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INNERMOST ASIA: ITS GEOGRAPHY AS A FACTOR IN HISTORY

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The First "Asia Lecture."

Delivered at the Meeting of the Society, 3 November 1924. *Map of the Lop Desert follows p.* 472. *The general map will be published with the second part of the lecture in the June Journal.*

IT was last spring, in the course of a holiday wandering through Northern Syria, that I received the letter conveying your Council's kind invitation to deliver the first of those lectures on Asia which a benefactor of the Royal Geographical Society has endowed. I was much gratified by the distinction, but at the same time somewhat embarrassed. On previous occasions during the last twenty-two years when I had the privilege of addressing you, it was my good fortune each time to give you an account, condensed indeed, yet, I hope, not too dry like some familiar "extracts," of a journey of exploration successfully accomplished. Each of them had taken me into that great region of drifting sands, bare wind-eroded steppes, and barren mountain ranges which may in its present condition well be called the dead heart of Asia. This time I do not enjoy the good fortune of being able to tell you of fresh travels and discoveries made there. The abundant harvest of surveys, geographical observations, and archæological "finds" I had brought back from my third Central-Asian expedition was, alas, bound to exact its penalty in the shape of years of labour at the desk, such as the publication of adequate records demands. This duty to research, together with the sad realities of present Eastern politics which bar access for me to my lifelong goal across the Indian North-West frontier, has denied me since 1916 the eagerly desired chance of another Central-Asian expedition. Yet my thoughts, whether in the condensed humanity of London, or in the peaceful solitude of my Kashmir mountain camp, never cease to turn to scenes of past work in that vast desert region of innermost Asia.

This may suffice from a personal point of view to explain the choice of subject I have made for my lecture to-night. But it may be justified even more by the appeal which that region must make both to the geo-

grapher and to the historical student. That region is singularly fitted to illustrate on the one hand how geographical features may invest even the least attractive parts of our globe with very real importance for the history of civilization, and on the other hand to show how helpful the evidence of the traces left on such ground by past human activity can be for throwing light on various aspects of much-discussed physical changes.*

The region to which I wish to take you to-night may be roughly described as comprising those vast basins, elevated and drainageless, which extend from east to west almost halfway across the central belt of Asia. Their longitudinal rim is well defined by the big rampart of the Tien Shan, the " Celestial Mountains," in the north and the snowy Kunlun ranges in the south which divide those basins from Tibet.† The eastern border of the region may be placed where the Nan Shan, itself a continuation of the Kunlun, forms the watershed towards the drainage area of the Pacific Ocean. In the west it abuts on the mighty mountain mass of the Pamirs, the *Imaos* of the ancients, which joins the Tien Shan to the Hindu Kush and on its western flanks gives rise to the headwaters of the Oxus.

If you look at the map which is put before you on the screen it might well seem as if this vast region of which I have just indicated the borders in the broadest of outlines, had been intended by nature far more to serve as a barrier between the lands which have given to our globe its great civilizations than to facilitate the exchange of their cultural influences. For within this area, measuring some 1500 miles in a direct line from east to west and close on 600 miles from north to south where it is widest, the ground capable of settled life is strictly limited to strings of oases, and of them only a few in the extreme west and east offer enough arable soil to support a population of some size. The rest of this area is occupied by huge stretches of desert. Whether they extend over high mountain ranges, or wide barren belts of foothills with their gravel

* For essential details of the topography of this great region reference may be made to the maps of 'Chinese Turkistan and Kansu, from surveys made during the explorations of Sir Aurel Stein, 1900–01, 1906–08, 1913–15,' published by the Survey of India, 47 sheets, scale 1 : 500,000, 1918–22.

In my 'Memoir on Maps of Chinese Turkistan and Kansu' (Trigonometrical Survey Office, Dehra Dun, 1923), chapter ii., I have briefly discussed the chief physical features determining the geographical character of the several main divisions of this region.

For archæological facts illustrating the cultural past of this region, as well as for observations on its historical geography and ancient civilization, see my detailed reports, 'Ancient Khotan,' 1907; 'Serindia,' 1921 (Clarendon Press, Oxford).

† An endeavour has been made in this paper and the two maps intended to illustrate it to spell all local names according to the latest decisions of the Permanent Committee on Geographical Names.

Chinese local names are spelt as in the Chinese Postal Guide; other Chinese names have been spelt according to the Wade system of transcription.

glacis, or over plains overrun by moving sands, these deserts are almost everywhere devoid of water.

It is this extreme deficiency of water which invests by far the greatest portion of the area we are considering with the character of what I may call " true desert." Let me lay stress on the word " true " in this expression in order to make it quite clear that the ground over which I shall have to ask you to follow me to-night in tracing historical movements, differs greatly indeed from those deserts with which biblical stories, descriptions of Arabian or South African scenery, and the like have made many of us familiar in a certain sense. These " tame deserts," as I should venture to call them for the sake of distinction, may indeed impress the town dweller, especially if he comes from our centres of congested humanity, with their sense of solitude, emptiness, and, let me add, peace. But deserts in which whole tribes can wander about for long periods sure to find water and grazing for their flocks, at least at certain regular seasons, deserts in which populations driven out from their seats or harassed by foes can safely seek refuge for a time, are not such as face us in most parts of the huge basin between the Celestial Mountains and the Kunlun.

By far the greater part of this basin is filled by the dune-covered Taklamakan and the wastes of hard salt crust or wind-eroded clay of the Lop Desert which stretch almost unbroken for a total length of over 800 miles from west to east. In them the absence of moisture bans not only human existence but practically also all animal and plant life. Conditions are almost as forbidding in the high mountains and plateaus of the Kunlun. There vegetation is to be found only at great elevations where the proximity of glaciers provides moisture and allows vegetation to grow for a few months in the year under quasi-arctic conditions, or else in the extremely confined space which the streams fed by those glaciers leave at the bottom of deep-cut narrow gorges. It is solely to the water carried down by these streams that the oases scattered along the edges of this and the basins adjoining eastwards owe their existence ; for nowhere is cultivation of any kind possible unless irrigation is provided by canals. It is, of course, clear that the almost total absence of atmospheric moisture which such conditions imply directly results from the geographical position of the basins. A glance at the map is enough to show us how vast the distances are which separate them on all sides from the seas and their life-giving vapours.

Where nature has been so stingy with those gifts which create resources for human existence and favour close occupation, it is obvious that the ground, however extensive, and however important for the great historical movements it has witnessed, can offer but little scenic attraction by diversity of natural features. I wish I possessed the gift of making, by a few striking word-pictures, those who now hear me visualize all the essential aspects of those barren regions through or along which there

moved for centuries the currents of trade, conquest, and cultural intercourse linking the Far East with the West and with India. But this gift, so graphically displayed in a great poet's scenic descriptions for a drama dealing with momentous historical events—I think of Thomas Hardy's *Dynasts*—is not within my reach. So I must be content to give you a summary survey, a bird's-eye view as it were, of the several zones into which that great region is divided by main geographical features, and to hope that slides, all of them brought back fron my journeys, will to some extent help to enliven them.

It will be best to start on our rapid survey from the west, not merely because it was from that side that the earliest influence of the classical world, of India and of Persia passed into innermost Asia and thence into China, but also because the mountain barrier to be crossed there has attracted more interest among us than the rest of the encircling ranges. I mean the great meridional range which from the series of high open valleys adjoining it westwards may conveniently be referred to as that of the Pamirs. It joins the Tien Shan on the north to the ice-clad Hindu Kush on the south, and was known already to the Ancients by the name of *Imaos*. Ptolemy in his Geography quite correctly describes it as the range dividing the two Scythias, *intra* and *extra Imaon*. These terms closely correspond to the Inner and Outer Tartary of our grandfathers' geography and to the more appropriate ones of Russian Turkistan and Chinese Turkistan of our own. On this range lies the watershed between the drainage areas of the Oxus and the Tarim rivers, and this watershed has been rightly enough accepted in practice (though scarcely in a formal diplomatic way) as the frontier between Russian and Chinese territory on these inhospitable high uplands. But it is of interest to observe that the line of greatest elevations, culminating in the ice-clad dome of Muz Tagh Ata (24,388 feet; Pl. 1) and in the still higher chain of Qungur, with one if not two peaks rising well over 25,000 feet, stretches to the east of the watershed.

To the high plateau-like valleys of the Pamirs which extend to the west of this line and for the most part are drained by the headwaters of the Oxus and its main tributaries, it is unnecessary to make more than passing reference; for all their geographical and historical aspects have been long ago analysed in a masterly publication of your late President, Lord Curzon. Nor do those bleak uplands properly fall within the limits of the region which concerns us here. Only to two points may special attention be called here. One is the very slight amount of precipitation which those bleak uplands receive. It explains their continuous occupation all through the year by small scattered camps of nomadic Qirghiz, notwithstanding their great elevation between *circ.* 11,000 and 13,000 feet and the rigorous climatic conditions. It stands out in conspicuous contrast to the great extent of the glaciation to be found on the previously mentioned line of high peaks. We shall have occasion to note the same

1. MUZ TAGH ATA PEAKS, SEEN FROM SOUTHERN SHORE OF LITTLE QARA KOL

2 KUNLUN RANGE, WITH GLACIERS ABOVE QASH VALLEY,
SEEN FROM BRINJAK PASS, S. OF KHOTAN

3. LOOKING S. ACROSS UPPER SULO HO VALLEY TOWARDS SNOW RANGE N. OF QARA NOR, CENTRAL NAN SHAN

4. ERODED RANGES OF OUTER KUNLUN, LOOKING N.W. FROM ABOVE YAGAN DAVAN, S. OF KHOTAN

curious contrast in the case of the northernmost Kunlun range and to consider an interesting question of climatic change that it raises.

The other point concerns the lines of communication which lead through or past the Pamirs into the Tarim basin. Importance attaches to these, as they must be assumed to have served in ancient times as arteries for the trade and cultural relations which linked the Tarim basin with the Oxus region. This comprised Bactria and Sogdiana, great flourishing territories occupied from an early period by Iranian populations and permeated by influences both from the Hellenistic Near East and from Buddhist India. Though the general east-to-west direction of all the Pamir valleys would seem distinctly to favour their use for such intercourse, yet geographical conditions make it clear that only two routes could lay claim to serious importance in this respect.

One of them lies to the south, leading from Badakhshan up the open valley of Wakhan to the head of the true main feeder of the Oxus. Thence it crosses either by the Wakhjir Pass or the passes approached over the Little Pamir, into the habitable portion of Sariqol, south of Muz Tagh Ata. From Tash Qurghan, which I have proved to have been already in ancient times the capital of this small mountain territory of Sariqol, the Hopanto of the Chinese, difficult tracks through very confined gorges in the main chain of the great meridional range lead down to the utterly barren foothills on the side of the Tarim basin, and so on to the oases of Kashgar and Yarkand. It is this southern route up the main Oxus and through Sariqol which Marco Polo followed on his ever-memorable journey to Cathay in 1273. Before him it had served Hsüan-tsang, the great Buddhist pilgrim whom I am accustomed to claim as my patron saint, when he returned to his Chinese home A.D. 644, laden with sacred Buddhist texts and relics after seventeen years' travels in India and the adjoining lands. In 1603 it saw again a pious traveller, in the person of Benedict Goës, the Jesuit lay brother. He had set out from India "to seek Cathay," and after spending years on his way "found heaven" instead and rest from all earthly troubles when reaching Suchow on the borders of true China.

But far more important for trade was the northern route which started from that ancient centre of Bactra, corresponding to the modern Balkh. It ascended the Qizil Su or Surkh Ab to the big Pamir-like valley of the Alai, and thence crossed the saddle above Irkeshtam to the headwaters of the river of Kashgar and thus down to the oasis itself. This route, of which in 1915 I was able to follow considerable portions both on the Russian Pamirs and through the Qarategin hills of Bukhara, offers particular interest to the student of the historical geography of Central Asia; for the researches of two great scholars, both closely connected with this Society, Sir Henry Rawlinson and Sir Henry Yule, have made it certain that it corresponds to the road which, as Ptolemy in his Geography tells us, was used by the ancient caravans once bringing

the silk of the Seres, *i.e.* of the Chinese, down to the Oxus basin and the great city of Bactra.

Ptolemy derives his account of this ancient trade route from his predecessor, the Greek geographer Marinus of Tyre, who himself had drawn his information from the "agents of Maës the Macedonian," men actually engaged in the silk trade with far-away China about the first century of our era. It is a most interesting glimpse of those early commercial relations which brought Syria and other parts of Western Asia permeated by Hellenistic civilization into contact with the silk-producing Far East. This contact, as we shall presently see, was a direct sequel of the events which caused Chinese trade, political control, and military power to expand into the Tarim basin after the end of the second century B.C. It accounts for the remarkable part which this basin has played for close on a thousand years as the main channel for the interchange of cultural influences between China, India, and the Near East.

If we follow eastwards the routes just briefly sketched or their few possible but distinctly more difficult variations, we reach through tortuous arid gorges (Pl. 7, 10) the western margin of the huge trough, appropriately known as the Tarim basin. Before we proceed to visit the great drift-sand desert of the Taklamakan which fills most of it, we may pass in rapid strides along the big mountain chains enclosing this basin; for were it not for the water which their glaciers send down into it and which the Tarim river gathers before it gets dried up in the Lop Nor marshes, the whole of this vast area would be barred to life.

On the southern flank of the basin there extends in an unbroken line the mighty mountain rampart of the Kunlun. Starting from the side of the Pamirs we find it buttressing, as it were, in several high parallel ranges the great glacier-clad watershed which the Karakoram forms towards the Indus drainage. Through them they have cut their way the Yarkand river and its tributaries, the main feeders of the Tarim. What grazing there is to be found high up at the heads of their valleys is of the scantiest kind and barely suffices for the flocks of a few scattered Qirghiz camps. The routes which lead up these valleys, like those further east crossing the outermost snowy range above the little oases of Kilian and Sanju, all converge upon the Karakoram pass. Some 18,600 feet above sea-level, it is the only practicable line of communication giving access to Ladakh and the uppermost Indus valley. The great elevation of the pass and still more the difficulties of transport implied by the utter barrenness of the high plateaus over which it is approached, sufficiently explain why this route, until its quasi-artificial fostering through political conditions in quite recent times, has never been of much importance for trade or any other relations between the Tarim basin and India.

Further to the east the Kunlun raises a practically impenetrable barrier to traffic of any sort (Pl. 2). The two rivers watering the Khotan

oasis, the Qara Qash and Yurung Qash rivers, break indeed through the northernmost main range (Pl. 9), which maintains from here onwards a crestline of close on 20,000 feet for a distance of at least 300 miles. But their passage lies largely in extremely deep-cut and for the most part quite inaccessible gorges (Pl. 5, 6). Even where less confined ground can be gained at the head of their valleys, the extremely rugged character of the northern slopes of the glacier-clad range would suffice to close the way to any but expert mountaineers. The explorations carried out by me at the head-waters of the Khotan rivers in 1900 and again in 1906–8 sufficed to show the formidable nature of the obstacles to human intercourse raised here by the Kunlun. But quite as great a barrier is represented by the utter want of resources on the drainageless Tibetan plateaus, 15,000 to 16,000 feet in height on the average, which adjoin and extend for many marches to the south (Pl. 8). Bare of grazing, fuel, and in many places even of drinkable water, these desolate high plateaus effectively close access to the Tarim basin even where the configuration of the range allows difficult tracks to pass through, as above the hamlet of Polur.

Very different in character and yet almost as forbidding and barren is the aspect which the outer slopes of the Kunlun present above the Khotan section of the basin. Here by the side of wide loess-covered peneplains we find areas where a perfect maze of steeply serrated ridges and deep-cut gorges has been produced by erosion (Pl. 4). It can only be due to prolonged water action. Yet only on rare occasions do these barren slopes, unprotected by vegetation, receive any heavy rain or snow fall. But when it does come the great aridity of the climate helps to make its erosive force all the more effective.

To the east of the glacier-girt high ground where the sources of the Yurung Qash river rise, the chain overlooking the Tarim basin takes for over 400 miles a trend to the north-east. Its character does not essentially change here ; but its width and height are somewhat reduced, and the elevated Tibetan plateaus approach it closer from the south. Throughout the whole length of the chain the foot of its northern slopes is formed by a glacis of piedmont gravel, attaining in parts a width of 40 miles and more and everywhere utterly barren. Of the rivers which descend from the chain east of Khotan those of Keriya and Charchan alone carry their water at all seasons across this bare thirsty belt of gravel.

This north-eastern bearing of the outermost Kunlun range ends approximately to the south of the point where the terminal course of the Tarim turns and dies away in the marshes of Lop Nor. From here onwards the mountain rampart hedging in the great basin resumes an easterly bearing and sinks lower. This and the approach from the south-east of the high grazing grounds of the Chimen Tagh and of Tsaidam receiving more moisture from across Tibet account for some routes debouching here towards Lop Nor and the terminal Tarim. Though Lhasa is over

700 miles away from the little oasis of Charkhliq, corresponding to the ancient *Shanshan* of the Chinese and now practically the only permanent settlement in this part of the Tarim basin, there is reason to believe that those routes had at times served for Tibetan invasions from the south and for nomadic inroads also. Whatever life-giving moisture the high valleys and plateaus towards Tibet and Tsaidam may receive, whether from monsoon currents passing across India or from the side of the Pacific Ocean, it certainly does not penetrate to the extremity of the Tarim basin north of this part of the encircling range. A wide and utterly barren glacis, of bare gravel in parts, elsewhere overlain by big ridges of drift sand, stretches down here to that huge waste of hard salt crust which marks the dried-up bed of the ancient Lop sea. To this we shall have occasion to return later.

At its extreme eastern end this dried-up sea-bed is closely approached by the depression which contains the terminal course of the Sulo Ho river and the marshes fed by it. My explorations, I believe, have shown that this drainageless basin of the Sulo Ho at a geologically recent period communicated with that of the Tarim. Along its southern rim there extends the Altin Tagh, as the outermost Kunlun overlooking the Lop tract is known to the people of Charkhliq, until it imperceptibly merges in the Nan Shan, the " southern mountains " of the Chinese. What exactly the morphological relation between the Nan Shan and the Kunlun system is need not concern us here. It is sufficient for us to realize that the part played by the Nan Shan with regard to the drainageless basins which continue the line of the Tarim basin eastwards is just the same as that of the Kunlun where it flanks the latter. In the western portion where the Nan Shan overlooks the Sulo Ho trough for over 200 miles from the river's terminal marshes to its great southward bend near the oasis of Yümensien, its northern slopes with their aridity and far advanced erosion closely reproduce physical features already familiar to us from the Kunlun. But there is a marked division into successive parallel ranges, each growing higher as we move south, and though the southernmost of those surveyed by us rises to peaks about 20,000 feet in height, access through them to the open uplands beyond is easier than in the Kunlun.

On passing east of the Sulo Ho trough into the central portion of the Nan Shan evidence of a climate far moister manifests itself in an increasingly striking manner. It indicates approach to the vicinity of the Pacific drainage area which along the Hwang Ho or Yellow River extends to the adjoining parts of the Kansu province and to the north-eastern uplands of Tibet. Favoured by the moisture which air currents from the Pacific Ocean carry up at different seasons of the year, abundant vegetation clothes the valleys from the westernmost limits of the Suchow river's drainage (Pl. 12, 15). To eyes accustomed to the barrenness of the Kunlun it is an impressive experience to see the excellent summer

grazing offered by the open Pamir-like valleys at the headwaters of that and the Kanchow river, notwithstanding the great elevation, in parts well over 11,000 feet (Pl. 3). Still further to the south-east increasing snow and rainfall permits of plentiful forest growth in the valleys drained by the Kanchow river in the northernmost range of the Nan Shan (Pl. 11).

Here we have arrived close to the watershed of the region which the Hwang Ho drains into the Pacific Ocean, and thus to the eastward border of that wide belt of innermost Asia with which we are dealing. This is strikingly brought home to us by the fact that from the edge of the Kanchow oasis eastwards climatic conditions along the fertile foot of the Nan Shan permit of cultivation being carried on without irrigation and dependent on rain and snowfall only. But none of this moisture reaches the ocean; for the Etsin Gol, which unites all the drainage from the northern slopes of the Central Nan Shan, finds its end in marshy lake-beds surrounded by the "Gobi" of Southern Mongolia and closely corresponding in character to the terminal basins of the Tarim and Sulo Ho.

From here we must turn back in order to complete our circuit of the mountains westwards. At first we may safely do it at a somewhat accelerated rate, for the uniformity of the desert hills which extend along the northern rim of the two easterly drainageless areas just referred to, and conveniently designated as the Etsin Gol and Sulo Ho basins, is quite as marked as their insignificance when compared with the imposing snowy rampart of the Nan Shan. There is little to say of the low and utterly barren hill chains which stretch north of the terrace-like belt occupied by the oases at the foot of the Central Nan Shan. They probably attach themselves to the system of the Ala Shan, which further east abuts on the Hwang Ho. Even where they are highest, near Kanchow, they rise only some 5000 feet or so above the level of the oasis. They could never in historical times have formed a serious barrier against nomadic inroads from Mongolia except by their aridity. Even in this respect their value is bound to have been much impaired by the convenient high-road which the terminal course of the Etsin Gol with its riverine belt of grazing-grounds has at all periods offered for invasion.

It is different with the great desert area extending westwards from the Etsin Gol and comprising the barren ranges and plateaus of the Pei Shan (the "Northern Mountains"). With its southern edge it stretches along the whole length of the Sulo Ho basin to about 93° E. long. There it merges in the equally arid hill chains known by the Turki name of Quruq Tagh, the "Dry Mountains." These continue the great belt of ground incapable of settled life or even nomadic occupation for another 400 miles or so westwards, all along the dried-up Lop sea-bed and right away to the Konche Darya below Qara Shahr. Pei Shan and Quruq Tagh in conjunction form a barrier nowhere from north to south less than

200 miles wide between the nearest places where cultivation is possible nowadays. Considerable portions of this vast stony "Gobi" still remain unexplored.

In the eastern and western portions of this "Gobi" brackish wells or springs can be found at rare intervals in the depressions between the greatly decayed ranges, and thus render a crossing there practicable for small parties at one time. This is the case along the *soi-disant* "road" by which the Chinese maintain communication between Ansi on the Sulo Ho and the Hami oasis at the foot of the easternmost Tien Shan. A very limited amount of grazing on reeds or scrub is ordinarily to be found at such points. But even here neither nomadic occupation nor large migrations were ever possible during historical times. Still less was this the case in the central portion of this lifeless desert. Between the 90th and 93rd degrees of longitude it has been proved by Dr. Sven Hedin's and my own explorations to be completely waterless. Violent winds, mainly from the north-east and icy even late in the spring, blow across this whole region at frequent intervals and cause its crossing to be dreaded by wayfarers.

It is to the east of the Hami oasis that there starts the great mountain chain of the Tien Shan which extends unbroken westwards far beyond the Tarim basin and throughout forms its northern rampart. It varies considerably in its height and width, but everywhere constitutes a strongly marked dividing line in climate and all that depends upon it between that great basin and the regions adjoining northward. These comprise the wide plateaus of Dzungaria, stretching to the north as far as the Altai mountains and southernmost Siberia, as well as great fertile valleys like those of the Ili and Narin, capable everywhere of cultivation or else affording rich grazing like those of the famous Yulduz and Tekkes. However much these tracts may differ among themselves, a distinctly moister climate prevails throughout along the northern slopes of the main Tien Shan. Grazing is to be found there both in plains and valleys, and this has at all times attracted waves of nomadic nations, from the Huns to the Turks and Mongols.

We are not for the present concerned with these migrations and the important bearing they had upon the history of the settled population occupying the oases in the basins to the south. Nor need I attempt here to sketch the orography, even in outlines, of the "Celestial Mountains," distinctly more varied and complicated than that of the northernmost Kunlun; for apart from the fact that my personal acquaintance with them is limited to certain portions chiefly in the east, it will be easier to appreciate the way in which their physical configuration has affected the historical past of the Tarim basin and its adjuncts, after we have passed in rapid review the chief phases in the history of the latter. Certain essential points, however, should be noticed here.

One of these is connected with the fact that the average elevation of the

Tien Shan along its crest line, except around the culminating massif of Khan Tengri (23,600 feet above sea-level), is distinctly lower than that of the Kunlun to the south of the Tarim basin. It consequently does not favour to the same extent the accumulation of reserves of moisture in the shape of glaciers and perpetual snow-beds. At first sight this might lead us to conclude that the amount of the water-supply which the range could assure to the arid tracts in the basin to the south would be reduced in consequence. This, however, is not the case except for short distances to the east and west of the Turfan depression, where at the saddles of Tashihto (*circa* 5300 feet) and Tapancheng (*circa* 3500 feet) the Tien Shan range sinks to its lowest points; for the effect of lesser altitude is balanced by the higher latitude. Of even greater importance is the fact that the atmospheric moisture coming from the side of Siberia is not liable to be intercepted here as in the case of the Kunlun by huge Himalayan ranges and high Tibetan plateaus. This all-important advantage of adequate rain and snowfall is strikingly demonstrated by the fine growth of conifer forest to be found all along the northern slopes of the main Tien Shan up to elevations between 7000 and 8000 feet (Pl. 13), and even in some high valleys to the south of it. It also accounts for the very considerable volume of water which the rivers of Qara Shahr, Kucha, and Aq Su carry down into the Tarim basin at all seasons.

Another point to be noted here has a direct bearing upon the historical past of the Tarim basin and of the old road which, stretching along the southern foot of the Tien Shan, connects it with the westernmost marches of China. I mean the opportunities which the Tien Shan range, notwithstanding the continuity of its rampart, offers to nomadic neighbours on the north for plundering inroads upon the oases and trade routes in the south. These opportunities are due to the mountain rampart being pierced at intervals by passes practicable during a considerable portion of the year for mounted men and transport. Starting from the east we find that the high Qarliq Tagh, the "Snowy Mountains" at the extremity of the chain, is adjoined westwards by the pass known as Barköl Daban of only a little over 9000 feet elevation. It is practicable for horses and camels for at least seven months in the year, and its use must have been particularly convenient for raids upon the Hami oasis (Pl. 14), the keystone, as it were, of the old trade route just referred to. We know from the Chinese Annals that the great Barköl valley to the north was during centuries a favourite haunt for Hun tribes and their nomadic successors. Beyond on both flanks of the great snowy massif of Bogdo Ula the range is crossed with ease over the two previously named low saddles of Tashihto and Tapancheng, which give access to that remarkable depression of Turfan with its fertile oases, situated below the level of the sea.

Passing on to the south-west of Turfan through an arid outlier of

the Tien Shan, the same main trade route brings us to the debouchure of the wide Qara Shahr valley. This descends straight from the high grazing plateaus of Yulduz, and has thus at all times served as an open gate for nomadic inroads into the north-eastern corner of the Tarim basin. Further to the west, too, the important oasis of Kucha lies exposed to attacks across the Tien Shan from the grazing-grounds of Yulduz and Tekkes. Similarly the cultivated tracts around Aqsu and up the open valley of the Taushqan Darya can be reached without serious difficulties over the Bedel and other passes leading down from rich Alpine grazing-grounds above the Issiq Köl lake. Finally we note corresponding conditions of liability to attack across the Tien Shan in the case of Kashgar, both the Terek and Turug Art passes offering access to that great oasis almost right through the year.

Here we have completed the circuit of the mountain barriers which enclose the Tarim basin. We may now turn to a summary survey of the basin itself. Of its vast dimension an adequate idea may be gained from the fact that from the plain around Kashgar to the easternmost inlet of the dried-up ancient Lop sea it stretches over a direct distance of some 900 miles. Its greatest width from the alluvial fan of Kucha to the foot of the gravel glacis of the Kunlun south of Niya is fully 330 miles. Vast as these dimensions are, the uniformity of the prevailing conditions makes it easy to take a bird's-eye view of the several zones represented in this basin and to describe them briefly. By far the greatest among them comprises the huge central desert of bare sand-dunes which is popularly known as the *Taklamakan*, a modern Turki designation convenient if vague in its application.

Its borders to the west, north, and east are marked by the belts of vegetation accompanying the Tiznaf, the Yarkand, and the Tarim rivers. To the south the border of the Taklamakan lies along the northern end of the oases, mostly small, found at intervals along the foot of the gravel glacis of the Kunlun from Qarghaliq to Niya. Further east their line is continued by patches of sandy jungle intermittently watered by streams of small size or subsisting on scanty subsoil drainage. These patches of quasi-tame desert extend below the gravel glacis as far as the debouchure of the Charchan river. Thence the narrow belt of vegetation accompanying this river forms the border of the Taklamakan right down to its junction near Lop Nor with the dying Tarim. There are considerable outliers of the dune-covered area to be found in several places beyond these riverine borders. Of these it will suffice to mention the moving sands of Ordam Padshah, beyond the left bank of the Yarkand river, and the big triangular area filled by high sand-ridges between the terminal Tarim course and the western shores of the dried-up Lop sea-bed.

Not one of the numerous rivers descending from the snowy Kunlun succeeds in making its way through the Taklamakan, except the Khotan river, and that too only during a few summer months. All the rest are

5. VIEW DOWN HEAD GORGE OF YURUNG QASH RIVER, FROM BELOW KANGRE CHIMLIK (CIRC. 15,000 FEET)

6. VIEW DOWN GORGE OF YURUNG QASH RIVER, FROM NEAR QOSHLASH LANGAR

7. QARA TASH RIVER GORGE, WITH BRIDGE BELOW PITLIK AGHZI

8. GLACIERS OVERLOOKING THE BASIN OF THE KERIYA RIVER SOURCES. KUNLUN

9. VIEW FROM QARA KIR SPUR ACROSS YURUNG QASH RIVER GORGE TOWARDS KUNLUN WATERSHED
Below, a short bend of river is just visible

10. VIEW DOWN TANGITAR GORGE FROM TAR BASHI ON ROUTE FROM SARIQOL TO YARKAND

lost in this " sea of sand " (Pl. 18) at a greater or lesser distance from the line occupied by the oases or the areas of desert vegetation which they adjoin. But within historical times a number of these terminal river-courses carried a greater volume of water, and hence permitted ground to be cultivated lying considerably further north than the corresponding " terminal oases " of the present day. This is conclusively proved by the ancient sites which I explored in the Taklamakan to the north-east of Khotan.

These explorations have familiarized me with the uniformity prevailing in the character of this huge desert, probably the most formidable of all the dune-covered wastes of this globe. Whether the traveller enters it from the edge of cultivated ground in the oases or from the jungle belts previously referred to, he first passes through a zone with desert vegetation, mostly in the shape of tamarisks, wild poplars or reeds, surviving amidst low drift sand. A very peculiar and interesting feature of this zone consists of " tamarisk-cones," hillocks of conical form and often closely packed together (Pl. 32). The slow but constant accumulation of drift-sand around tamarisk growth, at first quite low, has in the course of centuries built them up to heights reaching fifty feet or more. Further out in the Taklamakan there emerge from the dunes only shrivelled and bleached trunks of trees, dead for ages (Pl. 17), or sand-cones with tamarisk growth from which life has departed even at their top. These too finally disappear among utterly bare accumulations of sand, in places heaped up into ridges rising 300 feet or more above the bottom of the valley-like depressions between them.

While the shape of individual dunes and especially of those on the crest conforms to the prevailing wind direction, the big hill-like ridges or " Davans " (Pl. 19) to be met with at intervals seem generally to stretch parallel to those river-beds which lie nearest, whether still receiving water or dry for long ages. Another observation of interest, and one which has a direct bearing upon human activity along the edges of this great desert area, calls for passing record here. It refers to the character of the drifting soil which the winds carry across the Taklamakan and to which, from the want of a more specific term, we apply the designation of " sand." In using this we ought carefully to remove from our mind any notion of inherent sterility. This so-called " sand " of the Taklamakan is in reality a gathering of fine disintegrated particles of soil, which microscopical analysis shows to partake of the character of alluvial loess, *i.e.* of mainly sub-aerial deposit on what was once moist ground. This sand is perfectly fertile in itself, and wherever adequately irrigated is capable of producing crops or other vegetation adapted to local climatic conditions. The close approach of such dunes to the fields causes no apprehension to the cultivator as long as his canals carry sufficient water to produce a belt of vegetation which binds together this fertile soil and thereby stops the further advance of dunes.

It is erosion by the winds which produces the material composing these dunes, and the Taklamakan allows us to study the process of this production with remarkable clearness. The winds which during a considerable portion of the year blow with great force across the desert basin, especially from the north-east, constantly abrade the surface of the soft clayey soil, wherever there is a bare surface of ground not actually covered by dunes or protected by desert vegetation. The abrasive force which the winds exercise on such soil is considerably aided by the corrosive action of the disintegrated particles which they drive over its surface in the form of rudimentary dunes. The effects of the resulting erosion are nowhere more strikingly displayed than in the endless succession of parallel furrows and ridges, conveniently designated by the Turki term of *yardang*, which cover a great portion of the dismal belt representing a dead delta by the western shores of the dried-up Lop sea. In places this was once occupied by small settlements of the ancient territory of Loulan. Their remains, of which the first were discovered by Dr. Hedin in 1900, and which I was able to explore during my winter campaigns of 1906 and 1914, afford us an excellent gauge for the rate at which wind-erosion here carries on its work of excavation.

But already, on my first expedition, I had ample occasion to observe how, at the ancient site in the desert beyond the terminal course of the Niya river, all ruins of dwellings or even the remains of ancient orchards and arbours invariably occupy island-like terraces rising high above the wind-eroded bare ground close by. The *débris* of walls or the fallen trunks of trees had here protected the soil from erosion and thus preserved the original level, while the ground around was being scooped out around them lower and lower. Thus these archæological remains of ancient occupation have become " witnesses " for a physical process of distinct geological interest. The period of final abandonment both here and at the Loulan ruins is safely fixed by exactly dated Chinese documents discovered among the ruins, and thus we are supplied with a reliable chronological gauge for the progress of wind-erosion. I have been able to show that the rate at which the open ground in this area is lowered by wind-erosion is a little more than a foot per century.

Upon the questions which the abandonment of these and other ruined sites on the edges of the Taklamakan raises I shall have occasion to touch later. Before, however, we turn from the dead ground of the Taklamakan to the present zone of human occupation around it, we may well ask what becomes of all the soil which the winds are constantly excavating? It is clear that most of it lies heaped up in those huge ridges or " Davans," or is being constantly shifted about in the appalling expanse of minor dunes. But a considerable portion of this so-called " sand," in reality more like dust, is carried up into the air. There its presence accounts for the almost constant dust haze which hangs like a

pall over the whole of the Tarim basin and very rarely allows the traveller to catch a glimpse of the great mountain ranges enclosing it. When atmospheric conditions cause this fine dust to settle down it is caught and retained wherever the ground is covered with vegetation or is moist. It thus materially helps to supplement the process to which is due the fertile alluvial loess of the oases in the basin.

But when the winds are strong, as most of those are which blow into the basin from the north-east, they carry this dust high up into the mountains. There on the slopes of the Kunlun I have observed such yellowish-grey dust clouds covering up and effacing all features in the landscape below altitudes of 12,000–13,000 feet. Up to this height and even higher deposits of true aerial loess several hundred feet in thickness can at numerous points be seen overlying the rocky slopes of the Kunlun south of Khotan (Pl. 9). Much of this loess deposit is in turn washed down into the streams by drainage from occasional rain or melting snow. Then the rivers which gather this drainage in dark brown or chocolate-coloured floods carry the loess dust out again into the Taklamakan. There by the side of their banks and in their terminal deltas they leave it to rejoin the ground where it came from. Thus erosion alternately by wind and by water makes the soil of the Tarim basin rotate in an endless succession of cycles.

The possibility of permanent human occupation within the Tarim basin is confined to the areas left between the Taklamakan and the encircling mountain ranges to the north, west, and south. Compared with the great central desert this zone is of small extent, and the use of its natural resources for the most part limited to that elaborate form of cultivation which wholly depends on canal irrigation. This is fully accounted for by the extreme aridity of the climate, itself a result of the geographical position of the basin, which makes the local rain or snow fall a perfectly negligible factor as regards agriculture. This aridity is sufficiently indicated by the fact that the precipitation as recorded for Kashgar amounts to about two inches per annum. Further to the east and south it is probably even less.

The same deficiency of atmospheric moisture restricts grazing to the narrow belts of riverine jungle. These could never within historical times have afforded possibilities of nomadic existence to any but quite insignificant communities such as the present Dolans on the Yarkand river or the scattered families of Lopliks on the lowermost Tarim. This point is of distinct historical importance; for it explains why the great migrating tribes of Wusun, Sakas, Yüehchih, Huns, Turks, Mongols, and the rest whom, as we know from Chinese historical records, the last two thousand years saw in successive possession of the northern slopes of the Tien Shan, were always ready to raid or to make tributary the oases of the Tarim basin, but never crossed the range permanently to occupy it. To them the laborious and narrowly circumscribed life of the cultivator in these

irrigated oases could hold out little attraction as long as there were big open grazing-grounds to hold or to conquer.

The cultivable ground within the Tarim basin could never have borne more than an extremely slight proportion to the extent of absolute desert it comprises. As the map shows, the green oases of the basin appear like mere specks and splashes on a big canvas of yellow and light brown. The aridity of the climate, coupled with the fact that the difference in altitude between Kashgar in the extreme west and the Lop tract in the east is only about 2000 feet, accounts for the striking uniformity in physical conditions which prevails throughout these oases. Whatever their position or size, the traveller sees everywhere the same fields of wheat, maize, or cotton slightly terraced for irrigation; the same winding lanes lined with white poplars and willows; the same little arbours or orchards inviting with their shade and their plentiful produce of European fruits (Pl. 16). My explorations at widely distant sites of antiquity abandoned to the desert have proved that the same similarity of conditions has prevailed here all through historical times. Yet as the area over which the oases are scattered is so vast we may in our rapid survey conveniently distinguish two belts among them.

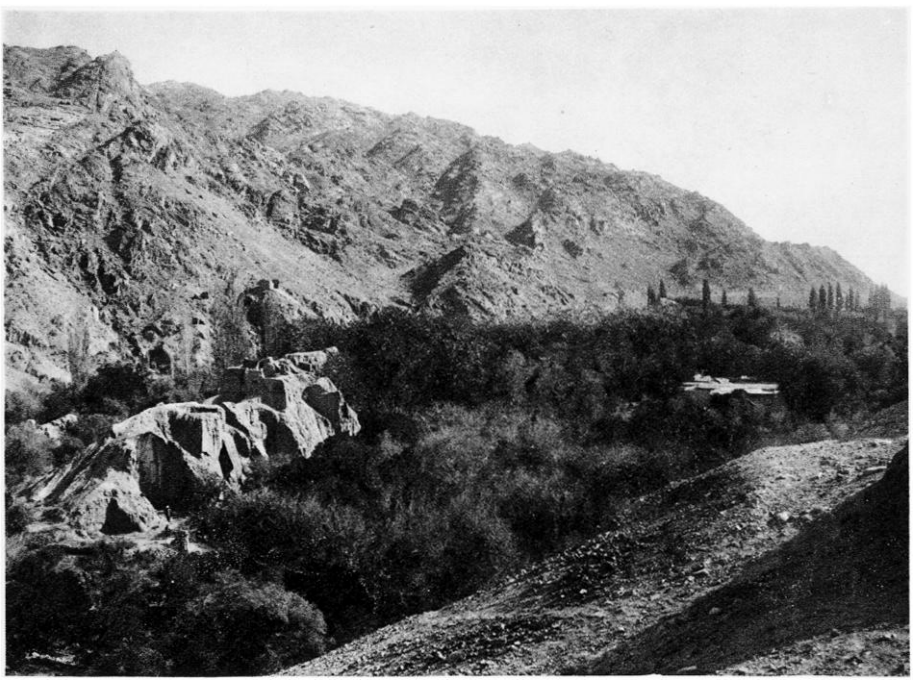
One of them extends in a big arc to the west and the north of the Taklamakan from Yarkand to Kurla. It contains the far larger number of important oases such as Yarkand, Kashgar, Aqsu, Kucha. Owing to these and to the convenient stages at which smaller ones are strung out between them, the route passing along this belt has from the earliest historical times to the present day been the chief line of communication and trade within the Tarim basin. These advantages result mainly from the fact that irrigation is here greatly facilitated by the volume and number of the rivers descending from the mountains as well as by certain features in the configuration of the ground which favour full use of their irrigation resources.

The southern marginal belt of the basin stretches along the foot of the Kunlun from Qarghaliq to the Lop tract. Here only one oasis of real importance is found, that of Khotan. The rest in most cases are separated from each other by considerable stretches of true desert. Thus, on the journey of some 350 miles from the village of Niya to Vash Shahri, the westernmost hamlet of Lop, there is no cultivated ground now to be found except at the small oasis of Charchan, and historical records show even this to have been again and again abandoned during intervals of centuries. The thinness or complete absence of cultivated areas along this belt is duly accounted for by geographical conditions. In the case of Khotan the big volume of water brought down by its twin rivers, the Yurung Qash and Qara Qash, has caused large and very fertile beds of alluvial loess to be formed right up to their debouchure from the mountains. The combined presence of abundant water and of an adequate area of fertile soil, conveniently near to the debouchure for

11. KHAZAN GOL VALLEY, CENTRAL NAN SHAN,
SEEN FROM FOREST-CLAD RIDGE TO NORTH

12. HEAD OF ALPINE VALLEY, N.E. OF SHENLINGTZE PASS, CENTRAL NAN SHAN

13. MOUTH OF VALLEY LEADING TO PANOPA PASS, TIEN SHAN, FROM SIDE OF KUCHENGTZE, DZUNGARIA



14. ORCHARD WITH RUINED BUDDHIST SHRINES AT ARATAM, QOMUL (HAMI), AT S. FOOT OF QARLIQ TAGH

its full use by irrigation, explains the existence here of a large oasis important throughout historical times.

Elsewhere along the foot of the Kunlun much of the water brought down by the rivers is lost through evaporation or absorption on its way across the huge glacis of gravel. The extent of this barren glacis has much to do with the fact that with the exception of Khotan and Qarghaliq all cultivated areas of the southern belt are " terminal oases," *i.e.* they occupy the furthermost ground to which water from the rivers of the Kunlun can be brought for irrigation. Such terminal oases are particularly liable to changes in position and extent owing to a variety of physical causes. Of these I need mention here only the difficulty of maintaining canal heads where the shifting river-courses pass over their fans of gravel deposit or approach their deltaic end in the desert.

Very interesting archæological evidence of such changes is furnished by the numerous ruined sites, marking ancient settlements abandoned to the desert, which I was able to trace and explore in this region. At the same time the fact of the most important among them being found far to the north of the present line of " terminal oases " furnishes definite proof of the water-supply brought down by those Kunlun rivers having undergone reduction within historical times. To the question as to the cause of this reduction and the relation between it and the abandonment of those ancient settlements we shall have occasion to recur later.

Within the Tarim basin there still remains for us to visit the terminal depression of Lop. It is the smallest and certainly the most desolate among the natural divisions of the basin, but offers special interest both to the geographer and the historical student. It may be described as comprising the terminal course of the Tarim ; the marshes in which its waters are finally lost and to which the locally unknown but convenient Mongol term of Lop Nor is usually applied ; and the great salt-encrusted bed of the dried-up Lop sea beyond them, together with the wastes of gravel, drift-sand, and wind-eroded clay which surround it. The whole of this region of *Lop*, as a term of very ancient origin designates it, is now uninhabited, except for three little oases at the foot of the Kunlun glacis where cultivation has been resumed in quite recent times near sites abandoned for centuries. Apart from their four hundred odd households, there are no people, except the scanty remnant of semi-nomadic Lopliks (" Lop people ") fishing and hunting along the terminal Tarim.

The central and geographically most striking feature of this region is the great salt-encrusted bed which our surveys have proved to extend for fully 160 miles from south-west to north-east with a maximum width of some 90 miles. It marks the position of a prehistoric salt sea which was fed by the drainage of the Tarim basin when the climate of Central Asia was moister. It already showed the same forbidding aspects as at present when the Chinese first became acquainted with it more than two thousand years ago. But it is different with the now equally

lifeless ground which adjoins this dried-up sea on the north-west. There, in an area of bare clay overrun by light drift-sand and now undergoing excessive wind erosion, can still be traced a series of well-marked dry river-beds. Our surveys have proved that they belong to an ancient delta formed by the dried-up "Quruq Darya." This during the first centuries before and after Christ carried the waters of the Konche river draining the Qara Shahr valley (together, perhaps, with some addition from the northern tributaries of the Tarim) to the then partially occupied territory of Loulan.

Abundant archæological evidence brought to light at various ruined sites of Loulan since Dr. Hedin first discovered one of them, makes it certain that the waters carried by the Quruq Darya reached here an ancient terminal oasis and the now utterly dead delta around it up to the beginning of the fourth century A.D. Through this once habitable ground and across the difficult salt-encrusted expanse of the dried-up sea beyond it, there had passed the earliest Chinese route leading from the Sulo Ho trough into the Tarim basin. Great historical interest attaches to this route, as it was the line by which China and its silk trade first maintained contact with Central Asia and the West. When later I come to discuss the establishment of this contact and its results, I shall have occasion to describe the truly forbidding aspect of this now utterly lifeless ground, and shall give some account of the difficult explorations by which I was able to track the vestiges of the ancient route through its wastes.

This ancient Chinese route crossed the salt-encrusted sea-bed east of Loulan and then turned round the low southernmost spur of the Quruq Tagh encircling it. Here we find a long bay of that dried-up sea extending to the north-east. In this bay and through a valley-like depression which continues it in the same direction, the ancient Lop sea-bed appears at an earlier but geologically not very distant period to have received also the drainage from the terminal basin of the Sulo Ho adjoining eastward. Along the clearly marked shore-line of the ancient sea and beyond along the southern side of this valley passes the difficult desert track which Marco Polo had followed from Lop to Shachow or Tunhwang, and which rare caravans still use during the few winter months when it is practicable.

This takes us across a dry lake-bed surrounded by a maze of fantastically eroded clay terraces (Pl. 28) directly into the lowest portion of the basin of the Sulo Ho, containing this river's delta and its present terminal marshes. Here we have reached the first of a series of drainageless areas which, if not comparable in size with the Tarim basin, yet resemble it closely in physical features and are linked up with it also in history. This close historical connection is brought home to us at once in a striking manner by the remains of the ancient Chinese *Limes*, or border wall, and its watch posts. I first came upon them in the gravel desert close to the terminal marshes of the Sulo Ho. I subsequently traced and explored

them along the river's course to the eastern end of the basin and thence right away to the Etsin Gol. The many ancient Chinese records brought to light by my excavations have clearly proved that it was constructed at the close of the second century B.C. as a true *Limes* for the protection of that earliest high-road for Chinese expansion into Central Asia to which I have already referred.

The Sulo Ho basin need not detain us long, for notwithstanding its extent of some 220 miles from east to west, its natural features are remarkably uniform, just like its *rôle* throughout history. The Sulo Ho river, fed by the glaciers and eternal snows of the Central Nan Shan, descends into the basin at its eastern end. On its whole course through the basin it receives only a single affluent, the Tang Ho. This, rising on high plateaus towards Tsaidam, provides irrigation for the oasis of Tunhwang or Shachow. Except for this, the only settlement of considerable size in the basin, and for a few minor ones, watered by the Sulo Ho itself, the trough consists mainly of slopes of absolutely bare gravel descending from the western Nan Shan in the south and the utterly barren Pei Shan in the north. The extreme aridity of this desert ground explains the abundance and remarkable preservation of the ancient remains recovered along the whole line of the ruined *Limes*. The importance of the Sulo Ho basin is solely derived from the fact that, flanked by high mountains in the south and desert wastes in the north, it forms a natural and easily defended " corridor " leading from north-western China into Central Asia. In ancient times, when this corridor saw much traffic passing into the Tarim basin, the local resources of the Tunhwang oasis were of special value, as they facilitated the use of the difficult route through the desert beyond.

Where the Sulo Ho trough ends near the oasis of Yümensien, the line of the ancient border wall continuing eastwards takes us over an almost imperceptible watershed into a much smaller drainageless area. Its terminal depression, situated north of the small oasis of Hwahaitze or Yingpan, receives what scanty water is brought down by the streams draining that portion of the Nan Shan which divides the valley of the Sulo Ho from that of the river of Suchow. The aridity of this portion of the range and of the rugged outer hills immediately overlooking the Hwahaitze depression is so great that water for irrigation in the latter is obtainable only from subsoil drainage. To the north-east ground covered with high dunes adjoins for a considerable distance. But even this did not prevent the ancient Chinese *Limes* being carried through it to the left bank of the lower course of the Suchow river.

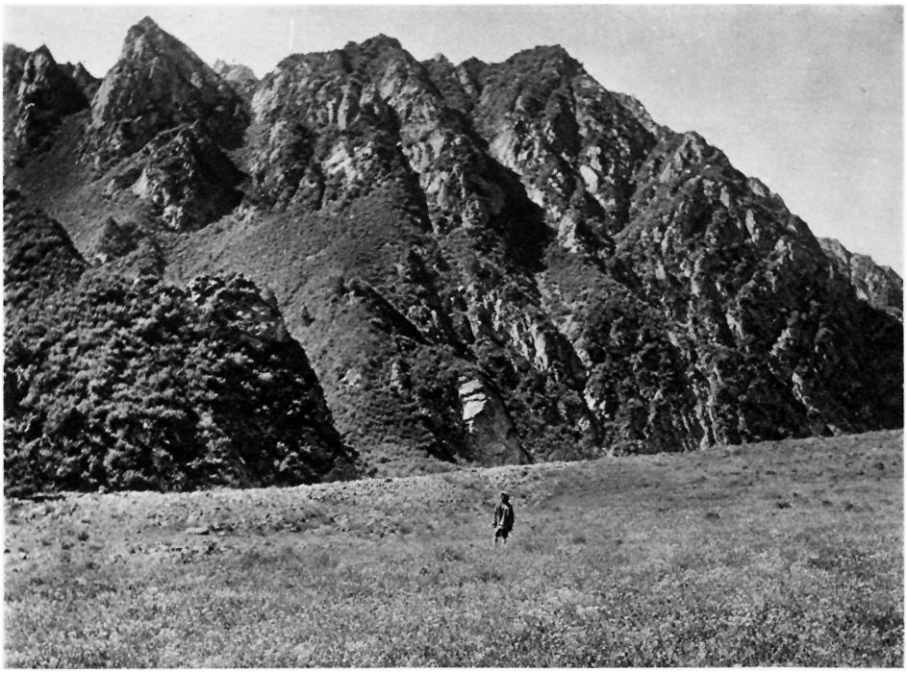
Whether we follow the line of this old border wall of Han times or move by the easier high-road across the plateaus above the Hwahaitze depression to the famous Kiayükwan gate of the mediæval " Great Wall " of China, we now reach the easternmost of the drainageless areas with which we are concerned. It extends from the headwaters of the

Kanchow river and the Pacific watershed in the south-east to the marshy lake-beds in which terminates the Etsin Gol carrying the united waters of the rivers of Suchow and Kanchow. It divides itself into three well-defined zones, all characterized by features which mark transition to adjoining regions of very different climatic conditions. To the southernmost of these, comprising the big snowy ranges of the Central Nan Shan and the wide valleys between them, we have already paid a cursory visit.

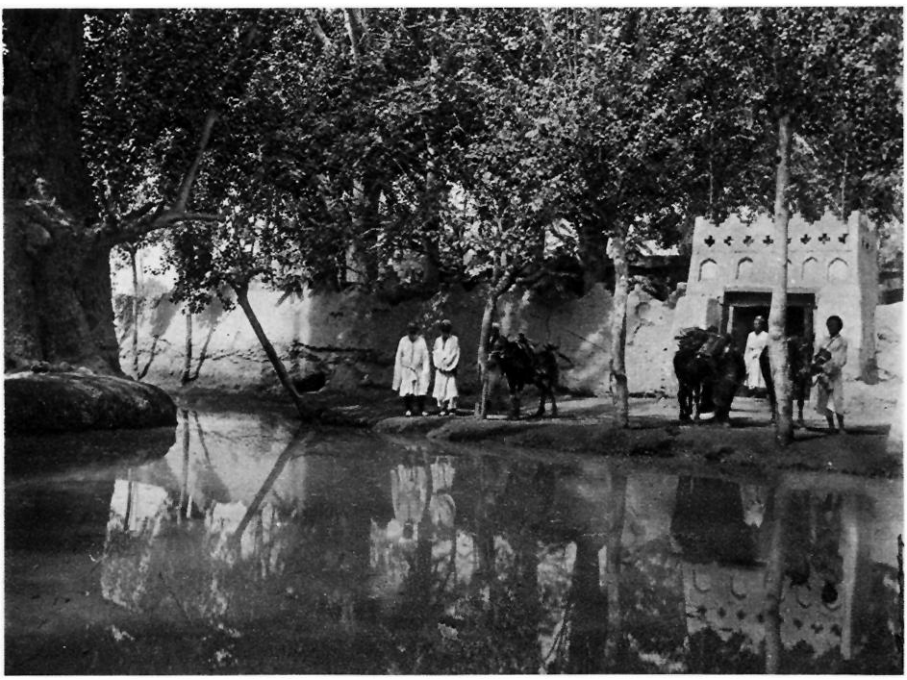
As we descend through the northernmost range in valleys which moisture derived from the Pacific has clothed with plentiful forest (Pl. 11), we come to a broad belt of fertile alluvial fans stretching along the foot of the range at an elevation of from 5000 to 6500 feet. The northern limit of this belt is formed by the barren hill-chain which overlooks the middle course of the rivers of Suchow and Kanchow and divides it from the "Gobi" of the southernmost Mongolia. Over great parts of this submontane belt cultivation is assured not only by abundant irrigation on the alluvial fans of those rivers, but also by favourable climatic conditions. East of the longitude of Kanchow these permit an almost continuous chain of smaller village tracts along the foot of the mountains to be cultivated with the help of rain and snow-fall only.

Owing to the favourable physical features just briefly indicated, this belt was destined in history to become a very important "land of passage" between China and Central Asia. Efforts continued for centuries to protect the empire from those ever-threatening neighbours, the Huns, led under the great Han Emperor Wuti (140–87 B.C.) to the Chinese conquest of the northern slopes of the Nan Shan. The almost inevitable sequel of this again was that policy of Central-Asian expansion which more than two thousand years ago first opened the route along the Sulo Ho to Loulan and thus into the Tarim basin. But before the advent of the Chinese and whenever internal weakening of the empire or other causes led to their losing control, the abundant winter grazing which parts of this territory afford, made it also for centuries an attractive goal of conquest to a succession of nomadic nations, from the Yüehchih or Indo-Scythians down to the Mongols and Dzungars.

For such nomadic invasions from the side of the Altai and the Mongolian steppes, nature has provided a convenient highway in the valley of the Etsin Gol. From its terminal lake-basin far away in the north right up to where the rivers of Suchow and Kanchow break through the barren hill range north of the Suchow and Kanchow tracts, there stretch on either side deserts almost wholly waterless, where even camel-grazing is scanty and confined to rare patches of ground. Cultivation along the Etsin Gol is now confined to two narrow strips, the oases of Chinta and Maomei. But far more important is the fact that grazing is to be found all along the Etsin Gol and its feeders right up to the defiles just referred to. This line of easy access, over 200 miles in length, must at all times have facilitated nomadic invasion to the south-east.



15. VALLEY NORTH OF PASS LEADING TO OPO ACROSS OUTERMOST RANGE, CENTRAL NAN SHAN



16. CANAL-FED TANK AT SHRINE. YOTKAN. KHOTAN OASIS

17. DUNES AND DEAD VEGETATION IN DRIED-UP DELTA, BEYOND TERMINAL COURSE OF KERIYA RIVER

18. OLD RIVER BED BETWEEN CHARCHAK AND INCHIKE RIVERS, IN DESERT S.W. OF QARA SHAHR

19. RIDGE OF DUNES IN LOP DESERT, BETWEEN LOULAN SITE AND TARIM RIVER

It is attested by Chingiz Khan's first great inroad of A.D. 1227 into China, which we know to have followed this line. The evidence of the ruined site of Khara Khoto shows that the Etsin Gol delta right down to mediæval times must have received more water than it now does, and this together with certain other features helps curiously to illustrate its affinity in more than one respect with the territory of ancient Loulan and its now completely dried-up delta.

We have now completed our survey of the vast region which for close on a thousand years had served as the principal scene for that important historical process, the early interpenetration of Far Eastern, Indian, and Western civilizations. The dominant geographical features of that scene have exercised a great and constant influence upon this prolonged process. In order to appreciate it fully, we must pass in review, however rapidly, the chief phases in the political history of the whole region. Fortunately we can gather our knowledge of these phases from a very reliable and precise source, the Chinese dynastic Annals, and for the earliest events from the contemporary record of Ssŭma Ch'ien, the Herodotus, as he has justly been called, of Chinese historical literature.*

The story may be said to start with the adventurous Central-Asian mission of Chang Ch'ien. The great Emperor Wuti (140–87 B.C.) of the Former Han dynasty, about 138 B.C. dispatched that young officer to the tribe of the Great Yüehchih who later became the Indo-Scythian rulers of north-western India. The object was to gain their aid against those hereditary foes of China, the Hsiungnu, destined to appear later as the Huns in European history. These powerful nomad tribes, united in a great confederacy, had for centuries from the side of Mongolia harried the northern marches of the empire. The Yüehchih, whom they had ousted some twenty years earlier from their old seats along the northern foot of the Nan Shan, had migrated far away to the west and established a new kingdom on the Oxus in what is, or until quite recently was, Bukharan territory. When Chang Ch'ien, after many trials and difficulties, including a ten-years' captivity among the Huns, at last reached the Yüehchih, these refused to turn back and seek revenge on the Huns. So the mission entrusted to Chang Ch'ien failed in its direct aim. All the same it was destined to open a new epoch in the economical and political relations of China with the world outside its own civilization.

* The following are some of the principal publications which have made Chinese historical records bearing on innermost Asia accessible to Western students in critical translations: Wylie, 'Notes on the Western Regions,' translated from the Former Han Annals (*Journal of the Anthropological Institute*, 1880, 1881); Chavannes, 'Documents sur les Turcs occidentaux' (St. Petersbourg, Acad. Imp. des Sciences, 1903); Chavannes, 'Les pays d'occident d'après le Wei lio' (T'oung-pao, 1905); Chavannes, 'Les pays d'Occident d'après le Heou Han Chou' (T'oung-pao, 1907); Chavannes, 'Les documents chinois découverts par Aurel Stein' (Oxford, 1913); Bretschneider, 'Mediæval Researches from Eastern Asiatic Sources,' 1888; Hirth, "The Story of Chang K'ién" (*Journal of American Oriental Society*, 1917).

Chiang Ch'ien, after a total absence of thirteen years, succeeded in regaining China by way of the Tarim basin, with only one companion surviving out of the hundred with whom he had started. He brought back definite information about the Central-Asian countries he had passed through, including in the west the rich territories corresponding to the present Ferghana, Samarqand, Bukhara, and Balkh, as well as about the still more distant regions of Persia and India. It was he who first revealed to the Chinese the existence of great civilized populations beyond the ring of barbarous tribes by whom all their land frontiers were hemmed in. The great importance of securing access to the former for the sake of the advantages to be derived both from trade and military aid was quickly realized by the Emperor Wuti, and the state of internal consolidation which the reign of this capable and energetic monarch assured, singularly favoured expansion.

The avowed aim of this policy at the outset was to open the road to the large territories in the Oxus region, especially Bactria, " full of rare things, with a population living in fixed abodes . . . but with weak armies and placing great value on the rich produce of China." That a first attempt towards this goal was made from the south-west, on the borders of Szechwan, is significant of the ignorance then prevailing in China as to the true relative position of India through which Tahsia or Bactria, it was supposed, might be gained. It also reflects the time-honoured caution of Chinese policy, ever anxious to avoid if possible the risk of military complications with powerful neighbours. But when this misdirected initial attempt had been frustrated by the resistance of the barbarous hill tribes on the Tibetan border, and, no doubt, also by the difficulties of the ground, the Chinese effort was promptly turned against the Huns. Their hold on the northern slopes of the Nan Shan blocked nature's true highway towards the Tarim basin and the Oxus region. And here the fortune of war soon rewarded the Emperor Wuti's persistent endeavours. After a series of successful campaigns the territories corresponding to the present Liangchow and Kanchow were in 121 B.C. freed from Hun domination. Minor raids into them by Hun bands still continued for a couple of years. Then the Huns were finally forced to retreat to the north of the desert, and by 115 B.C. control of the newly secured border was united in the command of Chiuchwan or Suchow.

This military advance along the great highway towards Central Asia was accompanied by a rapid organization of Chinese political missions to the different states both within the Tarim basin and beyond, even as far as Bactria and Persia. From the account given of the mission which Chang Ch'ien led in person to the king of the Wusun, the powerful nomad race established in the fertile valleys of Ili and Yulduz north of the central Tien Shan, we see how much trouble was taken to impress these and other nations with the power of China and its industrial wealth.

There can be no doubt that among the Chinese industrial products carried by this and the subsidiary missions of Chang Ch'ien, there prominently figured those fine silk stuffs which then began to reach the Mediterranean through Parthia and Syria. They soon carried the fame of the "silk-weaving Seres" to the great centres of Greek and Roman civilization. When Chang Ch'ien returned from this mission he was accompanied, so Ssŭma Ch'ien tells us, "by several dozens of natives," and "thereby afforded them the opportunity to see China with their own eyes and thus to realize her extent and greatness."

The pioneer of China's expansion westwards, fittingly honoured by the emperor with high rank as "the Great Traveller," died about a year after his return from this mission in 115 B.C. But the intercourse of which he had been the pioneer rapidly developed and increased, until embassies attended by several hundred men, we are told, "followed upon one another's heels all along the route." From the account we receive of certain abuses which before long came to attend these missions to distant foreign lands, we may conclude that in many cases they were largely prompted or exploited by private commercial enterprise. We may, in fact, surmise that these "embassies" were often but an early counterpart of those trading caravans from the West which the Chinese court during the middle ages and later prided itself upon receiving under the guise of tribute-carrying missions. And the same probably holds good also of that "coming and going of ambassadors of the foreign countries of the north-west," which after the first opening of intercourse by Chang Ch'ien is said to have become more and more frequent.

There is ample evidence in the records which the Chinese historical texts have preserved of this interesting period to show that the great westward move initiated by the Emperor Wuti was directed quite as much by political aims as by economic considerations connected with trade. No doubt the development of China's internal resources which the Han dynasty had from its foundation taken care to foster, made it very important that the route which Chang Ch'ien's pluck and persistence had opened should be used to secure direct access to fresh markets for China's industrial products, and in particular the most valuable among them, its silk textiles.

Yet even if the wish to obtain allies against the dreaded Huns in warlike tribes like the Yüehchih and Wusun had been absent, troubles attending the newly established intercourse with the West would soon have forced upon the Chinese government political and military expansion in the same direction. It did not take many years before Chinese missions on their way through the Tarim basin experienced serious trouble from the chiefs and inhabitants of petty territories which cut off their food supplies, obviously with a view to blackmail, or directly attacked them. Worse still, the power of the Huns to the north of the Tien Shan remained unbroken, and small parties of these formidable

horsemen would at times "intercept west-bound envoys," where they passed through Loulan or Lop.

Already in 108 B.C. we read of a Chinese military expedition being sent to coerce the chief of Loulan and to overawe the territory of Chü-shih or Turfan, through which Hun raiders could readily gain access to the route where it skirted the foot of the Quruq Tagh. Thus the need for military protection beyond the newly conquered territory along the northern foot of the Nan Shan very soon asserted itself. Nor did it find the Chinese unprepared. Immediately after the first conquest of that great natural "corridor" they had started the establishment of military colonies along it and the construction of a wall extending to the west. This was obviously connected with the defensive border-line of the "Great Wall" which Shih Huangti, the great predecessor of the Han dynasty, in the last quarter of the third century B.C. had created for protection against Hun inroads. By 108 B.C. the wall with its "continuous line of posts and small forts" had been prolonged from Suchow to the "Jade Gate" (Yümen), then established in the vicinity of the Tunhwang oasis.

There can be no doubt that this western extension of the "Great Wall" was primarily intended to protect the newly opened highway into Central Asia. It is equally clear that it was also meant to assure more safety from Hun raiders to the military colonies which were planted in the submontane tracts traversed by the great route. Their agricultural produce was essential for making this long line of communication practicable whether for trade caravans or troop movement. While the earlier "Great Wall" of Shih Huangti appears to have borne that purely defensive character which we are accustomed to associate with the familiar "Chinese Wall" of late mediæval construction, the Emperor Wuti's wall was distinctly intended to serve as the instrument of a "forward policy" conceived on a big scale. The analogy it thus offers to the earlier *Limes* systems of the Roman Empire is most striking; for modern antiquarian researches have proved that the lines of the Roman *Limes* were originally integral portions of the great strategic road system of the Empire.

It has been my good fortune on my second and third expeditions to trace and explore the remains of this ancient Chinese *Limes* from its westernmost end in the terminal basin of the Sulo Ho right through to the Etsin Gol, over a total distance of not far from 400 miles. In my 'Desert Cathay,' and more fully in 'Serindia,' I have been able to give an account of the many fascinating observations and "finds" which rewarded my surveys and excavations along this far-flung *Limes* of Han times. The physical conditions of the ground its line follows and the remarkable state of preservation in which its ruins have survived, especially west of Tunhwang, offer distinct geographical interest. But before I refer to the light they help to throw on questions we have to consider here, it will be convenient to complete our brief synopsis of the historical

developments which followed the first contact of Chinese trade and civilization with innermost Asia.

Events moved rapidly enough. As so often in history, the aims of peaceful penetration in the interest of trade and civilized intercourse called before long for support by political influence and military action. It was the not unusual case of the flag having to protect the trade. From the outset the Chinese policy of Central-Asian expansion appears to have fixed its hopes for profitable trade far more upon Tayüan or Ferghana and other large and fertile territories in Western Turkistan than upon the scattered oases of the Tarim basin. There were obvious geographical reasons; for neither in respect of extent of cultivable ground, population, and other resources, nor as regards vicinity to the great trade centres of the West, could the latter compare with the former. But the distances separating those western territories of Central Asia from China were great. Relying upon the protection thus afforded the people of Ferghana after a time treated the Chinese missions with scant regard; in the end they robbed and killed some imperial envoys who had been sent to secure a far-famed local breed of horses for their master.

Chinese prestige required prompt punishment of such an offence. So a punitive expedition was dispatched in 104 B.C. against Ferghana. It ended in complete failure. The large force sent became exhausted by the difficulties of the route followed across the "Salt Marsh," *i.e.* the dried-up salt sea-bed of Lop, and by the want of supplies beyond, long before its remnant reached Ferghana. There it was utterly routed while besieging a town, and when in its retreat it regained Tunhwang "only one or two out of every ten soldiers were left." To repair so signal a defeat all the resources of the empire were strained. By 102 B.C. the Chinese General Li Kuangli was enabled to set out once more from Tunhwang with a fresh army of sixty thousand men. A huge train and commissariat was provided for the formidable task of maintaining this force on the march towards its far-off goal.

This time Chinese power of intelligent organization triumphed over all the difficulties of nature, almost insuperable for an army as they must appear from our present knowledge of the forbidding desert which it had to cross between Tunhwang and Loulan. The force of thirty thousand men with which the Chinese general reached the capital of Ferghana sufficed to secure victory and the submission of its people. The prestige of China was so strengthened by this great feat that all the small states of the Tarim basin accepted imperial sovereignty. It was, no doubt, in order to make its control effective that measures were taken to safeguard henceforth the road westwards from Tunhwang, which was the natural gate and base for Chinese expansion into the Tarim basin. Thus we read of a military governorship established at Tunhwang and that "westward from here to the Salt Marsh, *i.e.* Lop Nor, the road at many points was protected by military stations." Further west along

the main trade route of the Tarim basin Chinese soldiers were settled as agricultural colonists to assure supplies for missions, etc.

Henceforth Chinese control of the great natural highways, provided by the strings of oases in the Tarim basin, remained practically unbroken for more than a century, until internal disorder in China brought about the downfall of the Former Han dynasty soon after the commencement of our era. The records furnished by the Han Annals about the "Western regions" allow us to see that this prolonged maintenance of Chinese control was due far more to the successful diplomacy of the empire's political representatives in these territories and to prestige based on China's superior civilization than to the force of arms. The mutual jealousies of the many petty states among which the oases of the Tarim basin were divided and a temporary weakening of those dangerous northern neighbours, the Huns, also helped during this period to keep the passage open for China's direct intercourse with the civilized populations of Western Asia. From the references of classical authors to the famous "Seric fabrics," *i.e.* silks, we know that these products of Chinese industrial skill then travelled westwards in an unbroken flow. In return China must then have received, particularly from Eastern Iran, many of the articles of foreign origin, both natural and manufactured, the introduction of which from the West is distinctly traceable in Chinese literary records.

It is to the same period of the "open road" through Central Asia that we may safely attribute the initial stages of that close mingling of cultural influences from China, Iran and India which archæological explorations at ancient sites of the Tarim basin have so clearly revealed as the characteristic feature of the civilization prevailing throughout that region during the pre-Muhammadan epoch. It is true that the earliest relics of that civilization as yet brought to light there by excavation—apart from prehistoric remains of the Stone Age—do not reach back so far. But there is every reason to believe that the people cultivating the oases of the Tarim basin for centuries before were of the same race and speech as those whose documents and literary remains, written mainly in a variety of Indo-European languages, we have recovered from sites abandoned to the desert between the third and eighth centuries A.D. In that exceptionally arid region climatic conditions would allow of the existence of comparatively large communities only on the basis of a highly organized system of irrigation. Thus nature itself had provided there a human medium far more suited for the absorption and transmission of cultural influences, whether coming from the Far East or the West, than nomadic populations could possibly be.

Geography in other respects, too, seems to have singularly prepared the Tarim basin for its chief historical *rôle*. It was to serve as the channel through which the ancient civilizations of China on the one side and of Persia and India on the other, both the latter already stimulated by

Hellenistic influences, were first brought into prolonged contact. We have seen how nature, by denying grazing-grounds to the vast basin between Kunlun and Tien Shan, had protected it against ever becoming the scene of great migratory movements and of such upheavals as are bound to accompany them.

The Huns in the north still remained dangerous neighbours, blocking the route along the northern foot of the Tien Shan range and making their power felt by tribes like the Wusun who held the fertile valleys on that side. But by lending organized support to the small kingdoms along the southern slopes of the Tien Shan between the Qara Shahr valley and Kucha it was not difficult for the Chinese to keep the Huns off from ground where they might have indeed interfered with traffic and exacted tribute from the oases, but never could have remained in permanent occupation. By 60 B.C. the Chinese, through the enterprise of an energetic "Protector-General of the Western regions," put themselves in possession also of the outlying small basin of Turfan, containing a well-cultivated tract south of the eastern Tien Shan, and thereby secured an important flank protection for the great northern trade route. The alternative line of communication along the southern rim of the basin, past Charchan and Khotan, was effectively protected from the danger of nomadic aggression by the mighty barrier of the Kunlun and still more, perhaps, by the utter barrenness of the high Tibetan plateaus adjoining. Not until some eight centuries later, when Tibet had risen from a congeries of barbarous tribes into a centralized state of military power, did Eastern Turkistan experience invasion from that side.

(*To be concluded in the June Journal.*)

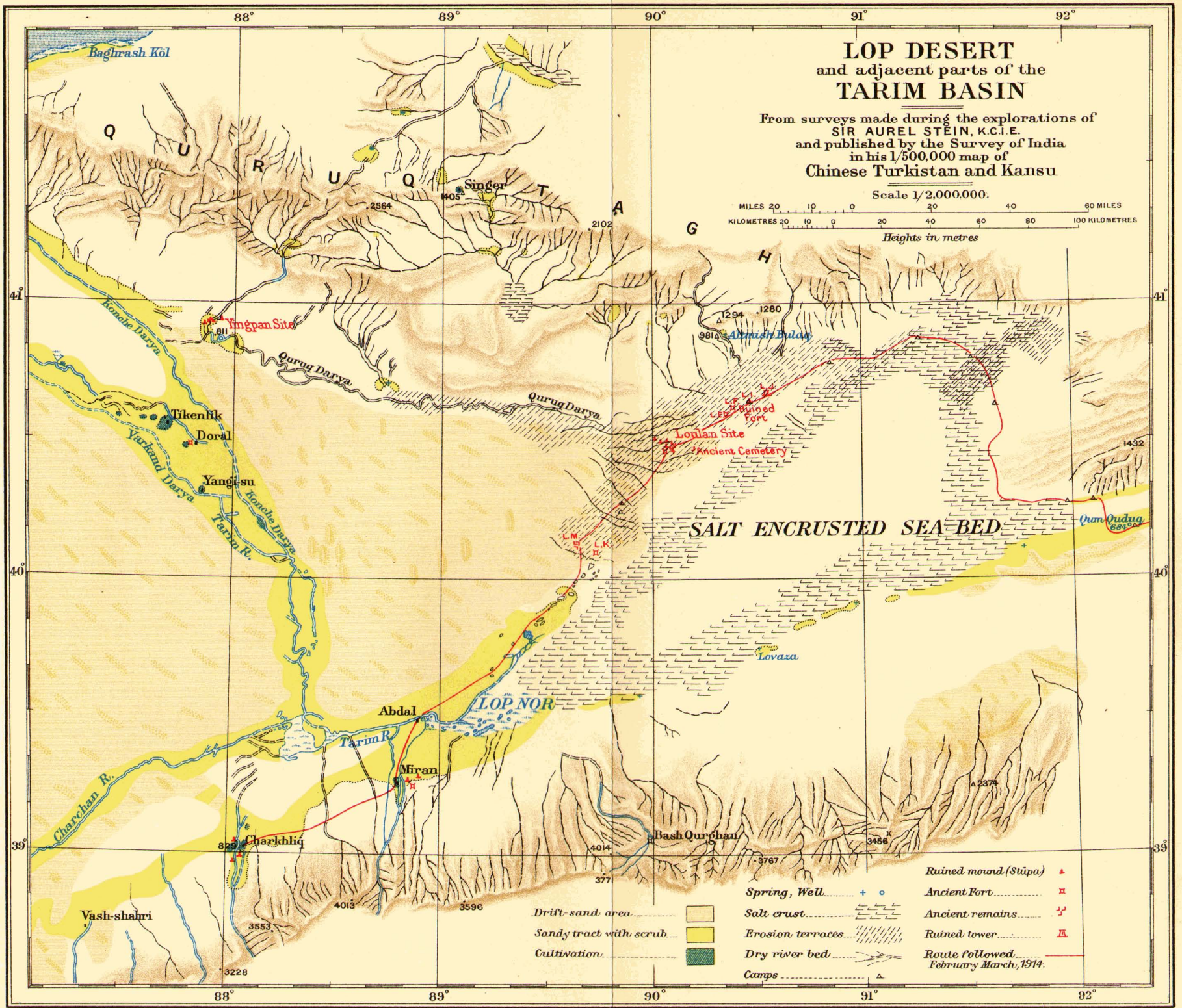
THE PORTOLAN MAPS OF THE RHÔNE DELTA

A Contribution to the History of the Sea Charts of the Middle Ages

R. D. Oldham, F.R.S.

Read at the Afternoon Meeting of the Society, 16 *March* 1925.

THE delta of the Rhône presents probably more varied and more numerous historical problems than any other region of equal size. The Camargue, the name by which that part of the delta enclosed by the two branches of the river is known, is at present a sparsely populated region, where mankind is repelled by a spread of malaria-breeding salt marshes, where the impression produced on the wanderers is that of a solitude more impressive than of the ocean, and where droves of cattle, goats, and horses wander as wild and as free as on the plains of Texas. Yet this same region was described as the granary of the Roman



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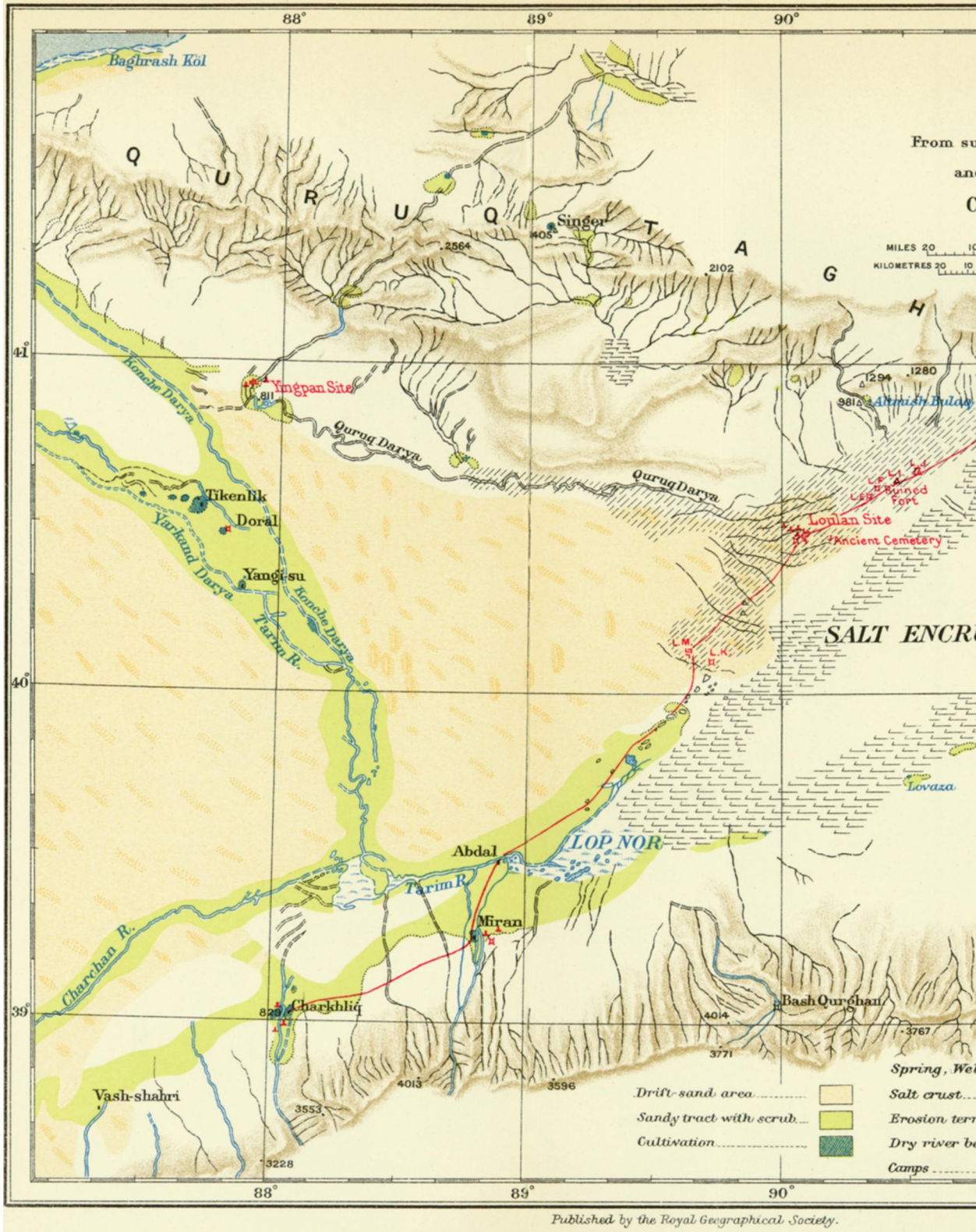
LOP DESERT
Stein



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LOP DESERT
Stein

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INNERMOST ASIA: ITS GEOGRAPHY AS A FACTOR IN HISTORY

Sir Aurel Stein, K.C.I.E., F.B.A.

The First "Asia Lecture."

Continued from page 403. *General Map following page* 556.

IT is necessary to keep well in view the exceptional importance and advantages which the Tarim basin possessed for the Chinese as a safe line of passage for trade intercourse and political expansion westwards, if we are to understand the reasons which induced them to face and overcome the forbidding natural difficulties besetting access to it. The explorations carried on during my winter campaigns of 1907 and 1914 enabled me to trace the route used for Wuti's enterprises over the formidable wastes of sand, bare gravel, and salt which it crossed. For all detailed evidence regarding its line and the physical conditions prevailing along it in ancient times I must refer to 'Serindia' and to the final report on my third Central-Asian expedition now ready for the press. But the observations made in the course of those explorations are of sufficient geographical interest to warrant our retracing the line, be it only in a rapid sketch.

Let us start from the side of China and its north-western marches in the great province of Kansu. We have already seen in our description of the drainageless basins of the Etsin Gol and Sulo Ho that the submontane belt on the northern slopes of the Nan Shan provided a great natural corridor westwards, easy both to follow and to protect. Abundantly watered from perpetual snow-beds of the Nan Shan, it could as far as Suchow furnish produce amply sufficient for the needs of any number of men and animals that trade or military movements might bring along it. From Suchow onwards the ancient route undoubtedly led, just like the present high-road into Chinese Turkistan, through the succession of small oases which extend along the left bank of the Sulo Ho as far as Tunhwang. To the north of the river there stretch the gravel and stone wastes of the Pei Shan Gobi right away to the foot of the easternmost Tien Shan (Pl. 25). In spite of their barrenness they were in ancient times as little as now impassable for small parties. Hence

there was need for the protection which the *Limes* line of the Emperor Wuti here provided against Hun raids. I could trace it first along the northern bank of the Sulo Ho to the river's last defile at the Wanshantze ridge and thence south of the river towards Tunhwang.

This oasis, in spite of many vicissitudes, including utter devastation during the last great Tungan rebellion, is still a place of some modest resources. It was destined by nature to serve as the base for the early Chinese advance into the Tarim basin. It was then, as now, the last locality capable of cultivation. Beyond it the route had to cross some 300 miles of true desert before striking the once habitable area in the now dried-up delta of the ancient Quruq Darya. West of Tunhwang down to the terminal marshes of the Sulo Ho there extends a bare gravel desert. Narrow strips of reed beds and other desert vegetation are found only along the deep-cut bed of the Sulo Ho and along the succession of small lakes which the dying river feeds at the time of its summer floods.

Desolate as this ground is, it is here that my explorations have revealed the most striking evidence of the thoroughness with which Chinese power of systematic organization had prepared for the safe use of the difficult route into the Tarim basin ever since it was first opened. We know from Chinese historical records, as already mentioned, that immediately after the success achieved by the second expedition against Ferghana (102–101 B.C.) the road from Tunhwang westwards to the "Salt Marsh" was protected by military posts. The westernmost extension of the Emperor Wuti's *Limes* is meant here, and of this my explorations have enabled me to recover the remains in an unbroken line and in a remarkable state of preservation.

The exceptional aridity of the climate prevailing here ever since the *Limes* was constructed made it possible to discover many very interesting relics of the life led during the first two centuries before and after Christ along this most desolate of borders. Among the hundreds of Chinese documents on wood excavated by me at the ruined watch-stations and deciphered by that lamented great scholar and incomparable collaborator M. Chavannes, there are a number of which the exact dates take us back to the very beginning of the first century B.C. The latest do not come down beyond the middle of the second century A.D., when altered political conditions caused the guarding of the *Limes* to be abandoned. Most of these records, written not only on wood but also on silk and in a few instances on the oldest known paper, were found in shallow refuse heaps on to which they had been thrown from time to time out of the military clerks' offices. Their survival here, protected often only by a few inches of gravel, bears conclusive testimony to the atmospheric conditions on this desert ground having been more than two thousand years ago quite as dry as they are now.

Equally interesting from the geographer's point of view is the evidence afforded by the wall or *agger* along which the ruined posts of the *Limes*

with their watch-towers were placed at distances varying from about one to two miles according to the character of the ground. It was throughout constructed of carefully secured layers of fascines alternating with layers of stamped clay or gravel. This method was specially suited to withstand the most destructive of nature's forces in this desert region, slow grinding but almost incessant wind-erosion. It was, besides, the only one practically adapted to rapid construction on ground bare of all resources and over great distances even devoid of water. Along those sections where the *Limes* line lay parallel to the prevailing direction of the winds, blowing mostly from the east and north-east and often with great violence and persistence, the wall still rises in remarkable preservation, in places to a height of 10 feet or more (Pl. 29). Its survival in spite of the apparently perishable nature of the materials used conclusively proves that the climate on this ground has been arid in the extreme ever since the wall was first constructed more than two thousand years ago.

Incidentally I may also mention here the curious collateral evidence furnished by the materials used for the fascines which served to assure cohesion of the wall. Generally these were made of reeds, the material readily obtainable from the reed beds still found in the riverine depressions along the Sulo Ho. But in certain sections of the wall the reed bundles are replaced by fascines made of tamarisk brushwood or branches of the wild poplar, and it is significant that this growth of desert vegetation is just the one now found on the ground through, or near, which those sections of the *Limes* pass. Economy of effort has at all times been a characteristic feature of Chinese methods of work, and here we have a proof of it in the intelligent adaptation to the local resources.

Nor should I here omit an observation which has a direct bearing on that much-discussed question of climatic change usually spoken of in connection with Central Asia as "desiccation." In keeping with its character as a portion of the "Great Wall," the *Limes* west of Tunhwang shows a continuous line of wall except in places where the general direction permitted its designers to substitute for it impassable marshes or lakes, and thus to economize in constructive effort. Exactly the same method is found in certain *Limes* lines of the Romans where a "wet border" had been inserted into a chain of frontier posts. Now where the line of the Tunhwang *Limes* thus abutted on small lakes or marshes, remains of the wall were ordinarily traceable to a level within a few feet of that still reached by the water. This suggests that the volume of water received by these depressions could not have greatly varied since Wuti's *Limes* was constructed.

This is not the place to indicate the many interesting glimpses which the mass of ancient record recovered gives us of the organization of the troops (largely recruited from convicts) guarding the *Limes* line; of

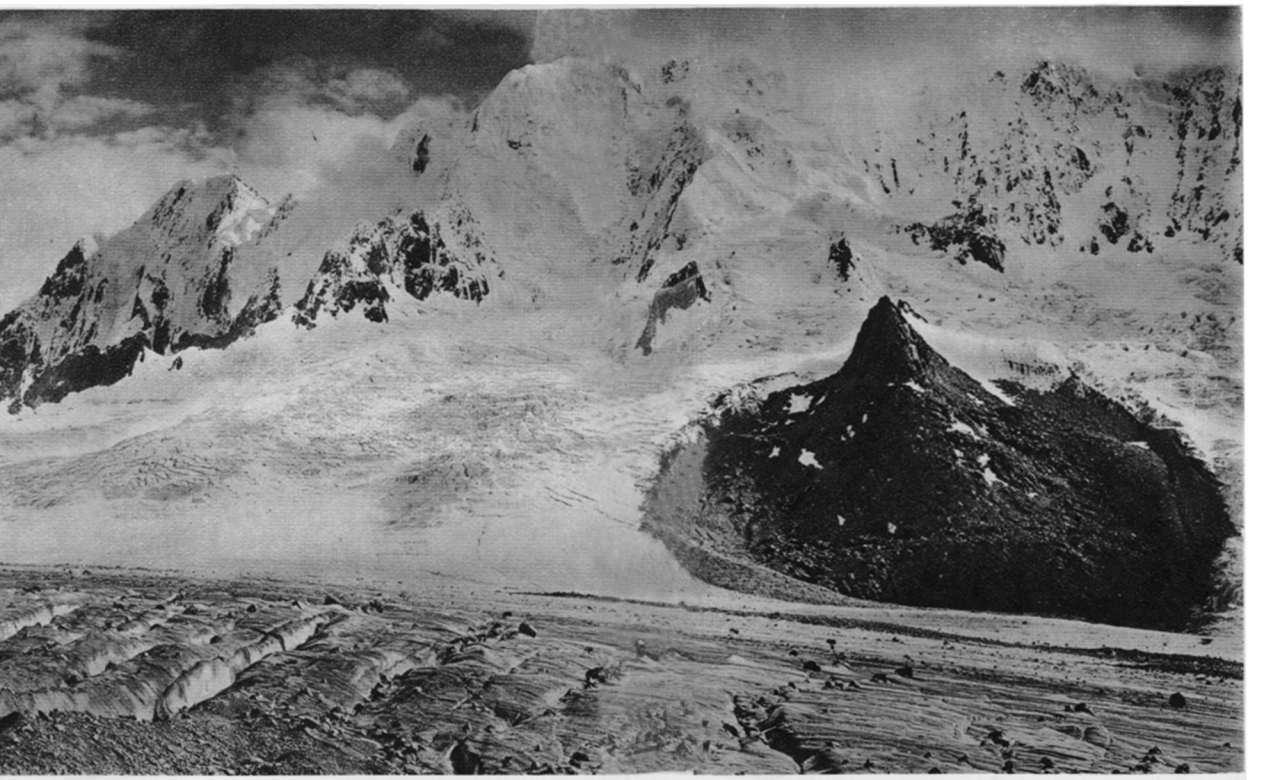
the elaborate system of supplies and transport provided for them; of the service of fire signals maintained along the line, etc. It must suffice to call attention to the evidence which the great size and solidity of the ruined magazine still rising close to the actual caravan route behind the *Limes* affords of the traffic once passing along it (Pl. 24). Throughout the disposition of the watch-posts, sectional headquarters, etc., bears testimony to that remarkable eye for topography which has always distinguished the Chinese. The use of this particular quality for strategic purposes is well illustrated by the way in which those old military engineers of the Emperor Wuti secured a natural flanking defence for their *Limes* line by letting it end close to the terminal marsh basin of the Sulo Ho (Pl. 30).

Beyond this the direction of the ancient route is indicated only by a couple of advanced signal towers along the present caravan track leading towards Lop and by the configuration of the ground. This marks out the desert valley of Besh Toghraq as the only practicable line for further progress between the utterly waterless wastes of the Quruq Ṭagh in the north and the high dunes of the Qum Tagh, or "Sand mountains," in the south. Here obviously there was no need for assuring safety by a *Limes;* for nature itself had provided for the defence of the route line against raids by impassable deserts on either side. And here the question obviously obtrudes itself as to why the Chinese, in spite of very serious difficulties and their traditional aim at economy of effort, had found it at all necessary to carry their protective line of wall and towers so far beyond the oasis of Tunhwang.

The answer to this question is, I think, clear, but obliges us for a moment to turn our attention away to the north. There at a distance of only some 200 miles in a straight line from Tunhwang lies the oasis of Hami at the foot of the Qarliq Tagh (Pl. 14), the easternmost snowy outlier of the Tien Shan. This important area of cultivation provides the natural bridge-head for the easiest route connecting Eastern Turkistan with the Kansu marches. Through it now passes practically the whole of the traffic between the two regions. But at the time of the first expansion of Chinese power into Central Asia and for fully two centuries later Hami was in the power of the Huns who in the great Barkul valley just across the Tien Shan and elsewhere on the northern slopes of the Qarliq Tagh held congenial grazing-grounds amply provided with water. As long as the Hun nation remained a formidable neighbour on the north-western borders no permanent advance to the Tien Shan across the "Gobi" of the Pei Shan could safely be undertaken by the Chinese. Yet without securing a hold upon Hami it was impossible for them to prevent Hun raiding parties crossing the Pei Shan towards Tunhwang and the terminal course of the Sulo Ho beyond it; for in this central portion of the Pei Shan well water for small parties of horsemen can even now be found at certain points, and along the marsh-lined bed of the Sulo Ho such bands could

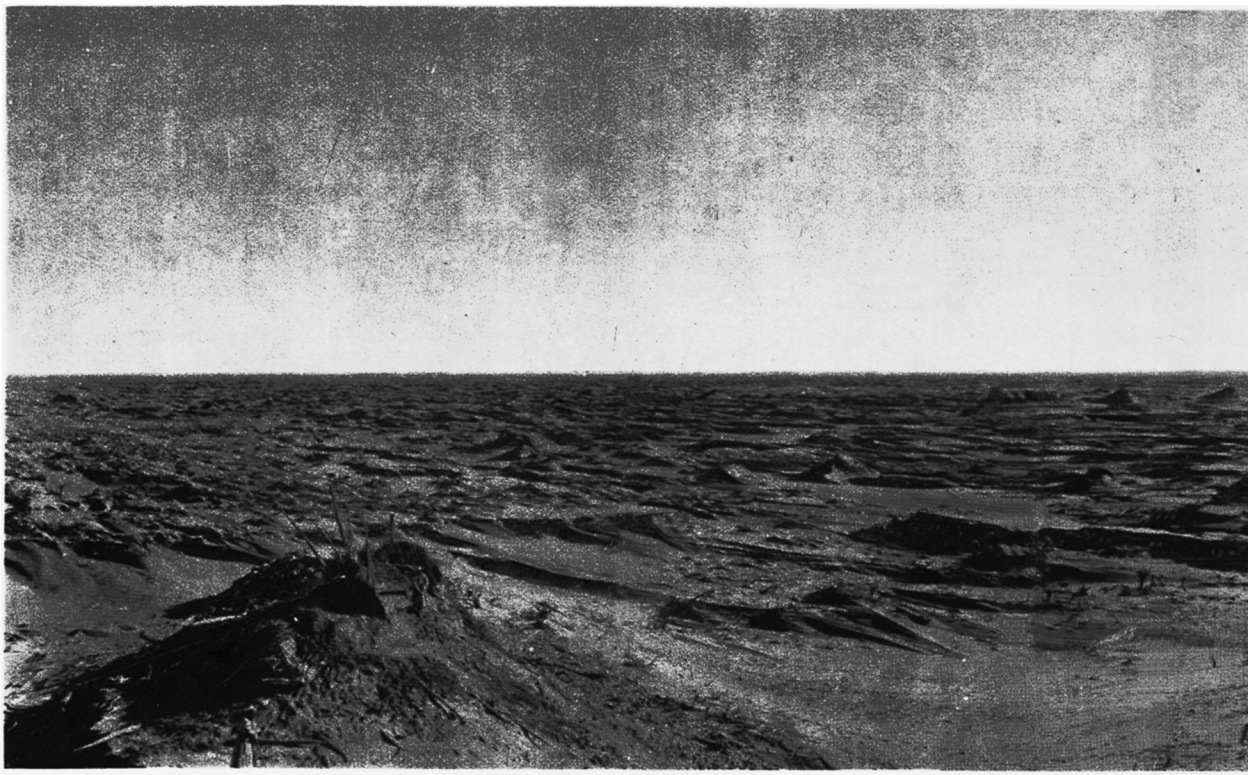
20. DARKOT AND CHATIBOI GLACIERS. SEEN FROM THE FOOT OF THE
On left the Darkot Glacier, over which the ascent to the Darkot Pass (15,600 feet) leads. On right the C

21. ASCENT TO DARKOT PASS FROM NORTH, WITH CREVASSED GLAC



OI GLACIERS. SEEN FROM THE FOOT OF THE RUKANG SPUR, MASTUJ
t to the Darkot Pass (15,600 feet) leads. On right the Chatiboi Glacier, below Koyozum Peak (22,603 feet)

T PASS FROM NORTH, WITH CREVASSED GLACIER IN FOREGROUND



22. VIEW TO SOUTH-EAST AND SOUTH, FROM RUINED STUPA OF LOULAN SITE, A
In foreground remains of ruined dwellings, showing original surface level. At *A* traces of eastern face

23. BODY OF NATIVE OF ANCIENT LOULAN, IN GRAVE OF CEMETERY EXPLORED ON MESA L.F.

24. RUINS OF ANCIEN

OUTH, FROM RUINED STUPA OF LOULAN SITE, ACROSS WIND-ERODED GROUND
owing original surface level. At *A* traces of eastern face of ancient circumvallation carried off by wind

24. RUINS OF ANCIENT CHINESE MAGAZINE ON *LIMES* OF TUNHWANG

always collect with ease and prepare for attacks. Hence arose the need for the executors of Wuti's Central-Asian policy to extend their *Limes* right away to the river's termination.

The difficulties of nature which beyond this had to be faced by the Chinese on their earliest route into the Tarim basin were great indeed. They might well have appeared altogether prohibitive from the point where it reached the bed of the dried-up salt sea which had to be crossed to Loulan, in the ancient delta of the Quruq Darya. But the Chinese at all times have been far more willing to face and overcome the difficulties and dangers of nature, however formidable, than to struggle with barbarian foes—ready to expose their lives and to endanger those of others. Thus alone can we account for the line followed by that ancient highway, for the most part over truly forbidding ground.

In tracing its line we are aided to some extent by the data which brief references in the Han Annals and a couple of Chinese historical texts composed somewhat later furnish as to successive stages of the route. But it is only since the surveys and archæological discoveries made on my third expedition that we can arrive at definite conclusions regarding it. I have had occasion to indicate the main outlines of these conclusions in 'Serindia,' and to discuss the evidence for them fully in 'Innermost Asia,' my forthcoming detailed report. The topographical facts are recorded in the Lop desert sheets (Nos. 29, 30, 32, 35) of the recently published atlas, 1:500,000, of my Central-Asian surveys. To these publications I may refer for all details.

Over a distance of close on 140 miles the general direction of the ancient route is adequately determined by the configuration of the ground. Starting from the extreme western point of the *Limes* the route was bound to lie along the desert depression which separates the southernmost chain of the utterly barren Quruq Tagh from the high sand-ridges of the Qum Tagh. This depression, as already noted before, contains the easternmost bay-like extension of the dried-up Lop sea. It may be called the Besh Toghraq valley from the name of the halting-place at its head. Past this leads the caravan track which was once followed by Marco Polo and after the abandonment of centuries was brought into rare use again in recent years. Further on it skirts the southern shore of the great salt-encrusted sea-bed (Pl. 27).

In order to reach this point the route in ancient as in modern times had to cross an earlier terminal basin of the Sulo Ho filled with a maze of fantastically eroded clay terraces or *Mesas* (Pl. 28). A series of high ridges of drift sand projects into this basin and accounts for the name of *Sanlung-hsia*, the "Three Sand-ridges," which an early Chinese itinerary, in the *Wei lio*, mentions near the first stage on the route to Loulan. At Besh Toghraq, which boasts of two wells less brackish than the rest in this valley, the line of the ancient route separates from the track still followed by occasional caravans towards Lop and continues along the

northern edge of the gradually widening bay. Strips of ground covered with light drift-sand and scanty desert vegetation intervene here between the well-defined shore-line of the prehistoric sea and the dismal expanse of salt crust, mostly hard but in places still boggy, which marks its former extension into this bay. Thus for a distance of about 80 miles from Besh Toghraq we may suppose that those following the ancient Chinese " route of the centre," as the *Wei lio* calls it, could still count upon finding in places water, not altogether undrinkable, and a minimum of reeds and scrub for their animals.

The difficulties of moving large convoys and big bodies of troops over desert ground so far from the nearest supply base at Tunhwang must have been serious enough. But they were as nothing compared with the formidable obstacles to be faced on the onward journey to Loulan. About 16 miles beyond the point where nowadays the last trace of vegetation is found, though no drinkable water, a final offshoot of the hill chain so far followed juts out into a vast expanse of hard salt crust (Pl. 34). This stretches here away, absolutely level and unbroken like the open sea, over some 180° of the compass. Here the salt-encrusted great bay which the route has skirted merges in the eastern extremity of the dried-up Lop sea-bed. To trace from this point onwards the route by which those old Chinese wayfarers had made their way to Loulan, still close on 100 miles off to the west in a straight line, would have been an impossible problem if attempted from this side. The forbidding salt waste ahead would afford no landmark to the traveller, and similarly the old Chinese accounts fail us as regards direction, stages, or distances. But they show clearly enough the terror with which this portion of the journey was regarded.

It was only from the opposite side, that of Loulan, that any attempt could be made with any chance of success, and, let me add, with due regard for safety. In the preliminary account I gave before you when I returned from my third expedition,* I had already occasion to relate how in the winter of 1914, helped by archæological discoveries and some measure of luck, I succeeded in tracking the ancient route through this waterless wilderness. But the story bears, perhaps, repeating in brief outlines, be it only for the light which some of its incidents throw upon the physical conditions now prevailing on this ground and on the life long ago departed of which it was once the scene.

The explorations which I carried out in 1906 among ruins first discovered by Dr. Hedin in the dried-up delta of the Quruq Darya, had furnished full archæological proof that they marked the site of an ancient station occupied under Chinese control down to the third century A.D. The documents found there made it clear beyond all doubt that it had served as the western bridge-head, as it were, in Loulan territory for the route which crossed the Lop desert towards Tunhwang. Excava-

* See *Geographical Journal*, August–September, 1916.

tions and surveys resumed in February 1914 enabled me to make further interesting discoveries, *inter alia* to trace remains of the square circumvallation which once enclosed the main site (Pl. 22). Excessive wind erosion, proceeding since moisture and vegetation departed, has sculptured this ground into a maze of steep clay terraces and trenches (Pl. 31), and has almost completely carried off the once massive ramparts. But of particular importance for the main task which had drawn me back to this desolate ground, now close on 100 miles away from the nearest drinkable water, were the results of reconnaissances made into the desert north-eastwards. They revealed there a succession of remains which clearly indicated that the ancient route towards China had followed that direction, at least in its initial portion.

The nearest among these was a cemetery situated some 4 miles off on the top of an isolated clay terrace or *Mesa*. Rapid clearing revealed that it contained grave-pits into which miscellaneous relics of earlier burials had been collected by pious hands at some period before Loulan was finally abandoned. The mass of beautiful figured silks, both polychrome and damasks, here recovered have proved quite a revelation as regards the artistic style and technical perfection of those products of Chinese silk-weaving which travelled westwards through Loulan while trade still followed this route.* Collateral evidence proves that the original burials belonged to the early period of Chinese expansion into the Tarim basin, and that they had undergone already prolonged exposure to erosion before the danger of complete destruction caused them to be collected in these pits.

These relics of Chinese textile art from the time of Christ and before, claim special interest because they have been preserved for us on the very route of the earliest silk trade. But equally important is it for the student of those early relations between the Far East and the West to note that among the decorated fabrics there are found fragments of exquisitely worked tapestries in wool which display a style unmistakably Hellenistic. Whether they are of local make or imports from Central-Asian territories further west, we have in them striking illustration of a cultural influence which that ancient desert route also served for centuries, but in the reverse direction.

Continuing to the north-east for another 12 miles, we soon left behind the last dry river-bed once fed by the Quruq Darya (Pl. 26) and still marked by trunks of wild poplars and tamarisks dead for centuries. Then we came upon the ruins of a small walled *castrum*, undoubtedly once serving as an advanced *point d'appui* on the road from Tunhwang. Its walls, built with alternate layers of carefully secured reed fascines and stamped clay, showed such close agreement in all constructive details with

* For a preliminary account of these textile finds, see F. H. Andrews, "Ancient Chinese Figured Silks excavated by Sir Aurel Stein" (*The Burlington Magazine*, 1920).

the wall of the westernmost Chinese *Limes* that there could be no doubt about its dating, just as this does, from the first military advance of the Chinese into the Tarim basin. The destructive forces of two thousand years had not succeeded in seriously breaching these massive walls. Under their shelter dated Chinese records survived, belonging like most of those found at the Loulan station to the period preceding the final abandonment of the route, soon after the end of the third century A.D. But the interior of the fort had suffered terrible havoc through wind-erosion scooping out deep hollows.

All the more gratifying was the remarkable state of preservation which the elevated position on the top of a high *Mesa*, together with the exceptional aridity of the climate since ancient times, had assured to remains of an outlying look-out post traced some 3 miles further to the north-east. Here we found graves holding bodies of the indigenous Loulan people who once tenanted the small stronghold (Pl. 23). Several of the bodies were so wonderfully well conserved, together with their burial deposits, that I felt myself brought here face to face with the race of semi-nomadic herdsmen and hunters whom the Han Annals describe as the native population of Loulan. Their features showed close affinity to that *Homo alpinus* type which, as the anthropometrical materials collected by me have proved, still continues the chief element in the racial constitution of the present population of the Tarim basin. The distant view gained from this elevated point made it certain that we were here near the eastern extremity of the ground once reached by life-giving water from the river. Beyond to the east there lay the boundless expanse of shimmering salt, marking the dried-up sea-bed.

The topographical indications I deduced from the position of the remains successively discovered seemed to point to the ancient route having lain to the north-east. Yet this bearing would lead us at right angles away from the line on which, as our preceding mapping showed, we should have to look for the direct route to the debouchure of the Besh Toghraq valley. It was an observation distinctly discouraging with regard to the search we should have to make for the ancient route. The ground ahead was sure to prove devoid of all resources for human life, including water. Careful preparation was essential for ensuring safety on such a journey through an absolute wilderness. By its estimated length of at least ten days it was bound to put to a severe test the endurance of our brave camels, already hard tried by work of the preceding weeks. So it became necessary at this stage to gain first the distant salt springs of Altmish Bulaq at the foot of the Quruq Tagh to the north, in order that the camels might gather fresh strength by a few days' grazing at reed-beds as well as by the chance of a drink.

After two trying marches from Altmish Bulaq, across a perfect maze of steep clay terraces and hillocks encrusted with hard salt, we regained the vicinity of that outlying little fort. There I was fortunate enough to

discover more remains confirming my conjectural conclusion that the initial bearing of the route lay to the north-east. At the very edge of the area showing some dead vegetation I came upon the remains, almost completely eroded, of an ancient watch-tower of the type familiar from the *Limes*. Beyond this there were no ruins to guide us; for we were now passing into ground which all through historical times must have been as devoid of plant or animal life as it now is.

But as we steered north-eastwards by the compass across absolutely barren wastes of clayey detritus or salt crust, chance came again and again to our help by strange finds. They seemed as if meant to assure us that we were still near the ancient track by which Chinese missions, troops, and traders had toiled for four centuries through this lifeless wilderness; that I was right in my reliance on the Chinese with their topographical sense having for good reasons selected this bearing, puzzling as it seemed at the time.

It must suffice here to mention what perhaps was the most striking and welcome of these finds. The last traces of dead vegetation marking the termination of the ancient delta had long remained behind when we suddenly found the old route line plainly marked by some two hundred Chinese copper coins strewing the dismal ground of salt-encrusted clay for a distance of about 30 yards. They lay in a well-defined line running from north-east to south-west. The coins, square-holed, were all of the Han type and seemed as if fresh from some mint. Clearly they had got loose from the string which tied them, and gradually dropped out through an opening of the bag or case in which they were being carried by some convoy. Some 50 yards away in the same direction there were scattered bronze arrow-heads, all manifestly unused. Their shape and weight exactly agreed with the ammunition of Han times so familiar to me from finds along the *Limes* of Tunhwang. There could be little doubt that coins and arrow-heads had dropped from some convoy of stores proceeding to Loulan in Han times. Their having remained on the ground is easily accounted for if the convoy moved at night-time and a little off the main track but still in the right direction.

That day's long march was taking us past a far-stretching array of big *Mesas* which with their fantastically eroded shapes curiously suggested ruined towers, mansions, or temples. It was easy to recognize in them those wind-eroded mounds which an early Chinese text mentions near the north-western edge of *P'u-ch'ang*, or the ancient Lop sea-bed, and in which Chinese eyes saw the ruins of a mythical "town of the dragon." Finally, after continuing our north-easterly course for another day across bare clay and mica detritus, we arrived at a forbidding belt of salt-coated erosion terraces (Pl. 35). They clearly corresponded to those which Chinese notices of the ancient route to Loulan repeatedly mention as the dreaded "White Dragon Mounds," and graphically describe. Progress between them was very trying for our poor camels' feet, and also for us

men. But still worse it was to face the crossing of the bed of the dead Lop sea with its terrible salt surface which I knew to lie beyond.

A fortunate find of Chinese coins and metal objects marking a halting-place on the ancient route induced me now to head straight eastwards for that bed, and the crossing effected next day proved that I had been rightly guided. The march of 20 miles across this petrified sea-bed, with its hard salt crust crumpled up into big cakes aslant and small pressure ridges between them (Pl. 36), was most fatiguing for men and beasts alike. But subsequent surveys showed that without several days' détour northward the crossing of this forbidding salt surface could not have been shortened, but on the contrary only lengthened.

It was, no doubt, this consideration which had determined the early Chinese pioneers in the choice of this line for their route. Archæological evidence of ancient traffic on it cropped up again soon in the shape of coins and beads, when through the opposite belt of "White Dragon Mounds" we had gained the eastern shores of the ancient salt marsh. Three marches along these over ground easy but still devoid of any trace of vegetation, dead or living, finally brought us to the debouchure of the Besh Toghraq valley. There I found the ancient Chinese road still plainly marked in one place by the straight wide track which the passage for centuries of transport animals, and probably also carts, had worn into the salt-encrusted ground.

How traffic of such magnitude as the Chinese Annals indicate was organized and maintained on a route passing across some 120 miles of utterly barren ground, already in ancient times without water, fuel, or grazing, is a problem we need not discuss here. But it is well to keep in view that great power of organization which was needed to solve it in practice, if we are adequately to realize the remarkable qualities which enabled the Chinese for centuries to control and keep open that far-stretched corridor of the Tarim basin. It was an achievement fraught with momentous results for the interchange of civilizations, and there is deep significance in the fact that it was due far more to prestige, economic resources, and political ability on the side of China than to any military prowess among its people or its rulers. It may well, in fact, be looked upon as a triumph of the mind over matter, whether manifested in space or in brute force.

The intercourse thus established through Central Asia suffered its first interruption about the beginning of our era through the rapid decay of internal order which took place in China during the short-lived reigns of the last two emperors of the Former Han dynasty (6 B.C.–A.D. 5). With the consequent weakening of Chinese control in the Tarim basin "the principalities of the Western countries," we are told in Later Han Annals, "broke up and formed fifty-five territories." When, on the accession of the usurper Wang Mang (A.D. 9), trouble arose with the Shanyü or supreme chief of the Huns, the territories before controlled

by the Protector-General in the Tarim basin and near it " broke off all relations with the Middle Kingdom and all again submitted to the Huns." The exactions of the Huns made those petty chiefships turn, indeed, again to China for protection towards the middle of the first century. But the empire reconstituted under the founder of the Later Han dynasty was not as yet sufficiently consolidated to resume a policy of Central-Asian expansion. The north-western marches of Kansu subsequently became exposed to prolonged raids from the Huns, until at last the need of effective protection for its borders forced the Chinese empire again to start upon a " forward policy " in Central Asia.

It is interesting to note that the first move made in A.D. 73 under the Emperor Ming was aimed directly at the Huns by the taking of Hami. This strategically very important oasis was the key to that " route of the north " which passed along the foot of the eastern Tien Shan and through the Turfan depression. It was destined by nature to serve as the easiest road into the Tarim basin—provided it could be protected against nomadic attacks from across the Tien Shan. Some temporary weakening in the power of the Huns still holding the grazing-grounds to the north appears to have influenced this diversion of the Chinese effort to a new line. But its success was short-lived ; for though the chiefs of the small territories in the Tarim basin had promptly offered allegiance after that first forward move, and again invited a Chinese " Protector-General," the difficulty of maintaining a hold on that exposed northern line forced the Emperor Chang, Ming's successor, by A.D. 77 to evacuate both Hami and Turfan.

It was not until thirteen years later that Hami was re-occupied by the Chinese. But meanwhile the Tarim basin had become the scene of events which in the end placed the empire once again in undisputed possession of that great passage land. Incidentally they also proved the value of the desert route first opened from the side of Tunhwang nearly two centuries earlier. This is not the place to relate the story of the remarkable exploits by which the famous Pan Ch'ao, the greatest of the soldier statesmen who ever served China's Central-Asian policy, re-established effective imperial authority throughout the Tarim basin. It must suffice for us to note that Pan Ch'ao started his series of brilliant successes when deputed in a subordinate capacity to the chief of Shan-shan, as the Lop territory, the ancient Loulan, had been renamed in the first century B.C. By a bold night attack made with a handful of men, he surprised and exterminated a mission sent there by the Huns. Then, having thus safeguarded the line of communication with China, he proceeded to win his way by the " southern route " all along the foot of the Kunlun. Gradually he gained mastery over the chiefs of Khotan, Yarkand, and Kashgar, not by the force of arms but by bold bluff and skilful diplomacy. Pan Ch'ao's maxim, as stated by him in a very interesting memorial to the Emperor which the Annals have preserved, " was to use the barbarians for attacking the barbarians." Thus securing

needful support in the country itself, he succeeded after many set-backs and hard struggles in steadily extending Chinese supremacy over the "Western Countries," until by A.D. 94 the last of the powerful kingdoms along the Tien Shan had been forced into submission.

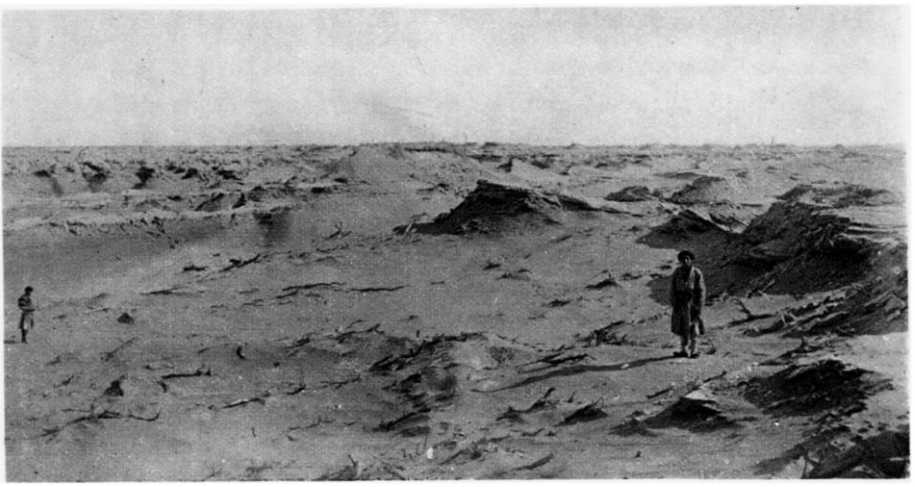
Chinese political influence had, in consequence of Pan Ch'ao's triumphs, been extended westwards even beyond the Tsungling or the Pamirs. Diplomatic relations were established with the Parthians and direct contact sought with distant Ta Ts'in or Syria by means of a mission which A.D. 97 appears to have reached the sea in the Persian Gulf. By A.D. 102, when Pan Ch'ao, grown old and laden with imperial honours, returned to the distant capital soon to end his days there, Chinese prestige and power in Central Asia may be said to have reached its apogee.

It is just about this time that we may assume *Scythia extra Imaon*, or the Tarim basin, to have been traversed by the trade agents of that Macedonian merchant, Maës Titianus, whose reports enabled Marinus of Tyre and through him Ptolemy, the Alexandrian geographer, to furnish us with information on the route followed by the caravans bringing to the West the silk of far-off Serike, the land of the Seres, *i.e.* China. But the same period probably witnessed also the first important developments in the use of that maritime route through the Red Sea and the Indian Ocean which made exchange of merchandise, whether direct or through Indian channels, possible between China and the trade centres of Egypt and Syria.

The opening of this new channel of commercial intercourse between China and the West may not have immediately affected the importance of the Central-Asian trade route. But changes more local took place likely to hamper its use. By A.D. 107 revolts among the "Western Countries" and subsequent inroads of the Huns led to the complete withdrawal of Chinese control from the Tarim basin. From A.D. 123 onwards endeavours were made to recover the ground lost. It is of interest to note that the first efforts, carried out under the leadership of Pan Yung, Pan Ch'ao's son, were based upon the ancient route *viâ* Loulan and first directed towards Turfan. Hami was not re-occupied until A.D. 131, when the Huns had been defeated north of the Tien Shan. But in spite of the partial successes recorded, the Later Han Annals clearly tell us that imperial prestige gradually decayed in the Western Regions during the century of increasing internal weakness which preceded the final downfall of the dynasty, A.D. 220.

The epoch of the "Three Kingdoms" which followed this event saw China divided between rival dynasties. Effective Chinese control over the whole of the Tarim basin was not likely to be maintained in these troubled times. Hence references to the Western Regions are scanty enough in the historical texts dealing with this period (A.D. 220–265) and that of the Chin dynasty (A.D. 265–419) which succeeded. Yet there is evidence that those territories still continued to be open to trade

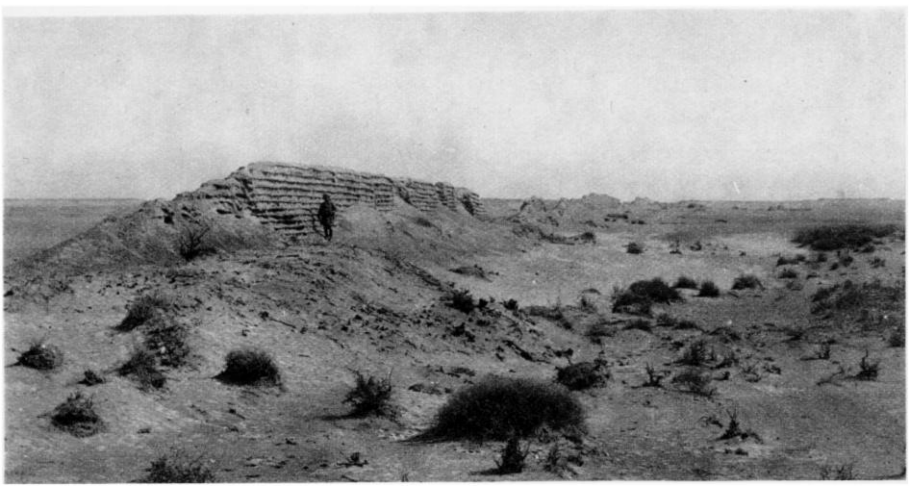
25. CAMP TO N.W. OF MINGSHUI WELLS, PEI SHAN



26. DRY BED IN DEAD DELTA OF QURUQ DARYA, N.E. OF LOULAN SITE

27. SALT SPRING OF LOVAZA, WITH ICE SHEET BELOW OLD SHORE-LINE, AND VIEW ACROSS SALT-ENCRUSTED LOP SEA BED

28. WIND-ERODED TERRACES (MESAS), 100-120 FEET HIGH, IN ANCIENT TERMINAL BASIN SULO HO



29 ANCIENT CHINESE BORDER WALL BUILT WITH LAYERS OF REED FASCINES, EAST OF WATCH-STATION T.XIII., ON *LIMES* OF TUNHWANG

30. RUIN OF ANCIENT WATCH-TOWER, T.IV.C. ON WESTERN FLANK OF TUNHWANG *LIMES*, WITH VIEW ACROSS ERODED BASIN TO NORTH

and cultural influences both from the East and the West, even though political power from the side of China could assert itself only intermittently and in the parts nearest to the Kansu marches.

The evidence I allude to is fortunately supplied not merely by such brief notices as M. Chavannes' learning has rendered accessible from the *Wei lio* and the Chin Annals, but by the abundant remains of two very interesting ruined sites I have been able to explore. I mean the ancient settlement brought to light in the desert sands beyond the termination of the Niya river, and the ruins at and around the ancient Chinese station of Loulan, which I have already had occasion to mention as the western bridge-head of the earliest Chinese route into the Tarim basin.

In ' Desert Cathay ' and ' Serindia,' as well as in the publications on my first expedition which led to the discovery of the Niya site, I have found occasion to deal at length with the manifold interesting aspects of the conditions of life and administration revealed by the remains both there and in the Lop area. Here only the most characteristic among them may be noted before we turn to those questions of direct geographical import which are raised by the abandonment of both sites to the desert and the state of utter desolation now prevailing there. Both at the Niya site and in Loulan we have the evidence of dated documents proving that occupation had continued until about the close of the third century of our era.

This approximately contemporary occupation accounts for the close similarity observed in most features of the ruins and of the finds their exploration has yielded, though the two sites are separated by a direct distance of close on 500 miles. At the Niya Site, the *Chingchüeh* of the Han itineraries, it is easier for us to reconstruct the conditions of life once led there; for its ruined dwellings, scattered along the ancient termination of the Niya river over an area measuring about 15 miles from north to south, with a maximum width of about 4, are far more numerous. They have also suffered less by destructive wind-erosion, while abundant drift-sand has helped to protect whatever the last occupants had left behind.

The careful construction of the houses once tenanted by local officials or landlords (Pl. 33); remains of well-made household furniture and implements; objects of decorative art in the shape of fine wood-carvings, etc., all attest a highly developed state of civilization. The products of local industrial arts and crafts clearly show the prevalence of a strong Hellenistic influence as transmitted from Eastern Iran and the north-western borders of India. Yet the use of articles of Chinese workmanship, such as silk fabrics and fine lacquered ware, is also well attested. Finds of objects of Buddhist worship in the shape of shrines and relic towers or Stupas make it quite certain that Buddhism, India's greatest contribution to the spiritual development of civilized mankind, had by

that time already acquired that predominant position in the religious and intellectual life of the indigenous population of the Tarim basin which it was destined to preserve for nearly a thousand years.

This strong influence of Indian culture is very strikingly reflected also in the mass of written records recovered in the ruined dwellings and the refuse heaps adjoining. At the Niya site I found by the hundred wooden documents comprising correspondence, mainly official, contracts, accounts, miscellaneous memoranda, and the like, all written in that Sanskritic language and Kharoshthi script which during the first centuries before and after Christ were used on the Indian north-west frontier and in the adjacent portions of Afghanistan. But the ingenious methods of wooden stationery used for all these writings is undoubtedly of Chinese origin. Chinese records, also on wood, found at the Niya Site prove that some measure of Chinese control still extended so far west. But the local administration was carried on under the authority of native chiefs whom the Kharoshthi documents name under the title of "Maharaja." At the Loulan station the vast majority of the written remains found are in Chinese, and comparatively few in Kharoshthi and Early Sogdian, the language of the Oxus region; for there, so much further to the east, on the ancient main line of communication between China and the Tarim basin, Chinese authority, while it lasted, was bound to assert itself far more directly.

We are able with almost as much clearness to reconstruct the physical aspects of the life once witnessed by these sites. At the ancient settlement beyond the present end of the Niya river I could clearly make out the position and arrangement of the orchards and arbours, as marked by the trunks of their fruit trees and poplars, dead for over sixteen hundred years, but often still upright. Fences and hedges could be traced marking the enclosures of residences or fields (Pl. 32), and in places also the lines of the canals which had once carried life-giving water to the cultivated area. The terminal course of the Niya river, as it then ran, was definitely indicated by the footbridge at one place lying across a dry bed which elsewhere is completely overrun by tamarisk-cones or smothered under sand-dunes.

At the Loulan site the surface of the ground had been abraded far more through wind-erosion (Pl. 22), and hence could not retain the traces of ancient cultivation so clearly. But there, too, everything in the way of dead vegetation, materials used in buildings, etc., distinctly point to conditions of cultivation and climate having been essentially the same as those now observed in oases of the Tarim basin similarly situated and still occupied. For detailed observations supporting this conclusion I must refer to my previously mentioned publications.

Just as in the present terminal oases of the Tarim basin, so cultivation at those sites must have been entirely dependent on irrigation, moisture in the local atmosphere being a factor wholly negligible for agriculture.

Had not such conditions of extreme aridity already prevailed in ancient times, it would be impossible to account for the survival in almost perfect preservation of a multitude of objects, very perishable by nature, in places so exposed as refuse heaps outside houses. Yet there is abundant antiquarian evidence to prove that the accumulation of such refuse, including the " waste papers " of more than one local reign, must have proceeded over a considerable number of years.

Exactly corresponding observations are furnished by what archæological explorations at other ancient sites of the Tarim basin have taught us. Whether their remains are found in the desert sands beyond the present limits of Khotan and other southern oases, as *e.g.* at the sites of Dandan Öilik, Khadaliq, and Endere, or in now deserted localities of Kucha territory to the south of the Tien Shan, or eastwards in the depression of Turfan, the archæological evidence uniformly points to the same conclusion. The climatic conditions of the periods immediately preceding abandonment—periods varying here at different sites from about the fifth to the thirteenth or fourteenth centuries—must have been practically as arid as they were since and are now.

This uniform and important fact invests the question as to the cause or causes which led to the abandonment of all these old sites, with special interest both for the geographer and historical student. That question has received much attention in recent years owing to its connection with much-discussed theories of " desiccation " within historical times. If I were to attempt to examine all the facts bearing on this question which archæological and geographical exploration of ancient sites in Chinese Turkestan has yielded, a separate paper would be needed. Instead of this I shall content myself here with emphasizing two observations which ought to be kept prominently in view by those generally interested in the problem.

One concerns the necessity of realizing how varied the initial causes of abandonment may be in the case of individual sites before assuming *à priori*, be it only as a " working theory," that the cause must in each case be connected with some phase of general or regional " desiccation." Where settled occupation on any scale is possible only with the help of so elaborate an organization as artificial irrigation presupposes, its chances of development or shrinkage are affected by the uncertainties of human activity vastly more than on ground where nature itself provides for the fields that indispensable element of agricultural production, adequate moisture. The factors influencing human activity may be manifold and are often very complex, and cultivation wholly dependent on irrigation is particularly liable either to benefit or to suffer by them. To ascertain the factors which had a determining influence upon such cultivation at a given period must be very difficult, where no definite record is preserved ; for human factors quite different in character may produce results which may appear indistinguishable to those who after the lapse of

centuries attempt to trace their causes in the light of purely archæological evidence.

Thus in the Tarim basin quite a variety of causes entirely, or at least partly, of human origin might lead to reduction in the size of oases or even to the complete abandonment of outlying ones. Prolonged periods of war or internal disorder; devastating epidemics; changes in the beds of rivers rendering existing canal heads useless and producing results with which the local population is unable to cope owing to deficient resources of labour; diversion of traffic and trade causing labour to recede from certain oases which are separated from others by long distances of desert and hence difficult to protect or to render profitable:—all these causes and their effect upon the oases of this region can actually be illustrated from experience gained in recent periods. Other causes, too, of a similar character might be suggested on ground where the conditions of cultivation are so complicated and the technical means available for the maintenance of canals comparatively so primitive.

The results of such diverse causes as I have indicated, must in each case be the same, viz., abandonment of once cultivated ground. The same result would obviously be produced if the supply of water needed for irrigation were from some purely natural cause to undergo serious diminution or altogether to fail. On ground thus abandoned to the desert and subsequently left unreclaimed the ancient remains preserved through the aridity of the climate will enable us to fix the time of abandonment with more or less accuracy. But it is clear that the critical student will not be prepared to assign this abandonment to a particular cause, whether originating from nature or some human factor, unless definite evidence in the shape of reliable records or unmistakable archæological indications are forthcoming.

Unfortunately, at none of the old sites explored in this region do we as yet possess such evidence as methods of sound historical research would allow us to accept as conclusive. To make up for the regrettable want of such evidence by means of a "working theory" would be of no real help; for where matters of a historical past, more or less distant, are under consideration it is impossible to apply those experimental tests without which a "working theory," however tempting, must remain intrinsically useless.

There is, however, a second observation to be borne in mind in connection with the question of "desiccation" so far as it concerns innermost Asia, and for this can be claimed a more positive character, in view of what the ancient settlements discovered at the Niya Site and in the Lop desert teach us. The former at its northern end is separated by fully 70 miles from the nearest point in the present oasis of Niya where cultivation is now possible. Yet its irrigation comes from the same river which about seventeen hundred years ago still carried its water to the fields of ancient Chingchüeh, the now sand-buried Niya Site. In the case of

the remains of Loulan the change in this respect is even more striking; for the small oasis of Tikenlik, the nearest cultivated area on the Tarim which now receives the water once flowing in the Quruq Darya to Loulan, lies over 120 miles to the west of the extreme point once irrigated from the "Dry River."

The circumstances connected with this wide separation of the two ruined sites from the present end of the rivers to which they once owed their irrigation, are not exactly parallel. At the Niya Site we have a striking and perfectly clear instance of shrinkage in the volume and length of course of the river which until the third century A.D. rendered the existence of a terminal oasis possible so much further away than it does at present. There has been no change in the direction of the river course. This, as our mapping shows, still runs straight towards the site, though what little water it carries below the present Niya oasis dies away in the sand before reaching the ruined area. We observe conditions closely corresponding also at other ancient sites abandoned to the desert at the southern edge of the Taklamakan from Dandan Öilik to Endere.

In the Loulan tract the situation may at first sight seem somewhat different. Here we find that the Konche Darya which carries the drainage of the big Qara Shahr valley and once had its continuation in the Quruq Darya, instead of flowing eastwards to the Loulan sites, now turns to the south-east and joins the network of beds representing the lower course of the Tarim. Yet whatever the relation may have been between this diversion of the Konche Darya and the abandonment of ancient Loulan, there is every reason to believe that here, too, a very great shrinkage has taken place in the available volume of water since the times when the Quruq Darya fed the extensive delta traced to the east and south of the Loulan ruins. There are indications pointing to similar shrinkage also in the case of other rivers which descend from the Tien Shan into the Tarim basin.

If we review the observations just summarized in brief outlines, we are forced to two conclusions by definite archæological evidence. One is that climatic conditions quite as arid as the present ones prevailed within the big trough of the Tarim basin as far back as ancient remains and available records can take us. The other conclusion is that the amount of water carried by its rivers has greatly diminished during the same historical period. It is possible that geological and meteorological research may have more than one conjectural explanation to offer which would account for the apparent contrast between these two conclusions. But the explanation which at present appeals to me most is the one which Colonel Sir Sidney Burrard, late Surveyor-General of India, first verbally suggested to me in 1908 on my return from my second journey; and the same has been recently proposed by a competent observer, Dr. Ficker, with regard to similar conditions in the Oxus basin.

This theory seeks the reason for the diminished volume of the rivers in the shrinkage of the glaciers on the high ranges which are their main feeders. It accounts for the shrinkage itself by assuming that those glaciers comprise great reserves of ice which have been left behind by the last glacial period and have since been undergoing slow but continuous reduction through milder climatic conditions. This continued process would suffice to explain shrinkage in the irrigation resources during historical times without the climate of the basin as a whole having in the course of this period, very short in a geological sense as it seems, undergone any appreciable change.

Two facts might, as Sir Sidney Burrard thought, be adduced in support of this view: in the first place, the large size of the glaciers still in being on the northernmost Kunlun which seems to be disproportionate in comparison with the annual snowfall actually received by that range; and next the enormous masses of detritus which overlie all these Kunlun glaciers. The thickness of this detritus cover was very striking indeed, wherever I had occasion to survey the glaciers of the Khotan river's headwaters. It is bound to offer very effective protection for "dead" or "fossil" ice derived from a preceding glacial period. It finds its own explanation in the rapid decomposition which the rocks all over the Kunlun undergo through the great variation of extremes in diurnal temperatures.

But by whatever explanation we may endeavour to reconcile these two apparently discordant observations on the physical side, we cannot expect it, in the present state of our knowledge, to furnish a safe answer to the question as to the direct cause of their abandonment. The critical student has to keep well in mind the great complexity of the human factor and of all its actions. He cannot accept the cogency of the argument that because both ancient settlements were apparently abandoned to the desert approximately about the same period, therefore the cause of this change must necessarily have been identical. Certainly both these once cultivable areas have since the beginning of the fourth century A.D. become incapable of settled occupation owing to the impossibility of securing water for irrigation there. But it would obviously be a mistake to assume the *post hoc* as implying a *propter hoc* and then on the basis of such an assumption to try and interpret developments in the history of the Tarim basin or of Central Asia in general, mainly by conjecturally determined changes of climate.

Instead of such speculations it will be better to resume, however rapidly, our survey of the part which the Tarim basin by its geographical function as a great corridor played in later phases of Central-Asian history. For more than three centuries our knowledge of this history is very meagre indeed; for with the disappearance of Chinese political control our chief sources of trustworthy historical information about the "Western Regions," as furnished by the imperial Annals, dry up for

the most part. While China itself was divided between rival dynasties, several of them of foreign origin, the Huns in the course of the fourth century had started westwards on the great move which ultimately led them to water their horses on the Danube, Rhine, and Po. After an interval during which the rulers of different great oases appear to have disputed supremacy of the Tarim basin, the whole of this, together with vast territories to the north and west, passed for about a century under the domination of a branch of the Huns, known to the Chinese by the name of Juan-juan and in Western Asia as the Hephthalites, or White Huns.

Neither this domination from outside nor the period of contested sovereignty within, which preceded it, appears to have seriously affected the firm footing which Chinese civilization had acquired in the oases or to have interfered with the steady flow in the opposite direction of Buddhist doctrine and literary as well as art influence from easternmost Iran and India. The growing closeness of religious and intellectual relations thus established is reflected by the journeys of Chinese Buddhist pilgrims, who at this period made their way through the Tarim basin to the sacred places of Buddhism in distant India. Of their narratives those of Fa-hsien (A.D. 400) and Sung Yun (A.D. 519) are the only ones of any length preserved to us. They clearly show how cultural influences from both sides mingled in the territories which the pilgrims visited before descending across the Pamirs and Hindukush to the north-western borders of India.

Sung Yun had found the " Western Regions " he visited, together with the states of the Oxus basin, still subject to the Hephthalites or White Huns and one of their rulers holding sway on the Indus. But some thirty years later a fresh wave in the stream of nomadic migration which was moving westwards along the Tien Shan, slowly at one time, more rapidly at another, had put the great confederation of Turkish tribes, known to the Chinese as the Western T'ouchüeh, *i.e.* Turks, in ascendency over the vast Central-Asian region, previously dominated by the Hephthalites. Like their predecessors they were content to levy tribute from the settled territories to the south of their grazing-grounds. Hence trade and other intercourse between the Tarim basin and the rich territories to the west could continue unbroken. But the Western Turks and their allies, the Northern Turks, were in the east troublesome neighbours to the Chinese empire, which by A.D. 589 had after nearly three centuries of division become once more united.

Hence the gradual consolidation of Chinese power which continued after the accession of the great T'ang dynasty by A.D. 618, was at first accompanied by a policy of rigid seclusion on the north-western marches. We receive very interesting glimpses of the jealous care with which the routes leading towards the Tarim basin were then guarded, in the story of the greatest of Chinese Buddhist pilgrims, Hsüantsang, my Chinese

patron saint, as I used to call him. In a paper contributed some years ago to the *Geographical Journal* * I have traced the details of the adventurous desert crossing on which the young traveller, anxious in spite of imperial prohibition to set out for the holy places of Buddhism, escaped A.D. 630 the vigilance of the posts watching the frontier in the Tunhwang region. The account of the extreme hardships and risks he encountered on his way across the Pei Shan to Hami, strikingly illustrates the " Chinese wall " policy which at that time tried to strangle China's intercourse with the West.

It was soon to give way to a " forward policy " on a grand scale which for over a century made Chinese imperial power under the T'ang dynasty expand over wider regions of Central Asia than it had ever before. When Hsüantsang after seventeen years' wandering returned to China *viâ* Khotan, A.D. 645, the northern line of access to the Tarim basin had already passed into Chinese hands. The ancient route through Loulan had by then been completely abandoned for centuries. The route along the easternmost Tien Shan was the only one practicable for serious military operations. The T'ang Annals fully acquaint us with the movements, significantly enough first directed towards the grazing-grounds on the northern slopes of the range, by which Hami and subsequently Turfan were wrested from Turkish supremacy. The power of the Western Turks was already weakened by tribal dissensions which Chinese diplomacy skilfully fostered. By A.D. 660 it was finally shattered by the Emperor Kaotsung's forces. China thus succeeded to their claim over a vast dominion extending from the Altai Mountains to beyond the Hindu Kush.

For a time the prestige of the imperial power and the diplomatic activity of its representatives sufficed to assert political control not only in the Tarim basin but also, in a more limited sense, over the territories now comprised in Russian Turkistan to the north of the Oxus. The routes of the Tarim basin must have seen then as much trade and traffic of all kinds as in the spacious times of the Han. The interchange of the influences, artistic and other, exercised at this period both from China on the one side and Persia, India, and the Near East on the other, are strikingly illustrated by the many finds which excavations at ruins of Turfan have yielded. Thus in the case of those conducted by myself at the seventh-century cemetery of Astana they included fine figured silks both of Chinese and pure Sassanian style, the latter undoubtedly manufatured in Eastern Iran or even nearer to the Mediterranean.

But this period of renewed Chinese expansion into Central Asia was not destined to be one of continued peaceful intercourse. The fact of China now claiming succession to the wide dominions once held by the Western Turks was bound to prove in time a source of trouble and weakness. The Chinese forces stationed in what were called " the

* See " The Desert Crossing of Hsüan-tsang," *Geo. Journ.*, November 1919.

31. WIND-ERODED GROUND OUTSIDE WESTERN FACE OF RUINED CIRCUMVALLATION, L.K., LOP DESERT

32. TAMARISK-CONES ABOVE WIND-ERODED GROUND AT SOUTHERN END OF ANCIENT SITE BEYOND NIYA RIVER END

33. CENTRAL HALL AND OFFICE ROOM IN RUINED RESIDENCE, N.XXIV., ANCIENT SITE BEYOND NIYA RIVER END, AFTER EXCAVATION

34. CARAVAN CROSSING SALT-ENCRUSTED BED OF ANCIENT LOP SEA

35. SALT-ENCRUSTED HILLOCKS OF "WHITE DRAGON MOUNDS"
NEAR WESTERN SHORE OF DRIED-UP LOP SEA BED

36. CAMELS AMONGST BLOCKS OF HARD SALT, COVERING DRIED-UP BOTTOM
OF ANCIENT LOP SEA

Four Garrisons " had to guard not merely the oases of the Tarim basin but also territories to the north of the Tien Shan. These offered attractive grazing-grounds to nomads, and were hence constantly subject to being disturbed by restless Turkish tribes. More serious still was the danger presented by aggression on the part of the Tibetans, who were then rapidly growing into a new military power. After the close of the seventh century they invaded the Tarim basin and were ever threatening the corridor between Tunhwang and Suchow.

Towards the middle of the eighth century there was added to the pressure from the Tibetans in the south fresh danger in the west from the steady advance of Arab conquest in the Oxus basin. The Tibetans were endeavouring to join hands with the Arabs as common foes of China's Central-Asian supremacy. By pushing down the Indus valley and thence across the Hindu Kush territories corresponding to the present Gilgit and Yasin they actually reached the uppermost Oxus valley. This junction threatened the Chinese position in the Tarim basin with being outflanked simultaneously both in the east and west. An effort had to be made to ward off this serious strategic risk. It led to an enterprise which stands out as perhaps the most memorable among the many proofs of Chinese capacity for overcoming by organization formidable geographical obstacles.*

In A.D. 747 the Deputy Protector-General of the " Four Garrisons," Kao Hsienchih, a general of Korean origin, collected a Chinese force of ten thousand men at Kashgar and led it through the gorges and passes of the Muz Tagh Ata range and across the inhospitable high valleys of the Pamirs to the uppermost Oxus. How such a force could be maintained in that elevated mountain region of the " Roof of the World " devoid of all resources, is a problem which might baffle any modern General Staff. But the detailed account preserved in the T'ang Annals which M. Chavannes' research has made accessible, proves that this most difficult task was faced and successfully overcome. After effecting a successful concentration at Sarhad, the highest habitable point in Wakhan, Kao Hsienchih completely defeated the Tibetan force which was guarding the Baroghil, the only pass across the Hindu Kush practicable for military purposes in this region.

But an achievement still more remarkable was his subsequent crossing of the very difficult glacier pass of the Darkot (Pls. 20, 21), at an elevation of 15,600 feet, with a Chinese force of three thousand men. I had twice occasion to cross the Darkot, and feel sure that those few British officers, first among them General Sir Edmund Barrow and the late General Lockhart, whom the duty of looking after the Hindu Kush defences of India has brought to this scene of Kao Hsienchih's exploit, would have thoroughly appreciated its greatness. If judged by the

* Cf. Stein, "A Chinese Expedition across the Pamirs and Hindukush," *Geo. Journ.*, February 1922.

physical difficulties encountered and vanquished, this crossing of the Darkot and the Pamirs may well be held to surpass the great Alpine feats of commanders famous in European history, from Hannibal to Napoleon and Suvorov.

The prestige accruing to the Chinese arms from Kao Hsienchih's expedition was deservedly great. But it did not save them from being signally worsted two years later. In a battle near Tashkent Kao Hsienchih was completely defeated by the Arabs and the revolted Turkish tribes, their allies. About A.D. 750 the Tibetans from the south secured mastery over Tunhwang and the adjoining tracts at the foot of the Nan Shan, and thus cut off the Tarim basin from all direct communication with the Chinese empire. Yet the Chinese administrators and garrisons within the former, notwithstanding their isolation, succeeded in holding out for another forty years—a heroic but obscure chapter in history.

In this long postponement of the final downfall we may well recognize direct proof, not only of the tenacious strength of Chinese organization, but also of the natural protection provided for the Tarim basin by the great mountain barriers in the north, west, and south and by the desert in the east. It is an interesting and, in more than one way, significant observation that the abandonment of a series of ancient sites in the Khotan region, such as Dandan Öilik, Khadaliq, Mazar Tagh, can be proved to synchronize with the end of Chinese control in T'ang times. It may well illustrate that dependence on ordered and fairly efficient administration which is so important a human factor wherever cultivation is wholly contingent on irrigation.

The period of about four hundred years following the disappearance of T'ang rule is a dark one in the history of the Tarim basin. We know that Tibetan domination in that region did not outlast a century, and also that Islam spread among the Turkish chiefs who acquired control over Kashgar and other oases in the western portion of the Tarim basin. From about the middle of the tenth century onwards it led to the gradual overthrow of Buddhist doctrine and culture by force as well as by propaganda. In the north-eastern portion, however, and in the outlying territory of Turfan, Buddhism continued to flourish much longer, side by side with Manichæism and Nestorian Christianity, under the protection of the Uigurs.

This virile tribe of the Turks, firmly established along the eastern Tien Shan, was the first among their great nation to show capacity for absorbing Western civilization, whether conveyed through Christian or Muhammadan channels. Other Turkish tribes, too, whom bravery and enterprise have carried far away towards Europe, have later on displayed the same capacity, combined with readiness to receive into the national fold and to digest racial elements from conquered populations more advanced in civilization. To these qualities, here only noted in passing

we must attribute the fact that throughout the Tarim basin Turkish is now, and has been for centuries, the only language spoken. Yet the population there, as the anthropometrical materials collected by me and analysed by Mr. T. A. Joyce prove, still retains in the main the fine *Homo alpinus* type, preserved in purity by the Iranian-speaking hillmen of the Pamir region, and shows but slight admixture of true Turkish blood.

It is difficult to believe that from the ninth to the twelfth century the conditions affecting the Tarim basin as a land of passage between Western Asia and China underwent any serious change. It was a time when China, under the weakening rule of the T'angs and then later under the Sung dynasty, was obliged to maintain towards Central Asia a policy of passive defence, if not of rigid seclusion. The north-western border lands passed under the domination, more or less transient, of foreign tribes, whether of northern race such as the Kitan (Khitai) or the Tanguts, who were of Tibetan affinity and established their kingdom along the foot of the Nan Shan. The Khitai who gave their name to *Cathay*, when driven from Eastern Mongolia and the adjoining parts of Northern China moved westwards and by 1126 established their supremacy all along the Tien Shan as far as Samarqand. The Uigurs as well as the smaller states in the oases of the Tarim basin owed them allegiance. Thus the contact with Muhammadan Central Asia which conquests of Uigur and other Turkish chiefs in what is now Russian Turkistan had established long before, was maintained. But in the absence of direct relations with China proper the importance of the ancient trade route leading through the Tarim basin must have greatly diminished.

The phenomenal rise of the Mongols under the great Chingiz Khan, another Napoleon, in the first quarter of the thirteenth century brought about vast changes in political conditions throughout Asia. By the time he died in Kansu, A.D. 1227, his astonishing conquests had brought all countries from the Black Sea to the Yellow River under direct control of the Mongol "Great Khan." The operations continued by his immediate successors ended some thirty years later in uniting the whole of China under the same Mongol dynasty which by its several branches held sway over all Central Asia as far as Persia, and over a great part of Eastern Europe as well. The establishment of one sovereignty across the whole of Asia again cleared the way for direct intercourse and trade between China, the Near East, and Europe. The policy of the Mongol empire distinctly encouraged relations with the Western nations, and thus opened an epoch of free interchange between the Far East and the Far West in commerce, arts, and knowledge such as the world had never known before.

For more than a century the trade routes to the north and south of the Tien Shan saw an undisturbed flow of traffic, and the accounts preserved to us of envoys, traders and travellers then seeking far-off Cathay

from the west tell us a good deal of those routes and of the ground which they crossed. None of those accounts, in accuracy of detail and interest for the geographical student, approach the immortal work of Marco Polo, the greatest of mediæval travellers. The route which he followed in 1273, when on his way from Persia to Kublai's court with his father and uncle, led through the uppermost Oxus valley and across the Pamirs into the Tarim basin. There he travelled by the caravan road between the Taklamakan and the Kunlun to the southern edge of the dried-up Lop sea-bed, and so on to Tunhwang, Suchow, and Kanchow. It has been my good fortune in the course of my journeys to retrace the footsteps of the Venetian along the whole of this route, and to justify by observation on the spot how right Sir Henry Yule, Marco Polo's great modern commentator, was in his implicit reliance on the correctness of Marco's narrative.

The Mongol dominion over China which Marco Polo still saw in its full greatness under the Emperor Kublai came to an end through internal decay within a century of Kublai's accession. The Chinese dynasty of the Ming which replaced it was necessarily bent upon safeguarding the north-western borders against fresh Mongol invasion. They remained exposed to this danger through the continued existence of the Chagatai Khanate along the Tien Shan until the death of Timur, or Tamerlane, and through the subsequent predominance of the Mongol clans of the Oirat in the same region.

Hence a policy of strict seclusion stifling trade once again prevailed on China's marches towards Central Asia. The wall which was erected under Ming rule to serve this close watch of the border still runs, more or less preserved, round the cultivated areas at the northern foot of the Nan Shan. The fortified gate station of Kiayükwan, a day's march to the west of Suchow, marks the place where this wall is crossed by the high-road leading to Tunhwang, Hami, and the Tarim basin.

Of the rigorous watch once kept here over the rare caravans or missions allowed to enter the sacred soil of the " Middle Kingdom," we receive interesting glimpses in the descriptions left us by Shah Rukh's embassy of 1420; by the Turkish Dervish whom Busbeq, the Emperor Charles V.'s ambassador, interrogated at Constantinople between 1555–62, and by Benedict Goës. This devoted Jesuit traveller arrived there in 1606 after a three years' difficult journey across the Pamirs and by the northern road of the Tarim basin. His detention at Suchow for sixteen weary months until death relieved him of all troubles, is proof of the extreme caution with which the admission of foreigners was controlled. That Goës parted only at Suchow " with the last lingering doubt as to the identity in all but name of Cathay and China " is striking evidence how knowledge of the oldest land route to China had faded in the West since Mongol domination had ended.

The rapidly developing use of the sea route to China, following upon

the first Portuguese voyages to India, had long before Goës' time deprived that ancient Central-Asian highway of its former importance for Western trade. Hence the renewed expansion of Chinese power into the Tarim basin which began under the great Manchu Emperor K'anghsi towards the close of the seventeenth century, cannot claim such great interest as that under the Han and T'ang. Yet it deserves here brief mention, be it only as an illustration of the marked influence which unchanging geographical factors must exercise upon historical developments in this region.

This time it was the growing power of the Oirats or Dzungars which forced upon China a fresh advance into innermost Asia. They were Mongolian tribes established north of the Tien Shan in the wide region still known after them by the name of Dzungaria. United under the energetic and ambitious chief Galdan, the Dzungars overawed eastern Mongolia and thus threatened the frontiers of China. The difficult expedition which the Emperor K'anghsi led in person into outer Mongolia ended in 1696 with a signal victory over Galdan. Then Chinese garrisons were first pushed forward to Barkōl at the eastern extremity of the Tien Shan. Next by the occupation of Hami the direct route was opened across the Pei Shan desert. Thus protection was secured for the Kansu marches, exactly on the same lines as Chinese " forward policy " had been obliged to follow more than a thousand years earlier against the Western Turks.

The danger from the Dzungars still continued. Their force was impressively demonstrated by the adventurous inroad into Tibet which brought them some twenty years later under Galdan's successor right to Lhasa through Lop, the ancient Shanshan. But it was not until 1755 that renewed aggression by the Dzungars led to expeditions organized by the great Manchu Emperor Ch'ienlung which finally brought the whole of the Tarim basin as well as Dzungaria north of it under direct Chinese administration. Once again, as under the Han and T'ang, a policy purely defensive in its origin had resulted in Chinese expansion over vast Central-Asian regions right up to the Pamirs and the Altai Mountains.

That Chinese control of these regions has continued to the present day, in spite of the growing internal weakness of the empire and the great upheaval caused by the Tungan or Chinese Muhammadan rebellion in the third quarter of the last century, is instructive for the student of political geography. The explanation lies in the fact that for the first time in history China's Central-Asian frontiers had become contiguous with those of a great civilized power, such as the Russian Empire was, capable of dominating the border populations and gradually restraining their nomadic migrations. It was Russia's temporary occupation of Kuldja and the fertile Ili valley which facilitated the Chinese reconquest of the " New Dominion " in 1877, after the Muhammadan rebellion had

flung the Tarim basin for a decennium first into anarchy and later on into oppressive misrule under Ya'qub Beg, a usurper from Western Turkistan. But it was their own organizing capacity which enabled the Chinese to overcome the very serious difficulties of supplies and transport. Thus they gradually moved up troops through the utterly devastated tracts along the northern foot of the Nan Shan and subsequently concentrated them upon Hami across the arid wastes of the Pei Shan.

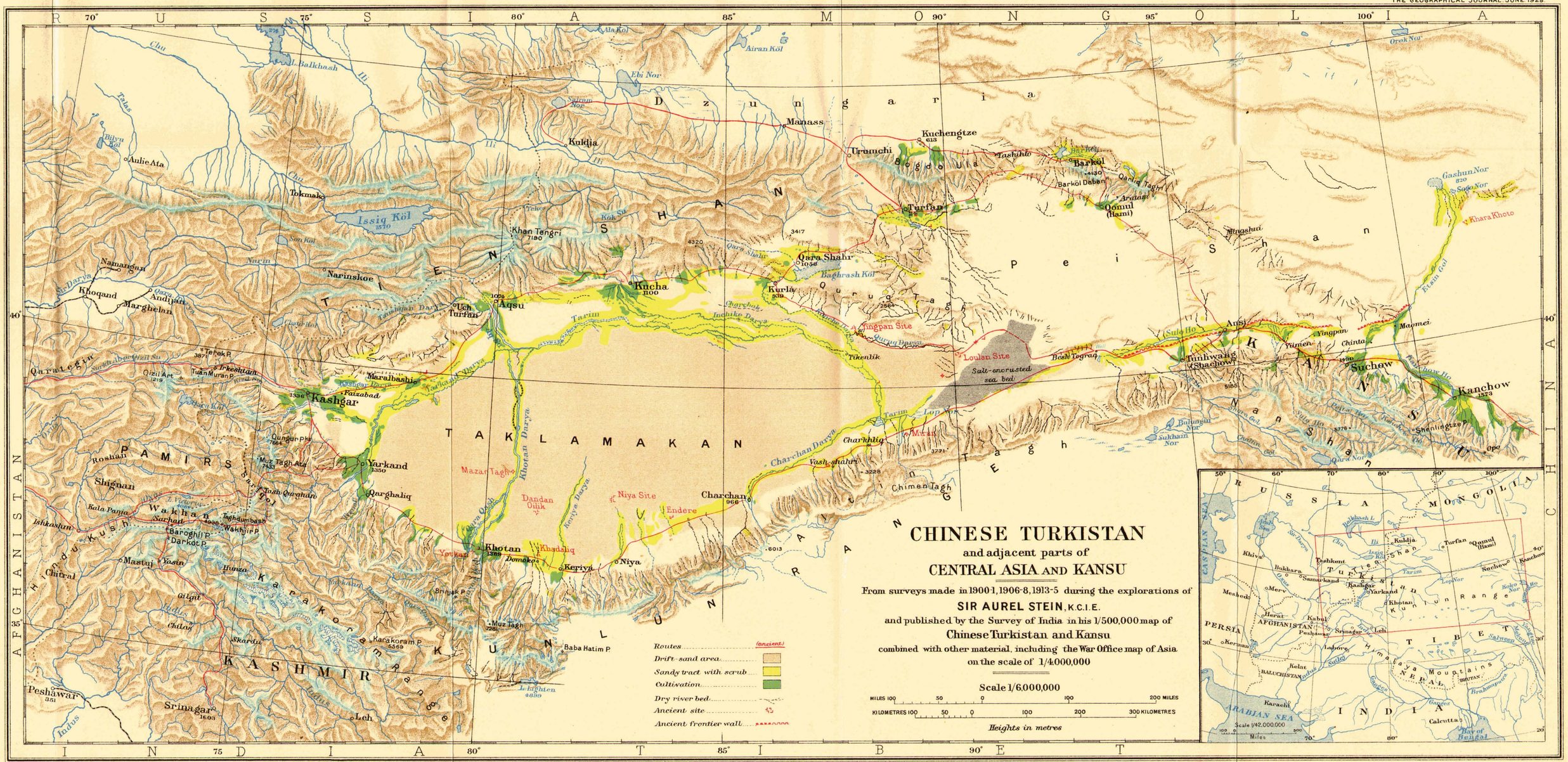
The times of that "self-determined independence" of the Tarim basin are still remembered with sadness by the people in the oases. According to reliable information I received, the population in some among them had during those times sunk to one-half of what it was before, and it is certain that the cultivated area had everywhere shrunk greatly.

The strings of oases between the Tien Shan and the Kunlun no longer serve a great trade route. So the brave patient camels which carry what traffic there is as efficiently as in the times of Chang Ch'ien or Marco Polo, are not likely to be replaced soon by the rushing motor car or the bustling railway. The traditions of China's great past as a Central-Asian power still protect the peace of the region of which we have followed the fortunes through history. Let us hope they will suffice also thereafter to ward off those troubles and sufferings of which its less secluded neighbour, Russian Turkistan, has had abundant experience during the last few years.

Note on General Map of Chinese Turkistan

This map is based upon the surveys of Sir Aurel Stein and the Indian Surveyors attached by the Survey of India to his expeditions in Central Asia, and published by the Survey of India as an atlas on 1/500,000 *to accompany his 'Innermost Asia,' the detailed report on the last of his three expeditions of* 1900–8, 1906–8, 1913–15. *In the compilation of this material account has been taken of the corrections to be applied to the positions of triangulated points, as indicated by Major Kenneth Mason in Appendix A to Sir A. Stein's 'Memoir on Maps of Chinese Turkistan and Kansu' (Dehra Dun,* 1923), *pp.* 112, 141 *sqq. By permission of Colonel Winterbotham, Chief of the Geographical Section, General Staff, the original compilations for the G.S.G.S. map of Asia on the scale of* 1/4 *Million have been used for most parts outside the range of the Stein surveys.*

Before the paper the PRESIDENT (the EARL OF RONALDSHAY) said: Before I introduce the lecturer you will, I know, desire that I should extend a cordial welcome from this Society to Their Royal Highnesses the Crown Prince and Princess of Sweden, who are honouring us with their presence to-night. We welcome them for the keen interest which they display in the science in which we ourselves are mainly interested, and I might perhaps be permitted to add



CHINESE TURKISTAN

and adjacent parts of CENTRAL ASIA AND KANSU

From surveys made in 1900-1, 1906-8, 1913-5 during the explorations of

SIR AUREL STEIN, K.C.I.E.

and published by the Survey of India in his 1/500,000 map of

Chinese Turkistan and Kansu

combined with other material, including the War Office map of Asia on the scale of 1/4,000,000

Scale 1/6,000,000

Conical Projection with Errorless Meridians and Standard Parallels 36° and 44°

Published by the Royal Geographical Society

CHINESE TURKISTAN
Stein

Conical Projection with Errorless Meridians and Standard Parallels 36° and 44°

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CHINESE TURKISTAN
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that we welcome especially Her Royal Highness amongst us as the daughter of a late member of the Council of our Society.

We are beginning our Session this year with the first biennial lecture upon discovery in Asia, a series which has been established by us, thanks to the generosity of a Fellow of this Society, Mr. P. L. Dickson, and we have been fortunate in securing for the inaugural lecture so distinguished a scholar and explorer as Sir Aurel Stein. Indeed, our lecturer requires no introduction to an audience of this Society, for his geographical work in Central Asia and Western China earned for him the gold Victoria Medal of the Society some fifteen years ago; and the geographical and archæological exploration which he began in Kashmir and the Afghan borderlands more than a quarter of a century ago and which he has carried on at intervals almost ever since in Central Asia and Western China has excited the admiration and the interest of geographers and archæologists the world over. For his lecture this evening Sir Aurel Stein has chosen the subject of the influence of the geography of innermost Asia upon history, and in the course of his remarks he will conduct us to that amazing tract of country which lies south of the Tien Shan Mountains and north of the snowy highlands of Tibet, a vast desert desiccated almost beyond belief and yet the background of rich romance; for it was along this arid and dusty corridor that the civilizations and culture of the West, of India and of the Far East passed and mingled. The long line of communication across hundreds of miles of forbidding desert opened up more than two thousand years ago by the organizing ability of the Chinese has been traced by Sir Aurel Stein in the course of his explorations. He will tell us this evening of many interesting and exciting moments during those days of toil when he was wresting from the sand hummocks of the Tarim basin the secrets of the past. But the height of romance, surely, was reached when the trail of the ancient trade route which he was searching for was dramatically revealed. At one place in a wilderness of salt-encrusted clay he happened upon a scattered line of copper coins of the ancient Han Dynasty of China, covering a stretch of some 30 yards of ground in a well-defined line running from north-east to south-west. How came they there? You can picture for yourselves, I think, the manner of their coming. A caravan of camels travelling silently through the cool of night a little wide of the main track; a hole worn in the sack in which the cumbrous coinage, with which those who have travelled in the interior of China are familiar, was carried; a break in the string on which the coins were strung; the falling to the ground of a few coins with each forward lurch of the camel as it moved on its way: a thing that so easily might happen, resulting in the scattering of a few handfuls of coins, unnoticed, upon the surface of the desert, to lie there until, after the lapse of many centuries, they were to be discovered by our lecturer of this evening. And that is but a single episode in the wonderful story which I will now ask Sir Aurel Stein to unfold to us.

Sir Aurel Stein then read the paper printed above.

The PRESIDENT: Sir Edmund Barrow, whose name has been mentioned by the lecturer, is present this evening, and would like to add a word to the evening's discourse.

General Sir EDMUND G. BARROW: At this late hour I will not detain you for more than a few minutes, but I should like to pay a small tribute to my friend, Sir Aurel Stein. I am brought into contact with this very interesting lecture by the fact that some forty years ago I was a member of a small exploration party under Colonel Lockhart, as he then was, and afterwards

Commander-in-Chief; and part of our duties was to explore all the passes and country in this northerly region of our Empire. May I add, parenthetically, that we were at that time expecting to go to war with Russia, and it was urgently necessary to get information regarding the routes by which India could be approached. The fact of my having been in that part of the world brought me into touch with Sir Aurel Stein twenty years later, or thereabouts, when I happened to be the General commanding on the North-West Frontier at Peshawar. Notices had appeared in the newspapers that a Director of Education for the North-West Frontier Province and Baluchistan had been appointed, and that his name was Mr. Aurel Stein. He was quite unknown to me at that time, but one day I received a card—"Mr. Aurel Stein." He was shown in, and I did not quite know to what I owed the honour of a visit, but in a very few minutes I knew I was in the presence of a most interesting personality who astonished me by his great historical and archæological knowledge of the regions north of the Hindu Kush and the Kunlun. But what surprised me even more was the fact that a Director of Education contemplated making what I knew from my past experiences to be a most arduous and even dangerous journey, and I warned him of the very great difficulties of the routes which lay before him. Being a person of great spirit and enterprise, he was not in the least deterred. For the next two years or so I did not set eyes on Mr. Stein, as he then was. No doubt, the youth of the North-West Frontier Province lost a great deal in the way of education during those two years, but, on the other hand, Mr. Aurel Stein was educating the whole world in very interesting archæological and geographical knowledge—the knowledge of ancient Central Asia.

Sir Aurel Stein was good enough to mention my name in connection with the Darkot Pass and the Baroghil. He mentioned the fact that a certain General Hsien-Chih had actually crossed the Darkot to our side of what is now the Indian border. In his lecture he speaks of this feat as rivalling the exploits of Hannibal and Napoleon. I quite agree with Sir Aurel Stein as to the extraordinary military enterprise that General Hsien-Chih displayed, but I go further and think he *out*-rivalled Bonaparte. I won't trouble you with Hannibal, as it is getting late, and I don't know much about his passage of the Alps. In the first place, you must remember that the passage of the Darkot involved going up to 15,600 feet. The St. Bernard is about 8000 feet, so that the former was double the height of the latter. Moreover, Bonaparte had a made road by which to cross the Alps. In fact, there had been a road there for many years, it having been originally made, I think, about the time of Augustus. There was, in any case, a road with post-houses, and so on, in Roman times. On the Darkot there is not even a path as you approach the top, and certainly from 13,000 feet you are going over soft snow and glacier, and for a good many miles below the snow-line there is the most horrible moraine. How any general could have brought a force of three thousand men over that high and difficult mountain range, I do not know. It was an amazing feat! and the wonder is that he got safely to the southern end, and, more wonderful still, that having got there he was not stopped; because 3 miles up the pass on the Indian side there is a spur which comes out from the main range, and that spur is covered with ancient ruined fortifications. I have often intended to discuss those fortifications with Sir Aurel Stein, because it seems to me that they may be connected with General Hsien-Chih's passage. They are very remarkable, and no one seems to know anything about them. If you ask the inhabitants they say the Kafirs built them, but as they also call us Kafirs, that does not convey much.

I do not think there is anything more I need say. I can only tell you that I have always been filled with the greatest admiration for the exploits of the lecturer, because I know the very great difficulties with which he has had to contend.

The PRESIDENT: The hour is late, and I will therefore not invite others to speak. For the same reason I do not propose to add anything myself. I only desire to assure Sir Aurel Stein that the manner in which he has wrested the secrets of the past from the shifting sands of the Taklamakan Desert and from the salt-encrusted wilderness of the dead Lop Sea has excited out highest admiration. I think I can safely assure him that Mr. Dickson, who is unfortunately prevented from being here to-night, will be deeply gratified when he reads the first of the Asia lectures which he has so generously endowed.

THE DETERMINATION OF GRAVITY AT SEA IN A SUBMARINE

Dr. A. F. Vening Meinesz

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IT may be expected that the determination of gravity at sea will give important contributions to many scientific questions concerning the figure of the Earth and the constitution of the Earth's crust, and it therefore has already several times been the subject of experiments. The first valuable observations were made by Hecker, who from 1901–1908 made voyages in the Atlantic, Indian, and Pacific Oceans. He applied the method indicated by Mohn of determining simultaneously the pressure of the air in two different ways, by the ordinary mercury barometer and by the boiling-point of a fluid. The first of these methods gives a result which depends on the intensity of gravity, and the second a result which does not, so the comparison of the two gives the desired intensity of gravity.

Hecker's observations led to the important general conclusion that in the mean gravity at sea does not deviate much from the normal value. It was however not yet possible to attack successfully the majority of the problems under consideration, as for that a greater accuracy of 1/100,000 or 1/200,000 is necessary. This paper is an account of a new endeavour in this direction, made during a voyage from Holland to Java, which has given satisfactory results, as the accuracy seems to comply with this requirement.

After studying the subject it seemed that an improvement of Hecker's method or of another statical method, to give a considerable reduction of the mean error, would present great difficulties. This opinion has since then found support in the recent publication of the experiments of Prof. Duffield, in spite of the admirable skill which he brought to bear on the application of these methods.

On the other side there seemed reason to doubt the general opinion