THE GEOGRAPHICAL JOURNAL

VOLUME LXXXII

JULY TO DECEMBER

1933

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL

EDITED BY THE SECRETARY

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE LONDON S.W.7

EDWARD STANFORD LTD. 12 LONG ACRE W.C.2

AND 43 WHITEHALL S.W.1

ROYAL GEOGRAPHICAL SOCIETY

Patrons

HIS MAJESTY THE KING
HER MAJESTY THE QUEEN

Vice-Patron

H.R.H. THE PRINCE OF WALES, K.G., F.R.S.

Honorary President

H.R.H. THE DUKE OF CONNAUGHT, K.G., G.C.B., G.C.S.I.

THE COUNCIL

(*Elected* 19 *June* 1933 *for the Session of* 1933–34)

President : Major-General Sir Percy Cox, G.C.M.G., G.C.I.E., K.C.S.I.

Vice-Presidents

Sir Harcourt Butler, G.C.S.I., G.C.I.E.
Colonel Sir Charles Close, K.B.E., C.M.G., C.B., SC.D., F.R.S.
Admiral Sir William Goodenough, G.C.B., M.V.O.
Brigadier E. M. Jack, C.B., C.M.G., D.S.O.
The Rt. Hon. Sir Halford Mackinder
Lieut.-Col. Sir Francis Younghusband, K.C.S.I., K.C.I.E.

Treasurer—The Lord Biddulph

Trustees—Douglas W. Freshfield, D.C.L.; The Most Hon. the Marquess of Zetland, G.C.S.I., G.C.I.E.

Honorary Secretaries—Dr. T. G. Longstaff; W. L. Sclater

Foreign Secretary—The Right Hon. the Lord Howard of Penrith, G.C.B., G.C.M.G., C.V.O.

Members of Council

Field-Marshal the Viscount Allenby, G.C.B., G.C.M.G.
Henry Balfour, F.R.S.
Air Vice-Marshal F. W. Bowhill, C.M.G., D.S.O.
Lieut.-Col. Sir John Chancellor, G.C.M.G., D.S.O., R.E.
The Lord Conway of Allington
Augustine Courtauld
Professor F. Debenham, O.B.E.
Vice-Admiral Sir Percy Douglas, K.C.B., C.M.G.
Admiral Sir Cyril Fuller, K.C.B., C.M.G., D.S.O.
Maj.-Gen. Lord Edward Gleichen, K.C.V.O., C.B., C.M.G., D.S.O.
John de Vere Loder, M.P.
Col. M. N. MacLeod, D.S.O., M.C., R.E.
Professor Kenneth Mason, M.C.
Dr. Hugh Robert Mill
Lieut.-Col. the Right Hon. Sir Matthew Nathan, G.C.M.G.
Mrs. Patrick Ness
Brigadier E. F. Norton, D.S.O., M.C.
The Hon. Francis J. R. Rodd
Sir Denison Ross, C.I.E.
Professor E. G. R. Taylor
Bertram Thomas, O.B.E.

Secretary and Editor of Publications—Arthur R. Hinks, C.B.E., F.R.S.

Librarian : Edward Heawood

Map Curator : F. Allen

Bankers—Martin's Bank Ltd. (Cocks, Biddulph Branch), 16 Whitehall, S.W.1

CONTENTS

NO. 1 *JULY* 1933

The
GEOGRAPHICAL JOURNAL

Vol LXXXII No 1 R.G.S. *July 1933*

THE GEOGRAPHICAL WORK OF H.R.H. THE LATE DUKE OF THE ABRUZZI: *A paper read at the Evening Meeting of the Society on 15 May 1933, by*

PROFESSOR GIOTTO DAINELLI, Accademico d'Italia

THE honour of commemorating H.R.H. the Duke of the Abruzzi, and especially of commemorating him in this place, is such as to cause deep emotion to one who has always, ideally, felt himself to be a faithful and devoted follower of the great Prince. But one thought is my encouragement, that in no place other than here amongst Englishmen who are accustomed to bold enterprises on all the seas and on all the mountains of this Earth, would it be possible to find a keener and a more complete understanding of this great and noble figure.

For us Italians however the figure of the Duke of the Abruzzi has a moral significance which reaches beyond his glorious activity as an explorer; for he has been, to us, an example and a pure symbol, a forerunner and a prophet, in grey times, of the actual rebirth of our country.

For this reason a thought full of gratitude goes, from Italians, to the proud and magnanimous resolution of King Amedeo, his father, who freed this great son of his from the destiny to which his birth would inevitably have bound him, and restored him to Italy, to be solely and completely an Italian Prince, free to obey that call which he felt towards all great actions and by which he has affirmed himself, not only as an Italian Prince with the age-long virtues of his family, but a truly national hero. To commemorate him in a worthy way will be an arduous task even later, when the pain has somewhat abated. Arduous, because H.R.H. the Duke of the Abruzzi was a sailor, a man of war, an alpinist, an explorer, a pioneer, and there is no one capable of speaking of the whole of his varied and complex activity, with any hope of describing it with the required efficiency. In this place we shall limit ourselves to remembering only the explorer.

Doubtless however two natural predilections—the sea and the mountains—which the Prince felt strongly even in his earliest youth, helped to form the explorer. He was bound to the sea before his love for it had shown itself; for the severe discipline of duty, which is a rule of life for all Italian Princes, made him a sailor in the Royal Navy at six years of age, when our sons are still left

to their mothers' care. When he was sixteen, he sailed along both coasts of South America. Then, on a small gunboat, he made long cruises in the Atlantic and the Indian Oceans. Immediately afterwards there followed the great voyage in the seas of India, China, and the South Seas, and North and South America. When he returned to his own country after so long an experience on all the seas, under every climate, by sail and by steam, in enervating calms or in raging storms, among every land and every people, the Prince, though hardly more than twenty years old, was already a really accomplished seaman.

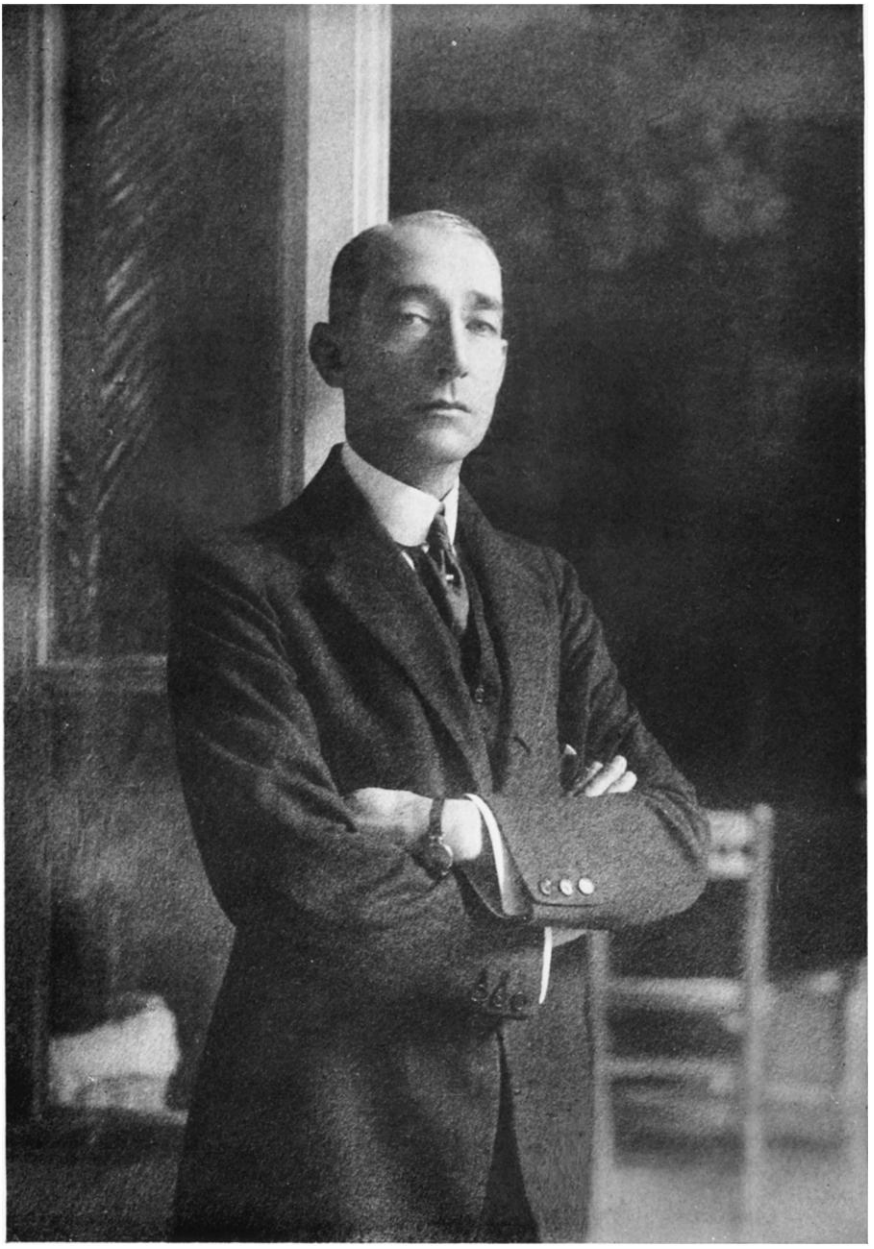
And between one sea voyage and another, when any one would have felt the right and the wish to rest—for the sea does not signify rest for those who have the responsibility of obedience or of command—between one navigation and another, the Prince, still very young but already used to dangers and discomforts, to rapid decision and intelligent courage, felt the call of those Alps, which seemed like a perfect amphitheatre closing in around the plains of his Piedmont. After his first initiation, he immediately showed himself to be a first-class alpinist: he was only twenty-one when he could count the Charmoz, the Little Dru, and the Grépon, till then only climbed by a few foreign alpinists, the Dent Blanche and the Rothhorn, among his numerous climbs. He had conquered the Matterhorn, even by the Zmutt route, which required the perfection of alpine technique and a courage which seems to border on audacity.

And it was not a passing whim. When he left the sea he always went to the mountains. New ways and new climbs were added by the Prince to the history of Italian Alpinism. Let us record only the ascent from the Charpona glacier to that Aiguille Sans Nom to which he gave the name of his faithful guide Petigax, the rocky peak of the Grandes Jorasses which became then the Punta Margherita, and one of the slender, steep Dames Anglaises which is to-day Punta Iolanda.

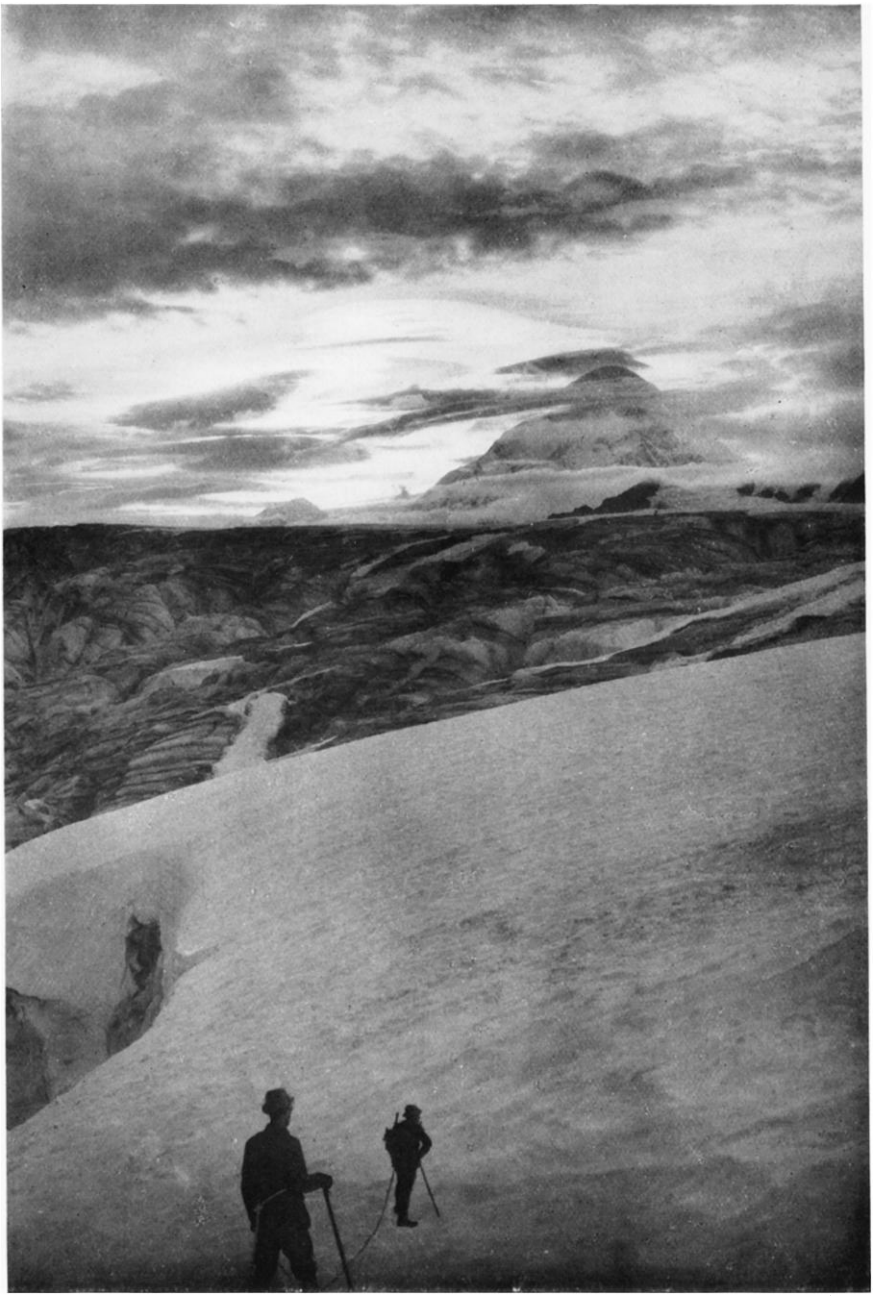
It is said, and truly, that those who love and understand and know how to conquer the mountains often remain indifferent spectators to the beauties of the sea, and that those who feel the fascination of the sea often remain without the slightest understanding of the divine majesty of the mountains. But he who has the full and complete understanding, both of the mountains and of the sea, must possess a remarkably keen and wide soul.

The sleepless and tiring nights on deck and the nerve-racking hours on the bridge of command, when the life of all and the safety of the ship may depend on one man's actions, are sufficient to harden a man. And he is also strengthened by the fight with the sudden burst of the storms, the solitary bivouacs, the anxiety of imminent danger, which must be measured and overcome by the alpinist, to ensure his own and his companions' safety and victory. But he who has had long experience in active navigation and also in alpinism is certainly prepared for any daring undertaking.

For us Italians however the sea and the mountains also form the boundaries of our country. And to be alpinist and sailor, at the same time, must mean a great devotion to our land and the wish to dedicate every thought and every action to its greatness. Few citizens have worked for the glory of Italy as much as H.R.H. the Duke of the Abruzzi, solitary, silent, almost taciturn, but ever sustained by the traditions of his great House, morally and physically prepared



H.R.H. the late Duke of the Abruzzi



Phot. V. Sella

Alaska 1897: Mount St. Elias from the Seward glacier

by his love and experience of all seas and mountains. The sea in fact had shown him that, for those who choose, the ways of the world are open; the mountains had taught him, with the conquest of our earthly summits, the way towards the ideal ones.

A little less than two centuries ago there appeared to the Russian navigator Bering, when sailing near the coast of Alaska, a high mountain, from the mighty pyramid of which glaciers and snowfields descended till they joined in an immense expanse of ice, between the foot of the mountain and the sea. The mountain was named Saint Elias after the Saint on whose day the discovery was made. Half a century later an Italian seafarer, Don Alessandro Malaspina, during his search for the North-west passage, again saw that mountain enthroned among the clouds; his name was given to the large glacier at its foot.

This was the period of discovery: much later began its difficult conquest, because of the distance from any base of operation, the breakers along the coast, a belt of woods and marshes, the immense expanse of ice, and also because of the frequent fogs and snowfalls. Because of all this, the progress was slow and the undertaking seemed as if doomed to fail. The repeated efforts of Russel, who succeeded at his second attempt in 1891 in reaching a col, 4400 metres in height, seemed superhuman. Russel's name is borne by this col at the northern foot of the final pyramid. Into this still unconquered field descended the young Italian Prince, although scarcely twenty years of age, in 1897.

Italy was a very distant base for organizing an expedition into Alaska; but already the perfect spirit of organization of the Prince showed itself, as though he had already had long experience in exploration. His companions were few: Francesco Gonella, who had initiated the Prince into the difficulties and the joys of Alpinism; Commander Umberto Cagni; Vittorio Sella, more an artist than a photographer of the great mountain world; Filippo De Filippi, who became later the historian of this and of other expeditions; a few alpine guides, and a small group of American porters to be employed only during the approach to the mountain.

Difficulties began on landing, which was delayed by the swell and the breakers; they were still greater on the large glacier, an immense extension which nearly forbade all access to the mountain. There were thirty days of laborious advance, with fog and frequent snowstorms, with much difficulty in pulling the loads, on the little sleighs, among a labyrinth of crevasses up the steep slopes from one plateau to another. Then began the real climb, more worthy of alpinists, and the Russel Pass was reached. So far they were on the tracks, so to say, of their predecessor. But from there onwards it resembled the charge of a patrol of *arditi;* the Prince at the head of all, the most untiring of all. Eleven hours of continual climbing from the pass upwards, with only the brief halts that were required to make necessary observations or to calm the breathing; but without uncertainties straight to the top. And on the top, at more than 18,000 feet high, ten Italians answered with one voice to the "Viva il Re" which the victorious Prince flung to the sky.

The return seemed like a race, first to the pass, then to the large treacherous expanse of the Malaspina glacier, then to the sea. In the first small village

there came to meet the Duke an alpine explorer who had also attempted to climb that same mountain: he had landed there ten days before the Duke, and had also preceded him in the return, giving up however the final climb to the top.

For years seamen and students had been fascinated by the great unknown blank that surrounded the North Pole. But the general imagination—which tried to picture this gigantic polar dome as covered with ice, never visited by man, desolate, mysterious, almost hostile—gave an almost tangible shape to that point of it which constitutes its centre, and is at the same time nearly the apex of the Earth. Then there grew the anxiety, not only of revealing the polar mystery, but also of reaching the Pole, like a far-off and coveted ideal goal. Coveted, but far away and surrounded by its own ice barriers: not flat and uniform and motionless, as they were imagined at first, but drifting continually and subjected to pressure and expansion which continually form large abysses or raise tall shapeless banks.

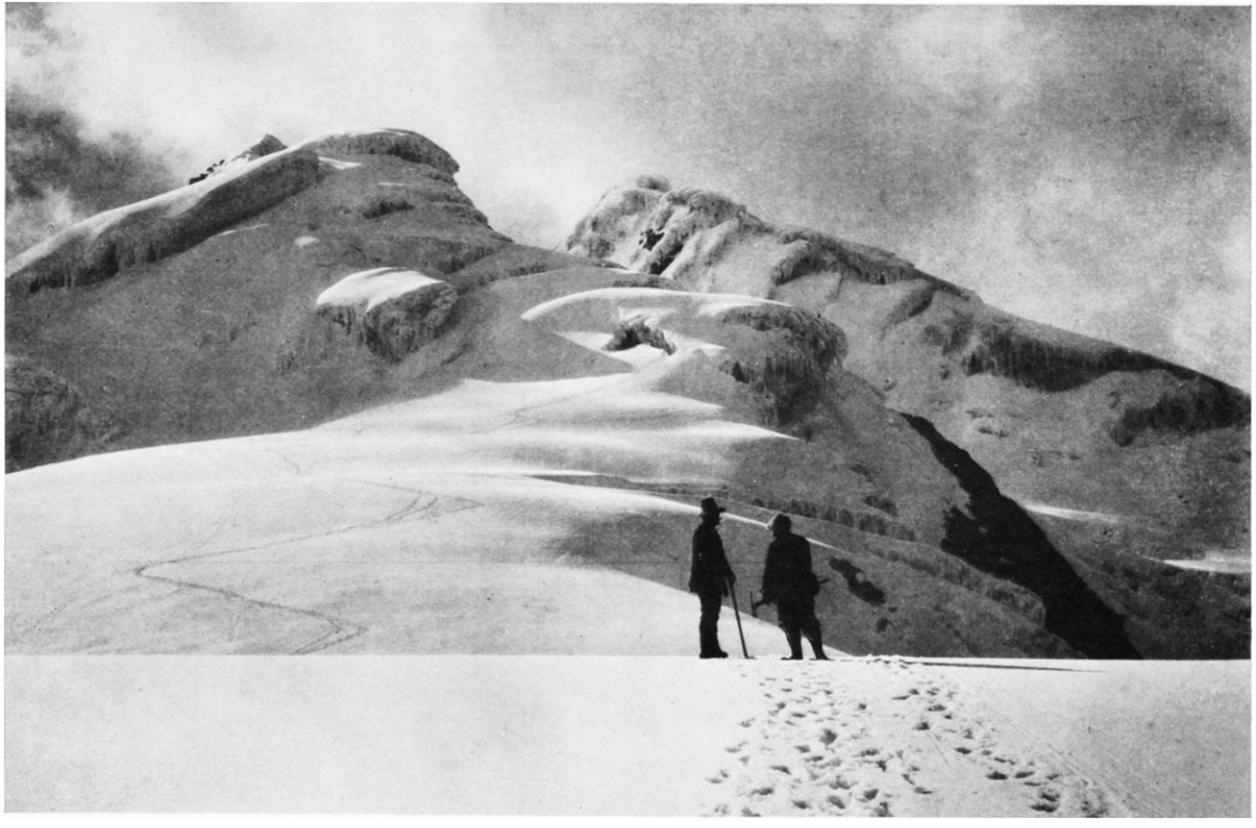
It was also soon discovered that it was impossible for ships to break through that strong barrier of polar ice. Only man might adventure on its large expanse. The fight thus grew harder and more dramatic, also more fascinating: man, alone, amidst the immense and hostile polar solitude. It was a fight that became nobler the more immaterial the goal appeared: a truly ideal goal, made for the sanest and strongest virtues of man. The principal stages in Polar Exploration were the following: in 1773 Phipps, an Englishman, reached with his two ships a northern latitude of 80° 48′; in 1827 Parry, an Englishman, with his launches, that were transformable into sledges, attained 82° 45′; in 1875 Markham, also an Englishman, ventured as far as 83° 20′; in 1882 Lockwood, an American, went only 4 miles farther than his predecessor; in 1895 Nansen, the Norwegian, taking advantage at first of the drift of the ice itself, reached 86° 13′. It seemed as though this was a field open only to the daring of the more northern races.

But wherever there was an enterprise more daring than any other; wherever there was a goal to be attained that was above any other; wherever there was a battle to fight and glory to conquer, there the young Prince of Savoy stepped forward, to take part in the competition of heroism. So it was also in 1899. His two great loves for the sea and for the mountains showed him where to choose his men: Cagni, Querini, Cavalli Molinelli, were men of the sea; also two seamen who were chosen to go with the sledge parties; and four alpine guides from the valley of Aosta.

The remembrance is still alive in us of the perilous navigation of the *Stella Polare* amidst the island labyrinth of Franz Josef Land; the unsafe anchorage in Teplitz Bay; the daily and hourly conflict with the ice; the sudden abandonment of the ship, which seemed as if it was going to be hopelessly crushed by the powerful pressure of the ice; the feverish work to construct a shelter on firm ground and to save the ship. Then followed the dark, cold polar night. But during the polar night the last preparations were made for the final attempt; during this time also the patient training of the dogs continued, with the sledges, which were loaded as they would have to be for the final race to the Pole.

Phot. H.R.H. Duke of the Abruzzi

Arctic Expedition 1899–1900: "Stella Polare" crushed by the ice in Teplitz Bay



Phot. V. Sella

Ruwenzori 1906: Punta Alessandra (left) and Punta Margherita (right) from the Stanley glacier

During one of these experiments an unexpected slope, that ended in a sudden descent onto the frozen sea, made the dogs and the sledges go too fast to save themselves, and the Duke, from a bad fall. And when, after endless toil, they at last returned to their companions, the Duke's hands were frozen beyond recovery. What greatness in the simplicity of the words with which the Prince told us of this misadventure, which necessitated the amputation of part of his fingers and forced him to entrust Cagni with the command of the sledge parties bound towards the Pole.

Then began the long waiting, more tiring even than action itself. There was still some work to be accomplished at Teplitz Bay on the ship which was still in danger. But the wait for the sledging parties took up all the leader's anxious thoughts. One group, the first one, did not return: all honour be to the vanquished in the Polar strife! But the second came back. Then finally, when the waiting had begun to be almost unbearable, the third party arrived from quite an unexpected direction, imposed by the inexorable drift of the ice: Cagni and the sailor Canepa, Petigax and Fenoillet, the alpine guides, at the very end of their resources, but still steadfast of soul, as on the day of their departure towards their uncertain destiny: they had been victorious, for they had carried the flag which had been entrusted to them by H.R.H. the Duke of the Abruzzi to a latitude of 86° 34′, a latitude that had never been reached before.

An ancient tradition said that the Nile rises in high snow-topped mountains. Only about fifty years ago however the Italian Gessi, whilst exploring the shores of Lake Alberta, had what appeared like a strange vision of snowy peaks which seemed to float and vanish in the sky. He took it for an optical illusion. And it was only in 1888 that Stanley really saw a shining white massive-topped mountain, Ruwenzori. But Ruwenzori, because of its position, its natural surroundings, and also its height, is nearly always surrounded by clouds; for that reason many travellers had passed along the edge of its slopes, without seeing it, without even suspecting its existence. For the same reason all attempts to climb it had failed, even those who had succeeded in reaching a ridge or a peak of its vast massif had in the end been able to tell us little to add to our knowledge of the mountain. Ever since the first year after its discovery attempts to climb it had followed rapidly; men like Freshfield and Mumm had tried their skill on it. But the mountain held itself impenetrable amidst a barrier of its clouds. And this explains why Stanley, its discoverer, a few years before his death, begged that some person devoted to his work, some lover of the Alps, should choose Ruwenzori as a goal, and should make a complete study of it, exploring it in all its wide valleys and deep gorges.

H.R.H. the Duke of the Abruzzi took up this message, which sounded like a challenge, and during the first months of 1906 he was preparing, with his usual perfect spirit of organization, his new expedition. Amongst his old faithful followers the Prince chose again Cagni, Sella, Cavalli; added a naturalist, Roccati, and a strong party of Alpine guides from Courmayeur, and then left to attack the mountain. Perhaps during the inevitable delays of preparation, rapid though this was, he may have feared to arrive too late in this noble strife: in fact, whilst still busy with preparations, between the months of January and

April of that year, seven attempts were again made to conquer the mountain, which failed however like the preceding.

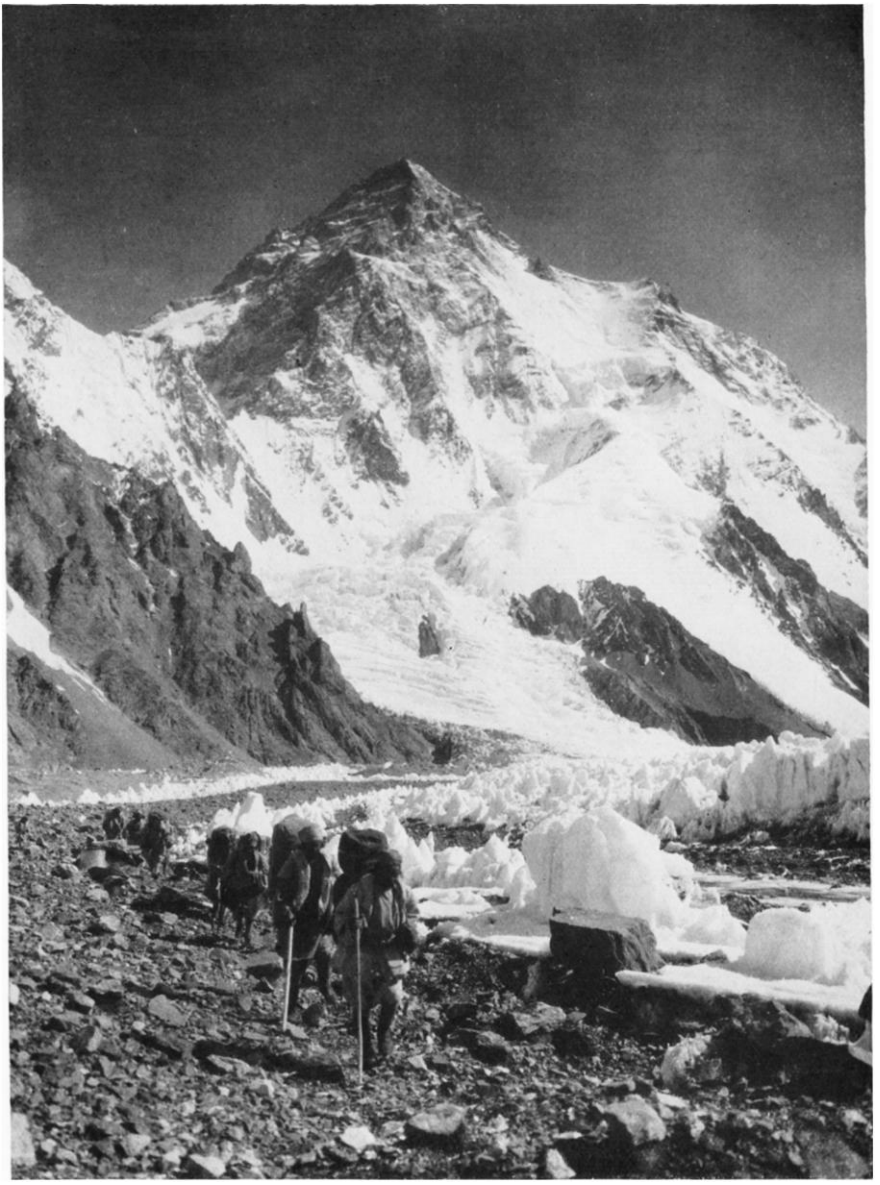
To climb Ruwenzori was a really new undertaking, new even in the means and in the surroundings: instead of the great extensions of ice in the polar region, here were the warm and damp and thick equatorial forests; instead of sledges, the long line of native carriers; instead of complete solitude of the most desolate nature, an exuberance of life and a little crowd of primitive humanity. But when the expedition finally reached Bujongolo, it was then on the threshold of a high-mountain world, and the high-mountain world is everywhere the same, under every climate, and in any part of the Earth, and it is ever admirable in its magnificence, even if, as with Ruwenzori, it likes to hide amongst the clouds and looks as if it wanted to escape from the equatorial heat into the frequent rain of thunderstorms. There were fogs and threatening clouds, insistent thin rain, or sudden and violent downpours. But "The King of the Clouds" was conquered at last; conquered with all its peaks: nineteen above 4500 metres high were climbed, and of these sixteen by the Duke, including the highest of over 5100 metres. And the course of the ridges and of the valleys was determined, the structure of the large massif finally recognized. The wish of Stanley was now fulfilled, the challenge, that had been accepted, was won.

With his predilections and with his experience the Prince could not remain insensible to the appeal of that part of the world where the mountains assume such shapes and heights as to appear almost the consummation of all alpine beauty. I speak of the Karakoram, one of the numerous Himalayan ranges, wherein the Baltoro glacier offers a field worthy of the most daring effort.

You will remember, among the first pioneers in this field, Sir Francis Younghusband, who penetrated into it in 1887, when, at the end of his memorable journey from far-off China to India, he found his way suddenly blocked by the high range of the Karakoram. Godwin Austen had already been over the main tongue of the Baltoro glacier, as far as that large terminal basin where immense glaciers join from all directions and which is dominated by K_2, more than 8600 metres high. Then Lord Conway, who made the first climb in this range, had reached in 1892 the top of a peak of nearly 6900 metres high. The following expedition, led by Eckenstein in 1902, proved only how the mountain, K_2, in all its grandeur, showed itself adverse to being conquered.

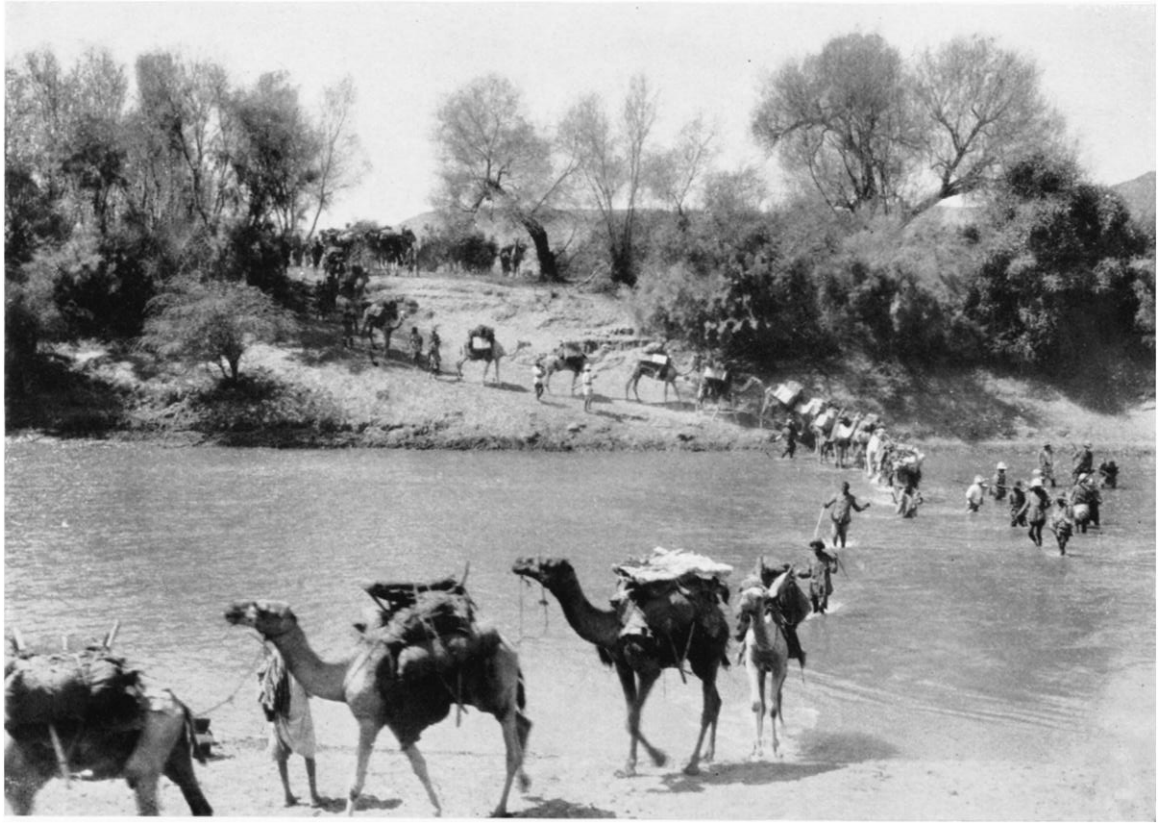
H.R.H. the Duke of the Abruzzi, always ready for every great deed, set out in 1909 towards the Baltoro. His companions were Sella, Negrotto Cambiaso, De Filippi, and a reliable group of alpine guides from Courmayeur. But in the attempts to climb the giants of the Karakoram, the Prince this time went alone with his faithful mountaineers from the Val d'Aosta. And K_2, the gigantic and majestic pyramid, was studied, was attempted on every side, up to the last lateral saddles, which gave one a view over the northern slopes of the range, towards a sea of peaks and glaciers until then unknown. But K_2, the giant of all, remained unconquered.

Others might have been content with this fine exploring campaign; not so the Duke, and while he was leaving the untamed giant, he saw in front of him a high snowy mountain, the Bride Peak, lower than K_2, but still worthy of being attempted. And the patient climb began, from one fall of séracs to



Phot. V. Sella

Karakoram 1909: K2 from the Godwin Austen glacier



Somaliland 1928: the Duke's caravan crossing the Webi Shebeli

another, till the last short slope that would have led directly to the summit. But there, within 150 metres of the summit, with only a moderate effort needed to reach it, the mountain seemed to defend itself against the daring climber, who clung to its rugged shoulders cloaked with snow. It shrouded itself in a sea of dense fog; and this barrier would not be removed. It seemed, on the contrary, to enclose it the more surely; and in the end, when every hope failed, it became necessary to abandon the final achievement.

To reach the summit has a moral significance, which only the true alpinist can feel in all its power. On the Bride there was something greater than merely reaching the summit, even though a new summit. Here men were striving, in ideal competition, toward the greatest altitude yet reached by man. Dr. Longstaff had reached 7134 metres on Trisul, and he, an Englishman, then held the record, though some doubt remained concerning a slightly higher altitude Graham was said to have reached on Mount Kabru. These records however had now been conquered by the Prince, who with his bivouacs at 7500 metres attained the greatest altitude then ever reached by man by his own efforts on the mountains.

Twenty years elapse, many years of war and of turmoil. When this was at its worst the Prince again wished to be an example to all Italians. In 1920—it is necessary to remember that date—when many things seemed about to fall in ruins, he showed that, on the contrary, it was necessary to begin to work tenaciously to build up, with courage and faith, "Ardisci e spera," as was the motto which the August Queen had given him for one of his great enterprises. In 1920 H.R.H. the Duke of the Abruzzi, as if he wished to start a new life, went to Somaliland, into the interior, where the woods near the river Webi Shebeli are only a feeble defence against the heated plains, arid for the greater part of the year, and showing, only after the rains, some green but meagre pasture for the nomads' flocks. And there along the Webi Shebeli he became a pioneer, and gave life to one of the most important agricultural enterprises that our colonies have known. Where the herds of cattle used to linger and graze there is now a great fervour of initiatives: new works, machines, cultivated lands, villages, canals, factories, where throbs the life of the colonists and of the natives.

But because of the unchanging laws of the climate it is only from the river that the ground can get the fertilizing water, and the river shows itself, in its floods, to be strangely irregular, perhaps also insufficient, if one is thinking not only of to-day's works, but also of to-morrow's. The Webi however, except for the last part of its course, could still be called an unknown river. Many travellers had partly followed it, or crossed it, or only just reached it; but they were travellers of that epoch of exploration which had given us only the general lines, not the details, of the Earth's features. In 1928 the Duke of the Abruzzi, no longer young, organized his last expedition between Abyssinia and Somaliland, and reaching that region of Sidamo, where the sources of the Webi were still hidden, he followed that river in its entire course, from gorge to gorge, from one bend to another, until it opens out into the plains of sand and there loses part of its water. The work of his predecessors is completed, because that river to-day holds no more mysteries.

These are the achievements of the Prince explorer, and we need not record all that he brought back, from each of his undertakings, for the progress of Science. Even had he not done so, his high moral figure would not be diminished in the least, for it has a very different and deeper and more essential root. Because he has shown that human life is fine and noble and worthy of being lived, only if it escapes from a too comfortable and quiet life, and knows, on the contrary, how to accept, always and in all places, the fight for an ideal aim. His life indeed has always appeared like a striving without end, because always renewed, towards always more distant and always more elevated goals: towards those same goals which are well known to you, my English friends.

Therefore his is a figure that dominates and seems surrounded by a halo of heroism: and great he was until the very end.

A comparison comes to my mind with one of your heroes. When Captain Scott was dragging himself along in his tragic return from the Pole, Oates, one evening, feeling himself to be at the end of his strength, got up and went out of the little tent, saying simply to his two companions: "I am just going outside and may be some time." And he walked off in the ice, amidst the snowstorm, to die, all alone, where he had fought and won.

And the Prince explorer, when he knew that the end was inexorably near, left his town and his palace, and to those who had the sad fortune of greeting him for the last time, he simply said: "Don't ask for news of me any more," and he too went, to die on the field of his last struggle and of his last victory. And perhaps, when sailing from Genoa, he may have gone back, in his thought, to all his voyages on the sea, from the time when he learnt as a princely child that life must be, always and for every one, a school of duty; but a duty which it is given to few to accomplish heroically as the Prince has done.

Sailing from Genoa, he may indeed have gone back, to all his enterprises: Saint Elias, *Stella Polare*, Ruwenzori, Baltoro, Shebeli, and perhaps he may have heard as an echo the distant voice of the poet who had sung him on the glorious and sad day of his return from the Pole.

And as he left his beloved Italy for ever he may have felt the love made of endless devotion which floated about him, the love of those who saw in him an example and the purest of symbols; above all, those who were young when he was fighting and winning his noble battles, young himself, remembered how their love for their country and the infinite craving for its greatness were upheld by an unshaken faith, even during the mediocrity of the greyest times; but this faith was again and again animated and strengthened by the young Prince, who, with every new action of his, always knew how to stand up high again, for Italy, in the world.

For to him, to the Prince, in those hazy times in which he lived his vivid youth, there must have appeared as in a vision of light an active and productive Italy such as the poet had sung, inspired by his great deeds, almost foreseeing the great renewal of to-day. Inspired indeed was the poet by the great deeds of our hero Prince, for whom the path marked by destiny seems to have been unique and immutable: TO WILL, TO DARE, TO CONQUER ALWAYS!

restrictions and under their own flag. There is in the judgment of the Court scarcely a hint of these considerations. The Court kept its attention directed to strict proof of title, and Norway's occupation of the land which they proposed to call by the name of Eric the Red was illegal because Denmark had an indefeasible title to the land deriving from the activities of Eric the Red himself.

THE MOUNT EVEREST EXPEDITION

THE account in the last *Journal* concluded with information contained in a dispatch dated June 14 when another attempt upon the mountain was just beginning. Between June 4 and 12 Mr. Ruttledge rested his whole party at Base Camp while heavy monsoon snow fell upon Mount Everest. Next day the advance was begun, and on June 16 the whole expedition with the exception of Shebbeare, Wager, and Smijth Windham reassembled at Camp 3 to be ready to occupy the higher camps as soon as the weather should improve. But though the mornings might be fine the snow which fell every evening quite counteracted the clearing effects of wind and evaporation. Avalanches were still frequent, and with the North Col in so dangerous a condition Mr. Ruttledge had no alternative but to take his party back to Base Camp.

When this news was received in England the Committee met to discuss the future of the expedition. They summarized the position briefly as follows: Mr. Ruttledge was anxious to stay near the mountain throughout the monsoon with a reduced party which however would be large enough to make another attempt if the monsoon allowed them. But he had modified his statement that their failure so far had been due solely to climbing difficulties: it was due to climbing difficulties combined with fresh snow and terrible winds, and now that mid-summer was passed and the monsoon had broken there seemed no reason to expect that better conditions would prevail this year. The party had worked under great strain for the last eight weeks and less than half of them were still really fit. Supplies were short, and in any case it would be difficult to re-equip the expedition adequately to make safe a later attempt. It was argued also that it would be unsafe to split the party. It was clear that the expedition had done wonderful work under unfavourable conditions which were unlikely to improve; everything possible had already been attempted, and in view of all these considerations the Committee felt bound to ask Mr. Ruttledge to bring his party home. A wireless message to this effect was dispatched on June 27 and an acknowledgment received on July 1. The party are now on their return march through Tibet, and those who are returning to England will probably sail from Bombay on August 5. J. M. S.

17 *July* 1933

When discussing the chances of the 1933 Mount Everest Expedition with Hugh Ruttledge before his departure, the writer expressed his belief that only two things could cheat them of success—bad weather, or a failure by the porters to carry Camp VI high enough. The latter obstacle, being dependent

on human effort, was successfully negotiated by this most efficient expedition; the former, being beyond human control, has beaten them. For recent dispatches have corrected an erroneous impression, given by the first telegraphic accounts, that the failure to reach the summit was due to sheer climbing difficulties; there now seems little doubt that snow conditions, combined in one case with winds of gale force, were responsible for the defeat of both attempts.

A comparison between the course of this year's expedition and of those of 1922 and 1924 is interesting. Both the 1924 and 1933 expeditions encountered impossible weather practically throughout the month of May, a month which was comparatively fine in 1922, though it must not be forgotten that each of the high climbs in that year happened to coincide with a storm. Whereas however the 1924 expedition subsequently enjoyed a fortnight of perfect weather before the break of the monsoon on June 15, this year, as in 1922, the monsoon broke on the first day or two of June.

Herein lies the great difference between the two years. Instead of the comparatively favourable conditions which marked the climbing above 27,000 feet in 1924, it was carried out this year in the same weather which characterized the whole preceding month. The experience must have been a devastating one; it is certain that the steep and dangerous slabs and "tiles" that guard the final pyramid by whichever route is taken must be impossible when plastered with fresh snow; while to climb, or to descend, as both Smythe and Shipton had to do under such conditions, complicated by terrific winds and a blizzard, must be an ordeal the like of which few men have come through alive and unhurt. Prodigious indeed must be the physical powers that enabled Smythe to survive such an experience with heart unaffected.

In 1924 it was believed that the weather throughout the Himalayas in May was unique in the experience of the last fifty years. If this was really the case it is incredibly unfortunate that the 1933 expedition should have met with similar conditions, in a year too when an early monsoon denied them the chance of retrieving their initial setbacks. Ruttledge and his fine party had achieved the winning position; it is probable that the layout of their camps cannot be bettered, and that above 27,400 feet no alternative site for a high camp, even for one tent, exists. Under such conditions as those of early June 1924 success should have been almost certain had two parties as strong as Wager and Wyn-Harris, Smythe and Shipton been able to go for the top from a Camp VI so situated.

There may be, as there were in 1924, critics of the policy of sending parties of two on the final climb, and these may point to the separation of Smythe and Shipton—which had its parallel in one of the high climbs in 1924—as proof of their contention that no party should consist of less than three on a formidable mountain. There are two answers to this criticism: no expedition yet dispatched to climb Mount Everest has had the resources to establish and maintain at Camp VI the requisite number of successive parties of three for the final climb; and, could it be done, it is doubtful if the summit could ever be reached by a party of three starting from 27,400, for the rate of progress of a roped party is in inverse proportion to its numbers, and time is the essence of this problem.

We have yet to hear, in detail, by what arts and by what expenditure of vital energy the porters were induced to carry to 27,400. The climbers who were thus responsible for establishing Camp VI and the porters themselves who did this record-breaking carry—the "tigers" of 1933—have done a bigger thing than they may realize: this year their efforts were in vain, but there is a curious psychological factor in mountain climbing which dictates that once a thing has been done it can be repeated again and again: *c'est le premier pas qui coûte*. Camp VI at 27,400, if not higher, may be counted on as a permanent feature of any future expedition.

We have much more yet to learn. Does the meteorological department in Simla consider that both the years 1924 and 1933 were quite exceptional from the point of view of weather? What exactly did Wager and Wyn-Harris think of the possibilities of the second step as an alternative to "Norton's route"? Did they try a variation of the latter, crossing the big couloir above its point of junction with the yellow band? What further advances in the progressive raising of the standard of comfort achieved each year are already projected? The possibilities of future success are bound up with such questions hardly less than with that vital one: will the Tibetan Government permit another expedition in the near future?

But we already know one thing: the expedition of 1933 did not fail. Hugh Ruttledge's tireless exertions for over nine months; his fine organization and leadership; the splendid team work and devotion of the whole expedition; and the courage and hardihood of the high climbers, British and Himalayan alike, have done far more than equal the height record of 1924. They have proved the possibility of establishing the key position and of maintaining there the necessary climbers, fit and ready to make the defeat of the mountain a moral certainty, given the reasonably fine weather that they never enjoyed.

E. F. N.

NOTE ON A MAP OF THE TURFAN BASIN

SIR AUREL STEIN, K.C.I.E., F.B.A.

THE map discussed in this note is intended to record the surveys carried out, mainly in the course of my third Central-Asian expedition, within that remarkable drainageless basin which lies between the southern slopes of the eastern Tien Shan and the desert ranges of the Chöl-tagh. Special geographical interest attaches to this basin, conveniently designated by the modern name of its chief oasis, Turfan, not only because it contains the deepest depression below sea-level in the whole of Asia apart from the Dead Sea, but also on account of its characteristic physical features. These exactly reproduce, as it were, on a small scale those of the Tarim basin, the greatest drainageless area of innermost Asia.

A variety of causes, largely geographical in origin, have invested the Turfan depression with considerable political and cultural importance during early periods of Central-Asian history. This importance is reflected by the large number of ancient remains which are to be found there within a comparatively small area and which the great aridity of the local climate has allowed to survive above ground.

The archaeological interest presented by those remains and the labours claimed by their survey and partial exploration caused me on my third Central-Asian expedition to spend over three months of the winter of 1914–15 within the Turfan basin. Busy as I was kept by antiquarian labours I endeavoured to utilize this stay also for observations on those geographical features which give a strongly distinctive character to the Turfan district and especially to its inhabited portion. For this purpose a more detailed survey of its topography was essential than that which it had been possible to effect on the occasion of my first visit to this area in November 1907. At that time Rai Bahadur Lal Singh, Extra Assistant Superintendent, Survey of India, my devoted old travel companion, had carried a reconnaissance survey on the quarter-inch scale along the main routes of the area.

I accordingly arranged for a plane-table survey on the comparatively large scale of one inch to the mile to be extended by the late Surveyor Muhammad Yaqub Khan, who had been deputed by the Survey of India as my second topographical assistant, over as much of the central portion of the basin as limitations of time would permit. The cultivated areas of the district are with very few exceptions confined to this portion, and the ruins of pre-Muhammadan times are almost all to be found either within them or in their close vicinity. This circumstance made it possible for me in the course of my successive visits to the different ancient sites to keep within easy reach of the young surveyor and thus to exercise personally that measure of supervision and control which previous experience of his abilities had rendered advisable.

A special map of the Turfan basin on the scale of 1 : 250,000 has been prepared at the Geodetic Branch of the Survey of India, Dehra Dun, in order to provide the geographical and antiquarian student of this interesting ground with a cartographical representation of its topography on a larger scale than that of the 'Maps of Chinese Turkistan and Kansu' (1 : 500,000) attached as

Vol. IV to my 'Innermost Asia,' and also separately issued by the Survey of India in 1923 with a "Memoir" from my pen forming Vol. XVII of the *Records of the Survey of India*. It is from this map that, with the kind permission of the Surveyor-General of India, the map accompanying this paper has been reproduced on a reduced scale.

In addition to the above detailed material the map embodies the plane-table work which was carried out by R. B. Lal Singh in 1907 and 1914–15 to the north and south, respectively, of that central belt of the basin as well as some minor plane-table traverses in the north-west and south-east portions of the sheet from Khan Sahib Afraz Gul's routes. The representation of physical details is the same as is adopted in my 'Maps of Chinese Turkistan and Kansu' and fully explained in my "Memoir" on them.[1] The same applies also to the use of symbols and the record of local names.[2]

The area represented in the map falls within Sheets No. 28 and No. 31 of the 'Maps of Chinese Turkistan and Kansu,' and the identical values for observed longitudes and latitudes as recorded in the corresponding "Notes" of Chapter IV of my "Memoir" have been used throughout for the adjustment of the plane-table work.[3] Since the Turfan basin derives special interest from the great depth below sea-level to which it descends in its lowest portion, care had been taken to obtain observations with a mercurial barometer in a comparatively large number of places. The heights or depressions derived from these observations have been recorded in the "Notes" of the "Memoir."[4]

All the other heights entered were deduced from observations with aneroids corrected to accord with the mercurial readings at the places where these also were available. It deserves to be mentioned that the results from the aneroid readings had proved very satisfactory throughout my third expedition, as shown by Dr. De Graaff Hunter's remarks on them.[5] The clinometrical heights shown are based on aneroid readings observed at the points nearest to the plane-table stations from which the former were taken. The results from the numerous observations with the hypsometer, on which Surveyor Muhammad Yaqub mainly relied in the course of his work within the area below sea-level, have unfortunately proved untrustworthy and had hence to be discarded. This accounts for the largely conjectural character of the approximate datum line and contours below sea-level indicated in the map.

From the above record of the materials used in the compilation of the map I may now proceed to a brief description of the chief physical features which the area represented in it exhibits. In respect of this analysis, summary as it must be for various reasons, I may at once acknowledge some serious limitations. In the first place I ought to point out that my want of geological training, combined with my equally regretted ignorance of Russian, restricts my knowledge

[1] See *Records of the Survey of India*, vol. xvii, "Memoir on Maps of Turkistan and Kansu," pp. 57 *sq.*

[2] Cf. *ibid.*, pp. 59 *sqq.*

[3] See *ibid.*, pp. 83 *sq.*

[4] Regarding the methods of reduction applied to readings both by mercurial barometer and aneroids, see Dr. J. De Graaff Hunter's Appendix B, "Memoir on Maps," etc., pp. 152 *sqq.*

[5] See "Memoir," Appendix B, p. 151.

as regards the most remarkable physical feature of the Turfan basin, its great depth below sea-level, to what information I can gather from the brief abstract Professor Suess's great classic, 'The Face of the Earth,' gives of the accounts contained in the publications of several distinguished Russian geologists.[1] The same applies also to the formation of the very striking hill chain which overlooks that great fault-trough from the north, and with its much disturbed deposits of sandstones and conglomerates represents the upthrown fault-ridge of this mighty dislocation.

It is at the foot of this hill chain, so utterly barren and forbidding with its red glow as to account for its Chinese name of "Hills of Fire," that the depression receives that supply of water which is utilized for irrigation to the utmost and alone renders cultivation possible. Most of the irrigation thus secured depends not upon the surface flow from springs but upon an elaborate system of *karezes* or underground wells and canals which tap subterranean drainage. This system is nowhere else practised in Chinese Central Asia and is believed locally to be of comparatively recent introduction from distant Persia. A close examination of it seems essential for a proper estimate of the economic resources of the Turfan district.

An exact comparison of the cultivated area now dependent on karezes with that irrigated from spring-fed streams might well throw light on the much-discussed question of climatic change; for archaeological evidence distinctly suggests that the economic importance of Turfan was quite as great, if not greater, during ancient and early mediaeval times, when we must assume that its oases depended wholly on irrigation from surface drainage. Yet, interesting as the question thus raised must be for the geographical student and the antiquarian also, it was not possible for me to spare time for the collection of adequate data regarding those different sources of irrigation used in the scattered oases of Turfan.

It would have been of distinct interest also from more than one point of view if it had been practicable to collect reliable data as to the population in the oases, large and small, comprised within the cultivable belt. But it was not possible for me to secure access to official statistics, supposing that such were to be found in the Chinese magistrates' Yamêns. What figures as to the number of households I was able to obtain by local inquiries at certain of the oases can scarcely be taken for more than rough traditional estimates indicating their relative importance. Yet even in this respect more reliable guidance may probably be gained from the extent of land actually under cultivation as the map's record based on the detailed survey shows it.

As already mentioned above, we find most of the physical features which divide the Tarim basin into well-marked different zones reproduced also in the Turfan basin, though on a much smaller scale. A determining factor affecting all those zones is the aridity of the climate, and this is equally great in both basins. To it is due the fact that in the Turfan basin, just as in its much larger counterpart westwards, settled existence implying cultivation is entirely dependent on irrigation and on what water is supplied for it by the mountains.

[1] Cf. Suess, 'The Face of the Earth,' translated under the direction of Professor W. J. Sollas, iii, pp. 166 *sqq*. Full references will be found there to the accounts of the brothers Grum-Grimailo, Bogdanovich, Obrucheff, Roborovski, etc.

In the case of the Tarim basin two great snowy ranges, glacier-crowned in many parts, the Kunlun in the south and the Tien Shan in the north, feed rivers which carry considerable volumes of water over their alluvial fans and allow large compact oases to be maintained there. The Turfan basin too is enclosed by two ranges stretching along its longitudinal axis. But the southern one rises nowhere to heights which could retain snow and is throughout so defective of moisture as fully to deserve its local designation of *Chöl-tagh*, the "Desert Hills." Water, usually brackish, can be found there only in rare wells or natural cisterns. Only on exceptional occasions may flood water descend in some gorges of this barren range to lose itself in the salt-encrusted marsh-bed of the Aidin-köl which stretches along its northern foot and forms the lowest part of the depression.

It is due solely to the vicinity of the Tien Shan main range stretching north of the basin that Turfan owes its oases and its economic importance attested all through historical times. That portion of the main range which sends its drainage southwards into the Turfan basin rises, as the map shows, to peaks over 14,000 feet. It attains over most of its length a crest-line which cannot fall much short of 11,000 feet and to the west is certainly higher. There it carries permanent snow-beds for a distance which from the observations made on our crossing of the Pa-no-p'a pass may be estimated as at least 50 miles. The conditions there noted on 23 October 1914 indicated an approximate level of about 12,500 feet for the snow-line. Its comparative lowness is largely accounted for by the fact that a far moister climate prevails on the northern slopes of the Tien Shan. This is abundantly attested by the fact that ample conifer growth is to be found there from an elevation of about 6500 feet upwards, while along the northern foot of the range cultivation is possible with the sole help of rain- and snow-fall right down to elevations between 2000 and 3000 feet.

The rich quasi-alpine vegetation to be met on the northern slopes of the range makes the contrast of the stony barrenness to the south of the crest-line all the more striking for the traveller. There only the scantiest grazing is to be found even at the very heads of the valleys. Farther down scrub and occasional growth of willows and wild poplars are closely confined to the banks of the small streams which descend here between spurs of utterly bare rock and conglomerate. These streams carry a considerably increased volume of water during the spring melting of the snow-beds on the crest of the range and on the rare occasions when heavy rain clouds pass across it from the north. But nowhere does their water succeed on the surface in crossing the zone of utterly bare piedmont gravel. This, from 20 to 25 miles wide on the average, everywhere separates the foothills of sandstone or conglomerate from the nearest areas of cultivation.

Whatever water is brought down by those streams is quickly absorbed by those huge beds of detritus or else evaporates under the fierce sun of the spring and summer of the Turfan basin. Springs are to be met only at certain points of the dry flood-beds which traverse this huge gravel glacis. These beds are clear marks left behind by the far more abundant drainage of periods when climatic conditions were moister. Near those springs small patches of vegetation, such as the map shows at Shaftulluk, Chichan, Örtang-aghzi, usually

including some orchards and arbours, serve as much-needed halting-places for travellers and traders who proceed from the Turfan oases to the passes of Pa-no-p'a, Sardakdawan, and Qara-dawan.

These passes give direct access across the Tien Shan to the fertile tracts around Guchen in the north. They are all open to traffic with horses for the greater part of the year, while the more devious but easier routes to the east and west by the saddles of Ta-fan-ch'êng and Ku-ch'üan are available for cart and camel transport at all seasons. This fact largely accounts for the close economic relation which exists between the districts of Turfan and Guchen, notwithstanding the intervening mountain range. It is also duly reflected by their close political connection throughout earlier historical periods.[1]

Before proceeding to visit the series of minor oases which are met after descending that wide gravel glacis, we may acquaint ourselves rapidly with that very striking feature of the Turfan basin, the rugged hill range which forms the northern rim of the great fault-trough. It is the result of geological flexing and fracturing which has produced the basin. It has upheaved and greatly disturbed "not only the coal-bearing clays and variegated sandstones of the Angara series, but also the red conglomerates and friable sandstones of the Gobi series." [2] As shown by the map, this hill range, known over different sections by varying local names such as Tuz-tagh or Kawan-tagh, stretches with a general east-to-west direction along the whole length of the depression from the Pichan oasis to north of Toksun.

It is to the east of its middle portion marked approximately by the gorges of Sengim and Toyuk that it attains its greatest height, rising in rugged ridges to approximate elevations between 2200 and 2700 feet. The slopes throughout show the effects of excessive erosion by water action, as seen in photographs taken near the Toyuk gorge.[3] Except at the bottom of the gorges in which small streams gathering from springs at the foot of the gravel glacis have cut their way through the range, these hills are absolutely bare of vegetation. Their reddish colour and fantastically fissured slopes add still further to their forbidding appearance.

Masses of drift sand are found in some places heaped up on the north slopes, as near Murtuk.[4] Near its eastern extremity the range merges in an area of huge ridges of dunes, appropriately known as *Kum-tagh*, "The Sand Mountains." These have been rightly assumed to overlie the eastern continuation of the fault-trough towards Hami. On the south they are adjoined by the waterless wastes of the Chöl-tagh.

There can be little doubt that the drift-sand ridges of the Kum-tagh owe their position in the south-east of the Turfan basin to the effect of "aspiration." The violent north-west winds which sweep over the basin during the spring and summer are obviously due to the cold air of the mountains and of Dzungaria being drawn into the Turfan basin by the fierce summer heat which

[1] Regarding the economic intercourse and common political fate of the two territories (known to the Chinese Annals as Cismontane and Transmontane *Chû-shih*), as a result of geographical factors, cf. 'Innermost Asia,' ii, pp. 569 *sqq*.

[2] See Suess, 'The Face of the Earth,' trans. Sollas, p. 166.

[3] See "Memoir on Maps," Fig. 29, B; 'Innermost Asia,' ii, Figs. 309, 311.

[4] See 'Innermost Asia,' ii, Figs. 314, 315.

prevails in the depression and causes the hot air to rise there. This heat itself directly results from so great a portion of the basin lying deep below sea-level.

It is equally clear that those winds, ever since the great fault-trough was formed, must have been constantly at work deflating the slopes of the mountains and the glacis below them, both wholly unprotected by vegetation. The fine drift sand thus eroded is bound to be carried to the south-eastern extremity of the depression and to find its place of deposit where the effect of that "aspiration" is countered and neutralized by the air current from the cooler heights of the Chöl-tagh and the great Pei-shan plateaus eastwards.

That wind erosion actually asserts itself in places also within the cultivated area I had occasion to observe in the north-western portion of the Turfan oasis. This, as the map shows, occupies a gap about 5 miles wide in the hill chain fringing the fault-trough. It may be described as marked on the east by the bed of the stream which issues from the valley of Buluyuk and on the west by the two deep-cut ravines of the 'Yar' which enclose the island-like site of the ancient Turfan capital of *Chiao-ho*, now known as Yar-khoto. There to the east of the Yar in close vicinity to cultivation I noticed patches of ground overrun by small dunes. The inroad of fine sand driven by the *burans* from the north-west threatens the fields in the vicinity, and in order to protect them from the risk of attending wind erosion their surface is covered with clods of hard clay before the windy spring season sets in. The intrinsically fertile fine sand, or rather dust, which is deposited between the clods is considered on such ground an adequate substitute for manuring.

Owing to the position of the tract of Turfan proper in the gap above mentioned the physical features affecting cultivation are there less clearly defined than in the smaller oases which are found along the northern foot of the hill chain overlooking the fault-trough. Throughout the string of these oases, from Buluyuk in the west to Pichan in the east, the water supply needed for irrigation is primarily derived from springs rising in close vicinity of the cultivated area either within flood-beds or else on their alluvial fans. It is obvious that the rise of these springs is due to drainage from the mountains having been absorbed higher up by the gravel-beds of the glacis and being here forced to the surface on striking impermeable strata of the fault-ridge. The supply of these springs is in the several oases supplemented to a varying extent by that of karezes. These tap the subterranean drainage farther away from the flood-beds and allow water to be brought to portions of the ground which irrigation channels taking off direct from the springs would not command.

As the construction of karezes involves very heavy expense the provision of irrigation by this means must necessarily depend on the extent and quality of the arable land within convenient reach of the karez mouths. This explains why, *e.g.* in Pichan, reckoned at 2000 households, the water from springs suffices to irrigate twice as much land as that derived from karezes, while Khando, the oasis nearest to the west, with its 500 households, is almost wholly dependent on karezes. Conditions closely resembling those of Khando are found also at Sengim, whereas at Murtuk, where the use of its spring-fed stream provided for a settlement of about 300 households previous to the Chinese reconquest of the Province, the construction of 28 karezes is believed

to have added 200 more. At Lamjin, reckoned at about 400 households, spring-fed streams and karezes may be supposed to account for about one-half each of the irrigated area.

The assured supply of water which both springs and karezes provide throughout the seasons, coupled with the warmth of the climate during eight or nine months of the year, make it possible in these oases, as in all the others of the basin, to reap two annual harvests. In all kinds of cereals, as well as in fruits and in cotton, the produce of cultivation in the Turfan oases is plentiful. The exceptional fertility of the soil when irrigated under such favourable climatic conditions and the profit derived from such a valuable and easily exported produce as cotton sufficiently explain the use of the karez system notwithstanding the heavy expenditure of money and labour it involves.

At the same time, as a consequence of the great extent of the profitable cotton cultivation for export to Dzungaria and beyond, and owing also to the presence of a considerable trading population in the large southern oases, Turfan is obliged to supplement its foodstuffs by imports from the north. On the other hand, the absence of grazing both in the mountains and in the depression makes Turfan depend on the tracts across the Tien Shan for livestock and wool. The economic interdependence thus created by diversity of geographical conditions is reflected throughout the political history of those territories.[1]

The agricultural conditions just described apply equally to the much larger oases to the south of the hill chain, but with a difference as regards that portion of irrigation which is not derived from karezes. Practically nowhere do we meet with springs along the southern foot of those utterly barren hills; but instead, as a look at the map shows, we find a number of streams breaking through that range and carrying a surface supply of water to parts of the potentially fertile belt of ground which forms its glacis. Those streams receive all the water of the springs and karezes which is left after having served the needs of the northern oases and bring it in deep-cut narrow gorges to where these debouch. The fertile loess-like ground which slopes down from the foot of the range permits the water of the streams to be utilized for irrigation within comparatively short distances from the mouth of the gorges and thus saves it from being lost through evaporation before it could be turned to use.

Thus we find the position of the three large and compact oases of Lukchun, Qara-khoja, and Turfan directly determined by the points at which the streams from the gorges below Lamjin, Murtuk-Sengim, and Buluyuk debouch into the depression. An examination of the map affords interesting evidence as to the close correspondence between the areas of cultivation in those oases and the observed volumes of water in the streams which feed their canals.[2]

[1] Cf. 'Innermost Asia,' ii, pp. 568 *sqq.*, regarding this interdependence.

[2] Measurements taken on different dates of November 1914 showed volumes of 125 cubic feet per second in the stream coming from Lamjin which irrigates the important oasis of Lukchun, and of 120 cubic feet per second at Sengim-aghiz. There the stream from Murtuk and Sengim debouches, and there the canals irrigating the fields of Qara-khoja, around the large ruined town of ancient *Kao-ch'ang*, have their heads. I regret not to have had an occasion to measure the volume of the stream of Buluyuk at its debouch. But lower down, where it is crossed by the road from Qara-khoja, it still

Reference to the map is equally instructive also as regards the great extent to which cultivation in those main oases is nowadays supported by irrigation from karezes. The absence of statistical data, such as only proper revenue records could supply, makes this cartographical evidence particularly useful. At none of those oases is it more striking than at the extensive area used mainly for the cultivation of cotton which stretches to the north-west and south-east of the town of Turfan, the modern administrative and trade centre of the territory. Here we have a continuous series of karezes, more numerous than limitations of scale would permit to be individually shown on the map. They tap the subterranean drainage both at the foot of the gravel glacis which stretches down from Shaftulluk towards the previously mentioned gap, and also along the foot of the hill range east of Buluyuk. The utter barrenness of this range and the extreme rarity of occasions when it receives any rainfall, suggest that the subsoil water which the wells at the heads of the karezes strike may also be derived from the precipitation which the snowy heights of the Tien Shan regularly receive. But only competent geological investigation could prove whether such an assumption is compatible with the character of the strata likely to underlie that fault-ridge.

It is obvious that the comparatively gentle declivity which marks the northern side of the subsidence facilitates the use of the subterranean water supply over a broad belt of ground. This helps to explain why we find the map marking an almost continuous string of detached cultivation plots, usually small, extending below the main oases from the south-west of Turfan to the south-east of Lukchun. All of them depend solely on karezes, and the construction of new ones, though often a speculative undertaking, is still proceeding.

As already stated, the construction of a karez involves heavy outlay; for the number of successive shafts to be sunk while cutting the subterranean channel amounts sometimes to two hundred or more. Figures up to 10,000 taels of silver were named to me as having been spent over certain karezes. It is obvious that the extension of karez cultivation must be determined not merely by the configuration of the ground, which may or may not permit the water-carrying stratum to be struck at a "paying" depth, but equally also by the quality of the soil on the ground to which the discharge of the karez can be brought. This observation may help to explain a certain inequality shown by the map in the distribution of those detached karez-irrigated plots. Whereas in the vicinity of Turfan proper these plots keep within a comparatively short distance of the foot of the hill chain, they are found to extend much farther away from it to the south below Qara-khoja and Lukchun.

I believe that a likely explanation is to be found in the greater salinity of the soil as we proceed westwards in that portion of the trough which lies below the approximate level of 500 feet below sea-level. The increased appearance of a soft salt-crust covering the ground, as observed on the route from below

carried on 8 February 1915 a volume of 52 cubic feet per second, and several canals take off from it higher up.

On the other hand it is interesting to note that the water of the stream which descends the rugged gorge of Toyuk and the volume of which below Subashi measured 45 cubic feet per second on 17 November 1914, suffices only for the limited cultivation of Toyuk and Yankhe, notwithstanding the very careful use made of it for the famous vineyards of the former place.

Faka-bulak towards Bejan-tura, is certainly due to this area forming the terminal delta of the river which descends past Toksun into the deepest part of the trough marked by the Aidin-köl marsh. It is the latter's main feeder; but, as the shrunk size of the marsh shows, much of the flood water brought down by the Toksun river from the high Algoi valley in the west is lost before reaching the Aidin-köl, through inundation of the deltaic ground. Evaporation then causes the soil there to become impregnated with salt.

A notable contrast to this is presented by the ground to the north of the Aidin-köl and to the east of it. To the north we find the large karez-irrigated oasis of Chige-bulak approaching within a few miles the shore of the ancient dried-up lake-bed of which the Aidin-köl is a remnant. Then, farther away to the east, there is similarly below Lukchun and towards Deghar karez cultivation to be seen at no great distance from that dried-up lake-bed. On my visit to the ruined site of Chong-hassar, only about 2 miles from the shore of the hard salt-encrusted bed, I found the scrub-covered loess-like ground still capable of cultivation if it were possible now to provide for its irrigation.

Here I may conveniently mention that the oasis of Toksun, which through unavoidable circumstances remained outside the detailed survey of 1914–15, presents the same features of cultivation as noted above in the case of oases like Qara-khoja and Lukchun. While irrigation supplied by the river apparently accounts for the major part of the cultivated area, the presence of karezes on both sides of the river-bed is also noted. Toksun, at a depression of 140 feet below sea-level, shares the climatic conditions of the other oases within the Turfan trough.

Before leaving that zone of the Turfan basin to which permanent human occupation has been confined all through historical times up to the present, I may aptly quote here from 'Innermost Asia' an observation concerning it which has a wider geographical bearing: "The development of Karez irrigation in the Turfan area is of comparatively recent date, and its introduction does not reach back farther than the eighteenth century.[1] But that the district possessed a dense population, wealth and corresponding economic importance in much earlier periods also, is abundantly proved by the large number, size, and elaborate character of its ruins as well as by its recorded history. Irrigation must have been all through historical times indispensable to cultivation within the Turfan area. We are therefore driven to the conclusion that the water supply brought down in streams from the mountains was more plentiful in ancient times than it is now, when subterranean drainage has to be tapped by Karezes in order to supplement it in a proportion which at present is probably close on one-half of the total available supply." The bearing of this conclusion upon the question of desiccation in Central Asia, whether local or general, is clear.

[1] Regarding the karez cultivation of Turfan and its introduction, cf. the remarks of Professor E. Huntington, based on careful observation, 'Pulse of Asia,' pp. 310 *sqq.*

The total absence in Chinese historical notices relating to Turfan of any reference to so striking a feature as the use of karezes may safely be considered clear evidence that this method of cultivation was not known there down to T'ang times and even later. It is very difficult to believe that the detailed and exact description of the territory of Kao-ch'ang in the *T'ang shu*, which duly mentions the two annual crops and the cultivation of cotton there, could have passed over the karez system if it had then existed.

There still remains to be noticed that deepest portion of the Turfan depression which forms the terminal basin of whatever surface drainage is to be found in it. My remarks on it must be brief; for, as plentiful archaeological labours, to my regret, did not allow me to devote myself personally to its study, I have little to add to what the map clearly shows. I had however taken special care to entrust the survey of the dried-up lake-bed which forms the most characteristic feature of this area to R. B. Lal Singh, and to secure through this ever-careful and painstaking topographical assistant a series of reliable mercurial barometer observations along its shore.

They extend from the eastern extremity of the salt-encrusted dry bed at the point known as *Tuz-kan*, the "Salt Pit," to the ruined watch-tower of Bejan-tura, the "Tower of the lifeless (ground)."[1] Examination of the readings thus observed leaves little doubt that the greatest depth of —980 feet recorded on the actual surface of the bed about 3 miles to the north-west of Tuz-kan represents as close an approach to the maximum of the subsidence as could be obtained without exact levelling operations. In their absence it cannot be considered as certain whether the Aidin-köl salt marsh, which at the time of the survey, 18–21 January 1915, was seen to hold water, marks the deepest portion of the bed. It is obviously the one which is most likely to be reached by flood water from the Toksun river. But evaporation and the presence of ridges of hummocky hard salt such as I observed rising above the flat expanse of crumpled-up salt cakes on a short reconnaissance made east of Bejan-tura, may well keep such water from spreading farther eastwards.

In this, as in other respects also, this terminal depression of the Turfan trough, having a total length of some 30 miles, presents a striking pendant to the dried-up salt sea-bed of the Lop Desert,[2] though on a much reduced scale. Here too the southern shore of the salt-encrusted bed is overlooked by a steadily rising glacis of coarse gravel and detritus, utterly devoid of vegetation, leading up to the foot of the northernmost range of the Chöl-tagh. The rise of the ground adjoining the northern shore is far more gentle, and here subsoil moisture derived from the irrigated areas farther north permits of the growth of low scrub, reeds, and tamarisks. It is dreary arid ground, yet not as forbiddingly bare as the slopes of the Chöl-tagh to the south of the dried-up lake-bed.

Up those slopes, covered with stony detritus and in parts also with accumulations of drift-sand, there lead tracks crossing the rocky wastes of plateaux and much decayed ranges towards the Lop region in the extreme east of the Tarim basin. Those ranges all belong to a system appropriately designated as the *Kuruk-tagh*, the "Dry Mountains." Of them the one crossed by the passes of At-ölgan-dawan and Igar-dawan at elevations of about 4000 feet above sea-level forms the watershed towards the Turfan basin. Nowhere between that watershed and the bottom part of the trough can drinkable water be found, except to the west, where the ancient highway from Toksun towards Qara-

[1] It is probably from a careless pronunciation of this name, inadequately recorded, that Russian maps and other publications have derived the apocryphical name "Bujento," not known locally as a designation of the marsh.

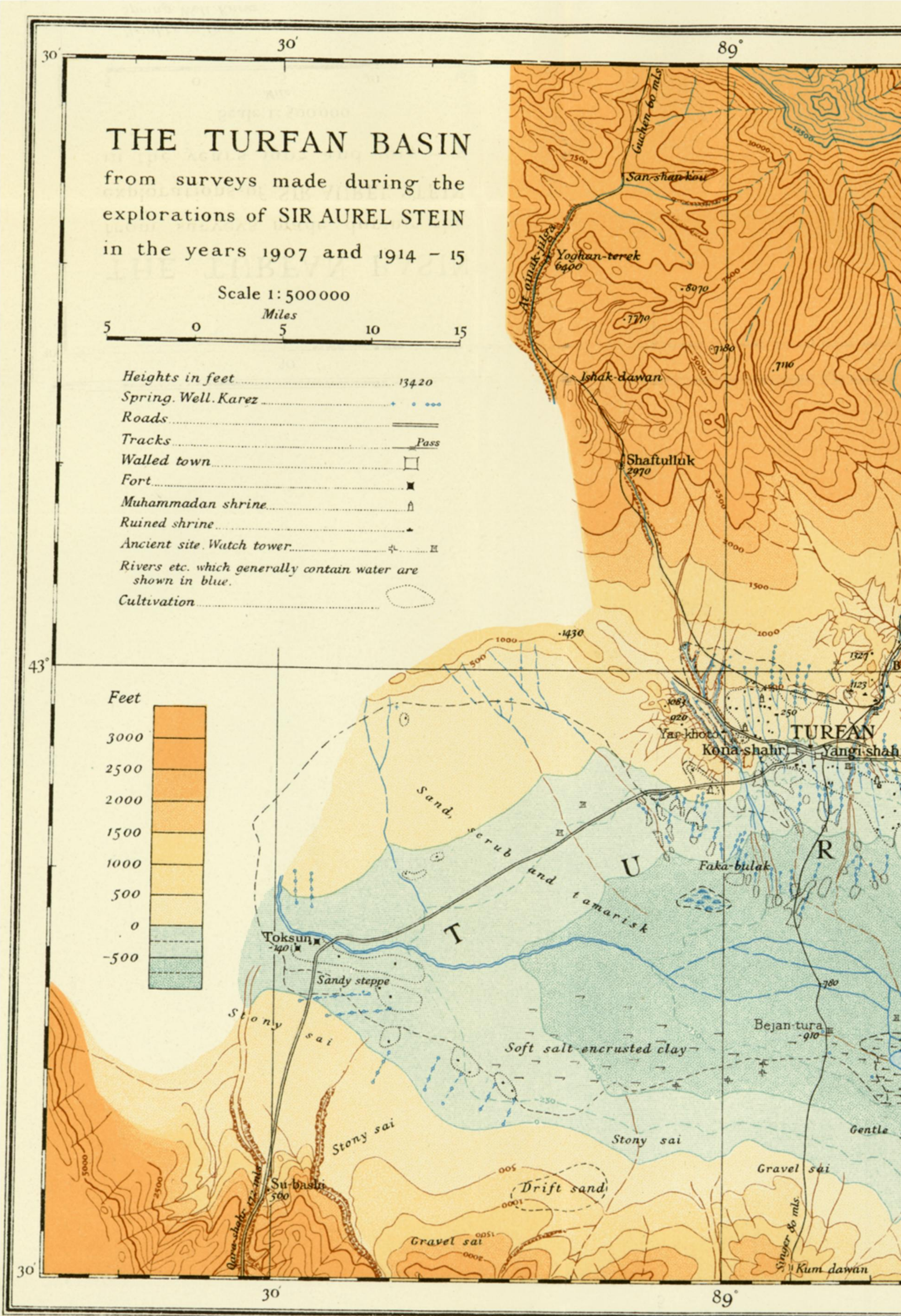
[2] For observations on the characteristic features of the dried-up bed of the ancient Lop Sea, cf. 'Innermost Asia,' i, pp. 295 *sqq.*

shahr and the north-eastern corner of the Tarim basin crosses a higher portion of the range.

The rapidly rising ground to the west of Toksun, with the great valley of Algoi and those descending from the side of Urumchi, has remained outside our surveys. Nor have I had an opportunity of becoming personally acquainted with that portion of the depression which may be assumed to extend due east of the Kum-tagh towards Hami. So here I may close this summary account of a well-defined Central-Asian region which, small as it is in extent, can yet lay claim to special geographical interest as illustrating all physical features that are typical of innermost Asia.

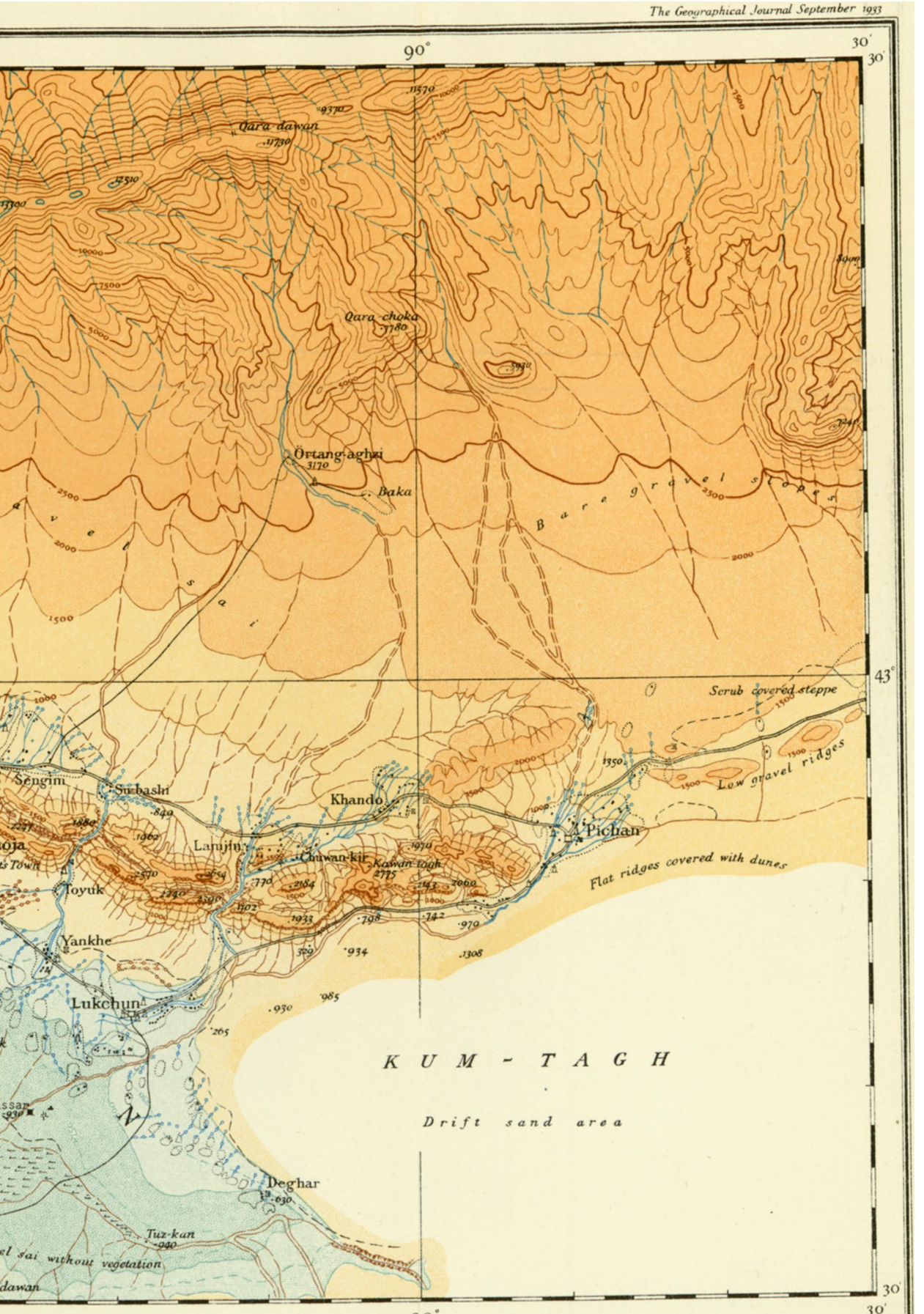
Note by the Editor:

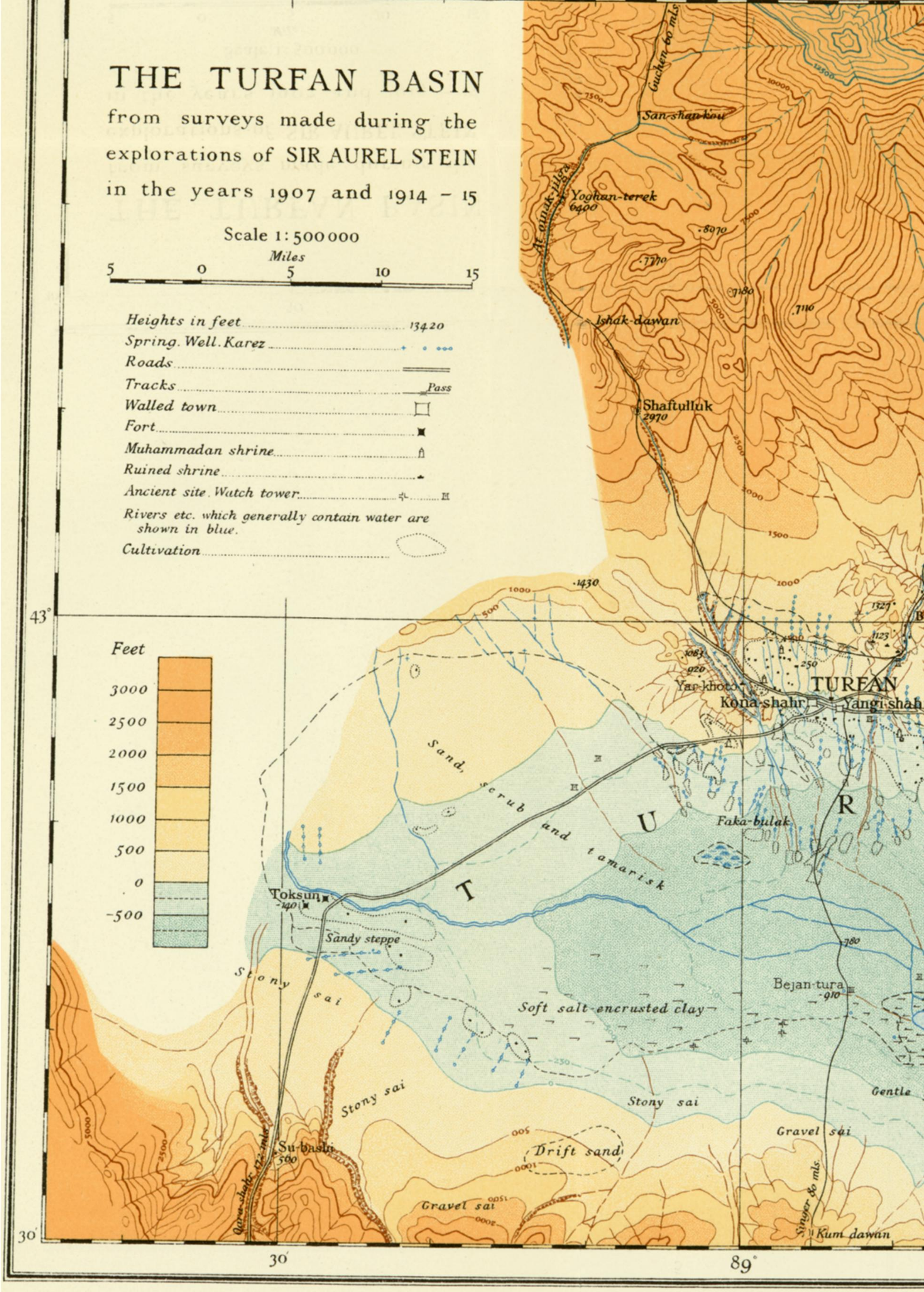
When Sir Aurel Stein consented some two years ago to write for the *Journal* a note on his Map of the Turfan Basin, it was at first contemplated that we should ask the Surveyor-General of India to print for us an edition of the "Map showing the main portions of the Turfan Basin" which had been drawn on the scale of 1/250,000 under his direction at the Trigonometrical Survey Office, Dehra Dun, and is included among the special maps published by the Survey of India. But further consideration showed that not only was this sheet inconveniently large for the *Journal*, but the complexity of its names and detail, and the emphasis given by colour to the cultivated areas, had inevitably obscured to some extent the remarkable topography of the basin. With the consent, therefore, of Sir Aurel Stein and of the Surveyor-General, we have extracted the topography from the larger sheet, and have emphasized the relief by adding a simple layer-colouring. The resulting map, on half the scale of the original, must be considered as a supplement to the latter, made for a special purpose; for a full appreciation of the above paper the student will necessarily refer to the map published by the Survey of India.



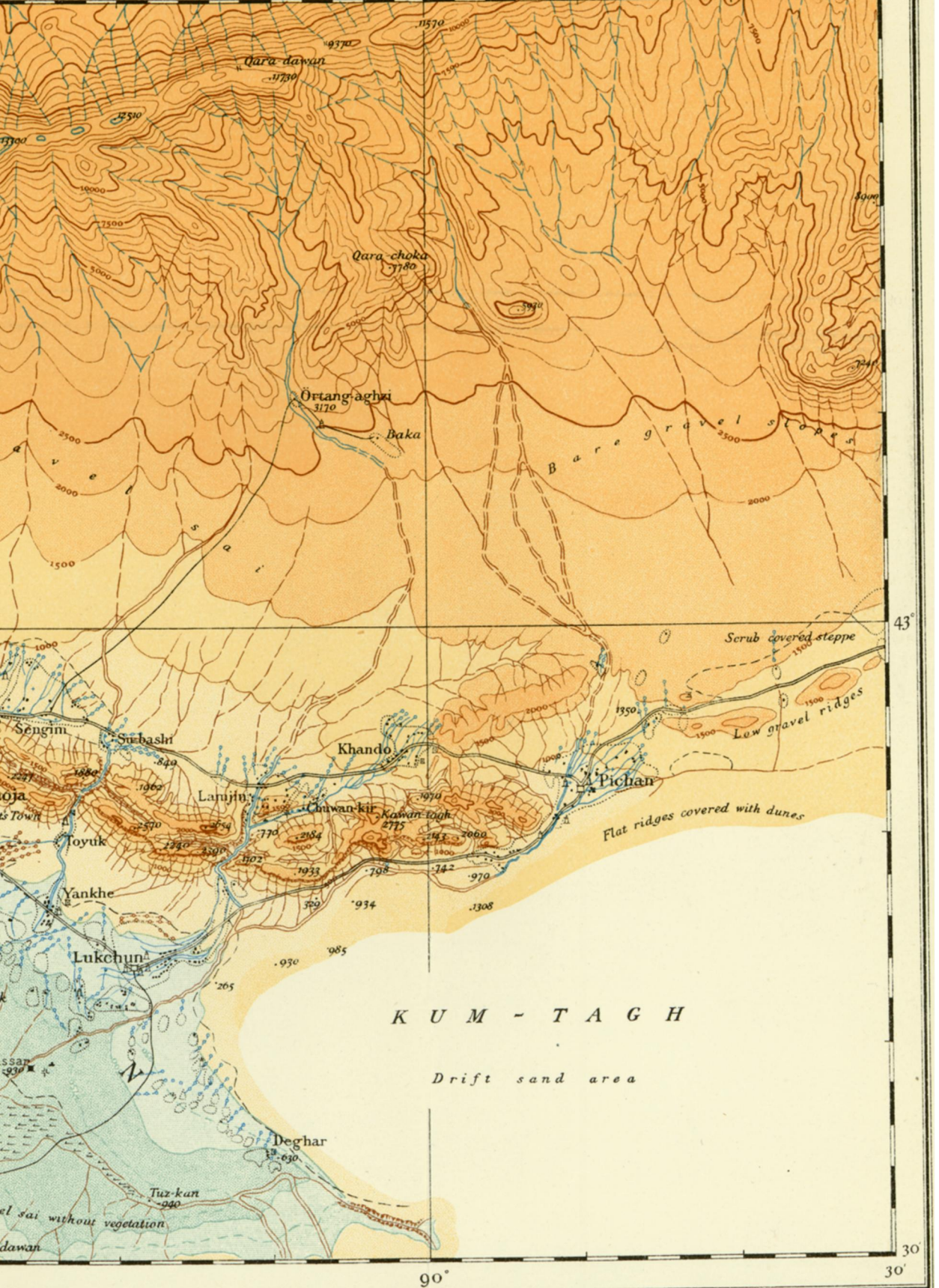
THE TURFAN BASIN
from surveys made during the explorations of SIR AUREL STEIN in the years 1907 and 1914 – 15
Scale 1: 500 000
Miles
5 0 5 10 15
Heights in feet 13420
Spring. Well. Karez
Roads
Tracks Pass
Walled town
Fort
Muhammadan shrine
Ruined shrine
Ancient site. Watch tower
Rivers etc. which generally contain water are shown in blue.
Cultivation
Feet
3000
2500
2000
1500
1000
500
0
-500
30'
89°
43°
Guchen 60 mls.
San-shan-kou
At-oinak-jilga
Yoghan-terek 6400
Ishak-dawan
Shaftulluk 2970
TURFAN
Yar-khoto
Kona-shahr
Yangi-shah
Faka-bulak
Sand, scrub and tamarisk
T U R
Toksun -140
Sandy steppe
Stony sai
Soft salt-encrusted clay
Bejan-tura -910
Stony sai
Gentle
Gravel sai
Drift sand
Su-bashi 560
Qara-shahr 172 mls.
Gravel sai
Singer 80 mls.
Kum dawan


89°
30'
Guchen 60 mls.
San-shan-kou
14080
14140
13600
13300
12510
Qara-dawan
11730
Sardak-dawan
12560
8970
7770
7180
7116
Ishak-dawan
Shaftulluk
2970
B a r e
Chichan
g r a v e l
s a i
Qara-yuz
Örtang
3170
Buluyuk
TURFAN
Kona-shahr
Yangi-shahr
Yar-khoto
Murtuk
2024
Sengim
Su-bashi
Qara-khoja
Bedaulat's Town
Idikut Shahri
Toyuk
Lamjin
Yankhe
Lukchun
Drift sand
Faka-bulak
U R F A N
Chige-bulak
tamarisk
Bejan-tura
910
780
Sand, scrub and tamarisk
-encrusted clay
Aidin-köl
Chong-hassar
930
Stony sai
Gentle gravel slope
Hard salt crust
Gravel sai
Drift sand
860
Deghar
630
Tuz-kan
940
Gravel sai without vegetation
Singer 80 mls.
Kum dawan
Singer 90 mls.
Kosh-oi-dawan
800
89°
30'


90°
30'
Qara-dawan
11730
Qara-choka
11780
Örtang-aghzi
3170
Baka
Bare gravel slopes
Scrub covered steppe
Low gravel ridges
Flat ridges covered with dunes
43°
Sengim
Su-bashi
Khando
Pichan
Lanjin
Chuwan-kir
Kawan-tagh
2775
Toyuk
Yankhe
Lukchun
KUM-TAGH
Drift sand area
Deghar
630
Tuz-kan
930
el sai without vegetation
dawan
90°
30'


THE TURFAN BASIN
from surveys made during the explorations of SIR AUREL STEIN in the years 1907 and 1914 – 15
Scale 1: 500 000
Miles
5 0 5 10 15
Heights in feet 13420
Spring. Well. Karez
Roads
Tracks Pass
Walled town
Fort
Muhammadan shrine
Ruined shrine
Ancient site. Watch tower
Rivers etc. which generally contain water are shown in blue.
Cultivation
Feet
3000
2500
2000
1500
1000
500
0
-500
43°
30′
30′
89°
Guchen 60 mls.
San-shan-kou
At-oinak-jilga
Yoghan-terek 6400
Ishak-dawan
Shaftulluk 2970
TURFAN
Yar-khoto
Kona-shahr
Yangi-shahr
Faka-bulak
Toksun
Sandy steppe
Stony sai
Sand, scrub and tamarisk
Soft salt-encrusted clay
Bejan-tura
Stony sai
Gravel sai
Drift sand
Gravel sai
Su-bashi 560
Qara-shahr 172 mls.
Singer 80 mls.
Kum dawan
Gentle
T U R

Published by the Royal Geographical Society



TURFAN BASIN

Stein

NOTES ON THE MOUNTAINS ABOUT TATSIENLU

J. H. EDGAR

THE article on "The Mountains about Tatsienlu" (*Geogr. J.*, vol. 75, pp. 345–353) deals with the majority of travellers who have been in a position to discuss these mountains, but the names of Potanin, Prince Henry of Orleans, Doctors Tafel and Assmy, Captain Stötzner, General Pereira, L. M. King, and Dr. Heim are omitted. The author also seems unaware that in a biography of the late Dr. Z. Loftis, of Batang, published about 1910, a vivid description of the Tatsienlu Mountains is on record. The present writer published a paper, "The Gangka—a peak in Eastern Tibet" (*J. West China Border Research Soc.*, vol. 3, pp. 157–161) before seeing the article in the *Journal.*

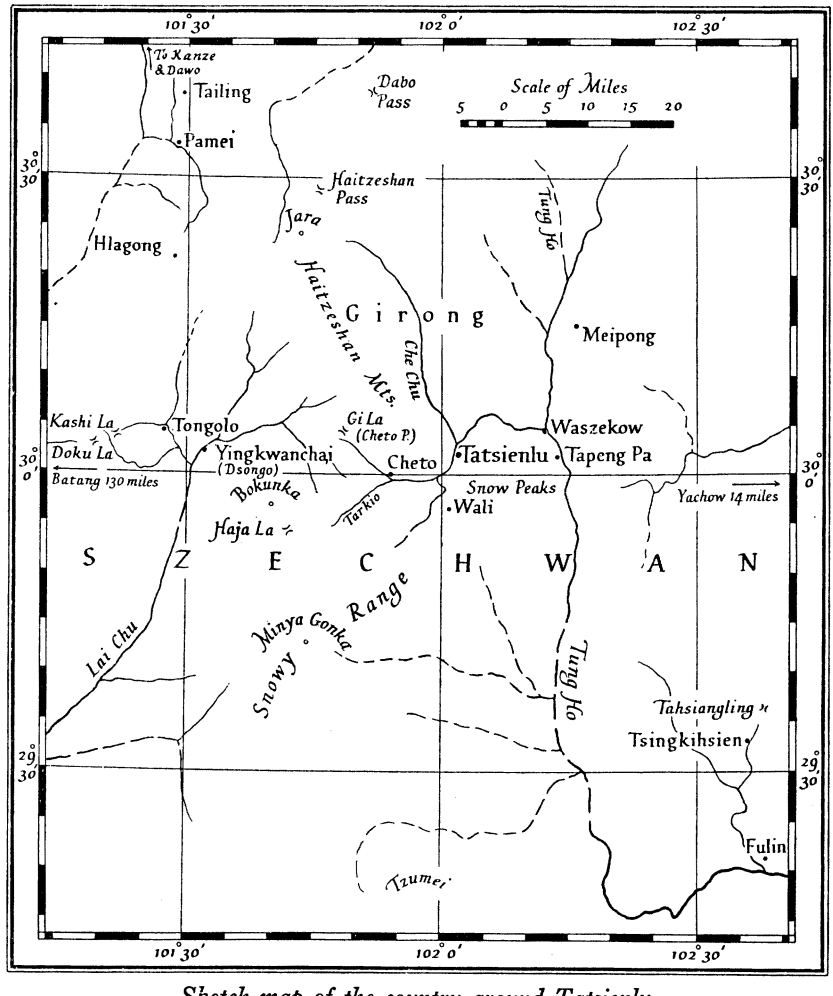
The following comments upon the accounts of the travellers quoted may be of interest. Kingdon Ward's remarks are approximately correct; he is also near the mark when he suggests 20,000 feet for the Tatsienlu Range.

The "Ta Hsiang" of Gordon's account does not mean the "Great Elephant," but the "Premier Pass"; and I know the Tzu Mei more particularly as a col and a non-Chinese hamlet 4 miles south of the Gang Kar lamasery. The name may be loosely applied to some adjacent mountains, but not seriously to any system continuous with the Gang Kar [the "Kunka" of the original article] complex. I do not know of any feature in the locality indicated by the sketch-map that could claim the name "Tzu Mei" (Tibetan: T'si Min). Regarding Gill's account, the Gang Kar is not seen from the valley roads on the T'ung side of the Gi La or Cheto; what he saw when looking back the first time was the short Tatsienlu range. The Ka Ji (Kashi La), 50 to 60 miles westward of Tatsienlu, gives just such a view as Gill describes. But my belief is that he was speaking of the Zhara (Jara) and looking at the Gang Kar!

In the narrative of Szechenyi's Expedition there is again a description of a journey towards the Cheto col. But on, or near, the summit the narrative becomes confused. In the first place, on the Pass there is no vista of specially arresting mountains, and even the higher saddles or lower plateaux would only reveal an ordinary snow-field and a rather poor view of the Zhara. From the Ka Ji however it is possible to admire not only the great rim of the Gang Kar complex, but also an intrusion of serrated peaks which run between the T'ung and the Che Ch'u from the Hai Tzu Shan to Tatsienlu. This may explain the suggested confusion. In any case the most northern peak of the great rim is the Zhara and the southern one the Gang Kar. About 90 miles north of the Gi La, just east of Taofu or Dawo, we have crossed the Yalung–T'ung divide above glaciers and near snow peaks. To the north-west—again perhaps 100 miles—on the left bank of the Yalung is another snow peak, the Kawalori of Coales, which is detached from the snow-clad Kanzè system on the right bank of the same river.

Returning again to Loczy's "Bo Kunka" we find that this name, so pronounced, is the one given to-day in every case where the southern peak is concerned, and this traveller's description, also, is admirable. Evidently Kreitner's "Kunka Range" (literally "Snow Mountains") east-north-east of the main peak is also correct, or nearly so.

The Ajala crossed by Stevens is roughly halfway between the Gang Kar and Ying Kwan Chai. The country representing the more northern part of this division consists of rolling downs with excellent pastures. This is true in the very region chosen for the position of the "Bo Kunka" in the sketch-map. The Chengtu Expedition made its observations not far from the same spot.



Sketch-map of the country around Tatsienlu

Stevens's "Ying Kwan Chiai" and Kreitner's "Dzong Go" are the same place and are the Chinese and Tibetan rendering respectively of the same word.

As regards the name Gangs t'Kar (Kunka), the word as written in the Tibetan script must mean the "White Ice Mountain," a common name for snow-clad peaks in eastern Tibet. In this very region there are three or four "Gangs t'Kars" modified by regional names. Since Dr. Rock's visit the qualifying Minyag has been added to *the* Gangs t'Kar. The explanation is simple. Dr. Rock came from the south, and his men, catching their first

glimpse of this superb feature, exclaimed: "The Gangs t'Kar of Minyag." But "Bang Gangs t'Kar" (pronounced "Bo Gang Kar") is now as it was in Kreitner's day the local designation. When at the Gang Kar Monastery in 1931 its scholarly abbot gave me, in the Tibetan script, the words "Bang Gangs t'Kar," asserting that they represented the official name. The same applies to the head monastery about 35 miles in a southerly direction on the Yalung side of the mountains.

Rockhill's description applies to the Zhara, and his second suggestion reminds us that the principality through which he passed was at that time officially known as Chag La. "The Mountain of Chag La" therefore is an excellent guess; but I have never heard the word pronounced other than Zhara.

Wilson on the Ta P'ao refers more particularly to the Zhara, but also must have seen the Gang Kar and indeed all the other ranges. Coales alone of all the travellers renders the northern mountain correctly.

The Tibetan names as spoken are, as a rule, widely different from their written equivalents. The Zhara is an exception; but this name has been written wrong by every traveller except Coales, unless we may suppose they use the French, not the English, *j*. While the name of the state and its ruler "Chia" might vindicate Rockhill, a literal translation of Zhara as "the Fence of Helmets" accords well with the topography. For, viewed from the plateaux of Minyag, the Zhara surely suggests a fence or barrier, and one peak is not unlike the ceremonial hat of some Lama cults. It was this peculiarity that suggested to Rockhill the "Horn of China" as a possible explanation.

Mr. Edgar's additions make the list of travellers in the mountains around Tatsienlu more complete, but it does not appear that all have left their impressions on record. Potanin's account is in Russian; Bonvalot's account of Prince Henry of Orleans' journey does not refer to the mountains; L. M. King, Dr. Assmy, and Captain Stötzner have left no easily accessible accounts. A preliminary report of Dr. Heim's visit did not appear until 1931: a note upon it was published in the *Journal* for January 1932 (p. 74). Dr. Tafel's 'Meine Tibetreise' (2 vols., 1914) however contains references to these mountains, which are translated here to complete the record. He was travelling southwards from Kanze, in April–May 1907.

> "Once over the Heka pass, there are two routes to Tatsienlu from Dawo [the Taowo of the 1/M sheet]. . . . The western route which I followed leads over debris-strewn terraces, which are dissected by numerous streams, but yet belong to a common elevated surface of 4000–4250 metres. I experienced fine weather, and the peaks of Dschara re (Zarsun) and the Hai tse schan massif, which lay on my left hand, were a magnificent spectacle for two days. The main summit rose about 2000 metres above the track. Far to the south, the great holy mountain of Bogungga, well over 6000 metres, beckoned, while to the west, towards Li-tang, high steppes (4000 metres) stretched to the far-distant horizon. No soaring peak or summit attracted one's attention in that direction. Fine meadow land covered an old, interminable peneplain, upon which myriads of yaks might browse. . . . This is Minyag" (vol. 2, p. 200).

Dr. Tafel gives (vol. 1, p. 193) two panoramic photographs of "Dschara re" (Jara) from the west at 4100 metres, and from Dabo pass on the east. The first

may be compared with Nos. 4 and 6 of Mr. Stevens's sketches. There is also a distant photograph of "Bogungga re" opposite p. 192, vol. 2.

Other travellers in the Tatsienlu region are the Indian surveyor, A. K., Mr. E. Colborne Baber, and Sir Alexander Hosie.

The remark that Gill was probably confusing Jara and Kunka is difficult to accept, as Gill marks them both distinctly on his route map.

Mr. Edgar's conclusions confirm those to be drawn from the travellers' narratives collected in the original article in the *Journal*, that the "Bokunka" of Kreitner and the "Minya Gonka" of Stevens are the same peak, but that it lies farther south than the position given by Kreitner.

The *Alpine Journal* for May 1933 states that Messrs. Terris Moore and R. Burdsall made the first ascent of "Minya Koonka" on 28 October 1932. They approached from Tatsienlu, but found the eastern slope impossible, and ultimately ascended the north-west ridge, establishing a light camp at about 21,500 feet. From this camp the final ascent was made. The weather was very fine, but the party suffered much from frost-bite. The summit is given as *circa* 24,000 feet, as against Kreitner's 7600 metres (24,900 feet).—ED. *G.J.*

THE WORLD-MAP OF PIRI RE'IS, 1513

DIE VERSCHOLLENE COLUMBUS-KARTE VON 1498, in einer Türkischen Weltkarte van 1513. By PAUL KAHLE. *Berlin and Leipzig: Walter de Gruyter & Co.* 1933. 10×7 *inches;* 52+9 *pages; facsimile maps. M.*5

THE recent discovery, in the Serai Library at Constantinople, of the western half of a world-map drawn in 1513 by the noted Turkish Admiral Piri Re'is, would in any case have been of interest to students of early maps, but it has even greater claims to attention from its author's statement that for the new lands in the west he had followed a map by Columbus himself. Of original maps in which the new western discoveries were shown, not one has survived which is the actual work of the navigator, so that if Piri's statement can be trusted, we have in his map a new side-light, if nothing more, on the ideas of the Genoese on the scope and meaning of his discoveries.

It was in October 1929 that Professor A. Deissmann, then engaged in researches in the Serai Library, called the attention of Dr. Paul Kahle, of Bonn—a Turkish scholar who had for some time been busy with the publication of a previously known work of Piri Re'is, of which the first part appeared in 1926—to the existence of the map in question, and his interest in it was at once aroused. In the known work of Piri—elaborate sailing directions for the Mediterranean, with which as an active seaman he was thoroughly familiar—the author states that he had previously drawn a world-map depicting the newest discoveries, and that he had offered it to Sultan Selim in Cairo. This must have been in 1517, the year of the Turkish Conquest of Egypt. The newly found map bears an inscription stating that it was drawn by Piri Re'is at Gallipoli in 1513, and there could be no reasonable doubt that it represented a part of the map given to the Sultan in 1517. (No trace can be found, unfortunately, of the eastern half, which, it is suggested, may have been taken by Ali Ekber when sent to China by Sultan Selim to collect information about that country.) Dr. Kahle made a careful study of the map and soon reached the conclusion that the Columbus map used by its author was no other than the lost map sent by the navigator to Spain in 1498.

THE ARCHAEOLOGY OF CENTRAL ASIA

ON ANCIENT CENTRAL-ASIAN TRACKS: brief narrative of three expeditions in Innermost Asia and North-western China. By Sir AUREL STEIN. *London: Macmillan and Co.* 1933. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xxiv+342 *pages; illustrations and map.* 31*s* 6*d*

THIS latest volume by Sir Aurel Stein is a comprehensive summary of the results of his first three Central Asian Expeditions and of his Central Asian researches carried out during the last forty years. It is based on lectures delivered at the Lowell Institute at Boston, which were intended to give a condensed account of his archaeological and geographical explorations. All except one of Sir Aurel Stein's previous scientific or personal accounts of his travels are long since out of print and some are now unobtainable by the general reader. This summary would therefore be welcome if only because it renders easily available the more important results of Sir Aurel's work. In fact, it does much more than this, for the author has now reviewed in retrospect the whole of his journeys after the various collaborating specialists have examined the abundant material brought back by him. The book is by no means therefore merely a series of disconnected lectures, any more than it is just a popular book of travel. Sir Aurel Stein has brought together in one volume the most outstanding and most interesting of his discoveries, irrespective of their chronological dating during the last forty years; he has described the physical conditions under which they were made; and he has then turned his critical mind to the interpretation of the results as a whole. Each of the discoveries dealt with is illustrated lavishly by the most suitable photographs selected from his large collection already used in one of his previous books. This practice has enabled the publishers to include no less than 147 illustrations, many of them large half-tone panoramas, carefully annotated, and a number of magnificent colour plates showing specimens of ancient Chinese silk banners and tapestry. Throughout the book these illustrations are placed in close proximity to the text to which they refer, and, being numbered and referred to in the text, make the book extraordinarily vivid and easy to read. As the book is intended for the general reader, there are no references to detailed reports; the result is that the attention remains absorbed in the narrative throughout.

The first two chapters give a fairly detailed summary of the geography and history of Innermost Asia, and show the contact of Eastern, Western, and Indian civilizations. These chapters are themselves largely founded on research into ancient Chinese records as well as on the results of Sir Aurel Stein's own discoveries. The author then selects the most interesting of his routes into Central Asia, that by way of Chitral. In Chapters IV–VI he records the thrill of his first explorations at a sand-buried site, his discoveries there, his subsequent return and later finds, so that the exploration of the Niya site stands as an example of what occurred later at many other places, where details cannot be given in a summarized account.

After a brief chapter on the ruins of Miran, Sir Aurel takes us to Lou-lan and the dried-up Lop Sea bed, and tells the ever-fascinating story of his discovery of the ancient route across those desolate wastes, opened up under the direction of the Han Emperor, Wu-ti (140–87 B.C.). A broken copper buckle, an iron snaffle-bit, a scattered heap of bronze arrow-heads, a line of over a hundred Wu-shu copper coins, dropped from a leaky money-bag from the back of what may have been the last camel of the last caravan to use the route: these slender threads of evidence which led the explorer onwards to trace the route contribute

to the intense interest of this part of the story. Next is described the discovery of the ancient wall, an extension of the Great Wall of China, built by the Emperor Wu-ti, and fortified to protect the corridor in the Su-lo-ho basin from Hun raids. Sir Aurel Stein paints from the evidence of his finds in the old refuse heaps an interesting picture of the life of the ancient garrison of this Chinese outpost, the Hsien-ming Company of the Jade Gate, from which the silk-caravans used to start for the West and by which the jade-caravans from the Khotan district entered the comparative security of China.

The story of the discovery of manuscripts and paintings on silk in the walled-up chapel among the Cave Shrines of the Thousand Buddhas loses nothing of its interest in being retold; and the detailed negotiations and tactful persuasion displayed to secure these treasures for Western scholarship give an amusing indication of Chinese character. The explorations in the Nan-shan ranges and among the ruins of Turfan are treated in less detail, and the book closes with brief summaries of the author's subsequent travels on the western Pamirs, carried out on his third expedition.

The whole volume is of intense interest to geographers. If they have not already read the earlier volumes, they will surely wish to do so after reading this summary; while if they have already done so, they will find this volume an extraordinarily good précis of the whole. Only a few points of detail mentioned by Sir Aurel Stein can be briefly touched upon here.

The distinction between the "true desert" of Taklamakan and what the author describes as the "tame deserts" of Arabia, America, or South Africa is well brought out, while the actual formation of the Kunlun oases is most interesting. Early in the book Sir Aurel Stein alludes to "the Nan-shan, itself a continuation of the K'un-lun." There is a discrepancy here between the author's ideas and those of some other authorities. Sir Sidney Burrard, for instance, writes: "It is, however, only west of longitude 83° that the Kuen Lun faces the Tarim desert: east of this its branch, the Altyn Tagh, becomes the border range. . . . From Prejevalsky's descriptions the Kuen Lun appears to bifurcate at its eastern extremity into two ranges, the Burkhan Buddha and the Shuga." The Kunlun, that is, according to Sir Sidney Burrard, extends south of the Tsaidam swamps and Koko Nor, while the Nan-shan are of course north of these. Is it possible that the latter have ever had any geological connection with the desolate Kuruk Tagh or Pei-shan ranges and that such connection has been destroyed by the violent north-east winds mentioned in this district by Sir Aurel Stein, or buried under sand, as has apparently occurred to the Mazar Tagh in the Taklamakan?

Sir Aurel Stein stresses his views on the "desiccation" of Asia. It is as well that he does so, for he has often been misquoted to support a view he does not hold. He writes:

> "Everything in the orchards and arbours dead for sixteen centuries but still recognizable (Figs. 6, 45, 49); in the fences; in the materials used for buildings, etc., distinctly point to conditions of cultivation and local climate having been essentially the same as those now observed in oases of the Tarim basin similarly situated and still occupied.
>
> "Just as in the present terminal oases of the Tarim basin, so cultivation at those sites must have been entirely dependent on irrigation. Had not 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 mere refuse heaps outside houses. . . . The climatic conditions of the periods immediately preceding abandonment must have been practically as arid as they have been since and are now."

Sir Aurel attributes the diminished volume of the water carried by the rivers of the Kunlun to the most obvious and most likely cause, namely, that the glaciers which supply those rivers have been undergoing slow but more or less continuous reduction in volume. In a later section of the book, Sir Aurel refers to the abandonment of the Dandan-oilik site as follows:

> "Everything at the site pointed to its abandonment having been a gradual one, and in no way connected with any sudden physical catastrophe such as popular legends current about so-called 'sand-buried cities' of the Taklamakan have induced some European travellers to assume. The Sodom and Gomorrha stories related all over the Tarim basin about 'old towns' suddenly overwhelmed by sand dunes are more ancient than the ruins of Dandan-oilik. Hsüan-tsang had already heard them more or less in the same form in which they are now current. These legends are interesting as folk-lore, but in the face of plain archaeological evidence to the contrary, such as the examination of Dandan-oilik and every other ancient site in this region has supplied, scientific enquiry need have no concern with them."

Sir Aurel Stein also shows how in time of internal disorder, *e.g.* the epoch of the "Three Kingdoms," effective Chinese control over the whole of the Tarim basin was loosened, yet these territories still continued to be open to trade and cultural influences from both East and West. The reader will be tempted to make some interesting comparisons between the conditions at the end of the Han dynasty and those of the present. One interesting point which Sir Aurel Stein emphasizes is that the gradual abandonment of the old silk route was caused more by the opening up of the sea-route to China than to any physical difficulties of the route itself or degeneration in the stamina of the traders.

Enough has been said to indicate the outstanding interest of this concise summary of a brilliant period in Central Asian exploration. The description of the actual archaeological finds is every bit as interesting as the more purely geographical results. It remains only to add that the publishers, Macmillan & Co., and Messrs. Henry Stone and Son, of Banbury, are to be congratulated on the excellence of the printing, on the superb illustrations, and on the inclusion of the coloured map, which is published with the permission of our Society. The volume is more than worth every penny of its price. KENNETH MASON

THE NATIONAL GRID ON THE MAP OF LONDON

ORDNANCE SURVEY 3-INCH MAP OF LONDON. With Gazetteer (7 × 5 *inches;* 132 *pages*). *Southampton: Ordnance Survey Office.* 10*s*

THE 3-inch Map of London with Gazetteer recently published by the Ordnance Survey is the first to show on an adequate scale the National Grid as applied to London, and it is therefore of particular interest to study it in connection with the paper by Brigadier Winterbotham on "The Use of the New Grid on Ordnance Survey Maps," published in the *Journal* for July last. The grid is over-printed in red in squares of a kiloyard (1000 yards) and numbered in figures of two digits, the first two digits of the complete grid reference being omitted except at the corners of the map. The accompanying gazetteer gives the grid reference in three figures, that is to say, to one decimal place of a kiloyard; and it would, we think, have been well if the decimal point had been inserted as a guide to the user of the new system.