of Khotan.

Fortunately, by the time when the evident exhaustion of the few available Yaks and the growing exasperation of the Taghliks made it advisable to make our way down to the high but less-confined valley of

Pisha, we had succeeded in clearing up many interesting details of orography in the rugged, ice-covered main range rising south of the Yurung-kash, and in establishing beyond doubt that that long-forgotten route led up the Chomsha valley. It had become equally certain that any advance through that very confined valley to its glacier-crowned head was quite impracticable during the summer months or early autumn. I also convinced myself that my long-planned attempt to reach the uppermost sources of the Yurung-kash itself would have to be made from the east.

By September 9, 1906, I had returned to Khotan, where preparations for my archaeological campaign and the examination of miscellaneous antiques brought in by treasure-seekers detained me for some days. Hard at work as I was, I could not help attending a great feast which Chien-Ta-jên, the obliging prefect, was giving in my honour to the assembled dignitaries of the district. In spite of the time it cost to get through some thirty strange courses, I appreciated the attention the kindly mandarin desired thus to pay in acknowledgment of the labours I had devoted for years past to the elucidation of the history and geography of Khotan. Then I set out for the desert adjoining the oasis north-eastward, where I succeeded in tracing much-eroded but still clearly recognizable remains proving ancient occupation well beyond the great Rawak Stupa. I found the court of the latter even more deeply buried under dunes than when I carried on here excavations in 1901, and, alas! the fine stucco reliefs then brought to light completely destroyed by treasure-seekers in spite of careful reburial.

But when I subsequently surveyed the extensive débris-strewn areas known as *Tatis* fringing the north edge of the tract of Hanguya, where potsherds, fragments of bricks, slag, and other hard material cover square miles of ground once thickly occupied, but since long centuries abandoned to the desert, I had the satisfaction of recovering by excavation a mass of interesting small reliefs in hard stucco which had once decorated the walls of a large Buddhist temple dating probably from the fifth to the sixth century A.D. In their style unmistakably derived from models of Græco-Buddhist art, these relief fragments closely resembled the Rawak sculptures. Curiously enough, of the temple itself and the larger sculptures once adorning it, but the scantiest remains had survived in the ground. The probable explanation is that the site had continued to be occupied for some time after the temple had become a ruin, evidently through fire, and that only such smaller stuccoes as had become hardened by the latter into a likeness of terra-cotta could survive in soil constantly kept moist through irrigation.

The finds possessed special interest as proving that even sites so much exposed to wind-erosion and havoc wrought by human agency as 'Tatis' generally are, may preserve antiquarian relics of interest in lower strata which neither the slowly scooping force of driven sand

nor the burrowings of treasure-seekers, etc., from the still inhabited area close by had reached. Another important feature was the prevalence of richly gilt pieces. This furnished striking confirmation of the hypothetical explanation I had given years before of the origin of the leaf gold washed from the culture strata of the old Khotan capital at Yotkan. I may notice in passing that just as elsewhere along the edges of the Khotan oasis cultivation in the fertile Hanguya tract is now steadily advancing in the direction of the areas previously abandoned to the desert. The present favourable economic conditions and the consequent increase in the population seem the chief cause for this extension of the cultivated area which struck me again and again on revisiting portions of the oasis surveyed six years before, and which may yet, given a continuance of those factors, lead to the recovery of a considerable portion of that desolate Tati overrun by dunes and elsewhere undergoing wind-erosion. But it appears to me equally certain that the water-supply at present available in the Yurung-kash could under no system whatever be made to suffice for the irrigation of the *whole* of the large tracts now abandoned to the desert, and for this broad fact desiccation alone supplies an adequate explanation.

From the Hanguya Tati I passed on to a group of small ruined sites exhibiting in a typical form the destruction to which ancient remains are exposed in the belt of sandy jungle often intervening between the still cultivated areas and the open desert of drift-sand. In 1901 I had passed some completely eroded dwellings, forming the northernmost of those sites, in a maze of tamarisk-covered sand-cones not far from the village tract of Domoko, on the route from Khotan to Keriya. But information about the rest had become available only since an enterprising villager, stimulated by my old desert guide, Ahmad "the Hunter," had begun to prospect there a few years later for "old papers" to sell in the antique market of Khotan. The site of Khadalik, from which the old man had extracted some manuscript remains of interest, and to which the promise of a good reward now induced him to take me, seemed disappointing at first sight; for its principal ruin, which soon proved to be that of a large Buddhist temple, presented itself merely as an extensive low *débris* heap covered with sand. But scarcely had we begun systematic clearing of it when pieces of paper manuscripts began to crop out in numbers.

It soon became evident that the destructive operations of those who in early days had quarried the ruined temple for timber, and the more recent burrowings by "treasure-seekers" like my guide Mullah Khoja, had failed to disturb the votive offerings of the last worshippers, which, being mainly deposited on the floor, had long before passed under a safe covering of sand. So we were able to recover here, in spite of the almost complete disappearance of the superstructure, a large number of manuscript leaves in Sanskrit, Chinese, and the "unknown" language

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of Khotan, besides many wooden tablets inscribed in the same language, and some in Tibetan. Most of them probably contain Buddhist texts, like some excellently preserved large rolls, which on one side present the Chinese version of a well-known Buddhist work, with what evidently is its translation into the "unknown" language on the other. The clue thus offered for the decipherment of the latter may yet prove of great value. Plentiful remains of stucco reliefs and fresco pieces once adorning the temple walls, together with painted panels, had also found a safe refuge in the sand covering the floor. Their style pointed clearly to the same period as that ascertained for the Buddhist shrines I had excavated six years before at the site of Dandan-Oilik in the desert northward, *i.e.* the latter half of the eighth century A.D. It was gratifying when the subsequent discovery in a second shrine close by of stringed rolls of Chinese copper pieces, no doubt deposited by some of the last worshippers, supplied definite numismatic confirmation of this dating.

We worked hard here with a large number of diggers, and in spite of heat and smothering dust practically without interruption from daybreak until nightfall. Yet it took us fully ten days to clear these temples together with some smaller adjoining shrines and dwellings. I was eager to move on to the east towards sites further away in the desert, and hence likely to have been abandoned far earlier. Yet I was doubly glad in the end to have spared the time and labour for Khadalik at the outset; for when I returned to this tract nearly eighteen months later I found that the area containing the ruins had just been brought under irrigation from the stream which passes within three miles of it.

I cannot do more than allude here to a problem of geographical interest presented by Khadalik and another small site, Mazar-toghrak, near the opposite (southern) edge of the Domoko oasis, where I subsequently excavated a considerable number of records on wood both in Chinese and the Brahmi script of old Khotan, indicating, as at Khadalik, abandonment about the end of the eighth century A.D. Now it is noteworthy that the same period must have seen the desertion of the large ruined settlement of Dandan-Oilik, which I explored in 1900, and which, as duly recognized also by my friend Mr. E. Huntington, who has carefully studied since the physiography of this whole region, must have received its water from the same drainage system. Dandan-Oilik is situated fully 56 miles further north in the desert, and if shrinkage of the water-supply needed for irrigation were to be considered as the only possible cause of abandonment of these sites, the chronological coincidence in the case of localities dependent on the same streams and yet so widely separated would certainly be curious.

I cannot stop to describe the interesting instances of successful fight with the desert which I noticed in certain recently opened colonies on my way to Keriya, the chief oasis of an administrative

district mainly desert, which extends nearly five degrees of longitude eastwards to beyond Charchan. It is a fit region for producing "ships of the desert," and the seven big camels which I purchased at Keriya after a great deal of sifting and testing, proved the mainstay of my transport thereafter. They, together with four baggage ponies, sufficed amply for equipment and stores of our large party. But, of course, when it came to the carrying of antiques, water-supply for the desert, or the impedimenta of large bands of labourers, I had to supplement our train as well as I could by hired animals. On archaeological expeditions into the desert, such as I had to conduct, the cares and difficulties about "transport and supplies" are apt to become truly forbidding, and often used I to think wistfully of the relative ease with which I might have effected my desert wanderings if I could but have restricted myself to purely geographical exploration and a few hardy followers. But my brave own camels from Keriya never caused me worry. They held out splendidly against all privations and hardships, and were, after nearly two years' travel, so fit and fine-looking that when I had at last to dispose of them before my departure for India, they realized over 50 per cent. profit—of course, for the Government of India. (How I wished to be with them again instead of being a frequenter of bustling trains!)

At Niya, the last small oasis eastwards, which I reached on October 14, I had to prepare rapidly for fresh exploration at the ancient site in the desert northwards, where, on my first visit in 1901, I had made important discoveries among ruins deserted already in the third century A.D. It was encouraging to learn from my old "treasure-seeking" guide Ibrahim that the further search I had enjoined him to make for ancient dwellings hidden away amidst the dunes had been fruitful, and equally pleasing to see how readily my old Niya diggers rejoined me. I was resolved this time to take out as many labourers as I could possibly keep supplied with water. So it was encouraging that, what with the example set by my "old guard" and the influence still possessed here by Ibrahim Beg, my energetic old Darogha, whom luckily, as it proved, a little local conspiracy had turned out of his Beg's office just in time to make him available for me, a column of fifty men, with additional camels and supplies for four weeks, could be raised within a single day's halt.

Three rapid marches lay through the luxuriant jungle belt which lines the dying course of the Niya river northward, and were made delightful to the eye by the glowing autumn tints of wild poplars and reed beds. Picturesque parties of pilgrims returning from the lonely shrine of Imam Jafar Sadik added a touch of human interest to the silent sylvan scenery. At the supposed resting-place of that great holy warrior, with its quaint collections of rags, yak-tails, and other votive offerings, we left behind the last abode of the living, and also the present end of the river. Two days later I had the satisfaction of

camping once more amidst the bare dunes close to the centre of that long-stretched, sand-buried settlement to which a special fascination had made my thoughts turn so often since those happy days of labour in the winter of 1901. The bitter cold then experienced was now absent; but when, in the twilight of that first evening, I strolled across the high sands to a ruin sighted then but reluctantly "left over" for unavoidable reasons, and lighted upon a fine carved cantilever since laid bare by the slight shift of a dune, I felt almost as if I had never been away, and yet full of gratitude to the kindly Fate which had allowed me to return.

Already that day's route, slightly diverging from that followed on my first discovery of the site, had taken me past a series of ruined dwellings, rows of gaunt trunks of dead fruit trees, and other signs of ancient occupation which had not been seen by me on my previous visit. A little experimental scraping had even revealed in the corner of a much-eroded modest dwelling some wooden tablets inscribed in that ancient Indian Kharoshthi script and of the curious type with which my previous excavations had rendered me so familiar. The encouraging promise thus held out to us soon proved true when, after tramping next morning some 4 miles over absolutely bare dunes, I started our fresh diggings at the northernmost of the ruined dwellings which Ibrahim had discovered scattered in a line some 2 miles to the west of the area explored in 1901. High dunes had then kept from our view these structures, evidently marking what must have been the extreme north-western extension of the canal once fed from the Niya river.

The ruin we first cleared was a relatively small dwelling, covered only by 3 to 4 feet of sand, and just of the right type to offer an instructive lesson to my native assistants and the men. It occupied a narrow tongue of what owing to the depression produced around by wind erosion looked like high ground, extending in continuation of the line of a small irrigation canal still marked by fallen rows of dead poplars. As soon as the floor was being reached in the western end room Kharoshthi documents on wood began to crop out in numbers. After the first discovery of a "takhta" (tablet) had been duly rewarded with some Chinese silver, I had the satisfaction of seeing specimen after specimen of this ancient record and correspondence in Indian language and script emerge from where the last dweller, probably a petty official, about the middle of the third century A.D., had left behind his "waste paper." Rectangular tablets, of the official type, with closely fitting wooden covers serving as envelopes; double wedge-shaped tablets as used for semi-official correspondence; oblong boards and labels of wood serving for records and accounts of all kinds, were all represented among the finds of this first ruin (Fig. 4). It added to my gratification to see that a number of the rectangular and wedge-shaped letter tablets still retained intact their original string fastenings, and a few even their clay seal impressions. How cheering it was to

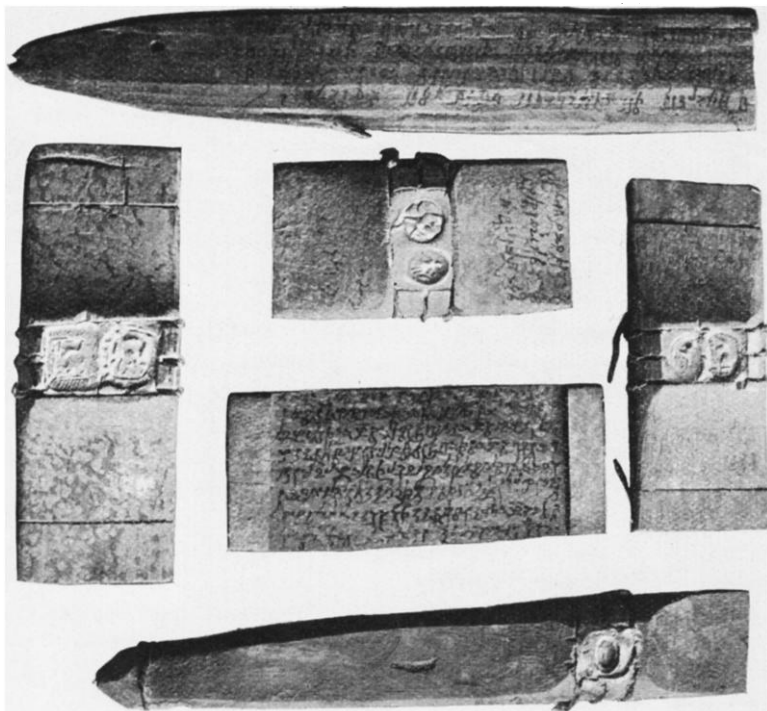


FIG. 4.—WOODEN TABLETS INSCRIBED IN KHAROSHTHI, WITH COVERS AND CLAY SEALS, FROM NIYA SITE.

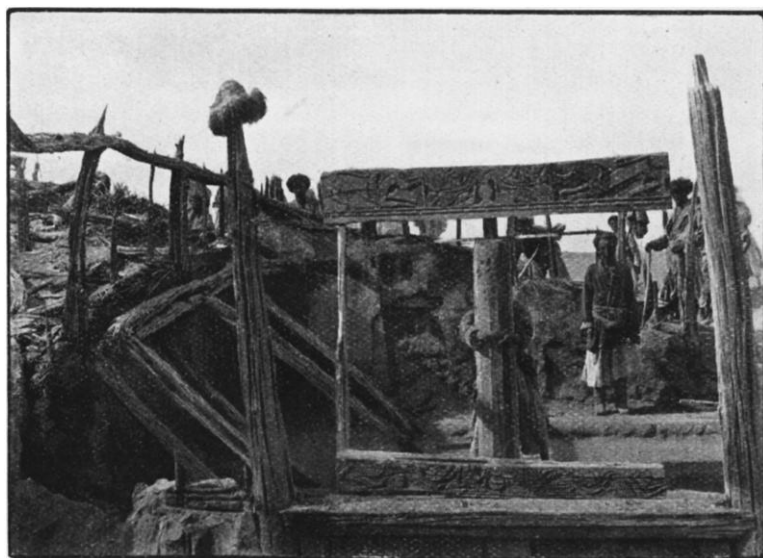


FIG. 5.—HALL OF ANCIENT DWELLING (THIRD CENTURY A.D.) AFTER EXCAVATION, NIYA SITE.

discover on them representations of Heracles and Eros left by the impact of classical intaglios! Just as familiar were to me the household implements which this ruin yielded. Remains of a wooden chair decorated with carvings of Græco-Buddhist style, weaving instruments, a boot last, a large eating tray, mouse-trap, etc., were all objects I could with my former experience recognize at the first glance just as the various methods employed in building the timber and plaster walls.

Our next task was the clearing of the remains of a far larger structure close to my camp. Here the walls and any objects which may have been left between them proved completely eroded, though the massive posts, bleached and splintered, still rose high, marking the position of the timber framework. But when I examined the ground underneath what appeared to have been an outhouse or stables, I realized quickly that it was made up of layers of a huge refuse heap. Of course, previous experience supplied sufficient reason for digging into this unsavoury quarry, though the pungent smells which its contents emitted, even after seventeen centuries of burial, were doubly trying in the fresh eastern breeze driving fine dust, dead microbes and all, into one's eyes, throat, and nose. Our perseverance in cutting through layer upon layer of stable refuse was rewarded at last by striking, on a level fully 7 feet below the surface, a small wooden enclosure which had probably served as a dustbin for some earlier habitation. There were curious sweepings of all sorts—rags of manifold fabrics in silk, cotton, felt; seals of bronze and bone; embroidered leather, wooden pens, fragments of lacquer-ware, broken implements in wood, etc. But more gratifying still was a find of over a dozen small tablets inscribed with Chinese characters of exquisite penmanship, apparently forwarding notes of various consignments. The localities mentioned are of considerable geographical and historical interest, as throwing light upon the connection maintained by this settlement or its Chinese garrison with distant parts on the route into China proper. Quite at the bottom of the enclosure we found a small heap of corn, still in sheaves and in perfect preservation, and close to it the mummified bodies of two mice.

I cannot attempt to give details of the busy days spent in searching the chain of dwellings stretching southward. Some had suffered badly from erosion; others had been better protected, and the clearing of the high sand which filled their rooms cost great efforts (Fig. 5). But the men, encouraged by small rewards for the first finds of antiquarian value, yielded their "Ketmans" with surprising perseverance, in spite of the discomfort implied by strictly limited water rations, and Ibrahim Beg's rough-humoured exhortations sufficed to keep them hard at work for ten to eleven hours daily. Kharoshthi records on wood, whether letters, accounts, drafts, or memos, turned up in almost every one of these dwellings, besides architectural wood carvings, household objects, and implements illustrative of everyday life and the prevailing industries. Though

nothing of intrinsic value had been left behind by the last dwellers of this modest Pompeii, there was sufficient evidence of the case in which they had lived in the large number of individual rooms provided with fire-places, comfortable sitting platforms, etc. Remains of fenced gardens and of avenues of poplars or fruit trees could be traced almost invariably near these houses. Where dunes had afforded protection, the gaunt, bleached trunks in these orchards, chiefly mulberry trees, still rose as high as 10 to 12 feet.

With so much of these ancient homesteads in almost perfect preservation, and being constantly reminded of identical arrangements in modern Turkestan houses, I often caught myself wanting, as it were, in antiquarian respect for these relics of a past buried since nearly seventeen centuries. But what at first fascinated me most was the absolute barrenness and the wide vistas of the desert around me. The ruins at this end of the site lie beyond the zone of living tamarisk scrub. Like the open sea, the expanse of yellow dunes lay before me, with nothing to break their wavy monotony but the bleached trunks of trees or rows of splintered posts marking houses which rose here and there above the sandy crests. They often curiously suggested the picture of a wreck reduced to the mere ribs of its timber. There was the fresh breeze, too, and the great silence of the ocean.

For the first few days I found it difficult to limit my thoughts to the multifarious archaeological tasks which claimed me, and not to listen inwardly to the Sirens' call from the desert northward. A variety of matter-of-fact observations did not allow me to indulge in dreams of "buried cities" far away in that direction. Yet I longed to leave behind all *impedimenta* and scholarly cares for a long plunge into the sand ocean. So it was perhaps just as well for my ample antiquarian tasks in hand and before me when Rai Ram Singh, whom I had despatched on a reconnoitring tour to the north and north-east as soon as we reached the site, returned after a several days' cruise with the assurance that he had failed to trace any signs of ancient occupation beyond the line of the northernmost ruins already explored by us. Curiously enough, though the dunes were steadily rising, the surveyor had at his last camp found a group of living wild poplars, evidence perhaps of the subsoil drainage of the Niya river coming there nearer to the surface.

I must forego any attempt at detailed description of the results here yielded by a fortnight of exacting but fruitful work. Yet a particularly rich haul of ancient documents may claim mention were it only on account of the characteristic conditions under which it was discovered. I was clearing a large residence in a group of ruins on the extreme west of the site which had on my previous visit been traced too late for complete exploration, and which I had ever since kept faithfully *in petto*. Fine pieces of architectural wood carving brought to light near a large central hall soon proved that the dwelling must have been that of a

well-to-do person, and finds of Kharoshthi records of respectable size, including a wooden tablet fully 3 feet long, in what appeared to have been an ante-room, suggested his having been an official of some consequence.

The hope of finding more in his office was soon justified when the first strokes of the Ketman laid bare regular files of documents near the floor of a narrow room adjoining the central hall. Their number soon rose to over a hundred. Most of them were "wedges" as used for the conveyance of executive orders; others, on oblong tablets, accounts, lists and miscellaneous "office papers," to use an anachronism. Evidently we had hit upon office files thrown down here and excellently preserved, under the cover of 5 to 6 feet of sand. The scraping of the mud flooring for detached pieces was still proceeding when a strange discovery rewarded honest Rustam, the most experienced digger of my "old guard." Already during the first clearing I had noticed a large lump of clay or plaster near the wall where the packets of tablets lay closest. I had ordered it to be left undisturbed, though I thought little of its having come to that place by more than accident. Rustam had just extracted between it and the wall a well-preserved double wedge tablet when I saw him eagerly burrow with his hands into the floor just as when my little terrier is at work opening rat-holes. Before I could put any questions I saw Rustam triumphantly draw forth from circ. 6 inches below the floor a complete rectangular document with its double clay seal intact and its envelope still unopened. When the hole was enlarged we saw that the space towards the wall and below the foundation beam of the latter was full of closely packed layers of similar documents.

It was clear that we had struck a small hidden archive, and my joy at this novel experience was great; for apart from the interest of the documents themselves and their splendid preservation, the condition in which they were found furnished very valuable indications. The fact that, with a few exceptions, all the rectangular documents, of which fully three dozen were cleared in the end, had their elaborate string fastenings unopened and sealed down on the envelope, manifestly confirmed the conjectural explanation I had arrived at in the case of a few previous finds of this kind, that these were agreements or bonds which had to be kept under their original fastening and seals in order that in case of need their validity might be safely established. Characteristically enough, the only two open records proved letters addressed in due form to the "Hon'ble Cojhbo Sojaka, dear to gods and men," whose name and title I had already before read on many of the official notes dug up in the scattered files. The care which had been taken to hide the deposit and at the same time to mark its position—for that, no doubt, was the purpose of the clay lump, as Rustam had quite rightly guessed—showed that the owner had been obliged to leave the place in

an emergency, but with a hope of returning. This may help to throw light yet on the conditions under which the settlement was deserted.

Great care had to be taken in the removal to save the clay sealings from any risk of damage. It was amply rewarded when I discovered on clearing them at night, in my tent, that almost all had remained as fresh as when first impressed, and that most of them were from seals of classical workmanship representing Heracles with club and lion-skin, Eros, Pallas Promachos, helmeted busts, etc. It was strange how victoriously the art of the Greek die-cutter had survived in this distant region, and strange, too, to know myself the *de facto* possessor of Sojaka's deeds probably referring to lands and other real property buried since long centuries under the silent dunes. Where was the law court which might help me to claim them ?

As our work proceeded to the south of the site the surroundings grew, if anything, more sombre and almost lugubrious, in spite of the appearance of still living scrub. The ruins had to be searched for amidst closely set sand-cones raising their heads covered with tangled masses of tamarisk, dead or living, to 40 or 50 feet. Ruins just emerging from the foot of sandhills with deeply eroded ground on the other side made up weird pictures of solitude. The dust haze raised by a cold north-east wind added an appropriately coloured atmosphere. It was almost with a feeling of relief that we emerged at last upon somewhat more open ground towards the southern end of the site. The ruined dwellings were small there; but an inspection of the ground near by, as reproduced in a photographic panorama (Fig. 6), revealed features of interest.

Only some 60 yards off the ruin which had yielded the first tablets, there stood a square of dead mulberry trees raising their trunks up to 10 feet or more, which had once cast their shade over a tank still marked by a depression. The stream from which the canal once feeding it must have taken off was not far to seek; for behind the nearest ridge of sand to the west there still lay a footbridge about 90 feet long stretched across an unmistakable dry river-bed. Of the trestles which had carried the bridge two still stood upright. Beyond the left bank stretched shrivelled remains of arbours for upwards of 200 yards, to where steep banks marked a large square reservoir. For over 2 miles to the north-west we could follow the traces of the ancient river-bed, in places completely covered by drift-sand, but emerging again amongst low dunes and patches of dead forest. Finally it seemed to join a broad valley-like depression stretching far away with living wild poplars and tamarisks, and flanked by big ridges of sand. This great nullah, and others like it which Ibrahim had vainly searched for ruins west of it, had certainly seen no water for long ages. Over all this strange ground desiccation was written most plainly.

The 400 odd miles of desert through which my marches took me in November, from the Niya site past Charchan to Charklik, offered

Remains of ancient
orchards.

Ancient tank with dead
mulberry trees.



FIG. 6.—PANORAMIC VIEW OF GROUND NEAR SOUTH END OF NIYA SITE, WITH TAMARISK-COVERED

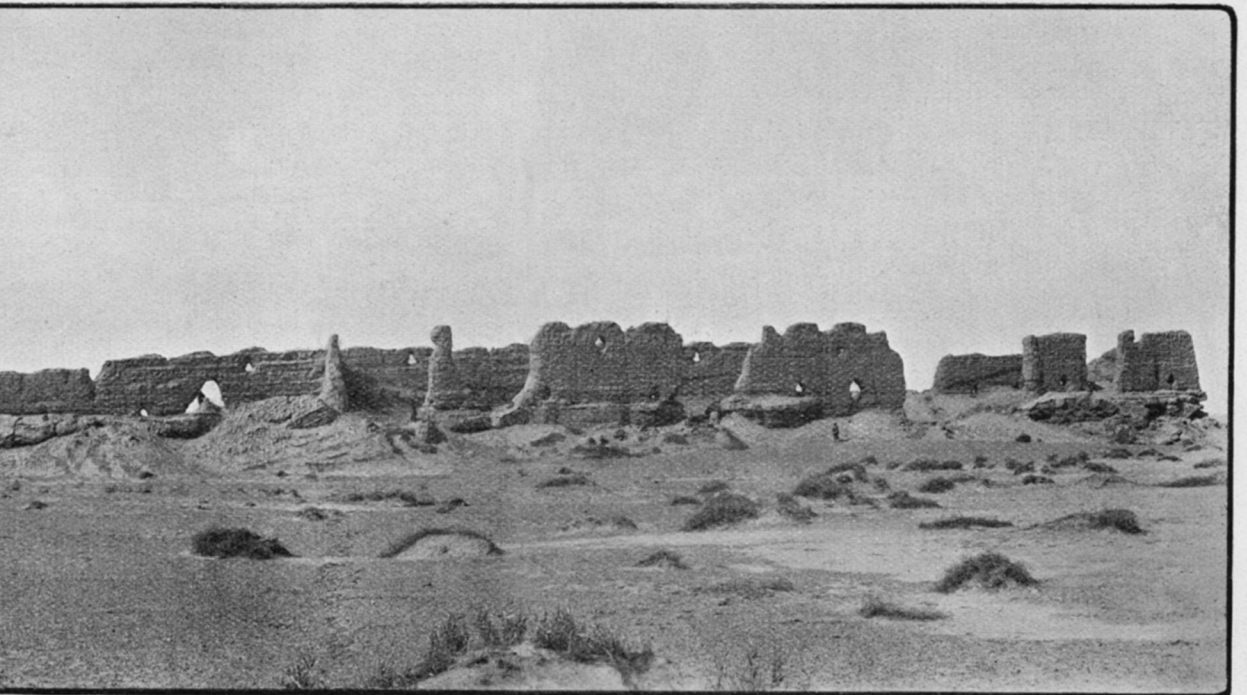


FIG. 11.—RUINS OF GREAT MILITARY MAGAZINE, BUILT IN FIRST CENTURY B.C., ALONG ANCIENT CHINESE FRONTIER

Ancient footbridge over
dry river-bed.



GROUND NEAR SOUTH END OF NIYA SITE, WITH TAMARISK-COVERED SAND HILLS AND DUNES.



, BUILT IN FIRST CENTURY B.C., ALONG ANCIENT CHINESE FRONTIER-WALL IN DESERT WEST OF TUN-HUANG.

opportunities for interesting work at more than one point. But I can pause now only to mention the solution which some fortunate archaeological finds at an ancient site near the Endere river afforded for a problem of antiquarian and geographical interest. In 1901 I had excavated there the sand-buried ruins of a fort which epigraphical and other finds proved to have been occupied about the first decades of the eighth century A.D., and abandoned during the Tibetan invasion soon after. Now it was curious that Hsüan-tsang, the great Chinese pilgrim, who had passed by the same route from Niya to Charchan about 645 A.D., found no inhabited place on the ten days' march, but distinctly mentions in a position corresponding exactly to the Endere site ruins of abandoned settlements which the tradition of his time described as "old seats of the Tukhara" famous in Central-Asian history.

That we have here a definite historical instance of an old site abandoned to the desert having been reoccupied after the lapse of centuries, was conclusively proved by discoveries made on this second visit. A shifting of the low dunes near the fort had exposed much-eroded remains of ancient dwellings. When carefully clearing the consolidated refuse heaps which had saved them from complete destruction, we came upon Kharoshthi records on wood which clearly belonged to the second or third century A.D.—and thus to the very period of Tukhara, *i.e.* Indo-Scythian ascendancy. Further striking evidence of the often-proved accuracy of my Chinese guide and patron saint came to light when I discovered that the rampart of the fort built within a generation or two of his passage was in one place actually raised over a bank of refuse which belonged to the first centuries of our era as proved by a Kharoshthi document on leather. It is significant that the time which saw Hsüan-tsang's ruined settlement brought to life again coincides with the re-establishment of Chinese power in the Tarim Basin assuring peace and security,

At the small oasis of Charklik, which a variety of indications prove as the true location of the *Lou-lan* of the old Chinese pilgrims and Marco Polo's *Lop*, the preparations for my long-planned expedition to the ruins north of Lop-nor, first discovered by Dr. Hedin on his memorable journey of 1900, proved an exacting task. Within three days I had to raise a contingent of fifty labourers for proposed excavations; food supplies to last all of us for five weeks; and to collect as many camels as I possibly could get for the transport, seeing that we should have to carry water, or rather ice, sufficient to provide us all on a seven days' march across waterless desert, then during a prolonged stay at the ruins as well as on the return journey. The problem looked indeed formidable when I found that, exhausting all local resources, I could raise the number of camels only to twenty-one, including our own and some animals hired from Charchan. Fortunately, Liao-Daloi, the Chinese magistrate of this forlorn tract, counting all in all between four

and five hundred homesteads, proved most helpful, and soon I was joined too, by two hardy hunters from Abdal, who had seen service with Hedin and were not frightened like the rest of the men by the risks of such a desert expedition. On the eve of my start Rai Ram Singh too arrived; he had carried separate surveys along the foot of the Kun-lun and succeeded in extending a net of triangles connected with fixed points of Captain Deasy's surveys and of the Indian Trigonometrical Survey all the way from Polur to beyond Charchan. The cold which was so welcome to me, as giving me hope of being able to carry our water-supply in the more convenient form of ice, had been severe in the foothills of the great range, and caused the surveyor's old trouble, rheumatism, to reappear in a measure which seriously handicapped him during the remainder of these trying winter months.

Eager as I was to push on to our goal north of the Lop-nor desert and to husband time and supplies, I could not forego the temptation of trial excavations at the ruins of Miran, on the way from Charklik to Abdal, the last fishing hamlet on the Tarim. The "finds" brought to light there, in the shape of early Tibetan records from a ruined fort and of sculptural remains from a temple of far more ancient date, were so encouraging that I determined in any case to revisit the site. Then, on December 11, 1906, crossing the deep and still unfrozen Tarim, I started my desert column from Abdal. For one day we followed the incipient Lop nor marshes eastwards, and luckily found good ice already available in one of the fresh-water lagoons. Every available camel was loaded with big bags full of ice, and in addition some thirty donkeys, which were to march on for two days further and leave their ice there for a halfway depôt. Of course, they themselves needed water; but with a two days' thirst and relieved of loads they could be trusted to return quickly to the Tarim. The route we now struck, to the north-north-east, led necessarily near the one followed by Hedin in 1900, in the reverse direction. But there was nothing to guide us, only the position of the ruins as indicated in his route-map and the compass; neither of the Lop hunters had ever visited the ruins from this side. A notable change had taken place in the physical aspects of this dismal ground since Hedin had traversed it. The great newly formed lagoons, in which the waters of the Tarim then spread northward, had since almost completely dried up. The water of the rare pools left behind in salt-encrusted depressions was so salt that, in spite of the great cold, it had not yet frozen.

On the morning of December 15 we had left the last depression with dead poplars and tamarisks behind us, and very soon after we passed into that zone of excessive erosion which constitutes so striking a feature of the northern portion of the Lop-nor desert. The succession of steep clay banks and sharply cut nullahs between them, all carved out by wind erosion and clearly marking the prevailing direction of the

winds, north-east to south-west, was most trying to the camels' feet (several of the poor beasts had to be "re-soled"—a painful operation), and did not allow us to cover more than 14 miles a day at the utmost, though I kept men and beasts on the move from daybreak until night-fall. There could be no doubt about this ground forming part of a very ancient lake-bed. Yet curiously enough we had scarcely entered it when frequent finds of flint arrow-heads and other implements of the Stone Age, together with fragments of very coarse pottery, supplied evidence that it must have been occupied by man in prehistorical times. An equally important discovery was that of small bronze objects, including early Chinese coins, together with plentiful fragments of well-finished pottery, at a point still fully 12 miles to the south of Hedin's site.

By that time we were already in the clutches of an icy north-east wind, which in the middle of the following night nearly blew my tent down. With short intervals it continued during our whole stay in this region; with minimum temperatures rapidly falling below zero Fahr., it made life exceedingly trying for the next weeks. Had it not been for the plentiful fuel supplied by the rows of bleached dead tree-trunks, evidently marking ancient river-beds, the men would have suffered even more from exposure than they did. In spite of the sun shining brightly, a double supply of my warmest wraps and gloves failed to keep head and hands warm.

So it was a great relief for us all when, on December 17, the first great mound indicating proximity of the site was duly sighted, exactly where Hedin's sketch-map had led me to expect it. By nightfall I was able to pitch camp at the foot of the ruined Stupa which stands out in this weirdly desolate landscape as the landmark of the main group of ruins (Fig. 7). The excavations which I carried on unremittingly for the next eleven days, with a relatively large number of men, enabled me to clear all remains traceable at the several groups of ruins, and yielded plentiful results. Among the dwellings, constructed of timber and plaster walls exactly like those of the Niya Site, wind erosion had worked terrible havoc. Its force and direction may be judged by the fact that of the solid walls of stamped clay once enclosing the principal settlement, those facing east and west had been completely carried away, while the north and south walls could just be traced.

But, luckily, in various places a sufficient cover of drift sand or consolidated refuse had afforded protection for many interesting relics. In a large rubbish heap, fully 100 feet across, extending near the centre of what proved to have been a small fortified station, we struck a particularly rich mine. The finds of written records, on wood and paper, also on silk, proved remarkably numerous, considering the limited size of the settlement and the number of dwellings which had escaped erosion. The majority of the records are Chinese, apparently chiefly of an administrative character: their detailed examination is likely to

throw light on questions connected with the use of the ancient Chinese trade route which passed once here along the south foot of the Kuruktagh and north of Lop-nor into Kan-su, and also on matters of geographical nomenclature.

Kharoshthi documents were also numerous. Their character and the observations made as to their places and conditions of discovery justify the important conclusion that the same early Indian language as found in the records of the Niya Site was in common local use also in the Lop-nor region for indigenous administration and business. Considering how far removed Lop-nor is from Khotan, this uniform extension of an Indian script and language to the extreme east of the Tarim basin has a special historical interest. Fine architectural wood carvings, objects of industrial art, metal seals, etc., brought to light in considerable number show the same close dependence on models of Græco-Buddhist art brought from India as the corresponding finds of the Niya Site. The resemblance to the latter is so great that even without the evidence of dated Chinese documents and of the very numerous coin finds, it would have sufficed to prove that the ruins which from the salt springs situated a long march northward may for the present be called those of Altmish-bulak, were abandoned about the same time as the Niya Site, *i.e.* the latter half of the third century A.D.

The results of our excavations prove clearly that the principal group of ruins represents the remains of a small fortified station garrisoned by Chinese troops, and intended to control an important ancient route which led from Tun-huang (Sha-chou), on the extreme west of Kan-su to the oases along and to the north of the Tarim. We knew from Chinese historical records that this route, opened through the desert about 110 B.C., served for the first expansion of Chinese political influence and trade westwards, and remained in use through the whole period of the Han dynasty. But it was only in the course of the explorations of this winter and spring that its exact direction and the starting-points east and west of the absolute desert intervening could be determined with certainty.

There was a series of indications to show that the settlement around this western station derived its importance far more from the traffic with China which passed through it than for the resources of local cultivation. Yet even allowing for this, how impressive is the evidence of the great physical changes which have overtaken this region, mainly through desiccation! For over 150 miles to the east no drinkable water could be found now along the line which the route must have followed towards the westernmost point of the ancient frontier-line subsequently discovered by me in the desert west of Tun-huang, and no possible canal system from the Tarim could now carry water for anything like that distance beyond the Altmish-bulak site, nor even as far probably as the latter. The springs of Altmish-

bulak and some to the west of them where we sent such of our camels as could be spared from transport work proved so salt that the poor beasts, even with the thirst of a fortnight, would not touch their water. For the same reason no ice had as yet formed on them, in spite of the minimum temperatures during our stay at the ruins having fallen as low as 45° below freezing point.

With the hoped-for supply from the springs north failing, our ice store was getting very low. Cases of illness among the men showed how exposure to the continuous icy blasts was telling on them. I myself was frequently shaken inwardly with recurring attacks of malarial fever brought from the Indian North-West Frontier. So it was just as well that by December 29, 1906, the exploration of all structural remains traceable was completed. The main camp in charge of the surveyor was sent back to Abdal with the "archæological proceeds," while I set out with a few men through the unexplored desert south-westwards. It was an interesting though trying tramp, which after seven days brought us safely to the ice of the Tarim lagoons. Progress was far more difficult than on the journey from Lop-nor, owing to the steadily increasing height of the ridges of drift sand we encountered. The curious erosion trenches forsook us just when they would have favoured progress in the intended direction. Also otherwise the desert crossed showed marked differences in its physical aspects. The ground, where not covered by the lines of high dunes running north to south, bore here, too, indications of having formed part of an ancient lake-bed. But the rows of dead trees so frequently met on the former route, and marking the banks of lagoons or river courses of a subsequent period, disappeared here soon. The resulting difficulty about fuel was a serious matter for us, considering that just then we experienced the lowest temperatures of the winter, down to 48° below freezing point. Curiously enough, relics of the Stone Age, including a fine jade axe, cropped up here too on the rare patches of eroded bare ground.

After surveying some localities of archæological interest on the lower Tarim and Charchan rivers, I hurried *via* Charklik to resume my excavations at Miran. This, too, was a very desolate spot situated at the foot of the absolutely barren gravel glacia which stretches down from the mountains towards the westernmost portion of the Lop-nor marches. The latter had probably within historical times receded fully 10 miles or so to the north of the position occupied by the ruins. But luckily a small stream which had once been used to irrigate the area, still passes within a few miles of the ruins. In the narrow jungle belt on its banks our hard-ried camels found such grazing as dead leaves of wild poplars and dry reeds can offer, and we ourselves were spared the usual anxieties about water transport. But none of our party is ever likely to forget the misery we endured during those three weeks of hard work from the icy gales almost always blowing. There

were days when all my assistants were on the sick-list with the exception of bright, alert Chiang-ssü-yieh.

But the results achieved offered ample reward to me. The ruined fort quite fulfilled the promise held out by the first experimental digging. The rooms and half-underground hovels which had sheltered its Tibetan garrison during the eighth to ninth century A.D. were rough enough in design and construction, but proved to contain in some respects the most remarkable refuse accumulations it has ever fallen to my lot to clear. Rubbish filled them in places to a height of 9 to 10 feet, and right down to the bottom the layers of refuse of all kinds left behind by the occupants yielded in profusion records on paper and wood, mostly in Tibetan, but some in a script which looks like *Kök-turki*, the earliest Turki writing. The total number rose in the end to close on a thousand. Similarly the remains of implements, articles of clothing, arms, etc., were abundant. Their condition, I am sorry to say, illustrated only too well the squalor in which these Tibetan braves must have passed their time at this forlorn frontier post. Evidence often of a very unsavoury kind seemed to indicate that the rooms which alone could have given shelter against the inclemencies of the climate, continued to be tenanted to the last, while the refuse accumulations on the floor kept steadily rising. In some places they actually reached up to the roofing. I have had occasion to acquire a rather extensive experience in clearing ancient rubbish heaps, and know how to diagnose them. But for intensity of absolute dirt and age-persisting "smelliness" I shall always put the rich "castings" of Tibetan warriors in the front rank.

There can be no doubt that the stronghold was intended to guard the direct route from the southern oases of the Tarim basin to Tun-huang (or Sha-chou). Like the branch previously mentioned as leading north of Lop-nor, this must have been a main line of communication into China from the last centuries B.C. onwards, and must have still grown in importance when the former became impracticable after the early centuries of our era. But older in date and of far wider interest were the art remains which we brought to light from the *débris* mounds of some Buddhist shrines surviving erosion in the vicinity of the fort. These must have been in ruins at least four centuries before the Tibetan occupation led to the erection of the fort. From one of them (Fig. 8) emerged remnants of colossal stucco reliefs, representing seated Buddhas, and showing in their modelling closest relation to Græco-Buddhist sculpture as developed in the extreme north-west of India during the first centuries of our era.

The influence of classical art was reflected with surprising directness in the much-damaged yet remarkable frescoes which covered what remains of the walls of two circular domed temples enclosing small Stupas. The paintings of the main frieze, on a background of Pompeian



FIG. 7.—REMAINS OF ANCIENT DWELLING ON ERODED CLAY TERRACE NEAR RUINED STUPA, ALTMISH-BULAK SITE.



FIG. 8.—BASE OF RUINED BUDDHIST SHRINE, MIRAN.

red, illustrating scenes of Buddhist legend or worship, showed the same clever adaptation of classical forms to Indian subjects and ideas which constitutes the chief characteristic and charm of Græco-Buddhist sculpture, but which in the pictorial art of that period can no longer be studied within Indian limits, owing to the destruction of all painted work through climatic vicissitudes. But even more interesting were the figures of the elaborate fresco dadoes. These were so thoroughly Western in conception and treatment that when they first emerged from the *débris* I felt tempted to believe myself rather among the ruins of some Roman villa in Syria or Asia Minor than those of Buddhist sanctuaries on the very confines of China proper. There were half-length figures of beautiful winged angels, and, more curious still, a cycle of youthful figures in a gracefully designed setting of garland-carrying *putti*, representing the varied pleasures of life. It was such a strange contrast to the weird desolation which now reigns in the desert around the ruins. Kharoshthi inscriptions painted by the side of some frescoes and pieces of silk streamers bearing legends in the same script indicate the third century A.D. as the approximate date when these temples were deserted. Unfortunately, the very confined space and the semi-Arctic weather conditions made photographic work very difficult, and what of frescoes we succeeded in safely removing still awaits unpacking.

After all the exposure undergone at Miran a week's halt at Abdal seemed pleasant, however humble the shelter which its reed huts offered, and however busy I was kept with packing my archaeological finds of the last four months. A large caravan entrusted to two veteran Turki servants, who had suffered too much to follow me further, was to take them back to Mr. Macartney's care at Kashgar. Then on February 21, 1907, I started on the long desert journey which was to take us from the dreary Lop-nor marshes right through to Tun-huang on the westernmost border of Kan-su and China proper. It was the same route by which Marco Polo had travelled "through the desert of Lob." Six centuries before him it had seen a traveller scarcely less great, Hsüan-tsang, the pilgrim of pious memory, returning to China laden with Buddhist relics and sacred books after many years' wanderings in the "Western Regions."

Ever since the end of the second century B.C., when the Chinese first brought the Tarim Basin under their political influence, this desolate desert track close on 350 miles in length had served as an important caravan route during successive periods, only to be forgotten again when Chinese power westwards weakened or a policy of rigid seclusion strangled trade. Some twenty-five years ago it had thus to be re-discovered. Mulla, the quaint honest Loplik who had helped me at Altmish-bulak and Miran, was one of the small party who guided a plucky Chinese official through. Captain Kozloff, to whose excellent pioneer work in the Pei-shan and westernmost Nan-shan it affords me special pleasure to bear testimony, had followed it in 1894, and since

then, just a year before me, also Colonel Bruce with Captain Layard. Now the rapidly rising tide of prosperity and commercial enterprise in the southern oases of Turkestan is bringing the route into favour again with traders from Khotan and Kashgar, but only during the winter months when the use of ice makes it possible to overcome the difficulties arising from the want of drinkable water at a succession of stages.

The seventeen long marches in which, with men and beasts now well broken to even more trying ground, we accomplished the desert journey, still ordinarily reckoned as in the days of Marco at twenty-eight stages, offered plentiful opportunities for interesting geographical observations. But of these only the briefest indication can be given here. After skirting for about one-third of the route the dreary shores of a vast salt-covered lake-bed marking the extent of the Lop-nor marshes at a relatively recent period, we found ourselves proceeding in a well-marked depression between the foot of the barren low hills of the Kuruk-tagh on the north and great ridges of steadily rising sand towards the snowy range of the Altun-tagh on the south. As we followed this depression, where in spite of low dunes water was easily reached by digging wells, we found that it gradually narrowed into a regular valley descending from the north-east. Our detailed survey clearly indicated that we had here the passage through which the waters of the Su-lai-ho and Tun-huang rivers had, at a period perhaps not so very remote, made their way down to Lop-nor. The geographical importance of this observation is obvious, seeing that the true easternmost limit of the great Turkestan basin is thus shifted from circ. 92° to circ. 99° of longitude. I may add here, in passing, that the close affinity shown by practically all physical features in the Tun-huang-Su-lai-ho drainage area to those of the eastern Tarim Basin fully agrees with this observation.

Where the valley just mentioned again expands east of the halting stage known from its little group of living poplars as Besh-toghrak, we came upon ground very puzzling at first sight. In a wide basin enclosed to the north by the sombre and absolutely sterile slopes of the Kuruk-tagh, and by high ranges of dunes on the south, we found a succession of unmistakable dry lake beds, and between and around them a perfect maze of high clay terraces remarkably steep. The lake-beds, salt-covered in parts, looked quite recent. Yet the lake shown as Khara-nor in the maps, where the Su-lai-ho and Tun-huang rivers were hitherto believed to end and from which alone water sufficient to fill this great basin could come, lay still more than a degree further to the east. The explanation was furnished two months later when, in the course of resumed surveys, we discovered that a considerable river flows out of the Khara-nor during the spring and summer floods, and after draining a series of smaller lakes and marshes lower down, carries its water right through to the lake beds we had passed so much further

west. The deep-cut bed of this river could easily escape discovery owing to the very deceptive way in which its course is masked by what looks an unbroken flat glacia of gravel.

After emerging from this terminal river basin and at a point still five long marches from the edge of the Tun-huang oasis, I first sighted remains of ruined watch-towers, and soon came upon traces of an ancient wall connecting them. A lucky chance rewarded already the first scraping of the ground near a watch-tower with relics of manifest antiquity, including a Chinese record on wood, and a variety of archaeological indications rapidly gathered as we passed onwards, made me feel convinced that these ruins belonged to an early system of frontier defence corresponding in character to the extant 'Great Wall' on the Kan-su border. So as soon as men and animals had recovered from the preceding fatigues by a short halt at Tun-huang, I returned to the still wintry desert in order to explore this ruined *limes* in detail. It proved a fascinating and fruitful task, but also one of uncommon difficulty. The ground over which the line of the wall ran was, from the old frontier town of An-hsi westwards, practically all an absolute desert of gravel, broken only at rare intervals by belts of sandy scrub or thin jungle near the river or marshes.

Nothing was known of the ruins to the magistrate and other educated Chinese officials of Tun-huang, who all took a very friendly interest in my work and would have been ready enough to help us. On the other hand, the deep-rooted secretiveness of the local Chinese population effectively prevented any of the hunters or shepherds who occasionally visit the nearer of the riverine jungles from coming forward with guidance. So all the tracking of the ancient wall, often completely effaced for miles, and frequently crossing most deceptive ground, had to be done by myself. Still more serious was the trouble about adequate labour for excavations. The slum-dwelling coolies, whom only exercise of special pressure on the magistrate's part could induce to venture into the dreaded desert, were, in spite of very liberal treatment, ever ready to desert—or else to get lost in the desert through their helplessness as confirmed opium smokers. Yet, by moving first to the north of the oasis, and subsequently striking the ancient *limes* by a new route right through the desert west of Tun-huang, we succeeded, in the course of two months, in accurately surveying its line all the way from An-hsi to its westernmost point, a distance of more than 150 miles, and in exploring the ruins of all watch-stations, sectional headquarters, etc., which adjoined it.

The fine massive watch-towers (Fig. 9), usually rising at intervals of 2 to 3 miles along the wall, were my best guides in tracking the line. Almost invariably I could trace near them ruins of the modest quarters which had sheltered the detachments écheloned along the wall. From the Chinese records, mostly on wood or bamboo, which the excavation of

almost every ruin yielded in plenty, I soon made certain with the scholarly help of my indefatigable Chinese secretary, Chiang-ssü-yieh, that this frontier-line dated back to the end of the second century B.C., when Chinese expansion into Central Asia first began under the emperor Wu-ti. Exactly dated documents commencing with the year 99 B.C. showed that the regular garrisoning of the border wall continued throughout the first century B.C., and probably for the greatest part of its length down to the middle of the second century A.D. But the outlying westernmost section appears to have been already abandoned earlier. The main purpose of this *limes* was undoubtedly to safeguard the territory south of the Su-lai-ho river, which was indispensable as a base and passage for the Chinese military forces, political missions, etc., sent to extend and consolidate Chinese power in the Tarim basin. It is equally certain that the enemy whose irruptions from the north had to be warded off were the Hsiong-nu, the ancestors of those Huns who some centuries later watered their horses on the Danube and Po. It is an important geographical fact, brought out by the very existence of this defensive line, that the desert hill region north of the Su-lai-ho marshes, now quite impracticable owing to the absence of water, must then still have been passable, at least for small raiding parties.

The very character of the ground through which the fortified frontier-line ran from An-hsi westwards, almost all of it already in ancient times a real desert, had presented exceptionally favourable conditions for the preservation of antiques. Whatever objects had once passed under the protection of a layer of gravel or *débris*, however thin, were practically safe in a soil which had seen but extremely scanty rainfall for the last two thousand years, was far removed from any chance of irrigation or other interference by human agency, and had suffered on its flat surface but rarely even from wind erosion.

So it was natural enough that the hundreds of inscribed pieces of wood, bamboo, silk, the remains of clothing, furniture, and equipment, etc., all the miscellaneous articles of antiquarian interest, which the successive occupants of these desolate posts had left behind as of no value, should have survived practically uninjured. Sometimes a mere scraping on the surface of what looked like an ordinary gravel slope adjoining the ruined watch-station sufficed to disclose rubbish heaps in which files of wooden records, thrown out from the office of some military commander before the time of Christ, lay amongst the most perishable materials, straw, bits of clothing, etc., all looking perfectly fresh. The Chinese documents, of which, including fragments, I recovered in the end over two thousand, refer mainly to matters of military administration, often giving details as to the strength, movements, etc., of the troops écheloned along the border; their commissariat, equipment, and the like. There are brief official reports and, more curious still, private letters addressed to officers full of quaint actualities, family news from their distant homes, etc.

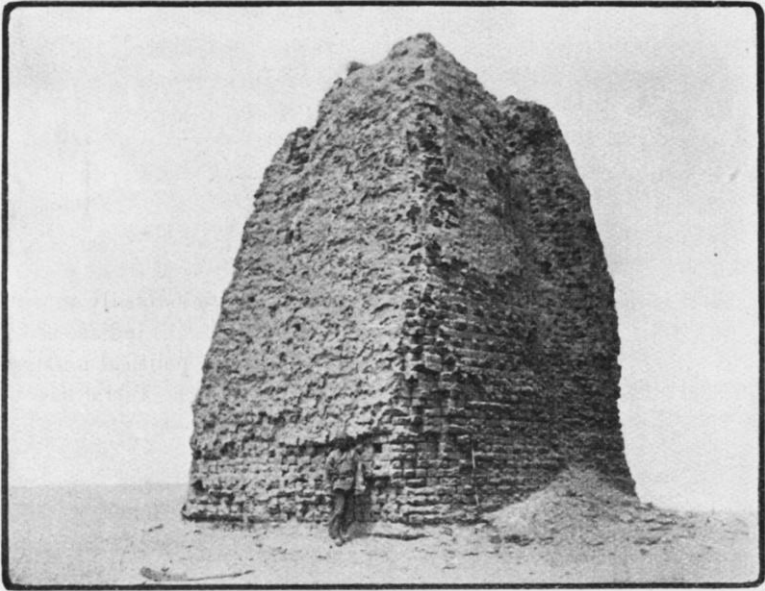


FIG. 9.—RUINED WATCH-TOWER ON ANCIENT FRONTIER-LINE IN DESERT WEST OF TUN-HUANG.

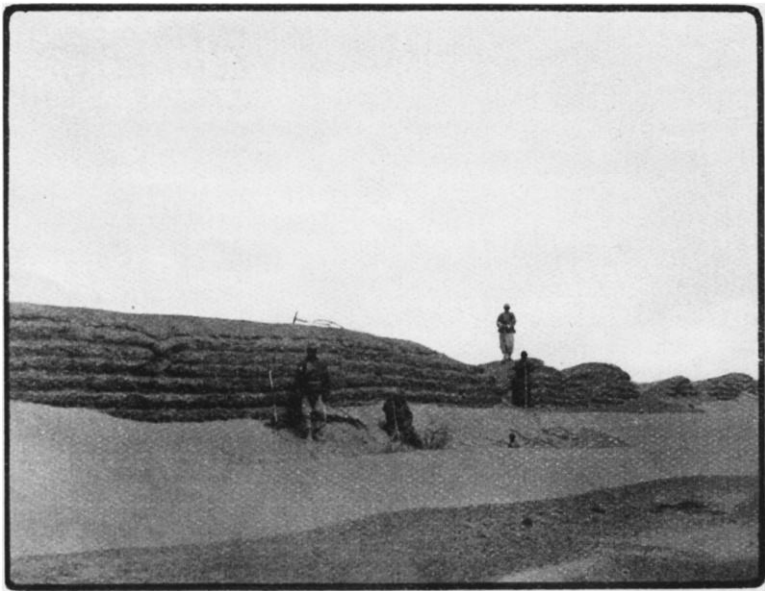


FIG. 10.—REMAINS OF ANCIENT FRONTIER WALL (BUILT AT CLOSE OF SECOND CENTURY B.C.) IN DESERT NORTH OF TUN-HUANG.

The careful study of these miscellaneous records, far older than any which have as yet in original come to light in Central Asia or China, together with that of the actual remains of quarters, furniture, arms, etc., will suffice to restore an accurate picture of the life led along this most desolate of borders. But in addition to this evidence I recovered very interesting relics of the traffic from the distant west, which once passed along the line guarded by the *limes* in the form of silk pieces inscribed with Indian Kharoshthi and Brahmi and in a number of letters on paper found carefully fastened, containing writing in an unknown script resembling Aramaic. Are these perhaps in some Iranian tongue, and were they left behind by some early traders from Persia or Western Turkestan coming for the silk of the distant *Seres*?

The construction of a regular defensive line across so extensive a stretch of desert, bare of all resources, must have been a difficult task, and it was interesting to find again and again evidence of the skill with which the old Chinese engineers had attacked it. Guided by a sharp eye for all topographical features, they had cleverly used the succession of salt marshes and lakes to supplement their line by these natural defences. For the wall itself they had had recourse to materials which, though of little apparent strength, were particularly adapted to local conditions, and have stood the stress of two thousand years, on the whole, remarkably well. Between layers of stamped gravel, about 1 foot high, they interposed carefully secured rows of fascines, about as high, made of neatly cut and strongly tied bundles of reeds, which were obtained from the marshes (Fig. 10). The salts contained everywhere in the soil and water soon gave to the strange rampart thus constructed a quasi-petrified consistency, which in such a region could well hold its own against man and nature—all forces, in fact, but that of slow grinding but almost incessant wind erosion.

Again and again I noted in the course of my surveys how well preserved the wall rose along those sections which lay parallel to the prevailing direction of the winds, while where the line lay across it and in any way barred the progress of driving sand, wind erosion had badly breached or completely effaced the rampart. The winds which now blow over this desert with remarkable violence and persistence come mainly from the east and north-east. The observation derives additional importance from the fact that those winds make their effect felt even far away in the Tarim basin, as I have had ample occasion to observe in the climatic conditions and surface formations about Lop-nor. The extent and character of the damage which the various sections of the wall have suffered prove that the same conditions must have prevailed for the last two thousand years. "Aspiration," due to the higher temperatures which the atmosphere of the low-lying desert around and west of Lop-nor must generally attain as compared with the great plateaus

of stone and gravel which rise on either side of the Su-lai-ho depression, suggests a likely explanation.

The wall shows everywhere a uniform thickness of 8 feet, and still rises in places to over 10 feet. But that its builders knew how to make greater efforts where needed in spite of all difficulties about labour, materials, etc., is proved by the watch-towers, which are ordinarily built of sun-dried bricks of considerable strength, rising in one solid square mass to heights of 30 feet or more. One small fort, marking probably the position of the gate station of Yü-mên, long vainly sought for by Chinese antiquaries, at a period when its original position at the westernmost extension of the wall had already been abandoned, about the commencement of our era, showed high and solid walls of stamped clay fully 15 feet thick. Still more imposing is a solid block of halls nearly 500 feet long and with walls of 6 feet thickness still rising to 25 feet or so, which at first puzzled me greatly by its palace like look and dimensions, until finds of dated records of the first century B.C. near by proved that it had been constructed as a great magazine for the troops garrisoning the line or passing along it (Fig. 11).

(To be continued.)

THE LONGITUDINAL SECTION OF THE NILE.*

By Captain H. G. LYONS, F.R.S., F.R.G.S.

THE reopening of the Sudan after the capture of Omdurman and the defeat of the Dervish army in 1899 enabled the detailed investigation of the Upper Nile and its tributaries to be commenced, and it has been diligently prosecuted for the last eight or nine years. Our knowledge of the geography of the Nile basin has been greatly increased thereby, and the regimen of the main stream and of each of its tributaries has now been elucidated, although there are many points of detail which will repay further study.

The yearly increasing demands of the cultivator in the Nile valley and the Delta have led to the preparation of several projects for increasing the available water-supply during the early summer months, when the cotton crop requires to be regularly watered. The first step in this direction was the completion of the Delta barrage, 12 miles north of Cairo, which enables the river to be maintained at such a level as will supply the main canals of the Delta; the second was the construction of the dam at Aswan (1898-1902), by which some 80 kilometres (50 miles) of the Nile valley in Lower Nubia were converted into a reservoir from January to June, in which the water of November and December, which is surplus to the needs of the country at that season, is stored to augment

* Map, p. 120.