

RECENT GEOGRAPHY OF CENTRAL ASIA;
FROM RUSSIAN SOURCES.

By E. DELMAR MORGAN.

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NOTES
ON THE
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By E. DELMAR MORGAN, F.R.G.S.

Map, p. 338.

A FEW words of explanation, or rather of apology, are necessary for the delay that has attended the publication of the following matter.

About a year ago M. Maief's report of his journey to Hissar in 1879 was translated for the Society. This was printed and a map commenced to illustrate it. But while in progress it was suggested that better cartographical material might be obtained than any we possessed. Reference was accordingly made to St. Petersburg, and shortly afterwards a map of Russian Turkistan was received from General Ilyin's establishment on sixteen sheets, scale 40 versts to the inch, giving the results of recent surveys in the Upper Oxus regions. On comparing it with the work in hand it was found to contain many more details and to differ so widely that it was decided to begin afresh as the most satisfactory way of meeting the difficulty. To draw a map with requisite care and detail is a laborious and lengthy affair in the most skilful hands; to engrave it when drawn is also a tedious business. This excuse must suffice for the tardy appearance of the following notices on the recent geography of the Upper Oxus, for it became evident that to do justice to the map the letterpress would have to be entirely recast and the whole scope of the article enlarged.

1. GENERAL DESCRIPTION.

The field we have chosen for our consideration is a wide and interesting one. It includes the Zarafshan on the north, and the Panj or Upper Oxus with its northern affluents on the south—a region almost wholly filled in with mountains. From the north-east corner, where the Tian Shan throws up one of those knots or tangles of intersecting chains, to the south-west, where it dies away in the plains bordering the valley of the Amu-daria, it is nothing but a network of mountain ranges, rising in places far above the snow-line, and presenting some of the grandest

natural phenomena in the world. A Russian writer has recently compared this part of the Tian Shan to a colossal ruin, but it would we think be more appropriate to speak of it as the centre and fountain of life to the parched up plains of Turkistan, for here the Zarafshan springs from the glacier that gives it birth, here are the sources of the Surkhab the river of Karateghin, the Kafirnahan and other tributaries of the Oxus.

Not very long ago the whole of this region was unknown to modern explorers. It was only by patient and long study, by comparing all the old writers and geographers Chinese, Arabian, and Persian with those native Indian explorations of a modern date, that Colonel Yule succeeded in removing some of the obscurity which enveloped these highlands, and, in his essay to Wood's Oxus, laid down their geography in its main features with something like an approach to general truth. He whetted our desire to plunge into those dark and gloomy gorges in which, as in the cañons of North America, rivers bury themselves to reappear after many miles of subterranean course, and gave additional zest to the study by collecting a number of historical notices dealing with the past greatness of the country. The student therefore who would acquaint himself with the Upper Oxus tributaries cannot do better than read attentively the highly suggestive introductory paragraphs to Lieutenant Wood's travels. But since the publication of that work the world has not been idle. There is indeed no longer the same desire manifested by Englishmen to be first in the field of research. With the single exception of Captain (now Colonel) Trotter's journey from Kashgar to Wakhan in 1874, not an effort has been made from the Indian side to follow in the footsteps of Wood, of Moorcroft, of Burnes, of Conolly and others of that gallant band who set forth to explore the countries north of the Hindu Kush.

Times have changed, and when we look for information on Central Asian subjects it is to the Russians and their literature that we turn. On their side progress has been uninterrupted and rapid beyond expectation. Twenty years ago their frontier, which had for previous generations lain to the north of the Kirghiz Steppe, suddenly took a bound to the Syr-daria, and before Europe had time to recover from its surprise another great stride was taken, and the Amu-daria came to be regarded as the southern limit of Russian Turkistan. Parts of Bokhara were indeed allowed to retain a semi-independence, but this was a measure of prudence, for, with such inadequate numbers, Russia could not have attempted more without endangering all she already possessed. The wiser policy was pursued of preparing the highland states and beksships for eventual absorption by encouraging the Ameer of Bokhara, now a faithful vassal, to bring them under complete subjection. For this purpose, Bokharian troops, supplied with superior arms and munitions of war, overran the states of Hissar, Karateghin, and Darwaz, overawing

the inhabitants, and carrying away their native princes into captivity at Bokhara.

Meanwhile Russian scientific explorers kept pace with the military detachments, and completed the much needed details required for the cartography of High Asia north of the Pandj. In this way MM. Severtsof, Kostenko, Oshanin, Maief, Mushketof, Regel, and others, visited Hissar, Karateghin, and Darwaz, explored the Pamir table-lands, traced the courses of the northern head-streams of the Oxus, and threw a new light on its orography. The picture they have drawn for us differs widely from former conceptions. Instead of the whole space consisting of great plateaux divided by single chains, we are introduced to an alpine region dwarfing into insignificance the Swiss mountains. We cross range after range, one higher and greater than the other, and from deep valleys look up to snow-clad peaks seeming to touch the sky. The passes are hardly if ever below the snow-line, and the traveller has to feel his way often along ledges of rock or over swinging wooden bridges many hundreds of feet above the rushing torrent. In the wider parts of the valleys we meet with the inhabitants, a brave, patient race of Tadjik, i. e. of Iranian blood, as distinct in language as they are in habits and character from their Uzbek neighbours in the plains. Only in the very highest belts bordering on the snow do we find the nomadic Kara-Kirghiz with their flocks and herds; but even they begin to feel the restraint of advancing civilisation, and surround their winter haunts with patches of cultivated ground. Such, then, are a few of the leading features of this country, which will be found fully treated of in the following notices translated from the Russian.

To begin with, Colonel Kostenko's book, published in 1880, a work compiled for military purposes, but arranged with commendable simplicity from beginning to end, has been consulted. Starting with the orography, Colonel Kostenko has described all the mountain ranges, and given particulars of each pass; he then proceeds to speak of the rivers, inhabitants, roads, &c., and in this way conveys a general idea of the country as far as his material will allow. In borrowing largely from him we desire to acknowledge our obligation. M. Oshanin's articles on Karateghin and Darwaz, giving the results of his journeys in 1876 and 1878, have been translated verbatim, and the same liberty has been taken with M. Mushketof's exploration of the Zarafshan glacier in 1880, a work which extends and corrects the survey of General Abramof's expedition in 1870, and which, combined with Fedchenko's journey to the sources of the Isfara, acquaints us with some glacial aspects of High Asia.

Some features in the physical geography call for special remark. The observer approaching from the west will find that he is continually rising, though the heights around do not show any apparent great elevation. M. Fedchenko, when he ascended the Zarafshan by the usual

route up this river, noticed at Oburdan the hills on either side did not exceed 1000 feet above the valley, though the height of Oburdan was 6000 feet, and he was therefore among mountains 7000 feet above the level of the sea.

The Alai Valley is another instance. Here the rise is very gradual from west to east. Proceeding from Daraut-kurghan (8000 feet) up the banks of the river for 80 miles, the traveller finds himself at an elevation of 11,000 feet, with nothing to mark the watershed between Eastern and Western Turkistan but a low ridge. These two instances out of many show the great absolute elevation the country attains, and the comparatively low relief of any particular part.

The passes afford another illustration of our argument. In but few cases do the peaks, when seen from the summit of one of these, appear to be more than 2000 or 3000 feet higher than the observer. The upheaval has been gradual, the whole of this part of the crust of the earth has apparently risen together, and only near the centres of subterranean activity, at the knots or tangles of chains, do we find that diversity which lends so sublime an aspect to the scenery. Rivers have done the rest of the work by hollowing out valleys, wide and open, as in the case of the upper Alai and the lower Zarafshan; narrow, deep, and rocky, like the gorge of the Surkhab below Daraut-kurghan, or that of the Zarafshan above Dashti-Kazi.

Another characteristic of the Tian Shan are the long, wide valleys, which bear the marks of having once formed great lake beds, where the water, constantly supplied by atmospheric deposits, has gradually risen till it forced an outlet on the west, burst through its rocky barrier, and drained off the lake.

The Alai Plain or valley, margined on either side by the Alai and Trans-Alai ranges, illustrates our meaning. This valley is about 80 miles in length, and covers an area of 800 square miles in extent. It begins at Bash-Alai (i. e. Head of Alai), near the source of the Kizil-su (upper Surkhab), where the Kok-su, an affluent of the Kashgar-daria, flows in an opposite direction, and ends where the Kizil-su receives its important right tributary, the Kok-su. Between these extremes the Alai measures 80 miles. Its greatest width is near its centre, where it widens to nearly 15 miles. Lower down it becomes continually narrower, till at Daraut-kurghan, where the Kizil-su enters the Isfairam gorge, its width is only two miles. Lower still, about a mile and a half, mountains press so closely upon its bank as barely to leave room for the river. There are many valleys like the Alai in the Tian Shan; that of the Tekes or upper Ili is another. The peculiar feature of the Alai is its straight course, deviating but very little from an east and west direction. Through it flows the Kizil-su or Surkhab, the "red river" of the Kara-Kirghiz and Tadjiks, taking its name from the colour of the clay composing the slopes of its marginal mountains. On the right, falling steeply down to

the river, is the Alai range, without offshoots or intermediate ridges, throwing up its crest only eight miles from the river. On the left is the still loftier Trans-Alai range, presenting a broad belt of intervening chains between the valley and its axis. The Alai is the "paradise" of the Kirghiz. Here, removed from the burning heat of the plains, free from insects, flies, and all manner of torments of the lower valleys, he can pasture his sheep and horses on luxuriant herbage, the effects of which are so wonderful that the worst-conditioned animal grows fat and strong after a fortnight's grazing. It is a steppe valley, like so many others of the kind in the Tian Shan, a valley without trees or bushes, but clothed with thick, luxuriant grass covering the surface of the plain, the slopes of the outlying hills, and some of the lateral glens. Here is found in profusion the *Lasiagrostis splendens*, growing in clumps with stalks three to four feet high, invaluable not only to the cattle, but to their Kirghiz owner. Of it he manufactures mats, which serve him in lieu of a carpet inside his *yurt* and as a protection outside against wind and snow.

The Kizil-su rises as we have said at the eastern extremity of the Alai, in lat. $39^{\circ} 42'$ north, and long. $73^{\circ} 37' 40''$ * east of Greenwich. It flows without any windings of consequence, in a bed nearly a mile wide, by several arms which are continually shifting their position owing to the soft pliable nature of the soil. Its banks are high and steep in the lower half of the Alai, steep but not high in the upper half, and present no obstacles to travel. The widest of its arms is only 70 feet across at its confluence with the Kok-su, where the river is bridged, whilst higher up it may be easily forded, the depth not exceeding two or three feet, and the bed being hard and pebbly. Owing to the sediment of clay the water is thick and reddish in colour, but after standing for a while in a vessel it becomes perfectly clear, and is at all times wholesome to drink. Of the central Kizil-su or Surkhab, we shall have a good deal more to say when we speak of Karataghin. We now proceed to give some particulars of the Alai range.

In extent the range runs for 200 miles with an average elevation of 16,000 feet, and passes out deeply into the range so as to be considerably below its crest. Fifteen of them are known by name: the Dungarma, Terek-davan, Shart, Archat, Koidjol-davan, Taldyk, Jiptyk, Sarik-mogol, Kindik, Tuz-ashu; beyond the limit of the map there follow westward the Kizilshime, Tengiz-bai, Kara-kazyk, Alaudin and Tarak. Six of these (Archat, Koidjol-davan, Taldyk, Sarik-mogol, Tengiz-bai, and Kara-kazyk) were surveyed during the Alai expedition in 1876.†

Separate peaks rise to a height of 18,000 to 19,000 feet above the sea,

* I cannot say if this be an astronomically fixed position, though it agrees with Colonel Walker's map. Two astronomers, MM. Skassi and Schwartz, accompanied Severtsof's expedition to the Pamir in 1877, and they probably fixed the position of the Kizil-yart Pass across the Trans-Alai range, that of the source of the Kizil-su being taken relatively.

† See Journal R.G.S., xlvii. pp. 22-47.

the more westerly parts of the range being higher than those on the east. The slopes vary, those on the north side being as a rule more gradual and ten times longer than those on the south which descend steeply to the Kizil-su.

The snow-line on the Alai lies at 14,000 feet on the north, and higher still on the south side of the range.* The glens are overgrown with *archa* or arborescent juniper (*J. pseudosabinus*) 35 feet high, growing so thickly as to resemble a forest. The upper limit of this tree according to Fedchenko, is 11,200 feet, the lower 6000 feet, a zone 5000 feet in breadth representing its vertical distribution here. Deciduous trees have a range of 2500 feet, and are rare above 6000 feet, though the birch was seen by the same observer at 8500 feet; 300 to 400 feet higher were solitary specimens of ephedra and honeysuckle, but lower down nearer the birch trees, barberry, mountain ash, roses, and willow were found mostly in sheltered places along the banks of brooks, whereas honeysuckle and ephedra preferred open slopes. In the Isfairam defile brushwood grows at 3150 feet, hence its range is much more extensive than that of trees. Wheat and barley flourish no higher than 8000 feet, and are sown by the nomads in valleys between mountains. Artificial irrigation is largely used, though in some parts cultivation entirely depends on rains. This kind of arable land is called *lialmi*. The yield is in proportion to the elevation, thus at 8000 feet wheat returns fourfold and barley fivefold.

The Alai range is pierced transversely by rivers flowing from south to north to join the Syr-daria, but some of them are exhausted before reaching it. The principal rivers are:—

1. The Sokh flows from the mountain mass of Kok-su, and is the westernmost of the rivers rising in the Alai range. About twenty streams contribute to make it up. From the village of Sokh it becomes a steppe river, and on entering Ferghana is soon drained off into aqueducts for irrigating purposes, some of its water being utilised by the town and gardens of Kokand.

2. The Shah-i-murdan rises in Kara-kazyk Pass, after which it is called for the first part of its course. Further on it is known as the Ak-su, and after uniting with the Kara-su at the village of Shah-i-murdan, it takes this name.

3. The Isfairam has its source in TENGHIZ-bai Pass.

Further east are (4) the Naukat, (5) the Akbura or Turuk, (6) the Kurshab, and (7) the Tar.

The Turkistan range begins with a broad belt, in long. about 71° east, and is a westerly continuation of the Alai range. From its beginning to the meridian of the town of Ura-tiube its absolute elevation is very great, and about in the 70th meridian its peaks exceed 20,000 feet. Large

* Severtsof, who crossed it in October, fixed it at 15,000 feet. Fedchenko, earlier in the year, found it to be 14,000 feet.

glaciers are met with in its eastern part, and of these the Zarafshan is the chief. The upper end of this glacier lies near Mount Kok-su, the lower descends to 8675 feet, but we shall speak of it more fully in our translation of M. Mushketof's paper. Within the above limits the Turkistan range does not present a continuous upheaval, but is rather a series of parallel ridges rising in terraces and divided by occasional deep valleys. One remarkable depression occurs in the range in the meridian of Ura-tiube between the towns of Mitke and Aúchi, and continues as far as the road between Ura-tiube to Varziminor. This depression separates an outlying parallel ridge from the main chain. The passes across the Turkistan range are as follows:—

1. *Akhba-Rama*, near the Zarafshan glacier, leads to Kokand. This is an extremely difficult road, lying partly over icefields, and uniting with—

2. *Akhba-Tro*.—The road begins at the Zarafshan, near the town of Langlif, follows the river Tro, then mounts to the pass itself, which is only available in summer.

3. *Akhba-Vadif*.—This pass, lying above the snow-line, and also uniting with *Akhba-Tro*, is only fit for pedestrians. The road to it begins at Vadif, on the Zarafshan.

4. *Yanghi-Sabak*, crossed twice by the Russian troops in 1870. Its summit, crowned with a glacier, is 13,300 feet high, and the descent into the valley of the Syr-daria is dangerously steep. The troops, in ascending it towards the Zarafshan, were obliged to make use of long ropes to raise men, horses, and mules. The road begins two miles east of Tavushin, on the Zarafshan, follows a defile seven miles long by the side of a torrent to the top, and descends by a wide ravine and the deep gorge of the Hodja-Bakarga-su, known near its sources by the name of Jiti-Kupriuk, or "Seven Bridges," that being the actual number thrown across it. After leaving this gorge, which is five miles long, and has almost perpendicular sides, the road bifurcates, the eastern branch leading to the village of Lailak, the western to the town of Isfaneh, in the district of Khodjend. Between the pass and the gorge grass is abundant, and trees of various kinds are seen, such as juniper, birch, mountain ash, &c., whilst water is everywhere plentiful. The road, difficult for horses, is impracticable for camels. The inhabitants of Tavushin and Sabak have nearly all relatives in Lailak, and nomadise together in summer on these mountains. The stern, forbidding character of the scenery, one would have supposed, might have deterred human beings from resorting thither. Such is not the case, however, for in summer they congregate as thickly as ants, attracted by the excellence and abundance of the pasture lands, of which, in the Zarafshan Valley, there is a scarcity. In this way close ties are formed by inhabitants of towns who for eight or nine months of the year are separated by impassable mountains.

5. *Akhba-Yarkut*.—The pass is 11 miles from the Zarafshan. The

road leading to it begins two miles from Langar-yuz on that river, and follows the course of the Yarkut stream to the summit. Horsemen can with difficulty make use of it even in summer. The descent is by the Sarkat glen to Dinau, and beyond by the river Ak-su to Nau. A footpath leads from the Sarkat glen through Marengbel, a lateral pass to Andarak.

6. *Akhba-Hudgif* is extremely difficult, dangerous for pedestrians, and quite impassable in winter. The road to it begins at Hudgif and ends at Dinau.

7. *Akhba-Postigau-Mitke* unites the Zarafshan Valley with Ura-tiube. The road begins at Postigau, on the Zarafshan (whence it is six miles to the pass), is full of difficulties, and only practicable in summer. During winter, wild boar, which are numerous, have it all to themselves. About 15 miles from Postigau are the villages of Mitke and Hodja Mitke (in Khodjend). The descent, by no means easy, lies at first over snow and ice, then winds by a steep track between bushes and juniper to Hodja Mitke, the first settlement reached on the northern side. Here the rocks are siliceous schists in layers, with occasional quartz, sandstones, and limestones; farther down are blocks of conglomerate. From Mitke the road follows a rivulet to its confluence with the Ak-su, continuing along this river till it reaches Dokhat, where it bifurcates, the eastern branch probably leading to Nau, the western to Ura-tiube. From Dokhat the western track rises by a steep ascent to a great height, descending again on the north side and continuing to Ura-tiube via Mudjir without further obstacles. The whole distance from Postigau to Ura-tiube is 50 miles. South of the latter and three miles from it is a low chain of hills connected with the range dividing the Sanzar Valley from the Ura-tiube district. It stretches from east to west, and forms the southern limit of the terraced highlands on the north. On this plateau, 17 miles wide, are situated numerous hamlets belonging to the town of Ura-tiube. At Yangi-arik a chain of mountains 9000 to 10,000 feet high has to be crossed, but these are separated from the main Zarafshan range by a long valley beginning a little to the west of Mitke and extending through Ugut and Aúchi to the Aúchi-Oburdan road, which crosses it, and beyond this in a westerly direction to the highway leading from Ura-tiube to Varziminor. The length of this valley is about 20 miles.

8. *Akhba-Ugut* or *Akhba-Komadon*.—The road begins at Komadon on the Zarafshan, and follows a defile of the same name to the pass. It descends by the Tengri-ugut defile to Ugut, whence it turns west to Aúchi by the longitudinal valley already mentioned. From Aúchi it reaches Ura-tiube by the Basmandy defile. This road is comparatively easy and mostly frequented in summer by inhabitants of Ura-tiube and Matcha. By it, too, the villages near the Shahristan defile communicate with those on the Matcha.

9. *Akhba-Oburdan-Aúchi* unites Oburdan on the Zarafshan with Ura-tiube. The road from Ura-tiube to Yangi-arik, 18 miles long, is smooth, and rises gradually in a northerly direction. At Yangi-arik the defile of Basmandy begins, watered by a rivulet of the same name, which issues from the valley uniting Mitke and Aúchi, and bursts through the outermost chain of the Turkistan range. Its length is eight miles, which is therefore the breadth of the chain. On either side rise lofty precipitous mountains, composed mostly of siliceous schists, here and there disposed in horizontal layers but generally inclined at various angles and partly tilted on edge. These are common, but other rocks are to be met with. Along the western margin of the defile an aqueduct four miles long has been made, artificially supported on wooden props and various other contrivances. From Aúchi a defile leads southward to the pass. No inhabited places are met with the whole way to Oburdan. A wide but very uneven and stony path leads to the ascent, which is long and arduous to the top, 11,200 feet high; the descent to the Zarafshan is steep at first, but afterwards becomes sufficiently gradual. Near the southern end of the pass rises a brook which pours its waters into the Zarafshan, distant five miles from the summit by a tolerable road.

10. *Akhba-Utanaki-Shamtitch*.—The road leading to it begins about a mile to the west of Shamtitch on the Zarafshan. Horsemen ride up it in summer as far as Aúchi, 12 miles. The pass is five miles from the river, and is both difficult and dangerous. From Aúchi it is easy to get to Ura-tiube and Shahristan.

11. *Akhba-Vishab*.—The road starts from Vishab on the Zarafshan, and lies up the right bank of the Obi-Vishab by a gradual and easy ascent to the pass six and a half miles from Vishab. The descent is nine miles to Aúchi, and the road is practicable throughout the year.

12. *Akhba-Shavatki*.—From Shavatki-bala on the Zarafshan to Aúchi, 16 miles by a footpath crossing the pass in a northerly direction and entering the above-mentioned longitudinal valley, uniting Aúchi, Mitke, and Shahristan.

13. *Akhba-Pahut*.—A bridle road from Pahut on the Zarafshan through a defile of the same name to Aúchi. The pass is blocked with snow and only practicable in summer.

14. *Akhba-Rarz*, from Razr on the Zarafshan by the left bank of the Obi-Rarz rivulet, over the snowy crest of the range, descending by the Khanjei-lau glen to Shahristan defile, 21 miles. This is a mere bridle-path, very difficult, and only practicable during the summer months.

15. *Akhba-Ispan*, from Fatmi on the Zarafshan over Nau-Forgan mountain through Ispan village, descending by a glen to Shahristan defile. It is reckoned to be 27 miles by this route to Shahristan, and 18 miles from the Zarafshan to the top of the pass. There is no traffic by it except in summer.

16. *Akhba-Putkin*, from the vicinity of Taumin on the Zarafshan through Putkin glen; 11 miles to the pass, with dangerously steep ascent and descent; 84 miles altogether to Shahrستان.

17. A footpath from Senkistan on the Zarafshan across the snowy range to Shahrستان.

18. *Akhba-Kishkat*, unites Varziminor with Ura-tiube, via the Shahrستان defile. Between Ura-tiube and Falgar the road is well trodden by inhabitants of the last-named town on their way to and from the bazaar at Ura-tiube. The pass is approached in two ways: first, from Kishkat up a defile of the same name, along a brook to the mountains. This is an easy route. Secondly, from Varziminor the road lies over Jobistagh Mountain, intersects the Obi-bars defile, then crosses mountains by steep and long ascents, entering Hishkat defile and joining the foregoing road about three miles above the village of Hishkat. The second is by far the more difficult of the two. The top of the pass is 10,700 feet above sea-level, and 11 miles distant from the Zarafshan.

19. *Akhba-Taumat*, from the village of Dardar on the Zarafshan to Shahrستان, 33 miles. The ascent is by the Taumat-sai defile. Beyond the mountains the road, which is only practicable in summer, joins No. 18 at Kizil Mazar.

20. *Akhba-Langar*, from Urmitan on the Zarafshan to Zaamin and Ura-tiube, lies along Langar defile to a low and easy pass, whence it descends to Obi-kul defile. At the fifth mile it turns towards the east, crosses a mountain of no great height, and enters Kizil Mazar rivulet. Another low offshoot of the mountains has to be crossed before the Machit rivulet is reached. Then the road lies through Kata-shibar, rich in pasturage and trees, to the Kum-bol Pass, after ascending which the descent is by a brook to the Shahrستان defile. Near Obi-kul a road branches off to Zaamin, 16 miles. The distance to Shahrستان by this route is 40 miles.

It appears, therefore, that all the passes enumerated, with the exception of two, are difficult and of great height; that in the eastern part of the range they are fewer in number and higher than in that part situate between Oburdan and Urmitan; that the absolute height of the Turkistan range, very great at first, gradually diminishes towards the west. Thus the Yanghi-Sabak Pass is 13,300 feet, whilst the Shahrستان is 10,700 feet. Water is everywhere abundant, and trees, mostly juniper, are not wanting, whilst at an elevation of 7000 to 10,000 feet above sea-level there are splendid pasturages for cattle.

From the meridian of Urmitan the Turkistan range stretches away in a broad belt to the north-west, filling the eastern and northern parts of the Central Zarafshan basin with hills. Near the town of Jizak it becomes much lower, though its chains continue to skirt the southern border of the Kizil-kum desert. In the meridian of Urmitan the range separates into two, forming in this way the Sanzar Valley. The southern

range accompanies the course of the Zarafshan as far as Penjakend, whilst the northern reaches Jizak, a town about 50 miles north-east from Samarkand. The road from Jizak to Samarkand crosses the lowest dip in the range. Here lies the so-called Jilan-utinsk defile, in the centre of which (eight miles from Kliuchevoi) precipitous cliffs almost meet on either side, barely allowing room for a narrow gorge known as Tamerlane's Gates. On a rock in this gorge on the right-hand side (going towards Jizak) may be seen two inscriptions dating from the time of Abdullah Khan.

On the right of the Zarafshan and on the left of the Sanzar Valley extends the ridge of Osmut-tau, barely 5000 to 6000 feet high, and much lower near the Stone Bridge Fort. North-east of this are the low Sanzar Mountains, very easily traversed. Farther westwards the range breaks up into several small chains, but these do not enter into our map, and we will therefore confine ourselves to those which do.

The Zarafshan range, stretching nearly due west from the mountain knot of Guibas, and parting the valleys of the Upper Zarafshan and Yagnaub-daria, is pierced in the meridian of Varziminor by the very deep and narrow gorge of the rapid Fan-daria. This part of the range is very regular and of great height. The following passes cross it serving to connect the hamlets of the Upper Zarafshan with the settlements on the Yagnaub.

1. *Akhba-Tavastfin*.—From the village of Hairabad on the left bank of the Zarafshan the road lies up the Tavastfin defile, through the summer camping-grounds of Ustan, Hukimi, and Hishkat. The top of the pass is 10 miles from the Zarafshan. The descent is by the valley of the Yagnaub-daria to Senghi-mailek, 16 miles altogether. The road winds, though it can be used in summer by horsemen, and is upon the whole comparatively easy.

2. *Akhba-Revut*.—A footpath from the Zarafshan village of Isis lies through the Revut gorge, crosses the range at the twelfth mile, and reaches Senghi-mailek on the Yagnaub three miles beyond.

3. *Akhba-Guzun*.—The road begins at the hamlet of Hodji-shar on the Zarafshan, and follows the Guzun-sai defile by the villages of Pud, Haz, Ravaz, and Guzun, entering the Yagnaub valley at Novobot.

4. *Akhba-Surkhat*.—From the gardens of Postigau near the Zarafshan, via Tamshin, Surkhat, and Arnagan, 11 miles to the top of the pass, which is only accessible in summer. From the summit the distance to the Yagnaub village of Tagi-Chenar is rather over five miles.

5. *Darkh Pass*.—Rather less than half a mile from the Zarafshan village of Shamtitch a road leaves the river in a direction almost due south, forming the chief line of communication between the hamlets on the Zarafshan and those on the Yagnaub-daria. In the Darkh gorge the road has to be carried along narrow cornices and balconies 300 feet above the river. At the fourth mile it enters a wide and cultivated valley

reaching to the village of Darkh, situated at the point of confluence of two rivulets. Here three roads meet, the easternmost leads over the snowy range to the Yagnaub hamlet of Bidif, the central one also crosses a snowy pass to the hamlet of Varzaut, whilst that on the west follows the narrow defile of a mountain torrent to the summit, 13,000 feet above sea-level. From Darkh it is seven miles to the top, with splendid pasturage and occasional thick clumps of poplars. The first mile of the steep ascent is over rocks, the second over snow. The descent is abrupt to the village of Kishartab in the valley of the Yagnaub. The length of this road is 16 miles in all, 14 miles from Shamtitch to the pass.

6. *Minora*.—The road leaves the Zarafshan at the village of Falmaut, and rises by the bank of a stream through a defile. At the eleventh mile the pass is covered with snow and full of difficulties; the descent is by the Luilau gorge in an easterly direction to Kishartab—16 miles—only practicable in summer.

7. *Marda-Kishtigeh*.—The road turns off the Zarafshan riparian route at Rarz, and crossing the river by a bridge leads up the Margelak defile to the pass—12 miles to the top. After five miles of descent by the valley of the Pshansa, the village of Tak-fan is reached. This road can be used for pack-animals, though not without difficulty.

It will be seen from the preceding remarks that of all these passes that of Darkh, though extremely difficult, offers the fewest obstacles to traffic. It may therefore be readily imagined how wild and inaccessible is this region. Yet even here, as in eastern parts of the Turkistan range, excellent pasturage is to be found and every requisite for summer encampments. The Darkh pass illustrates a feature generally characteristic of all these ranges, in the abrupt and steep fall of its southern slopes as compared with those on the north. The following figures will help to make this clearer to the reader:—

		Length of Northern Slope.		Length of Southern Slope.
Pass of Tavastfin	10 $\frac{2}{3}$ miles	5 $\frac{1}{3}$ miles
„ Revut	12 „	2 $\frac{2}{3}$ „
„ Guzun	—	—
„ Surkhat	10 $\frac{2}{3}$ „	5 $\frac{1}{3}$ „
„ Darkh	13 $\frac{2}{3}$ „	1 $\frac{2}{3}$ „
„ Minora	10 $\frac{2}{3}$ „	5 $\frac{1}{3}$ „
„ Marda-Kishtigeh..	12 „	5 $\frac{1}{3}$ „

The above remark equally applies to the Turkistan range. In both chains the streams on the north side are much longer than those flowing south.

The mountains bordering the Upper Zarafshan contain coal, iron, gold, alum, and sulphur. Gold occurs throughout the course of this river in small grains and fine flakes, washed from the conglomerates on its banks, while there is none found in the more distant rocks. The poorest

of the native population are engaged in the gold industry and earn a bare livelihood by it. Alum is worked in various parts of the Fan and Falgar. Sulphur is found in Mount Chandara, near Fort Sarvad (now abandoned), and is collected from fissures of the mountain in the form of powder. The high temperature of these rocks is a fact not to be overlooked by the geologist. Four miles from Fort Sarvad up the Yagnaub are thick layers of iron ore and coal. The Zarafshan range in the meridian of Varziminor, as above stated, is pierced by the Fan-daria, and farther west by the two last tributaries of the Zarafshan, the Kshtut-daria and Maghian-daria.

Defiles.—The Fan defile is entered from the north near Varziminor, where the Fan-daria pours its impetuous stream into the Zarafshan. This wild and narrow gorge presents obstacles of no ordinary nature to traffic. Starting at a height of 4500 feet, it ends at Sarvad with 6300 feet, having a total length to this point of 18 miles. After following the east side of the Fan-daria the road crosses to the west by a bridge named Pul-i-mulla. The path winds among rocks, along "cornices" and artificial "balconies," supported on light wooden props, overhanging the river. The sides of the defile are full of interest to the geologist, presenting a complete section of the rocks of this range in the various sandstones, white gypsum, marble, slate, and granite, with occasional outcrops of coal.

The Fan defile unites Ura-tiube, Falgar, Fan, and leads (via Iskanderkul and the Mura Pass) to the valley of the Kara-tagh and to the Amudaria. The abandoned fort of Sarvad is the point of convergence of several tracks over the mountains communicating with the neighbouring districts, and uniting the Kshtut, Fan, and Yagnaub valleys with Penjakend and Samarkand.

The Kshtut defile begins at the confluence of the Kshtut-daria with the Zarafshan, near Dashti-Kazi village, and leads southward via an old fort of the same name. After crossing the Hissar range somewhat to the east of Sibi-surkh Pass, the track ascends the mountains of Kara-tagh. To the west of the Fan defile the Zarafshan range borders the Shahr-i-sebz valley on the north, and throws out several offshoots to the south-west and south, no longer preserving the regularity of form characteristic of its eastern part, though still of very considerable height. The Kshtut Pass, leading from the defile of the Pasrut-daria to that of the Kshtut, is 11,650 feet high, whilst the peaks rise much higher, Mount Chandara, for instance, having an elevation of 18,300 feet.

The road up the Maghian defile begins at the village of Sudjin on the Zarafshan, and lies, via Sufian, over open ground as far as Charbak, where it crosses to the right bank of the Maghian-daria, entering some low hills near the village of Kostarash, and winding through a defile to the confluence of the Shink. Keeping along the right bank of the river, the track ascends Mount Vachekna, but before reaching the village of Gaisan it crosses to the left bank and approaches Maghian, via Hurmi. Hence

the source of the Maghian-daria is followed to the difficult pass over the Hissar range leading to Sari-jui in Bokharian territory. From the confluence of the Shink with the Maghian a route branches off in a S.S.E. direction up the Shin to the Sibi-surkh Pass.

West of the Maghian defile the Zarafshan range is separated from that of Hissar by the Shahr-i-sebz Valley, and the connection between the two is severed. The culminating point in this part of the Zarafshan range is situated in the meridian of Penjakend, 10 miles south of Maghian. Here three lofty peaks shoot up above the surrounding mountains, hiding from view Mount Hazret Sultan, 15,000 feet high. Starting from the Maghian defile, some long offshoots from the range fill in the upper Kashka-daria, while the chief mass preserves a general westerly direction. In the meridian of Urgut the mountains are still of great height, but beyond this they gradually diminish towards the west, where they may be easily crossed.

The principal passes in this part of the chain are three in number: Over *Sanghi-juman* lies the highway between Urgut and Farab, through the villages of Hish-duvan and Guss (8560 feet). On leaving Guss a succession of steep ascents, descents, and zigzags over bare rocks has to be accomplished. Immediately before reaching the pass the track descends to the bed of a mountain torrent. The pass itself is easy, though 7110 feet high, and not used in the winter months. The descent on the other side is difficult; the road lies through Musa-bazar to Farab on the Farab-daria, an affluent of the Kashka-daria. At the foot of the ascent a route branches off in an easterly direction to Maghian.

A little farther to the east another and more difficult road for horsemen leads from Penjakend to Farab, *Kara-tiube*, the highway of commerce between Samarkand and the chief towns of the Shahr-i-sebz Valley, Kitab and Shahr. Beginning at Samarkand, the road lies over the plain nearly to the village of Kara-tiube, 20 miles. Seven miles beyond is the pass, easy and practicable at all seasons. The descent is by the village of Kishlak [i. e. hamlet] to the town of Kitab, reached at the sixteenth mile from the top of the pass.

Between the ravines of Kara-tiube and Jam snow lies on the mountains only in winter, their height not exceeding 7000 feet, and sensibly diminishing towards Jam.

The *Jam* Pass is quite at the extremity of the range; beyond it mountains soon become hills, and die away in the plain. Jam Pass is most important owing to the fact of its being the only one suitable for wheeled traffic from Samarkand to Karshi and the Amu-daria; it is, too, the highway between Bokhara and the valley of Shahr-i-sebz, and is but 2050 feet high.

The *Hissar* range begins at the mountain mass of Kok-su, where it rises at once to a great height. It forms a direct continuation of the Tian Shan Mountains, and divides the valleys of the Zarafshan and

Kashka-daria from the Amu-daria. Stretching away almost due west, it touches the eastern extremity of the Zarafshan range at Mount Guibas. It then turns to the south-west as far as Haki, where it resumes its westerly direction, and continues to the Bokharian town of Ghuzar. On the east it divides the waters of the Upper Zarafshan from those flowing into the central Surkhab. Then it serves as a water-parting between the Yagnaub-daria and Iskander-daria on one side, and the rivers of the bekship of Hissar on the other. Its westerly extremity divides the basin of the Kashka-daria from the Shirabad-daria and river of Baisun. The Hissar range throws off numerous offshoots to the south; between them flow the rivers Dehemilaudal, Sorbokh, Surkhab, Kafirnahan, Zigdi, and Turpalan, belonging to the basin of the Amu-daria. The roads and passes across these mountains are:—

1. *Akhba-Yarkitch*, which unites the Upper Zarafshan valley with the river Dehemilaudal. The road turns off a little to the west of the glacier, follows Obi-kadjra defile, blocked with ice, and mounts to a snowy pass only accessible during part of summer. The road and the pass are exceedingly difficult for pack animals. The descent branches off in two directions—one east to the village of Nazar-ehilak, the other west, along the Dehemilaudal river to its confluence with the Surkhab-daria, a little south-west of the village of Sakau, 55 miles in all.

2. *Piobrut*, for pedestrians only, from the village of Dihisar on the Zarafshan by the Piobrut ravine, five miles to the summit. The pass is snowy, difficult, and only accessible in summer. After crossing the range the track lies along the Obi-Dubursa rivulet to a village of the same name 13 miles from the summit.

3. *Vadif*, also fit for foot passengers only. From the hamlet of Vadif on the Zarafshan up the defile of the same name, and across the range to the above-mentioned village of Dubursa. It is six miles to the pass and eight to the village beyond. The path lies through the villages of Didehi, Ziya-janghil, to Hodja-Chauk, 28 miles altogether.

4. *Pakshif*, for laden animals. The chief traffic between Matcha and Karateghin is by this route, and by it the people of Karateghin reach Ura-tiube. The ascent from the village of Pakshif on the Zarafshan is by a glen to the pass, seven miles. The descent is gradual, and leads to Gharm, the chief inhabited centre of Karateghin. This is the best pass from the Upper Zarafshan to the Surkhab.

5. *Novobot*, available only for pedestrians, unites the valley of the Yagnaub with Karateghin. The path also leads from the village of Novobot to the Zarafshan river, and forms a continuation of the Akhba-Guzun road over the Zarafshan range.

6. *De-balan* leads from the valley of the Yagnaub to the Kafirnihan. The route begins at the village of Debalan, follows the Vitkhan rivulet, and reaches Roumit on the other side of the pass. Distance, eight miles to the top; 20 miles farther to the village.

7. *Chukat*, from the Yaghaub to the Upper Zigdi-daria, begins near Chukat, and ascends by the Tagobi-kul ravine to the summit, nine miles. The road then runs south-west to the village of Ibol on the Upper Zigdi-daria, 12 miles from the pass, which is full of snow and difficulties.

8. *Anzob* is the best route from the Hissar hamlets to the Upper Zarafshan. It begins a little above the village of Anzob on the left bank of the Yaghaub, and follows a defile by easy gradients to the top, 12,000 feet high, and seven miles from Anzob. Three miles farther is the village of Ibol, where this route falls in with No. 7.

9. *Kahir* turns off the rivulet of this name, which intersects the Takfan-Anzob road, and follows the Jijik-rut stream. The village of Zigdi lies beyond the pass. It is six miles to the summit, and $5\frac{1}{2}$ beyond to Zigdi.

10. *Jijik-rut*.—From the same road mentioned in No. 9 a pathway separates and crosses the pass leading to the Zigdi-daria. This is the best after No. 8 to the valley of the Zigdi. From Takfan it is 10 miles to the summit, and seven miles farther to the Zigdi.

11. *Mura* communicates directly between Ura-tiube and Kara-tagh, forming a continuation of route No. 18, over the Kishkat Pass via Varziminor, the Fan-daria, and Iskander-kul. From Fort Sarvad pack trains may proceed along the left bank of the river for three miles to the confluence of the Yaghaub and Iskander-daria, where the road turns to the south-west and follows the course of the last-named river. At the sixteenth mile from Sarvad, a very arduous and long ascent has to be accomplished to Lake Iskander-kul, two miles south of the ascent. The track skirts its western shore and is very dangerous, though less so than that along the Fan-daria. On leaving this lake the Sara-tagh rivulet may be followed for seven miles, and laden animals pass along with ease: it then becomes more difficult, the pass itself being extremely steep and blocked with snow. Having gained a height of 12,000 feet, a descent must be made to a glacier, and this is bad travelling even for pedestrians. A second glacier, 12,200 feet high, has also to be crossed before beginning the descent, which is steep at first, then enters the valley of the Kara-tagh-daria, and through the village of Hakimi comes to the town of Kara-tagh. From the northern shore of Iskander-kul to the summit is 11 miles, and 25 miles more to Kara-tagh. From the south-eastern shore of the lake a pathway leads to the Khanaka Pass, via Senghi-dival ravine.

A road over the Mura Pass unites the valleys of the Kshtut and Maghian-daria with the Hissar hamlets, via Voru, on a river of this name, the chief tributary of the Kshtut-daria.

In describing the passes over the Zarafshan range those routes were mentioned which follow the valleys of the Kshtut and Maghian-daria and are continued southward across the Hissar range. To the west of them are others communicating between the fertile districts in the

Zarafshan Valley and Hissar. One of these was crossed by M. Maief in 1879 on his way to explore the valleys of the Vakhsh (Surkhab river) and Kafirnahan, and from his report we borrow the following particulars:—

From Shahr to Sari-jui viâ Tash-kurgan.—The valley of Shahr-i-sebz is bounded on the north by the Samarkand [or Zarafshan] and on the south by the Hissar ranges. The latter, considerably loftier and more massive than the former, is crossed by three roads leading from Shahr-i-sebz to Hissar. The first and westernmost is that of Ghuzar; the second, a little to the east, passes through Kalta-minar, and joins the first road six miles from the celebrated Iron Gate;* whilst the third and most difficult is that of Tash-kurgan. All three are commanded on the Shahr-i-sebz side by forts—the first by that of Ghuzar, the second by Yar-tiube, and the third by Yako-bagh.

From Shahr as far as Yako-bagh the road is level and good, passing through cultivated land for eight miles. Seven miles before reaching Yako-bagh it crosses the Kizil-su rivulet, entering the gardens of Yako-bagh about three miles from the fort. The town itself is situated on a river of the same name, at the entrance to a well-cultivated and populous valley. Its climate is extremely bad, and fevers of an obstinate character prevail, proving fatal in many cases where medicines are not procurable.

From Yako-bagh to Tash-kurgan the road lies at first along the valley of the swiftly-flowing Yako-bagh-daria, passing the villages of Samak (10 miles from Yako-bagh), the residence of an amlakdar, Ming-tut,† a rich village, Haider-bulak, on a rivulet of the same name joining the Yako-bagh-daria some way lower down, also the residence of an amlakdar, and Tatar, a group of hamlets at the foot of the mountains. Beyond Tatar a succession of steep zigzags leads to the rocky slopes of Mass-kara-koi, overgrown with arborescent juniper and a variety of bushes. Nearer the summit the gradients are easier, and the road is good to the rocky, jagged crest of the mountain. Turning this ridge by the Chakman-kuida Pass, the descent begins into the Tash-kurgan Valley, on the northern slope of the Hissar range. This descent is at first easy, but afterwards becomes more difficult, as the road is a mere track, narrow, and covered with loose stones, continually winding between projecting crags along the verge of precipices, and so steep that equestrians hardly dare ride down it, and usually dismount. This leads

* The following appears in the Monk Hyacinth's 'Historical Records of the Ancient Inhabitants of Central Asia,' part iii. p. 247: "There is a mountain known as the Iron Gate; on either side are lofty cliffs, and the colour of the rocks is like iron. This answers the purpose of a frontier fortress to two kingdoms." But nothing is said of the folding gate bound with iron and hung with a multitude of bells, as described by Hwen Tshang. See Colonel Yule's note to Professor Lerch's article on Hissar, translated in the Geogr. Mag., vol. ii. 1875, where earlier notices will be found.

† i. e. 1000 mulberry trees.

direct to the gardens and fields about Tash-kurgan, a large highland village. Here in summer an amlakdar resides; in winter, when communications are interrupted by snow, he removes to Yako-bagh.

Tash-kurgan is well supplied with water from mountain springs; the brook of the same name (an upper feeder of the Yako-bagh-daria) flows below the village in a deep cleft, uniting with another stream, the Shud-arad-daria. The first of these rivulets is crossed by a primitive kind of bridge, the second by a ford. After crossing the Tash-kurgan-daria, the road ascends the red sandstone slopes of the Tash-kurgan mountains margining the valley. These hills have an undulating, hilly surface, and are everywhere covered with cornfields and junipers. At length the main axis of the Hissar chain is reached at the pass of Lagar-i-murda. Two roads lead across it; the first, though shorter, is extremely difficult, the other, much better, is also hardly practicable.

In order to follow the shorter route it is necessary to turn to the right and ascend by a gradual and easy incline to the summit of the pass, marked by two pyramids. Difficulties only begin with the descent, and none but *djigits* ride down this way in their rapid journeys. Travellers mostly get off their horses and lead them by the bridle, for besides its steepness the descent is dangerous owing to frequent landslips. This leads into the bed of a small brackish stream, the Sarim-sak-bulak* (Shur-su). Then the track ascends to a level gravelly plain, continuing over it to some reddish sandstone hillocks, overgrown with juniper and forming the side of the deep bed of the so-called Sarim-saklik (Sarim-saglik, according to Rodionof), a noisy mountain torrent. This gorge opens into the still narrower Bakhcha cleft, cut by aqueous action between lofty overhanging walls of rock, almost meeting overhead, and excluding daylight from its gloomy recesses. Below rushes a stream a few paces wide, except when melting snows in spring swell its waters, when it occupies the whole width of the gorge (which is only 150 to 200 feet long) and interrupts communication.

The second more circuitous track keeps to the left of the first from Lagar-i-murda, and also leads into Bakhcha cleft. The road descends by short but very steep terraces, avoiding the deep channel with its brackish stream by means of a narrow ledge. Then it enters the Surfa range, twice crosses a valley of no great depth with excellent grass, and, by a series of gradual ascents and descents, at length enters the bed of the Sarim-saklik. This too may be turned by a *détour* westward, passing along a tolerably easy river course opening into the valley of Bakhcha-sai below the gorge where the two tracks join.

From Bakhcha cleft the road continues along the narrow Bakhcha-sai or upper Sang-gardak, supported on ledges of rock overlooking the

* Sarim-sak is the Kirghiz name for the wild onion. It grows plentifully on the Tian Shan and its ramifications, and doubtless originated the Chinese name of Tsung-ling, "onion mountains," for this range.

impetuous and boulder-strewn Sang-gardak-daria, occasionally descending to the river itself, and constantly crossing and recrossing its stream. The road is very stony and dangerous, and often ascends by steep paths to the cliffs above in order to avoid impassable parts of the river. The village of Bakhcha, not large but straggling, stands in a side glen formed by retreating heights, its huts and gardens alternating with patches of arable land occupying whatever level ground there is.

The road from Bakhcha to Sang-gardak is no better than that leading to Bakhcha from the gorge of the same name, having continually to cross the Sang-gardak-daria. This river is fordable only during the dry season, but in spring and summer bridges of the most primitive description, in fact nothing more than juniper trees, are laid across from bank to bank. The distance from Bakhcha to Sang-gardak is reckoned at two *tash* or 11 miles.

Sang-gardak is larger than Bakhcha, but like it in other respects. An amlakdar resides here, whose jurisdiction extends over the mountaineers, or Illebai Turkomans, as well as over the local population.

From Sang-gardak to the end of the pass the road is less dangerous, though in many places unsafe, where balconies* have been thrown out to widen it, or where the bed of the river is confined by cliffs, and heaps of stones, over which it is necessary to pick one's way, have been thrown into the water. Frequently, too, lofty precipices have to be scaled to avoid masses of fallen rock.

About a mile below Sang-gardak a sparkling cascade leaps down the side of the defile and keeps vegetation green, forming a welcome oasis of verdure amidst the prevailing sombre tints of the rocks. Not far off stands the hamlet of Chujak, a collection of mud hovels.

Throughout the whole length of the ravine there is a variety both of trees and bushes. The first met with are the characteristic *archa* or juniper (*Juniperus pseudosabina*), mingled with ash (*Acer tataricum*) afterwards. Standing alone lower down are willows and tamarisk (*Tamarix floridus*) covered with elegant sprays of rose-coloured flowers. After these comes a belt of mulberry (*Morus alba*) and the dense bluish-green foliage of the iron tree conspicuous amidst the prevailing lighter shades of vegetation. In still lower parts of the ravine grow apricot (*Prunus armeniaca*), wild cherry, and plum. But poplars, elms, called by the natives *karagatch* (*Ulmus campestris*), and other trees characteristic of the cultivated zone are only seen in plantations at Bakhcha and Sang-gardak, mingled with an undergrowth of thorn, Siberian acacia, *Caragana jubata*, honeysuckle of various kinds, and bushes of *Colutea arborescens*. Below these again are cherry and stunted apple trees, whilst at the very end of the ravine, near its entrance to

* A good illustration of an artificially widened road supported on wooden props along the precipitous side of a gorge is given in Mr. T. T. Cooper's 'Pioneer of Commerce.'

the plain, are a few fig trees (*Ficus carica*), with small but sweet and edible fruit.

Towards the end, where the defile widens out, the road improves, and quite at the extremity stands the village of Dagana, surrounded by gardens and fields. Six miles beyond is the town of Sari-jui, on the river Turpalan. Its citadel, like all others in Hissar, has lost all strategical importance, and is falling into ruins. Sari-jui is the residence of a bek, to whom Sari-asiya with its district and Yurchi are also subject, both these towns, formerly centres of independent beks, being now under officers appointed by the bek of Sari-jui.

From Dagana to Sari-jui the road is throughout good and even, and there is another direct way from Dagana to Yurchi.

2. KARATEGHIN.

Karateghin is the mountainous country occupying the whole of the central course of the Surkhab. In a straight line it extends approximately 100 miles, with an average width probably of 25 to 30 miles. On the north and east it borders on Russian dominions, on the south it touches Darwaz, and on the west Kulab and Hissar. Its orography is very intricate, for it wholly consists of a collection of valleys, separated by numerous offshoots of the great ranges which stretch along its northern and southern borders. Besides those north of the Surkhab, there are apparently other parallel chains: one at all events follows the right bank of this river.

The northern border of Karateghin is occupied by two ranges, the Alai and Hissar, converging at the mountain knot or group situated near the upper end of the Zarafshan glacier. All recent maps, from that of Kohistan by Aminof, give the name "Kok-su" to this mass of mountains. Yet this must be an error, for so inappropriate a name as "Green Water"—the meaning of the Turki words composing the name—could never have been given to any single peak or group of peaks. But however this may be, three chains radiate from this knot—one towards the east and two towards the west. The first forms the watershed between the Syr-daria and Surkhab, and was named by A. P. Fedchenko the "South Kokandian" range, while on more recent maps it is marked "Alai-tau." But this name was found inconvenient, owing to its resemblance to Ala-tau, and therefore on the military topographical staff corps map of 1878 it appears as "Kchi-Alai," i.e. "Little Alai." This too is a misnomer, for the term is applied by the native Kara-Kirghiz exclusively to the valley at the upper course of the Ak-buru. Of the other two branches the northernmost or Turkistan chain forms the watershed between the basins of the Syr and Zarafshan, and does not belong to Karateghin; the other, the Hissar chain, divides the systems of the Zarafshan and Surkhab. This terminology, however, cannot be

adopted as final till the geology of these mountains has been studied and their inter-connection finally decided.

Near this mountain knot the Hissar, Turkistan, and Alai ranges apparently attain their culminating height. Many circumstances favour this presumption. All the passes in this part of the mountains are extremely difficult of access; some are almost impracticable for laden animals, and only remain open for two or three months in the year. Most of the glaciers, which are generally scarce in Central Asia, are to be found here, and the few persons who have been near this tangle of mountains have estimated the height of its surrounding peaks at not less than 18,000 feet. For instance, Baron Aminof judges the peaks near the head of the Zarafshan glacier to be over 18,000 feet. Fedchenko estimates those inclosing the amphitheatre of the Shurofski glacier at between 18,000 and 19,000 feet. The mass itself has hitherto been visited by no European.

Of the three ranges radiating from this centre, only two, as we have already seen, viz. the Hissar and Alai, and these only as regards their southern slopes, are comprised in Karateghin. The former touches it on the east from its commencement as far as the sources of the Sorbokh. Throughout this extent its crest is apparently above the snow-line, which on the north side has an elevation of 12,000 feet, while some, if not all the passes, are above the limit of perpetual snow. The eastern part of the Hissar range was mapped during Abramoff's expedition to the headwaters of the Zarafshan, in 1870.* Since then it has not been visited. M. Oshaniu could not see the chief range from the Surkhab side for intervening heights. At a few of the higher stations between Mujuharf and Garm snowy peaks were visible, but it was impossible to say for certain whether they belonged to the chief axis of the range or were situated on its offshoots.

From the Karateghin side this range is crossed by five passes. The westernmost of these leads to the sources of the Yagnaub, and is only available for pedestrians. Three—the Pakshif, Vadif, and Piobrut—lead from the sources of the Sorbokh to the Upper Zarafshan, and lastly the Yarkitch conducts thither from the right, westernmost, head tributary of the Obi-kabud. Only one of these cols, the Pakshif, has been instrumentally measured, and found to be 12,000 feet. This and the Yarkitch are available for pack-animals, the remaining three can be crossed only by foot passengers. They are all difficult of access and only open in the summer months, though frequently used by the inhabitants of the Upper Zarafshan, who bring their bread supply from Karateghin by these routes, especially over the Pakshif Pass. The eastern part of the Alai range bordering on Karateghin is even less

* See R.G.S. Journal, vol. xli. pp. 338-342—a short notice of this important expedition. The detailed narratives by Mishenkof, Aminof, Grebionkin, &c., have never appeared in English.

known than Hissar. No European has ever set foot in it, for the mountains explored by Fedchenko at the sources of the Isfara apparently belong to the Turkistan and not to the Alai range, and are situated west of the mountain knot. There appear to be only two very difficult passes across it, the Tarak and Ala-udin. The first leads from the left, eastern, head-stream of the Obi-kabud to the sources of the Sokh, the second from the upper waters of the Obi-zanku to the Ferghana village of Okhna, situate between Shah-i-mardan and Vadil. Fedchenko, in the description of his journey in the Khanat of Kokand, gave the first and very full information of these passes, to which the following particulars have been added by M. Oshanin regarding the Tarak Col. The road over the Tarak Pass certainly crosses a glacier as M. Fedchenko correctly surmised, but his informants appear to have designedly magnified its dangers. They told him that the Col itself could only be reached by pedestrians, and that those who went that way were obliged to fasten sticks to their bodies to support them in case of their falling into a fissure.

M. Oshanin, however, learned that the Tarak was practicable even for laden horses, provided that the weight of the pack did not exceed 100 lbs. But this means of communication only lasted for a month—from the middle of July to the middle of August. On the 28th August, when M. Oshanin made his inquiries, the Tarak was, according to the Karateghinians, hardly passable, and its state generally that year (1878) was extremely bad, owing to the unusual severity of the preceding winter. It was reported that the glacier was much fissured and rendered unsafe by large masses of snow which had remained unthawed, and completely concealed the crevasses.

The length of the road over the glacier was said to be half a tash, or $2\frac{1}{2}$ miles, but distances cannot be estimated with accuracy over such rough ground, where one mile seems to be more like five on the level. However this may be, the Tarak is decidedly one of the very difficult passes, practicable, though not without risk, and chiefly serviceable for pedestrians; indeed, horsemen will not attempt it, unless compelled by their necessity to come this way, preferring a more circuitous route into Ferghana by one of the more easterly passes.

With reference to Ala-udin nothing is yet known, except that it is also among the very difficult passes. In proof of this, M. Oshanin relates that some Kara-Kirghiz messengers he sent from Karateghin, where they were nomadising at the mouth of the Obi-zanku, to Marghilan, preferred making the circuit *viâ* Kara-kazyk, a by no means easy pass.

Kara-kazyk was visited by M. Oshanin in 1876.* He found it very

* He accompanied the force under Prince Wittgenstein to the Pamir, see R.G.S. Journal, vol. xlvii. pp. 44 *seq.*, for a translation of Kostenko's account of this reconnaissance. The heights are wrongly given, thus on p. 45, 12,600 feet are assigned to the Col, whilst in the appended list at the end of the article the figures stand at 14,400 feet.

bad, owing to its great height (14,400 feet), steepness (particularly on the Ferghana side), and the loose stony nature of the ground, which gave no secure foothold for the horses. Nevertheless, and in spite of the lateness of the season (17/29th September), the expedition to which he was then attached in the capacity of naturalist, traversed it safely. They were fortunate, however, in having fine weather, which thawed all the snow, for at these great heights it is impossible to rely upon the weather, and the traveller caught in a storm on the Kara-kazyk would fare badly, and his position might become critical.

Since the Kara-kazyk Pass, then, is so full of difficulties, and yet was preferred by M. Oshanin's native messengers to the more direct Ala-udin Col, the last-mentioned is probably almost impracticable. Moreover, according to hearsay information collected by Fedchenko, Ala-udin is not a regular route, but rather a track used by robbers, though it is quite possible that the chief difficulties are not at the Col itself, but in the approaches to it along narrow defiles.

South of the Alai and Hissar ranges in a direction parallel with them, not far from the right bank of the Surkhab lies a secondary ridge. This apparently begins on the east at the lofty Shum-kara peak, which is said to surpass in elevation all the other summits of the Alai range. From it flows the Kichik-Karamuk-su, a rivulet only 10 miles long, explored by M. Oshanin in 1876. From the point he then reached the crest of Shum-kara was invisible, being concealed by the nearest heights. Judging, however, from its vicinity to the Surkhab, Shum-kara is probably situate south of the main axis of the Alai range.

Of this, additional proof is afforded by an examination of the road from the head-waters of the Zanku to the Kara-kazyk Pass. The Kirghiz sent to Marghilan by M. Oshanin at first ascended the Obi-zanku, and from its head-waters crossed directly to those of the Kok-su by way of Kichik-Karamuk and Katta-Karamuk-su. Hence it may be inferred that the sources of the Obi-zanku and Kok-su (Kara-kazyk) lie close together, and are only separated by a spur of the mountains, which probably links Shum-kara with the Alai range. From this explanation of the topography it appears that four rivers take their rise in Shum-kara, viz. from its southern slopes the Kichik-Karamuk and Katta-Karamuk-su; from the north-west the right affluent of the Obi-zanku, and from the north-east the left tributaries of the Kok-su.

East of Shum-kara is an offshoot which divides the basins of the Kok-su and Katta-Karamuk-su; on the other side of it, not far from Katta-Karamuk, is Gurundi Pass, 10,000 feet above sea-level.

To the west of Shum-kara, as already stated, extends a ridge with a direction from E.N.E. to W.S.W. along the whole of Karateghin. Its last spurs terminate west of the meridian of Faizabad, and it margins the valley of the Surkhab on the north. But in its western extremity this chain no longer borders the Surkhab itself, but its right tributary,

the Obi-garm-daria, as well as the Iliak, forming the watershed between this river and the Kafirnahan, whilst it preserves its original direction throughout. Three affluents of the Surkhab—the Obi-zanku, Obi-kabud, and Sorbokh—pierce this range. Its crest is at various distances from the Surkhab, in some places not more than four miles, then again much further, leaving an interval filled in with high spurs across which there are passes. The ridge itself is very well seen from Garm, from the mouth of the Obi-dashta-siab and from Muchun Pass. It is very serrated, and here and there speckled with perpetual snow, particularly at the sources of the Obi-dashta-siab and Muju-harf. M. Oshanin judged the height of some of its peaks to be at least 14,000 feet. On the west the range is lower, and there its loftiest summit, Hazret-isha, on the border of Karateghin, is only from 12,000 to 13,000 feet above sea-level. There are doubtless several passes across it, but M. Oshanin only heard the name of one, the Soz, leading from the Obi-yasman, a right tributary of the Obi-kabud, to the basin of the Sorbokh. M. Oshanin only obtained a clear perception of this range after the survey had been drawn and numerous intersections made by his travelling companion, M. Rodionoff, an officer of the Topographical Corps, who has done much work in Central Asia. The cause of this was that, during the journey, the range was mostly concealed by its offshoots and valleys, rendering it impossible to obtain a general view. Besides, its severance in three places made the matter more obscure. The same type of mountains prevails in Karateghin as in Ferghana at the sources of the Zarafshan, that is to say that parallel with the main range are other chains pierced by rivers, and it is just in these narrow chasms formed in this way that the road is so extremely bad. The name proposed by M. Oshanin for the whole of this range from Shum-kara to its western extremity near the mouth of the Iliak is "Karateghin."

Great as are the Alai and Hissar ranges, in elevation they are surpassed by that chain which lies along the left bank of the Surkhab, and was named by M. Oshanin in honour of the first Russian sovereign who took in hand the exploration of Central Asia, "Peter the Great." Unmasked by outlying mountains, this range rises as a lofty wall, stretching from the mouth of the Muk-su along the whole southern border of Karateghin. Its connection, however, with the mountains rising from the left bank of the Muk-su opposite Altin-mazar is not apparent. It begins, probably, at some peaks near Tupchek, a favourite summer pasturage of the nomads, due south of the mouth of the Muk-su. From this point the range extends along the left bank of the Surkhab with a general direction E.N.E. and W.S.W. West of the meridian of Obi-garm it is pierced by the Surkhab, then crossing to the right bank of this river it forms the southern watershed of the affluents of the Obi-garm and Iliak rivers, and stretches away to Faizabad. The Surkhab bursts through it with a very narrow gorge, apparently most difficult of access,

for at its entrance the mountains appear to meet over the river. But the usual approach to Karateghin is by the Faizabad and Obi-garm road, not by the Surkhab. Farther east, Peter the Great range is again pierced by the Khullias, a tributary of the Surkhab. Its westerly part is bare of snow, but in the meridian of Garm patches of it make their appearance, and farther east the range rises to an enormous height. Directly opposite the Karateghin hamlet of Nimichi-bolo and about seven miles south of it the triple-headed Sari-Kandal peak rears up to a height estimated at 18,000 feet, its central head throwing up two sharp pinnacles. Even from Garm, Sari-Kandal is the most conspicuous object in view, and from Nimichi-bolo its grandeur is remarkably impressive. Between this place and Garm, from a deep glen in Peter the Great range, a glimpse is obtained of a still higher group of peaks south of Sari-Kandal, but whether in the range itself or in a subsidiary chain lying on the left bank of the Khullias it is impossible to say.

To the east of Sari-Kandal, Peter the Great range rises above the limit of perpetual snow. Here stands the isolated peak of Saganaki, 10 miles from Sari-Kandal and about the same distance due south of Kalai-Khait, whence it appears to have the same elevation as Sari-Kandal when viewed from Nimichi-bolo, but the distance being somewhat greater than in the case of the last-mentioned, it is probably very little of it at all below 20,000 feet. East of Saganaki the range is almost entirely masked by its outlying mountains and can only be seen from two or three deep glens. This part has apparently a lower altitude, snow only lying in patches, and it cannot, therefore, exceed from 14,000 to 15,000 feet. Beyond this depression and to the east of it the elevation is again enormous at Tupchek, where a group of four peaks rise. They are distinctly visible from Zanku, but from Jailgan their appearance is very striking, for they stand forth prominently from this point of view, the nearest, easternmost, of them being only 15 miles off, and its height may therefore be taken at 25,000 feet, while the others cannot be less than 22,000.*

The two easternmost only have a direction parallel with the axis of the range, those on the west are farther south and appear as if they belonged to some other chain. No. 1 appears to be the starting-point of Peter the Great range and of another chain, dividing the basin of the Khullias from that of the Wanjab; this ridge M. Oshanin proposes to name "Darwaz."

There can be no doubt that from peak No. 1, Peter the Great range extends in a westerly direction without a break beyond the borders of Karateghin. It may, of course, turn out that the ridge of mountains which margin the left bank of the Muk-su from its sources to peak No. 1 are also

* In order to distinguish these four peaks it will be found convenient to number them 1, 2, 3, and 4, beginning with the highest, easternmost, and ending with the westernmost.

a continuation of the same great range. M. Oshanin saw them only in two places, at the head-waters of the Muk-su and opposite its mouth. From the last-mentioned station he could see, but indistinctly owing to the clouds, great numbers of snowy crests in a south-easterly direction. At all events, in the present state of our knowledge and while there remains some uncertainty as to the orography of this part, it will be more prudent to limit Peter the Great range, and not extend it farther east, leaving to future explorers the task of deciding any doubtful points.

East of the Khullias, Peter the Great range is crossed by three passes open only in summer, for in winter the only means of communication between Karateghin and the valley of the Khullias is along the bank of this river. The westernmost is the easiest of these cols and may be crossed by pack animals. The Kamchirak, for that is the correct name of the pass, is erroneously named on all maps Shah Kend, or Shah Kendu, the word Shakandachi, properly speaking, only applying to the descent. Kamchirak faces the Karateghin hamlet of Saripul, and is approached over soft ground by a gradual ascent. On its summit there is a level expanse about half a mile wide. The distance from Garm to the summit is reckoned to be two tash or 10 miles. The descent of Shakandachi is steep and stony; for some distance it lies along the crest of a ridge with precipices on either side, but since 1878, when the Bokharians improved the road, it may be considered safe. This pass leads to the Darwaz fort of Childara, on the right bank of the Khullias.

The second pass, also available for pack trains, lies between peaks Sari-Kandal and Saganaki. To the west of the latter and close beside it a saddle may be observed in the range, here lies the snowy and difficult Liuli-harvi Pass. Three miles of snow have, it is said, to be traversed on this route. The southern slope is much fissured, suggesting the possibility of a glacier lying below. By this way the Darwaz village of Ishtian is reached.

Lastly, the third, and apparently the most difficult of the three, is opposite the mouth of the Zanku, and is called Gardani-Kaftar.

Besides the four ranges we have described there is yet a fifth in Karateghin, but this only touches it on the east. We refer to the Trans-Alai. The Karateghin portion of it does not present that continuous mass of perpetual snow which characterises the range east of the Ters-agar Pass. Here in Karateghin it is cut by numerous gorges and appears to be structurally compact. Snow lies only on some of the peaks; yet in spite of its comparatively low elevation the range is apparently impassable; at all events, the Kirghiz could not mention a single col between the Ters-agar and the mouth of the Muk-su. It is quite possible that there may be means of crossing it, but that for want of an object these have never been explored. The wintering places on the lower Muk-su are easily reached from Jailgan by the valley of the river and near Altin-mazar lies the track over the Ters-agar, one of the

easiest cols even for camels. Moreover, the valleys of the Muk-su and Surkhab, between Kichik-Karamuk and Jailgan are very thinly inhabited, owing to the want of good wintering places in that direction. The summer pasturages are on the head-waters of the Kichik-Karamuk-su, Obi-zanku, and at Tupchek.

All the ranges, together with their offshoots, form a large number of longitudinal and transverse valleys, the longest of these being that which intervenes between Peter the Great and Karateghin ranges, and which is mostly occupied by the course of the Surkhab, including in its westernmost end the Obi-garm flowing east to the Surkhab, and the Iliak running west to unite with the Kafirnahan.

The watershed between these two rivers is imperceptible, the valley of Dashti-bidan (quails' plain), where they rise, being a high steppe, such as are common in the highlands of Central Asia. For it may be established as a rule that every wide level valley has the characteristics of a steppe, in the total absence of trees and bushes, even on the slopes of the margining mountains; it is only in deep secluded glens that arboreal vegetation appears, in the steppe-like forms of plants which grow there, *Farulaceæ*, feathered grass (*Stipa*), hairy-grass (*Lasiagrostis splendens*), and various kinds of wormwood. These upland plateaux afford admirable summer pasturage for the nomads. Dashti-bidan is at this season occupied by encampments of Uzbeks of Hissar of the Kalluk tribe; on this steppe are the sources of the Iliak and Obi-garm-daria. Ascending one of the head-streams of the first of these rivers M. Oshanin found that after proceeding along the bank some distance the track left the water's edge, approaching it again after a while. No perceptible difference having been noticed in the level he thought he was following the same river, and was surprised on observing later the water flowing in an opposite direction, proving that he had crossed the watershed between the basins of the Kafirnahan and Surkhab, here undivided by the smallest eminence.

As we have said, the larger, eastern part of the longitudinal valley is occupied by the course of the Surkhab, the northerly branch of the Amudaria, known under three names. Its upper stream is the Kizil-su of the Kara-Kirghiz; in Karateghin itself, among Tadjiks, it bears the name of Surkhab, and in its lower course it is called the Vakhsh. The sources of the Surkhab in the Alai are largely fed by the melting snows of the Trans-Alai range. The red clay so widely distributed in that range mingles with its water and lends to it a ruddy tinge, which has earned two of its names, Surkhab and Kizil-su, i. e. red water. But the name is not appropriate when applied to lower parts of the river, for after receiving the dirty grey water of the Muk-su it assumes a brown colour.

The Upper Surkhab Valley is called Dasht-i-Alai (Alai Plain), or simply Alai, and extends to a low hill which is the water-parting

between the Kashgarian Kizil-su (tributary of the Kashgar-daria) and the Surkhab.* Over this low ridge or hillock lies the road to the Tau-murrun Pass.† M. Oshanin is of opinion that the lower limit of the Alai should be fixed at the west end of Katta-Karamuk. Here the river enters a gorge, and completely alters its character. East of Katta-Karamuk the valley is throughout wide, and only below Daraut-kurgan spurs of the mountains press upon the right bank, while there is enough level space on the left side between the river and the mountains. West of Karamuk the gorge continues without a break to the mouth of the Muk-su. Here the Surkhab flows in a single channel, and the road is mostly high above the water, only descending now and again at the estuaries of small streams, where there are level spaces of no great extent. Near the mouth of the Muk-su the valley widens on the left bank of the Surkhab and is somewhat uneven; through it the river has eroded a deep bed. Farther west the valley presents a succession of trough-shaped extensions, united by gorges formed by spurs hemming in the river. To avoid these narrow places the road leaves the river and follows a side ravine, then crossing the spur rejoins the Surkhab. Below Katta-Karamuk the following passes across lateral spurs occur:—Jalghiz-archa, before reaching Kichik-Karamuk wintering place; Sarigui and Kashka-Shirak, between Kichik-Karamuk and Atchik-Alma; Mainak and Jul-terek, before coming to the valley of Obi-zanku; Turpi and Obi-yasman, near Nimichi-bolo; Muguk, leading to the lower Mujuharf. Of these the only important one is Turpi, which is 2500 feet above Nimichi-bolo. But the road does not always circumvent these gorges, occasionally it goes right through them, along ledges of rock ascending and descending, here and there artificially supported from the side by wooden props, to which the Russians in Turkistan have given the name of *balkonchiki*, i. e. little balconies. These are piles driven into the side of the mountain, supporting beams upon which are thrown brushwood, earth, and stones, so as to form artificial cornices.

In the wider parts the river frequently divides into several arms, but nevertheless it is nowhere and at no season of the year fordable. All the trough-like extensions have been apparently at some time lakes. At all events, traces of raised beaches forming terraces are everywhere apparent. These are first seen outside Karateghin at Katta-Karamuk, where they are particularly well developed. They are invariably three in number. The uppermost and oldest having been more subject to aqueous action is less well preserved than the others, and is usually indicated by clumps torn from and clinging to the hill-sides. The soil of these terraces is almost wholly alluvial, a mixture of sand, shingle,

* In order to avoid confusion, as there are so many rivers of the name of Kizil-su, it has been thought advisable to use the Tadjik name Surkhab in speaking of this river.

† Not Ton-murrun, as erroneously given on some maps. Ton-murrun is nonsense. Tau-murrun is the mountain's nose.

and clay, and therefore is rarely cultivated, for the large quantity of pebbles prevents the plough from penetrating. Their horizontal plane, especially of the uppermost, is slightly inclined, not more than 2° or 3° , towards the river; their sides fall abruptly at an angle of 45° . Between the lowest terrace and the river there is a level expanse, also covered with alluvial deposits. In these widenings of the valley the Surkhab invariably flows by several arms, and the soil is a loose, easily eroded alluvium; this circumstance, combined with the rapidity of the current, accounts for the continual changes taking place in the direction, depth, as well as the number of channels into which the river divides. The trough-like valley widenings, with their raised beaches, occur most frequently between the mouths of the Obi-zanku and Obi-garm-daria, where the villages of Pillon, Garm, Pomboi, and Ali-galiabon are situate.

As already stated, the Surkhab in Karateghin is unfordable. The last ford is on the border, near Katta-Karamuk, in Russian territory; but even here it is only after the end of August, i. e. when the summer floods have subsided, that the river can be safely crossed. Hence three bridges have been thrown across the Surkhab in Karateghin; two above the mouth of the Muk-su at Duvana and Dumbratchi, the third below Garm, near the hamlet of Saripul. They are all constructed after one model in the following fashion: rough piers of alternate rows of timbers and stones are raised on either bank, so as gradually to incline over the river, the higher the more they overhang the water and diminish the span; timbers are then laid across to support the roadway, which is made of boughs, earth, and stones. These bridges are very unsafe, and shake even when crossed on foot; to ride over them requires the steadiest of nerves and some experience. There are no carts in Karateghin, and the bridges are therefore only wide enough to admit of single horsemen. Handrails are dispensed with in these primitive constructions.

Bridges being so few in number, communications between the several hamlets on either bank are with difficulty maintained, and in order to avoid long circuits it is customary to swim the river. In parts where the channel is subdivided, this may be done on horseback, elsewhere recourse must be had to skins: these are the entire skins of goats, sheep, or cows filled with air, and sufficiently buoyant to support a man on the surface. Several swimmers are in the habit of roping themselves together when about to cross, and the most experienced takes the lead. These crossings are not devoid of danger, especially where the banks are precipitous and the current very rapid, and deaths by drowning occur every year in the Surkhab.

Within the borders of Karateghin the Surkhab receives several important tributaries, besides a large number of minor feeders. The following join it on the right: Kichik-Karamuk-su, Obi-zanku, Obi-kabud, Sorbokh, Obi-dashta-siab, Obi-muju-harf, and Obi-garm-daria.

These all rise in the Karatoghin range, except the Obi-zanku, Obi-kabud, and Sorbokh, which burst through it in narrow gorges, difficult of access. They are the only channels by which the melting snows on the Alai and Hissar ranges reach the Surkhhab; they are therefore more copious than all the others, especially the Sorbokh.

The Obi-zanku is known to the Kirghiz under the frequently recurring name of Kok-su, and is formed of two rivers—the Lai-su, flowing from the left, and the Tamdi-kul, which may be regarded as the parent stream, whereas the Lai-su is merely a tributary. The Tamdi-kul rises in the Alai range at the Tarak Pass. The Lai-su has its source apparently in the offshoots of the principal range near the pass of Tiulvoye-davan. Its water, judging from the name (Lai-su, i. e. dirty water), must be very thick, and it is highly probable that this river is fed by glaciers, which give it a muddy appearance, the more so as the colour of the Obi-zanku is a greenish white, precisely similar to that of the combined Kaindi and Suak-su, the latter of which flows from glaciers. Towards its mouth the Obi-zanku divides into several channels in a wide, pebbly bed margined on two sides by well-defined terraces, and is fordable. M. Oshanin and his party forded it two miles above its mouth, and the water barely reached the horse's belly, but the current was rapid, although the river had fallen. At high water this must be a difficult and dangerous crossing.

The Obi-kabud is somewhat greater than the last-mentioned river. Its sources are in the Alai and Hissar ranges. Its upper waters are incorrectly named on all existing maps Dahi-milia-adal,* a corrupted form of a hamlet whose proper name is Dehi-mullah-badal, i. e. village of the Mullah Badal (probably an early settler). The names of inhabited places are, it is well known, often applied to rivers flowing near them.

At the sources of the Obi-kabud, as already stated, there are two passes: one, the Tarak, to the village of Sokh, in Ferghana; the other, Yarkitch, to the Zarafshan. The roads to these cols apparently bifurcate

* Some Central Asian names become strangely distorted on maps. Thus Yakobak frequently takes the place of Yakka-bago (single garden), Kafirnahan appears instead of Kafirmihan (hidden infidel), Karatchikum and Karatchkhum take the place of Karatchki-kum (robbers' sands), &c.

These mistakes are unavoidable. Sarts and Kirghiz pronounce so indistinctly, swallowing some of the syllables, that without a good interpreter (and these are scarce) even after the words have been repeated several times, one may fail to catch the sounds. There is yet another cause for these mistakes. In many parts of the country now occupied by people of the Turk race, Persian names of places have been preserved; the people not understanding the meaning of the words, of course distort them. Analogous instances are everywhere to be met with in Russia, where German names, e.g. Schlüsselburg, Oranienbaum, and Ranenberg, have been vulgarised into Schliushin, Ranbof, Ambur. To instance one more name in Central Asia, the river and town Sang-girdak signifying "surrounded by stones," has been altered in several ways, and appears on the map in the corrupted form Sangri-dagh.

at the village of Dehi-mullah-badal, reckoned to be four tash or 20 miles from Kalai-Khait. The defile by which the Obi-kabud bursts through the Karateghin range is said to be very narrow, and hardly practicable. It has numerous cornices. Opposite Khait, and but two miles above its mouth, the Obi-kabud divides into several arms, and may be forded, though not without difficulty, owing to the depth and velocity of the current. Above Khait there used to be a bridge, but it was carried away during the unusually high floods in 1878. In its lower course the Obi-kabud flows across a longitudinal valley of the Karateghin range. The two sections of this valley formed in this way are watered by two tributaries of the Kabud meeting here. The eastern portion is not above five miles long, and is occupied by the Obi-Khait, at whose mouth is a village of the same name. At the head of the valley is a small lake Khanzi-Khait (Khait pond), having no visible outlet. Between the lake and the source of the Obi-Khait an eminence may be remarked from the foot of which this river flows, fed by the water of the lake which filters through a crack in the rocks.

The western section of the valley is much the greater, measuring 12 miles in length, and from two to three in width. It is watered by the Obi-yasman, and is one of the most populous and fertile tracts in Karateghin; west of the Obi-yasman lies the Soz Pass, leading to the Sorbokh, whilst southwards a road over the Turpi Col debouches on the Surkhab.

The Sorbokh takes the first place among the eight tributaries of the Surkhab. It bursts through the Karateghin range by the defile of Darai-Kamaran, a name applied on many maps to the whole river. The head-waters of the Sorbokh apparently drain a wide tract of the southern slopes of the Hissar range. From them, as already mentioned, three passes cross to the upper Zarafshan—the Piobrut, Vadif, and Pakshif. Near its mouth the river flows in a wide transverse valley with well-defined terraciform beaches; at the hamlet of Podjeh it is bridged, and at its mouth the river divides into several arms, and is fordable at low water, but even so late as 20th August (1st September), when M. Oshanin saw it, the water was too high to be safe.

Of the left affluents of the Surkhab we shall only dwell on the Muk-su and Khullias. None of the others deserve to be called rivers; they are merely streamlets, for the crest of Peter the Great range closely aligns the Surkhab. Let us begin with the Muk-su, and describe the orography of its upper basin, though it does not belong to Karateghin, but forms part of Ferghana. This locality was visited previously to M. Oshanin's expedition by L. F. Kostenko in 1876 and J. F. Mushketof in 1877. But neither of them went beyond Altin-mazar, and therefore much additional information has been gained by M. Oshanin.

Altin-mazar lies at the southern foot of the Ters-agar Pass, situated in a much lower part of the Trans-Alai range, 9842 feet in height.

The ascent of the pass is very gradual from the side of Alai; it con-

tinues the whole way by the Tuz-su, a left affluent of the Surkhab. The transverse defile occupied by the course of the Tuz-su bears the name of Tuz-dara and Altin-dara.* It is 50 miles long, and has a fall in that distance of 1800 feet, so that the road is very good, and easily travelled even with camels. The descent from the Ters-agar Pass, on the other hand, is very short and steep, but perfectly safe. The height of Altin-mazar has been estimated at the same as, or a little over, that of Daraut-kurgan. Altin-mazar is the name of the tomb of a Mussulman saint, Hodja Fazilmanda, a descendant of the Khalif Omar. It is situate at Kuta-Kushta, which comprises a *tugai* or flat overgrown with trees and bushes, and a few fields with a nearly wholly abandoned Kirghiz wintering place.

Three rivers unite at Altin-mazar, viz. the Suak-su, Kaindi, and Sel-su, to form the Muk-su, which flows by several channels in a pebbly valley about $1\frac{1}{2}$ mile wide. On the south it is confined by a lofty ridge which rises directly from the valley, without any intermediate heights, considerably above the snow-line. Directly opposite Altin-mazar three peaks rise from this range, viz. Shilbeli, Sandal, and Muz-jilga. The first and easternmost fills the angle formed by the union of the valleys of the Sel-su and Muk-su; Muz-jilga is the westernmost of the three. Beyond, the range is invisible either from Altin-mazar or Ters-agar Pass, being hidden by the summits of the Trans-Alai Mountains. Sandal is the highest of the three peaks (23,950 feet) though the others are not much below it. The snow-line appears to be below the half of their height. However this may be, these are among the highest mountains of Central Asia. The view of them from Altin-mazar and Ters-agar Pass is superb. Nothing intervenes between the observer and their summits, and owing to their being so near they appear to shoot up to the sky. M. Oshanin had seen nothing in the Alps, the Caucasus, or Central Asia to equal the wonderful effect produced by their rugged grandeur.

Two small glaciers descend from the slopes of Sandal, each of them probably less than a mile long and 230 yards wide at their lower ends. They terminate before reaching the valley, and appear to be either wholly inaccessible or at all events very difficult to approach. Their lateral and terminal moraines are distinctly visible, medial they have none, for they receive no tributaries. These glaciers were described by Kostenko, and were inserted on maps, but a third also represented as descending from the mountains near the mouth of the Kaindi does not apparently exist.

Of the three rivers forming the Muk-su, the Sel-su flowing north-west contributes the greatest volume of water. Its valley is similar to that of the Muk-su, the bed being composed of pebbles and sand and the river divided into several channels. On the left it is hemmed-in by

* Altin-dara according to Fedchenko. Tuz-araai in Mushketof's narrative.

the slopes of Mount Shilbeli, and on the right by lower hills. Both descend very steeply, and in places almost precipitously, to the valley, which is $1\frac{1}{2}$ mile wide. This is its character for a distance of 12 miles, when it is closed by a glacier from beneath which the Sel-su issues at several places. The glacier which has given its name to the river (Sel in Kara-Kirghiz dialect signifies glacier) is formed of two principal arms uniting at its end. The first and largest of the two occupies the upper extension of the Sel-su valley, and therefore lies north and south. It is closed on the east and west by lofty snowy peaks seen from below to extend for 10 miles. After that they open out and their continuations are invisible; on the south no peak appears to bound the head of the glacier. There is therefore an absence of data for an estimate of its length, but in any case it cannot be less than 13 miles long. Hence it is a glacier of the first rank. M. Oshanin's expedition named it "Fedchenko" in honour of the traveller.

At the lower end Fedchenko glacier is joined by another which occupies the Taminas defile. This latter is much shorter and has a general east and west direction. The whole width of the lower end of the glacier is $1\frac{1}{2}$ mile. The terminal moraine is only visible in places, in other parts a vertical ice-wall 210 feet high is presented to view, and scattered about its foot are huge lumps of ice. The end of the glacier is irregular, bulging outwards. It partly enters the valley of the Baland-Kiyik, opening on the east into the valley of the Sel-su. The glacier nearly closes the mouth of the Baland-Kiyik valley, leaving only a narrow entrance 280 feet wide. According to old inhabitants of Altin-mazar, there are years when the glacier entirely closes the exit of the Baland-Kiyik valley, obliging the river to form a lake above the icy barrier. The water then continues to rise till it bursts through the ice, producing in this way serious floods in the valleys of the Sel and Muk-su. An inundation of this kind is recorded to have taken place about ten years ago, when many of the fertile tracts were entirely swept away. At present the glacier is again apparently advancing. M. Oshanin and his party were there on the 12/24th September when the passage of the Baland-Kiyik was 420 feet wide, and the ice formed an arch at this spot. Three days later they found the arch broken, and the passage narrowed by blocks of ice to 280 feet. That part of the glacier towards the valley of Baland-Kiyik presents a terminal moraine, and there the glacier may be ascended, but where it finishes with precipitous sides it cannot be approached without danger owing to constantly falling stones. Unprovided with either guides or regular mountaineering outfit M. Oshanin did not venture to go further, the more so as he had not the necessary experience for such work, but he climbed on to the glacier and saw its medial moraine. A rising wind and the threatening aspect of the sky also conduced to turn M. Oshanin back after passing two hours on the glacier. The slopes of the surrounding mountains at

its end descend very steeply, and it is quite impossible to climb them, M. Oshanin could therefore obtain no distant view of the surface of the glacier or count its medial moraines. At Altin-mazar, however, he met an old sportsman who in his youth had frequently visited the glacier on hunting excursions after ibex, and according to his report the glacier is 20 miles long. From it there is a pass to Darwaz, known as Kashalayak, or the long-legged. It debouches in the valley of the Vandj; only the most experienced mountaineers venture this way, and for several summers not a soul has traversed it. The glacier being within the Russian frontier, and easily reached from Alai, it is to be hoped that some one will undertake its exploration at no distant future. It should be added that the lower end of the glacier is about 9000 feet.

The Baland-Kiyik which, as already stated, joins the Sel-su on the right, has no glacier at its source and its water is therefore transparent and green. It flows in a valley extending from east to west. Three passes lead from its head-waters; the Kokui-bel debouching on Kara-kul, the Kaindi on the river of that name, and the Takhta-korum on Poliz, and thence to the Mürghab, i. e. into Shighnan (Shugnan). M. Oshanin followed the last mentioned, but after proceeding 10 miles along the Baland-Kiyik was obliged to turn back for the path proved quite impracticable for laden horses. The Kirghiz usually avoid this *mauvais pas* by first ascending the Kaindi from Altin-mazar, and then crossing the pass of this name into the valley of the Baland-Kiyik where it presents no special difficulties. But this route was not available for M. Oshanin as the Kaindi *col*, at all times covered with perpetual snow, was unusually blocked owing to the heavy snowfall of the preceding exceptionally severe winter. While they were there a Kirghiz arrived who related how he got his horse across by placing felt under its feet and thus kept it above the snow. With their large number of pack animals however M. Oshanin and his party could not attempt such a mode of proceeding. His personal survey therefore of the head-waters of the Muk-su was limited to the course of the Sel-su and the lower part of the Baland-Kiyik valley. Of the other two rivers which form the Muk-su he only saw the mouths. Both the Suak-su and Kaindi flow through defiles from east to west, at their sources rise lofty mountains covered with perpetual snow which are visible from Ters-agar. The Suak-su issues from a glacier; this was evident from the colour of its water and was confirmed by hearsay reports. The river is auriferous, and the Kirghiz have for a long time obtained gold alluvium, but in small quantities. It flows in a very narrow defile,* while the road up the Kaindi is reported to be without any great difficulties.

As above stated, the confluence of these three rivers, the Suak-su, Kaindi, and Sel-su, form the Muk-su. This river from Altin-mazar to

* M. Oshanin heard of a road from the sources of the Suak-su, leading across the Trans-Alai range to Aral-kungoh at the northern end of Tuz-dara defile.

its estuary is only known from report. Centres of population, i. e. wintering places of Kirghiz, are only met with at its mouth, not far from which is a bridge at Liaksh, a wintering resort. The greater part of the Muk-su is said to be very narrow, the road is carried along cornices, and is impracticable for laden horses. Even pedestrians cannot pass it in winter, on account of the snow which fills the defile. According to the Kara-Kirghiz, at one day's march from Altin-mazar there is a waterfall on the Muk-su, six spears' lengths, or from 35 to 40 feet high. Other Kirghiz denied its existence. The estuary of the Muk-su is near Dumbratchi. Here the river flows in several channels, with a rapid stream and with dirty brown water.

Another left affluent of the Surkhab is the Khullias, which in its upper course from its source to Tabi-dara bears the name of Vakhia. The expedition only saw the mouth of this river. Its valley is separated from that of the Surkhab by Peter the Great range, and from that of the Vandj-ab by still loftier mountains. As already stated, the Khullias near its mouth bursts through Peter the Great range, and only that part of its course below the gorge belongs to Karateghin. Its valley is wholly comprised in Darwaz, and therefore will be considered later on in the description of the last-named country.

Karateghin is inhabited by two races, the western part by Tadjiks, the eastern by Kara-Kirghiz, only in its westernmost corner, on the head-waters of the Obi-garm-daria, are the summer pasturages of the Uzbek tribe of Kalluk, who in winter remove to Hissar. The Tadjik territory appears to be gradually extending upwards and infringing upon the Kirghiz camping grounds on the east. Forty years ago the whole Surkhab valley above the Obi-kabud was said to have belonged to Kara-Kirghiz. At the present time the tract between the mouths of the Obi-kabud and Obi-zanku is occupied by Tadjiks, and it is only above the last-named river that encampments of Kara-Kirghiz are continuous.

The Tadjiks, as all over Central Asia, lead a sedentary life. Their villages are numerous, but not large. Many of the hamlets number no more than five houses; Garm, the capital of Karateghin, has only 300 houses. Of towns proper there are none, not even a trading centre or a bazaar. Forts are constructed at Garm, Muju-harf, Obi-garm, Namdonak, and Kalai-liabi-ob. Most of the hamlets are on the central Surkhab, between the estuaries of the Sorbokh and Garm; still denser is the population in the valley of the Obi-yasman. The tributary valleys of the Surkhab are it appears, from hearsay information, thinly populated.

Agriculture is the chief occupation of the Tadjiks. They produce enough corn in Karateghin to supply the Upper Zarafshan and Darwaz. The fields are of two kinds: those which depend on the rainfall for their water supply, and those artificially irrigated. The latter are compara-

tively insignificant, because they require level surfaces on which to admit the water. The soil of the shore beaches, as already remarked, does not usually admit of culture, owing to its nature and the immense quantity of pebbles, which prevent the plough from penetrating. Irrigated land is therefore only seen in small plots, with the exception of the valley of the Obi-yasman, which is irrigated throughout. On the flooded lands are sown common millet (*Panicum miliaceum*), Italian millet (*Setaria italica*), lucerne, flax, tobacco, melons, water-melons, vegetables, such as carrots, onions, beetroot, turnips, and cabbage, in small quantities, besides maize and cotton occasionally. Cotton is very little cultivated, and M. Oshanin only saw two small patches of it near Garm. It is liable to perish, owing to early frosts, without yielding any return.

Near the hamlets all the hill-sides which have any soil at all, and are not too steep, are cultivated. These depend on the rainfall for their supply of moisture. Some of them are at a great height above the valley, and often on such steep gradients as to be approached only with difficulty. Nevertheless the Karateghinians contrive to till them with a plough yoked to a pair of bullocks. They bring their corn home in sledges, a practice common in other mountainous districts of Turkistan, and in the Caucasus, Suanetia being an instance in point. The sledges are short, light, and furnished with a pole, to which they fasten a pair of bullocks in the usual way. The non-irrigated land is for the most part sown with wheat and afterwards with barley. The seed-time is always in spring, never in autumn.

The hamlets are surrounded with gardens, which are of great use to the inhabitants. The most common of the fruit-trees is the mulberry of both kinds, white and black; the fruit dried either in the sun or in ovens is an article of food, and is known as *tut talkan*. It keeps well, and forms an agreeable relish in winter when eaten with bread. Besides mulberry, peaches, apricots, grapes, plums, cherries, apples, pears, quinces, and walnuts are cultivated. Only two kinds of fruit-trees grown in Turkistan are not raised in the Karateghin valleys, viz. figs and pomegranates. All the above-mentioned fruit-trees are cultivated at Kalai-khait, and apricots thrive as high as Zanku. The wild apple is met with at Atchik-alma, not far below Kichik-Karamuk. Besides the cultivated sorts, the people of Karateghin also make use of wild fruits. These are plentiful, especially in Lower Karateghin, below the mouth of the Sorbokh, a kind of plum, yellow and red, about the size of a cherry, being particularly frequent. The Turki name for this is *tag-alincha*, or "mountain cherry." The other wild fruits are nut, apple, haws, barberry, and pistachio (very rare).

Cattle breeding is with the Tadjiks of secondary importance; and what strikes one as strange is the almost total absence of asses, so common among Tadjiks in other parts of Turkistan, in the valley of the Zarafshan for instance, in the district of Khodjend, and in Ferghana.

Oxen are exclusively used for field work. They possess a very peculiar kind of goat, small with very long coarse hair nearly reaching to the ground. They spin the wool of their goats and sheep, and make cloth or stockings of it; their cloth gaiters are a characteristic feature of their costume, and that of the inhabitants of the upper Zarafshan Valley.

Though supplying their wants for the most part with home produce, the Karataghians are not wholly independent of imports. These are cotton and iron. Cotton and the materials into which it is made are brought by itinerant merchants from Ferghana; iron comes from Darwaz. The trade is exclusively one of barter, for money is very scarce, though Bokharian and Kokandian *tengas* of the value of 20 copecks* each are current. The chief exports are corn and furs (martens and fox). Corn is sold by measure. The unit is the *batman*, equal to 15 bowls or 45 *tiubetikus* † filled to the rim. The inconvenience of this standard, which must vary in every case according to the size of the seller's head, must be very great, notwithstanding which it is in universal use in Karataghin. In the summer of 1878 a batman of wheat was worth 10 *tengas*, i. e. 2 roubles (4*s.*), at Garm; but in the winter of 1877-8 it rose to double that price.

Very many Tadjiks of Karataghin hire themselves out for service mostly as *saraimanni*, i. e. labourers about a caravanserai, in which capacity they are met with in all the larger towns of Russian Turkistan and Bokhara. This is in fact their exclusive monopoly, a class of occupation for which their tried honesty and great strength well fits them. They have almost driven all rivals out of this branch of industry. Their attachment to their country is another very marked feature of the Karataghinian character; a man who has put by a little money invariably returns home, laying out the wages he has earned in the purchase of cotton yarn which has always a ready sale in Karataghin.

Eastern Karataghin is inhabited by Kara-Kirghiz of the Kara-tait Tupchak, and Hidirsha tribes. Their winter quarters are in the valley of the Surkhab and on the lower Obi-Zanku, Kichik-Karamuk-su, and Muk-su; their summer pasturages as far as the snow-line on the southern skirts of the Alai and the northern slopes of Peter the Great ranges. Here they lead their usual semi-nomadic life engaged in cattle breeding but also growing a good deal of corn round their winter habitations. Some of them sow as much as twenty batmans and obtain on an average a yield of sixfold. Their system is one of sharing half and half. The rich man supplies his poor neighbour with seed and lends him oxen to plough his land and get in his harvest. He never remains near the cultivated fields for his wealth consists chiefly in cattle, and this obliges

* At the present exchange (1883) a copeck is worth about a farthing of our money. 20 copecks would be therefore 5*d.*

† The skull-caps generally worn by all Mahomedans in Central Asia from Russia to China.

him to seek the higher belts. The grass near the winter quarters is reserved for winter use; to obtain it the beasts must scrape away the snow as they invariably do in all parts of the Kirghiz steppes. Hill-sides swept by the violent winds are best suited for this purpose. Little snow and much wind is the Kirghiz idea of a favourable winter. Neither man nor beast mind the severity of the frost provided the snow is not too thick and the winds strong enough to blow it away; otherwise the animals perish from starvation. One such disastrous season happened in 1877-8, and was felt keenly by the nomads in Karateghin and the Alai. M. Oshanin heard many complaints of that inclement winter and convinced himself they were not exaggerated. It was the same all over Central Asia. Even on the lowlands snow remained a long while unmelted, and in Tashkend sledge-driving lasted a month, with the thermometer as low as -22° R. (-17° Fahr.); the mountains were of course thickly covered, and parts of the valleys to a depth of 14 feet. Then followed severe frosts without wind, instead of the usual violent gales common on the highlands. The cattle sought in vain for food and began to lose strength, their owners tried to stave off the evil time by feeding them on grain reserved for their own use, hay they never store for winter; at last the corn was all gone and starvation stared them in the face. The few who had money bought flour and millet in the Tadjik settlements. But the horses had by this time mostly succumbed; the survivors were so weak from want of food as to be hardly able to move, and the Kirghiz whose habit was to ride no matter how short the journey he had to make, was obliged to set out on foot and walk forty or fifty miles to fetch a sack of flour, weighing about a cwt., and return with it on his back. In the Tadjik settlements corn was dear, the harvest of the preceding year having been a failure, and the reserves had been eaten by the cattle. Prices rose enormously and 20 opecks (5d.) were paid for a *tiubeléka* of millet. The Kirghiz herds, particularly the sheep, died off in large numbers. Individuals who had owned 2000 head were left with fifty in spring, and horses became so scarce that when M. Oshanin visited the country the year after this terrible season a bowl of *kumiss* (mare's milk) was considered a rarity. The camels fared better, and here let us remark that the Karateghin and Alai Kara-Kirghiz are the only people who keep, besides the two-humped camel (*Cam. bactrianus*) the *koshmak*, a cross between the Bactrian species and the one-humped camel. The one-humped camel (*Camelus dromedarius*) is never bred in this highland country. Neither are yaks (*Poepagus grunniens*) domesticated in Karateghin, though met with on the Alai above Katta-Karamuk, and M. Oshanin saw a herd of these animals at Mamai, five miles to the east of Daraut.

In conclusion, a few remarks on the roads. Those in Karateghin, as in all other mountainous districts, are mere tracks, wide enough for pack animals to pass in single file. The chief road lies along the right bank of

the Surkhab, and is open throughout the year, though communications are occasionally interrupted for days together by violent storms. Some of the villages lying in lateral defiles are inaccessible in winter, and their inhabitants remain cut off from the rest of the world. The route taken by Oshanin is not particularly difficult, though steep ascents and descents are frequent, and among its other incidents are hanging cornices, bridges with a lively vibratory movement, &c. The section between the mouth of the Obi-garm-daria and Ali-galiabon is perhaps the worst, for here there are two very sudden ascents, and the track lies along ledges of nearly precipitous rocks a great height above the river; no actual dangers, however, have to be encountered, since it was repaired for the passage of the Bokharian troops, when 500 to 1000 men were reported to have worked at it for ten days. Formerly accidents of a fatal kind were not uncommon. The chief obstacles to communications are the bad fords across the Obi-kabud and Obi-zanku, which in June and July, after a snowy winter, are not altogether safe. The road along the opposite left bank of the Surkhab, judging from hearsay information and the general topography, must be much worse than the one described. Peter the Great range is close to the river, and numerous torrents descend from its snowy summits to join the Surkhab, cutting deep ravines in its steep sides, and afford serious obstacles to the construction of a road.

From the foregoing it should not however be inferred that Karateghin may serve as a convenient route for a strong military force, or even for a large caravan. The difficulty in obtaining forage in sufficient quantity would be great, and grass is not always met with, particularly in Central Karateghin, between the mouths of the Sorbokh and Obi-kabud. Lucerne is sown in sufficient quantities only to supply the wants of the people, and barley mixed with wheat is also sparingly cultivated. Hence, although the nearest road from the Hissar Valley to Kashgar passes through Karateghin, it will hardly be available for large parties if the trade between these places were ever to become of importance, an event, however, not at present to be anticipated. In such case the circuitous route viâ Samarkand, Jizak, Khodjend, Osh, and Terek-davan, will be found superior to the direct Karateghin road. But for small parties of twenty to thirty men with thirty to forty pack animals, the last-named is much preferable and comparatively good.

3. DARWAZ.*

Darwaz was till recently an independent state, ruled by its own Shah, who acknowledged fealty to the Ameer of Bokhara merely by sending annual presents, and these were always reciprocated by the

* M. Oshanin was not himself in Darwaz. The only person to visit it in recent times was Dr. Regel, a translation of whose letters will be found in the 'Proceedings' for July 1882 (vol. iv. No. 7). with a sketch map of the country.

Ameer. In all internal affairs the Shah acted independently. The last Prince of Darwaz was Seradj-eddin-Khan, a relative of Mahommed-sayid, Shah of Karateghin. When the last-named prince was taken prisoner in 1877, and Karateghin finally united with Bokhara, Seradj-eddin proclaimed his independence, and discontinued his customary *tartuk* or presents. Thereupon the Bokharian troops, commanded by Hudai-nazar-datkhā, the new bek of Karateghin, invaded Darwaz in December 1877. The war was apparently not attended by much loss of life, but it lasted till the spring of 1878, the deep snows and severe frosts of that season having caused its duration. Only one serious engagement was reported to have taken place near Kala-Khumb, where the defenders lost 200 of their men, while the Bokharians, according to their own account, had only three men killed. At all events Darwaz was completely defeated. The Shah was taken prisoner, and sent a captive to Bokhara, where he is still under surveillance. Most of his family, including his heir, Mahommed-Afzal-Khan, escaped to the south-east into Shughnan, and thence made their way to Ferghana, where they are now residing. In this way Darwaz became part of the dominions of Muzafar, Ameer of Bokhara, and Hudai-nazar-datkhā was appointed bek. The people of Darwaz, however, were not so easily pacified. At all events in 1878, 5000 Bokharian troops, chiefly taken from Hissar and Karateghin, almost denuding them of their garrisons, were stationed in the conquered country.

Darwaz is the mountainous region occupying the valley of the Pandj from Shughnan to Kulab, and the valleys of two large rivers, the Vandj and the Khullias.* Its population appears to be much scattered, and consists chiefly of Tadjiks, a few nomad Kara-Kirghiz being met with on the Upper Khullias. Comparatively little land is cultivated in the valley of this river; corn is seldom sown, but the crop is chiefly cotton, which they barter in Karateghin for wheat. Their diet is supplemented by the fruit of the mulberry preserved for winter use, and cattle are fed upon its leaves. They keep no silkworms. Besides cotton, their exports are gold and iron. The iron ore is obtained near Fort Vandj, where it is said a whole hill is composed of it.

Darwaz is a most inaccessible country. The only road by which it can be entered by pack trains is that from Garm to Kala-Khumb, and along the valley of the Khullias. The other roads are mere footpaths, only to be travelled by those accustomed to them. Even in Karateghin they spoke of them as "such places as only the people of Darwaz can pass, we cannot." Yet the Karateghinians are by no means contemptible mountaineers. The difficulties chiefly consist in the narrow cañons

* Dr. Regel applies the name "Khullias" to designate a locality, not the river itself. On his sketch map, the names "Vakhia-balk" and "Vaksh" appear for the upper and lower course of this river. As the Surkhab, however, is also known as the Vaksh, it would be convenient and probably correct to retain the name "Khullias."

flanked by lofty precipitous cliffs with a torrent rushing along at their foot. Here there is no ledge or "cornice" to give a footing, recourse must be had to a break-neck arrangement, though the roads are not quite so bad as they are sometimes represented. It was told to M. Oshanin that travellers in Darwaz were swung along in baskets suspended from the face of the cliff, the manner of progress being thus. The traveller got into the first basket, swung himself till he caught hold of the second, entered it, and continued the manœuvre till he had reached the last basket. This seemed on the face of it impossible, for how could baskets be hung from the cliff so far apart as to be beyond arm's length? The explanation, however, was simple, and threw an entirely different light on these marvellous contrivances. They were merely a variety of the so-called "balconies" to which allusion has already been made. Instead of being constructed in the ordinary manner, the horizontal timbers let into the rock (usually light) were connected by trestle-work, and their outer ends fastened with ropes to projecting rocks and trees. Some of these balconies are long, and oscillate under the feet of the passer-by. This, then, is the explanation of the story of swinging baskets.

Some of them are boarded over, but in any case they will only bear the weight of a man, and owing to their being seldom repaired, accidents to travellers are not unfrequent. Darwaz has no towns, not even a bazaar or market-place, but merely a few forts, the chief of which are Kala-Khumb, Kala-Vandj, Childara, and Tabi-dara.

Kala-Khumb stands on the right bank of the Pandj, and was always considered the capital of Darwaz and the seat of its Shah. Now, since the union of Darwaz with Bokhara, it has become the administrative centre and the residence of the bek. Its citadel has the reputation of great strength, and is larger and better than Garm. It stands at the confluence of the Pandj and Khumbou, where the former of these rivers flows in a single channel, and may be crossed in autumn and winter in boats. Kala-Khumb means "fortress of the pitcher," a name said to be derived from a rock having the form of a pitcher near the source of the Khumbou. This rock, after which the river is also named, was destroyed by Bokharian soldiers during the late war.

From Kala-Khumb roads lead both up and down the Pandj, equally bad in either direction. The first upper road follows the right bank to Djumardj at the mouth of the Vandj. Djumardj is a fort demolished by the Bokharians. Ten miles farther the valley of the Pandj becomes very narrow, and is known under the name of Yaz-ghulan. Here lies the way into Shugnan, only practicable for foot passengers, though about 100 houses are scattered along it.

From Djumardj another track leads up the Vandj to the fort of this name, five miles up the river. Above Vandj there are but few inhabitants. As already stated, from the sources of the Vandj to the Muk-su there is a pass, Kashal-ayak, if a mere opening in rocks can be called a

pass, for it seems that ordinary mortals will not attempt it: none but experienced mountaineers venture that way. Another pass, Sargi, leads from the Vandj to the valley of the Khullias, and there are probably communications from the Vandj to the Lower Murghab or Aksu valley in Northern Shughnan or Roshan. None of his informants, however, could tell M. Oshavin anything about it. Most of the evidence obtainable related to the road from Karateghin to Darwaz, which shall now be described.

In proceeding from Garm to Kala-Khumb it is necessary to keep along the right bank of the Surkhab to the hamlet of Saripul, where the river is crossed by a bridge. On the other side the road bifurcates, the two branches reuniting at Fort Childara in Darwaz. One of these tracks leads over the Kamchirak Pass, which has already been described.* This is the best of the two routes, and is reckoned to be half a day's journey, or about 20 miles, the summit of the pass being about half way. From the pass the Shak-ob rivulet is followed to Childara, situated on the right bank of the Khullias, near the mouth of the Shak-ob. The traveller who has crossed Peter the Great range by the Kamchirak Pass will find forests all the way to Childara, but he can only come this way in summer, in winter another route has to be taken.

The second winter road leads from Saripul down the left bank of the Surkhab to the mouth of the Khullias, and passes to the other side of Peter the Great range by the gorge of this river. Here there is a very narrow place, which may however be avoided by making a circuit and crossing the low Yafitch Pass, which takes its name from the Karateghin hamlet on its summit. After leaving the gorge the traveller finds himself in Darwaz, which includes the remainder of the valley of the Khullias. This river is only fordable in autumn and winter: it has therefore a bridge below Childara, near the hamlet of Pashal. The whole distance by the route we have just given, from Garm to Childara, is about 10 miles, divisible as follows:—

Garm to Saripul	4 miles.
To Mouth of the Khullias	20 "
.. Yafitch	5 1/2 "
.. Childara	10 1/2 "
	10 miles.

At Childara the summer and winter roads meet. From the winter road follows the right bank of the Khullias through a narrow and inhabited valley. At Fort Tabi-dara on the left bank, about 10 miles from Childara, there is a bridge across the river. The traveller going to Sagri-dasht leaves the river, and, ascending the mountain, takes the defile of the Sa...

above Tabi-dara, and which is preferred only in winter when the other track becomes impassable. Zakh-bursi has about the same elevation as Kamchirak: its ascent is steep and stony, but the descent is easier. From Tabi-dara to Sagri-dasht the distances are, by the summer road 15 miles, by the winter 18.

Having left Sagri-dasht behind him, the traveller has another range—the Darwaz—to cross, and here he will pass from the basin of the Surkhab to that of the Pandj, a transition which is effected by traversing the Hobu-rabat Pass, somewhat lower, but steeper and more stony than the last. On its southern slope, astride of the Khumbou river, are the two hamlets of Hobu and Rabat facing each other. These hamlets are 16 miles from Sagri-dasht and the same distance from Kala-Khumb. The last part of the road along the valley of the Khumbou is by far the worst. Here the traveller has to make his way as he best can along narrow ledges, first on one side of the river, then on the other, crossing and recrossing by 15 bridges. Along wider parts of the defile there are a few scattered hamlets.

The shortest summer route from Garm to Kala-Khumb has therefore a length of 78 miles, divided in the following sections:—

Garm to summit of Kamchirak Pass	10 miles.
To Childara	9½ "
„ Tabi-dara	16 "
„ Sagri-dasht	10½ "
„ Hobu hamlet	16 "
„ Kala-Khumb	16 "
	—
	78 miles.
	—

These distances are of course merely approximate. The unit everywhere in Central Asia is the tash, a quantity varying in the different localities, but generally considered to be equal to 12,000 paces, eight versts, or rather over five miles. No attempt has been made to calculate distances in Darwaz with anything approaching to accuracy, for here, as in the more civilised parts of Central Asia, the length of road is roughly estimated by the time it takes to travel it. It is obvious, therefore, a wide margin should be allowed for possible errors.

A few words in conclusion on the valley of the Khullias above Tabi-dara, where this river is known as the Vakhia-balk. The valley continues the same as before, i.e. is well peopled and cultivated. Three tash or 16 miles beyond Tabi-dara is Fort Ishtiun on the Vakhia. Hence there is a direct road into Karateghin by Kalai-liabi-ob and Kalai-khait, crossing the Liuli-harvi Pass. From Ishtiun to Kalai-khait is reckoned to be half a day's march. There are settlements in the Khullias (Vakhia) valley for some distance above Ishtiun, and it is only in quite the highest parts, whence Karateghin may be reached by the Gardani-Kaftar Pass, that encampments of Kara-Kirghiz are met with. This long Khullias

valley, then, is bounded on the north by Peter the Great range, while on the south rises a still higher chain, which M. Oshanin has named the Darwaz range.

4. THE ZARAFSHAN GLACIER.

*M. Mushketof's Exploration.**

M. MUSHKETOF'S narrative of his ascent of the Zarafshan glacier appeared in the *Ivestiya*, 1881, No. 2, but has not been translated.† The month of August (1880) was chosen because the rivers are then at their lowest, and the snow line at its maximum height. Fine weather may then be generally depended upon, an important consideration in such an enterprise, which necessitates walking for ten days over ice and snow, the estimated distance being 33 miles. Meteorological observations were undertaken by M. Ivanof, and a topographer of the name of Petrof kept the route survey and took sketches of the scenery. The party were further provided with a dragoman or interpreter by General Ivanof, commanding the Zarafshan district, and an escort of seventeen Cossacks, with two native guides or jigits. By August the necessary instruments and implements were ready, and on the 6th the expedition started—a caravan of forty horses—from Ura-tiube.

They first went south, crossing the Turkistan range by the Aúchi Pass, the summit of which they found to be 11,800 feet above sea-level. From this point they could see the Hissar range, which even at that distance appeared much higher than the one they were on, and was covered by greater masses of snow and ice. The Upper Zarafshan or Matcha valley appeared as a chasm or rift between the ranges, and seemed incapable of sheltering a whole tribe of people. Oburdan was reached at 9 P.M. the following night, the effect of moonlight on the weird outlines of the mountains being very remarkable. The Upper Zarafshan is one of those characteristic longitudinal valleys, the sides of which are composed of uniform clays and schists, sandstone and hornblende, the bed of the river being filled with alluvium of sand, loess, and conglomerate. As far as the village of Postigau chalk is met with. Wherever the schistose strata are synclinal, the valley is somewhat wider and the sedimentary deposits more marked. It is in these spots that the natives have erected their miserable dwelling-places, harmonising in their wretchedness with the stern aspect of the mountains. It took five days to travel about 100 miles from Oburdan to the glacier, such are the difficulties of the path which often overhangs the frothy waters of the Matcha.

The valley of the Zarafshan, says M. Mushketof, with those of its affluents, especially the Anzob and Yagnaub, has for a long while served

* This section of Mr. Morgan's Memoir was read as a paper at the Evening Meeting, March 12th, 1883.

† A brief notice of it appears in the 'Proceedings,' vol. ii. p. 765.

as a place of refuge for all the discontented spirits in the neighbouring khanats. It was the resort of such characters who laid the foundations of those independent communities which are now included in the highland districts. But isolated as were these mountain communes, the wild and barren nature of the country could not satisfy their daily wants, and this as well as perhaps other causes compelled them to hold intercourse with the lowlanders, and brought them into connection with the blood-stained annals of Bokharian history. They often suffered from the tyranny of some Khan, and occasionally threw off the hateful yoke. Their own form of government, however, was not distinguished for its humanity, and the sanguinary administration of their kazis is to this day remembered with horror by the inhabitants. It was only with the advent of the Russians that they knew a more tranquil existence. In fact, the history of the highland *tiumens* is anything but attractive, although one cannot help admiring the staunchness displayed by the people in preserving to the present time their old customs and habits. The inhabitants of the Upper Zarafshan are typical Tadjiks known under the general name of *Galcha*. They have led so secluded a life that to this day they speak their old language, and are so proud of it as to consider it unnecessary to associate with the Uzbeks, and have held aloof from their kinsmen for ten centuries, a phenomenon only to be explained by the influence of mountains in preserving the original character of their inhabitants. Like the neighbouring Uzbeks, too, the Tadjiks have occupied every available plot of ground, turned every slope of the valley to account, only to keep starvation from their doors, and wrest with extraordinary labour a bare sufficiency from ungenerous nature.

A comparison of the settlements of the lowlanders with those of the highland districts brings forward a very striking feature. All the towns and villages of the neighbouring plains of Turkistan are built of loess or clay, and stand on clay. Throughout the East, from China to Turkistan, this greyish-yellow, sandy, siliceous clay takes a prominent part in the well-being of the natives; this, the "black earth" of the East, is as important as water: no wonder the Sarts should say "where there are *turpak* and *su*—clay and water—there will you find the Sart." But ascending to the mountains the quantity of clay diminishes, conglomerate takes its place, and with this change the settlements are less numerous and the people poorer. Absolute elevation has, of course, something to do with this, but clay is the principal factor. Oburdan, the first of the highland settlements, as far as climate is concerned, is admirably situated, but in culture is far inferior to the villages lower down the valley. There is still, however, enough clay here to make huts; there are gardens, and small plantations of poplars whose pyramidal shapes accord well with the pointed peaks of the mountains. Above Oburdan, ascending towards the glacier, vegetation and fields

become scarcer, and at Paldorak there is no longer a single garden or plantation seen; instead of clay the houses are all of stone; low, four-cornered buildings of boulders, put together often without cement, hovels rather than houses; irregular groups of them without streets, merely connected by paths, constitute the village. These huts are often placed so near cliffs that it is only on close inspection they can be distinguished from the surrounding masses of rock.

At Vadif and Dihauz vegetation is still scantier; there are no trees, only a few stunted bushes of juniper and willow. The cultivated ground is only recognisable by the green blades of grass springing up between the stones, though carefully fenced round with the same boulders and irrigated. Yet these cultivated patches, often situated on fearfully steep and lofty slopes, difficult of access, and affording a precarious foothold when reached, are all the natives have to depend upon for subsistence. They contrive to till them, ploughing their land and harvesting their crops. Of domestic animals they have but few; donkeys, sheep, and an occasional cow are all they possess; there are no horses or camels; indeed, there is nothing for them to eat. Even dogs are very scarce, and the ten required by Mushketof's party to take with them up the glacier were with difficulty procured, thanks to the exertions of Akimbétief. Fowls too were hard to find, but this was exceptional, and was due to an indiscriminate slaughter of poultry that year, preached by a hadji from Mecca who said that fowls would be the ruin of the Tadjiks; therefore they sought to secure themselves from danger, and not only the people of Matcha, but Kokandians, Syr Darrians, and others.

The natives of Matcha perform all their journeys on foot, and only use donkeys as beasts of burden. When Mushketof appeared with his caravan of forty horses, doubts were expressed as to the possibility of feeding so many, "and it must be confessed," says M. Mushketof, "we ate up half their year's supplies, our silver kokans being much preferred to their stores." All the natives are excellent pedestrians, as will be readily understood. At Oburdan Mushketof came across a remarkable one, Abdu Samat by name, who in a day and a quarter walked 66 miles, over difficult mountain paths with fearfully steep ascents and descents. But his exploits appeared nothing remarkable when compared with those of the inhabitants of Paldorak, Vadif, Sabak, and other villages. An old man, a native of Sabak, crossed the difficult Yanghi-Sabak Pass in one day. Akimbétief said that the Matcha people traversed the Rama glacier, a distance of 32 miles, in fifteen hours. Grave but good-natured faces, with shaven Mussulman heads and black, bushy beards, broad shoulders, high chests, and thin wiry legs, these are the characteristics of the Matchinians. "Their joyless lives, their stone villages, all remind us," says M. Mushketof, "of prehistoric man of the stone age; just as sandy clay takes the first place in man's life in the lowlands, so here at

the glacier do stones, boulders, and shingle. Of stone is his house, on stone his land, stone are his implements, handiwork, and defences. In the course of all my travels in Central Asia this was the first time I saw undressed stone put to so general, so rude, and in its way so original a use. The nearer the glacier, the more striking the peculiarities of this distant relative of the men of the stone age, living among almost bare rocks and within sight of the glacier."

Thirty miles before reaching the glacier, the first ancient terminal moraine was met, closing the valley as with a wide rampart; from it three rows of lateral moraines led upward, much disturbed by the action of water, nevertheless preserving their form. Enormous masses of granite, syenite gabbro, and other of the higher formations, had been carried hither long ago and deposited on slopes of schist. Many of the boulders are 30 to 40 feet in diameter and 500 tons weight. These unmistakable moraines afford positive proof that the Zarafshan glacier formerly descended much lower and was at least 30 miles longer than at present. The erratic blocks extend uninterruptedly to the glacier, where they are connected with recent terminal moraines. Misled by this connection and the partial destruction by water action of the ancient moraines near the glacier where the three large streams, the Yarkitch, Rama, and Zarafshan unite, the Iskander-kul Expedition fell into the grave error of denying the existence of these moraines, though any careful observer would find too many proofs to be overlooked of their continuance for upwards of 30 miles; for instance, they are particularly conspicuous near Diaminor, Paldorak, at every step near Langlif, Vadif, Dihissar, Dihauz, and other places, so that M. Mushketof was at a loss to explain the extraordinary mistake of his predecessors.

The old moraines, however, far away from the present end of the glacier, differ but little in elevation above the sea level from those in course of formation. Thus the lower end of the glacier is 9000 feet high, Paldorak is only 8000 feet, but the boulder drift occurring on slopes 700 to 800 feet above the bed of the valley, the maximum difference in height is not much over 200 feet.

About four miles before the glacier is reached, the valley widens a little, and at the same time is enlivened by small bushes and patches of grass. From this point the aspect of the glacier is peculiar. In the midst of lofty steep slopes with sharp schistose peaks lies a yellowish-grey mass, filling the whole valley, putting an end to the boisterous torrent of the Zarafshan, and looking very unlike ice. The impression produced by it is novel, but the nearer the glacier the more imposing its appearance. After crossing the enormous moraines of a lateral glacier descending from the Hissar range and called Navishur, the ends of several others are at once seen. Near them M. Mushketof halted to prepare for the ascent. On the left was the great Rama glacier, on the right the Yarkitch, and straight in front the wide, principal Zarafshan

glacier, the goal of their wanderings. It was a marvellous sight; from every side, from deep gloomy ravines advanced the quiet masses of ice bearing enormous moraines and finally discharging streams almost black in colour, bearing away boulders and lumps of clear ice. The stern, lifeless region of ice contrasted wonderfully with the bushes of willow and juniper in the midst of which they were encamped. The first thing noticed on approaching the principal glacier was the vast accumulation of the terminal moraine through which the Zarafshan has cut a channel. Its banks, one-third of a mile higher, terminate in an ice arch underneath which the river rushes forth. The rapid melting combined with the erosive action of the stream causes frequent falls of the arch with its superincumbent masses of stone, breaking from time to time the pervading silence. The ice sections exposed by these falls show admirably the irregular stratification of the ice, depending on the greater or less pressure to which it has been subjected. The Yarkitch glacier still joins the principal one, but the Rama glacier is disunited, both having receded, though the moraines clearly show that they have not long been separated. The Rama glacier is frequently traversed by natives on their way to Ferghana by the sources of the Isfara and the Shurofski glacier.

All unnecessary impedimenta were left behind on arriving at the foot of the glacier, and nothing but the indispensable taken, for from this point the caravan had to be sent back, and the ascent commenced on foot. All this would have been soon arranged had not the porters protested. It seemed to M. Mushketof surprising that such excellent, untiring pedestrians as these natives, should have on no account consented to accompany them merely because the Zarafshan glacier was difficult to walk over, that none of them had ever crossed it or knew the road. Their fears arose chiefly from some fable of stone pillars at the summit, an extensive snow-field where it was easy to lose one's way, and lastly, Kara-Kirghiz on the other side who would infallibly kill them. Presents however, in the shape of boots, halats, *chekmeni*, and fur coats soon produced the desired effect, and a plentiful meal of mutton quite pacified them. But though they agreed to go with M. Mushketof, they refused to carry the things, i. e. do that for which they were engaged. Akimbétief wasted much eloquence and cunning before he could persuade them into believing that the loads were mostly rusks, i. e. food for themselves, and that besides rusks and presents they would receive daily payment. From this place M. Mushketof despatched his first telegram to Tashkend, to the Ethnographical and Anthropological Society, and did this every day he was on the glacier.

At last, having come to an agreement with the porters, twenty of whom were taken, and selected five Cossacks and the two jigits, they started on the 13th August, a party of thirty men armed with long pikes and laden with packs to ascend the glacier. They proceeded by

its left side along a moraine which filled the space between the side of the glacier and the contiguous slope. This commencement was difficult enough, and the men halted very frequently, out of breath with the weight of their packs, the heat, and the exertion of springing from stone to stone over enormous pointed blocks of granite. The first day M. Mushketof and his friends exchanged their European boots for native leather stockings without heels, which gave greater security and ease to the feet. After about a mile they could measure the thickness of the ice, finding it to be 250 feet, or exactly the same as its thickness at the vault over the Zarafshan. The slopes still exhibited occasional green patches of grass, but the surface of the glacier was a complete waste of rocks. Not a trace of ice or snow could be seen; the whole was covered with a drift proceeding from the medial moraine formed by the union with the Zarafshan of its tributary instreams. Heaps of stones were piled in rows of cones more or less regular in form. These combined with its dreary aspect, the high temperature (25° Celsius), and the monotony of the scenery, produced an impression similar to that of the Kizil-kum, the only difference being that instead of sand dunes there were hillocks of stone. It was difficult for the travellers to realise that they were marching over a glacier, particularly as the first day they ran short of water. Farther on it was obtained in hollows between distinct cones, but this was almost too impure to use. Besides the difficult ascent, the first day was full of troubles; the goats and dogs had to be trained to work, the loads equally distributed, &c. All this occasioned some amusement, particularly when the Matchinians began boxing the goats' ears as a punishment. By sunset that evening the expedition had only advanced three miles, when finding a pool of cleaner water they halted for the night opposite the large lateral glacier of Farakhnau and its *vis-à-vis* Porak, uniting almost at right angles with the principal glacier. Though their position under the open sky on sharp-pointed shingle was not an enviable one, the more so as a cool wind began to blow after sunset and the thermometer fell below zero, their supply of wood enabled them to make fire sufficient to warm themselves and cook their food, which pacified the Matchinians, who had begun demanding their day's pay, and frankly announced their intention of deserting at night. Of course their demands were refused, but a few kokans and a supper off goat's flesh restored good relations with them.

The next day progress was more satisfactory, the moraines were less numerous and composed of different rocks. The granites were now nearer the right or the Turkistan side,* whilst on the left or Hissar side schistose drift was brought down in large quantities by two new glaciers, Nazar-ailak. It was much easier walking over the schistose moraines where there were none of the large boulders and more of the pebbles, and progress was proportionately more rapid the second day,

* That is to say to the right of the glacier, but to M. Mushketof's left.

when six miles were accomplished, a result partly due to the greater tractability of the dogs and goats, partly owing to fatigue and partly hunger, particularly the goats, for the dogs had still bones to gnaw. And the second day the excellent qualities of the porters began to show themselves, especially their elder the Akhund, whose instinct in picking his way between fissures, deep, wide, and difficult to distinguish amidst the conical heaps of stones, was extraordinary.

The second day also level patches of snow began to make their appearance, with small crevasses, especially on the left side where a huge glacier (named by M. Mushketof "the Akhund," in honour of the chief porter), falling abruptly from the Hissar range, joins the main stream. This day's march was also marked by the occurrence of several lateral glaciers, viz. Nazar-ailak, first and second, the enormous Akhund, and others smaller. The Akhund descends at an angle of 30° from a vast amphitheatre lying almost on the crest of the Hissar range between lofty peaks. Its surface is seamed by a tangle of fissures. Lower, the fissures are more regular, and at its junction with the chief glacier radiate from common centres; lower still the surface is covered with dirt-bands. All the glaciers of the Hissar range are remarkable for their abrupt fall, their network of fissures, their comparative shortness, and their small slaty débris, whereas on the right side the glaciers descending from the Turkistan range, such as Farakhnan, Tolstof, and Skatchkof (the two last were named after two Ural Cossacks who accompanied the expedition and were nearly lost) lie in deep ravines with steep sides, are long, gradual, and have granite moraines. These glaciers unite with those of the Isfara, are of older formation and have worn beds for themselves, whilst the Hissar glaciers are more recent and have only begun to scoop out their channels. In fact the lateral glaciers on the right and left are altogether distinct except in one feature common to all, viz. their direction lying nearly at right angles with that of the principal glacier; affording an explanation of the strong lateral pressure to which the great central mass is subjected, as evidenced by the appearance of the ice, the direction of the crevasses, and the confusion of the medial moraines. The temperature during daytime rose to 30° Celsius, and even to 40° Cels. at noon, but at night fell to -4° – 6° Cels., and this with a strong wind made their encampment on the ice opposite Tolstof glacier, at a height of 11,000 feet, disagreeable.

The third day was the most difficult and dangerous for them. They now walked over pure snow in the region of *névé*, met with several more lateral glaciers, Biely, Miramin, and so forth, and approached the amphitheatre and the pass beyond it across the Alai range, the whole of which was covered with a continuation of the same *névé*. Crevasses were frequent, but as there had been no fresh falls of snow they were open, and the treacherous ground could be seen and avoided; it was not even necessary to loose the dogs. The wide crevasses were circum-

vented, the narrower jumped with the help of the long pikes, which were now only appreciated by the people who took them so unwillingly at first. There are on the surface of the ice an immense number of narrow but deep cylindrical holes. At the bottom of these there is always a small quantity of mud from the glacier mixed with water; these are little glacier tumblers. Millions of streamlets course over the surface, uniting frequently to form rivulets with cascades. These form fissures quite distinct from the crevasses. Under nearly every stone were found heaps of small ugly insects, *Desoria glacialis*,* apparently the only living denizens of the dead region of ice and snow. The remarkable stillness was broken but at rare intervals by avalanches, which resounded in the mountains with a muffled roar. From the right lateral glacier of Miramin the slates and granites of the Turkistan range are replaced by medium grained gabbro, and of this are composed all the prominent peaks on the right side, reaching a height of 17,000 to 18,000 feet, as for instance Obrif (Precipice) Mountain. On the left side at Biely (White) glacier the granites stand forth, at first in small outcrops, but soon afterwards as the predominant rocks, composing all the peaks of the left side, and uniting at the pass with gabbro. They also rise in enormous sharply-pointed pinnacles, Igol (Needle) Mountain being conspicuous among them.

As the rocks change so does the glacier in some degree. Opposite the opening of the Miramin glacier it widens, instead of one mile it measures two, across; its surface is comparatively smooth and even; there are no wide crevasses, only numerous and beautiful glacier tables, and its direction becomes from this point more north-east; lastly, the results of its movement are more evident here than anywhere else. From Precipice Mountain to the pass itself, those characteristic *roches moutonnées*, glacial scorings, furrows, troughs, &c., are met with, all of them much better preserved on the granites and gabbro than on the friable schists.

Beyond the strait formed by Precipice Mountain on the one side and Biely on the other, there are hardly any moraines, and the glacier becomes a wide field of névé. Owing to its apparently boundless expanse on the east and south, the vast amphitheatre, the inexhaustible store-

* Also noticed by Fedchenko on the Shurofaki glacier. He says, "In order to see the colour and structure of the ice, I raised a few stones scattered over its surface, and was astonished at the moving black mass under each stone; they proved to be small black glacier fleas, and I at once recognised them as such. I knew that these insects are met with in the glaciers of the Alps, and therefore was interested to find them in Central Asia, the species found by me having been subsequently ascertained to be identical with *Desoria glacialis* or *scandens* Ag. They were of every size underneath the stones, and it is therefore highly improbable that they come to the glacier from the surrounding mountains. Doubtless they are brought into existence on the glacier and pass their whole lives here. I found them at a height of 12,100 feet."—*Puteshestviya v. Turkestan*, tom. I., chart ii., p. 84.

house of the glacier, appears exceedingly grand; the névé covers both the Alai and Hissar ranges, and it is only on the north-west that it is fenced in by the vertical jagged ridges of gabbro which divide it from the glaciers of the Isfara. Looking upon the enormous supply of snow in this amphitheatre, the size of the Zarafshan is at once accounted for. This and the numerous tributary glaciers, the Porak, the Akhund, the Farakhnan, the Miramin, the Skatchkof, the Tolstof, and others, when considered in conjunction with the small width (one mile) of the chief trunk, explain the comparatively low level reached by the foot of the glacier and its descent far below the upper limit of vegetation. The numerous tributaries too produce frequent irregularities in the direction of the cracks, and are the immediate cause of the peculiar, desert-like aspect of the lower part of the main glacier, already commented upon. For upon closer inspection it appeared that each of the branches bore at least five rows of moraines in a channel not more than one-third of a mile across; so that reckoning the minimum number of rows and the chief branches only, upwards of thirty lines of moraines would be discharged into the main trunk, and would there become so confused and intermingled as not only to cover the whole surface of the ice, but pile up entire hills of débris.

M. Mushketof reached the névé at a height of about 13,000 feet; the pass was not far distant but the efforts necessary to reach it were great. The soft wet snow, and the exertion of leaping across crevasses at such a great elevation, retarded their progress and increased their difficulties. Their worst sufferings were occasioned by difficulty in breathing and pain in the knee-joints, producing a feeling which may be compared to that of having iron weights attached to the legs. Though the ascent to the pass was not steeper than 20° it appeared more like 50° , such were the conditions, and though repeatedly measured it was impossible to realise that it was only 20° . But when all difficulties had been overcome and they stood on the summit a marvellous picture was displayed before their eyes—a scene as grand as it was beautiful and diversified. In the foreground lay the boundless snowfield, glistening under a clear sky and southern sun with blinding brilliancy. In the sea of snow here and there rose jagged ridges, grandly towering peaks and bold cliffs, drawn with remarkable sharpness of outline on the white background. Far away on the west could be seen a labyrinth of mountains with fantastic crests, alternating with glittering belts of glaciers, and gradually dissolving in the distance, veiled in that transparent haze so characteristic of the whole of Central Asia.* The farthest peaks

* The phenomenon here alluded to is common both in the Tian Shan and Himalayas. It is produced by the wind blowing across the heated plains and raising great quantities of fine dust. Its effect on the tops of glaciers, says General Strachey, at an elevation of 10,000 or 11,000 feet is to obscure the view, though not quite so bad as a London fog. Kostenko observed the same phenomenon in Kokand and on the Pamir.—See R.G.S. Proceedings, O.S., vol. xxi. pp. 131, 139.

appeared suspended baseless in the air. From the huge upper snow-field the main Zarafshan glacier unrolled itself by degrees, harsh-featured and lifeless, yet majestic in its tranquillity. It was like a massive trunk spreading out its branches on either side; on the right, long and deep in gloomy defiles; on the left, steep, dazzling, and uneven, like frozen waterfalls.

But this does not exhaust the picture. On the east from the valley of the Zardalya rose a similar panorama of mountains even grander and more diversified; rays of glaciers descended abruptly into the dark abyss of the Zardalya defile, their surface scarred by huge ice-falls.

Up to this time the ascent, though full of difficulties, had not been so dangerous as the descent into the Zardalya afterwards proved. The glacier on the other side is no longer a wide level field, but falls in steep ledges. The first, about 150 feet high, is still within the névé region and terminates in a snowy expanse; here the descent was by a rapid glissade. The second, nearly 300 feet, is of frozen snow and ice, and abuts on a fearful ice-fall, seamed with deep, gaping fissures; to keep one's footing on a slippery incline of 40° or 50° , or to slide down it, were alike impossible without falling into a crevasse. Only one course was open—to fasten an anchor, attach ropes to it and holding by these to cut steps. This was done, but the work was tedious; day ended, cold had begun, all were wearied, more crevasses lay before them. After several hours' exertion, however, they succeeded in descending and lowering the loads, but not without accidents, though happily not of a dangerous kind. Two Cossacks only, Skatchkof and Tolstof, slipped on the incline, and would have infallibly perished had they not by some lucky chance stopped their headlong flight on the very brink of the crevasse, escaping with bruises and contusions. The third ledge was comparatively easy, but after it was passed there was another ice-fall and endless fissures to be crossed. Darkness had set in; to proceed farther or encamp was equally impossible; it was difficult even to find a level space a few yards square; there was no time for consideration, and they decided to lie down where night had overtaken them, especially as the topographer had fallen ill and could go no further. As misfortune would have it, the worn out Matchinians raised a protest. Naturally they were dissatisfied with the prospect of passing a night on bare ice with 4° of frost. Throwing down their burdens they departed, and though next to certain that they could not go far in the darkness, nevertheless their behaviour made an extremely unpleasant impression, heightened as it was by hunger, cold, and weariness. Meanwhile, M. Mushketof and his party hacked their sledges to pieces, broke off the handles of their instruments, in fact used all the wood they could get, to make a fire and cook their food in order to refresh themselves a little. These preparations soon attracted the mutineers, and after a distribution of rations peace was restored. There was no fear of an open attack, for

these people are timid and have too much respect for Russian strength to venture upon such a course. The third day's march was nine miles, a great distance under the above-mentioned circumstances. The fourth and last day, with great exertion, a descent from the glacier was effected, its length on this side proving to be only four miles.

The Zardalya glacier descends very abruptly in a deep granite ravine, and consists of three principal branches which very recently formed one, but at present a right branch has retreated so as to detach itself, and form a distinct glacier; the left arm is still united with the centre. The left glacier apparently crosses a granite spur and unites with the Isfara glaciers, the right and centre unite with the Zarafshan. Owing to the absence of a wide amphitheatre and the steepness of the narrow defile, i. e. purely topographical conditions, the Zardalya glacier does not reach nearly so low a level as does the Zarafshan, for while the lower end of the Zardal is 11,600 feet, that of the Zarafshan is 9000 feet, or 2600 feet lower. A comparison between these two glaciers, in like manner as did that between the lateral branches on either side of the Zarafshan, shows very plainly the influence of topographical conditions on their size, a phenomenon by no means new, for it has already been observed in the Alps, but illustrated here in the clearest and most convincing way. All the glaciers indeed of the region described are in precisely similar conditions as regards temperature, aerial deposits, wind, &c.; their difference wholly consists in the form of their amphitheatres and valleys, and yet this apparently immaterial difference affects their relative size in such an extraordinary degree, as shown by the Zarafshan and Zardalya glaciers, as well as by those of Rama, Farakhnau, Tolstof and Yarkitch, Porak, Akhund, and others. The same topographical influences may also explain some oscillations in the height of the lower ends of the glaciers, which of course vary with the configuration of mountains and valleys, and these are in their turn affected by waste and denudation of rocks. . . .

Thus the entire length of the Zarafshan-Zardalya glaciers is about 20 miles. From the lower end of the Zardalya extend vast accumulations of débris lying in three principal rows continuously to a height of 10,000 feet, i. e. nearly to the mouth of the Utren, and on the lower course of that river is a whole system of comparatively small glaciers also visibly receding. After four days on the glacier they were glad to meet with even the filthy encampments of the Kara-Kirghiz, who were not a little astonished and alarmed at their appearance from the Matcha Pass, not believing it possible for any one to cross from the Matcha side or Upper Zarafshan, particularly peaceful individuals, and convinced that none but robbers intent on plundering and securing rich booty would have attempted to descend this almost impracticable pass. Soon, however, their fears were allayed by the slaughter of three sheep, and the travellers forgot their fatigues. The 17th August, the day after

this improvised feast, M. Mushketof bade adieu to the kindhearted Matchinians, who did not hesitate to return the way they had come, preferring its difficulties to the encounter with Kara-Kirghiz, whom they dread as merciless robbers.

M. Mushketof had still a few versts farther to proceed on foot along the Zardalya valley before meeting, near the mouth of the Tarak, the saddle-horses sent for his party. With these they continued their journey. The deep valley of the Zardalya is at first composed of granite and gneiss, lower down of schists and mountain limestones, and lower still, near the confluence of the Zardalya with the Sokh, of sandstones and schists of the York series. On the slopes of this deep valley several other glaciers could be traced: the Kalta-kain, Kashka-su, &c. All are rapidly retreating, and their old moraines are much lower than the modern. The lower end of the Kalta-kain glacier almost reaches the foot of the valley; its former activity was apparent in the huge moraine which blocks the whole width of the valley like a dam. Here the valley narrows, and the river Zardalya, hitherto flowing a tranquil current, divided into many arms, collects into one mighty stream and bursts through the moraine near the left side, forming the picturesque and powerful waterfall of Kalta-kain. The mass of water as it dashes down from ledge to ledge is broken into the finest spray, and for about two miles presents the appearance of the curly fleece of an arkari or wild mountain sheep, a feature suggestive of the well-known Imatra fall in Finland. The fall, about 800 feet in a little over three miles, is unusually fine, and may be reckoned almost unique in the Tian Shan, where these phenomena are generally scarce. The topographical conditions of the valley of the Zardalya at Kalta-kain and of the moraine where the river forces its passage, led to the conclusion that the waterfall is caused by the glacier in the vicinity and the altered rocks in this part of the valley, that is to say, the replacement of the gneiss by the more friable slates.

The village of Sokh was only reached by the party on the 20th August (1st September), after they had accomplished 4500 feet of descent. Here their caravan, which had crossed the difficult Yanghi-Sabak Pass, met them. Then came a period of sickness, each of them taking it in turns to suffer either from slight inflammation of the eyes or fever.

Summarising the scientific results of his expedition, M. Mushketof says:

1. The Zarafshan glacier may be traversed though with difficulty. Its length to the pass is 16 miles. The lower end is 9000 feet, the upper 14,000 feet high.

2. It unites with the glaciers of the Zardalya, and their combined length is 20 miles; it therefore belongs to the class of glaciers characteristic of the Alai.

3. Fedchenko supposed that the névés of the Isfara and Zarafshan

glaciers were united. This does not prove to be the case; they are only connected by branches, and their principal stems are distinct.

4. The great Zarafshan trunk glacier issues from an extensive *Firn* or *névé*, large enough by itself to account for the size of this glacier, which is still further increased by numerous lateral tributaries descending from the Turkistan and Hissar ranges, and adding largely to the accumulations of moraine drift with which the lower half of the glacier is entirely covered.

5. The right and left tributaries are as distinct in character as the glaciers of the Zarafshan and Zardalya. This distinction, other conditions being precisely similar, depends exclusively on the topographical character of their amphitheatres, and the diversity of structure of the Turkistan and Hissar ranges.

6. All the glaciers of the Zarafshan, as well as those of the Zardalya and Sokh, exhibit the same phenomenon of retrogression observed in other glaciers of the Tian Shan and Pamir, as evidenced by their enormous terminal moraines and local traditions. In the recent past the Zarafshan glacier was incomparably greater, deeper, more massive and longer by 30 miles, so that it reached to the villages of Paldorak and Diaminor. M. Mishenkof's theory that the glacier is lowering is therefore refuted.

7. The Turkistan range is the immediate continuation of the granite-gabbro Alai range, and ought not therefore to have a distinct name.

8. The Hissar range is of more recent formation than the Turkistan, and is separated from it by chalky formations, which extend along the valley of the Zarafshan to the village of Postigau; it is built up of granite, gneiss, and metamorphic rocks. It begins as a separate chain to the west of the mountain mass of Karamuk, consisting chiefly of diabase. This tangle of mountain chains is not caused by the interlacing of the already mentioned ranges with the Trans-Alai, but is the result of denudation by aqueous action.

Besides the above-mentioned conclusions, the expedition brought back geognostic collections, a survey of the glacier, and a number of sketches showing better than any description the external appearance of the glacier and its surrounding mountains. The success attending their investigations was greatly due to fine weather. One moderate storm would have disorganised their plans, and perhaps been fatal to them.

The following discussion ensued on the reading of the above paper on M. Mushketof's ascent of the Zarafshan glacier, at the Evening Meeting, March 12th, 1883:—

Sir DOUGLAS FORSYTH said although he had not actually been in the Zarafshan Valley he had travelled, perhaps, as near to it as any Englishman could go, namely, Kashgar, and had traversed the mountains to the south, the character of which was very similar to that described in the paper. Evidently the Russians had their pet glaciers, but there were some on the British side of India which would bear

comparison with them. The writer of the paper had stretched his glacier by taking the two sides and making it 20 miles, but on the Indian frontier there was a glacier 30 miles long on one slope and 30 on the other, making 60. He could only speak of these things in a very unscientific way, but he was particularly struck during his journey to Kashgar at the absence of glaciers on the slope towards the north-west of the great range. Of course that would be explained by the absence of all humidity in the desert; and what snow did fall in winter about Kashgar and Yarkand was dried up almost immediately, the atmosphere being so very dry. With regard to the retrogression of the glaciers, he went over the Sasser, which was about 30 miles long. There they had to cross enormous crevasses, and it appeared as if each time they had to get down to the bed of the river and then ascend. It was like going up a large mountain, but underneath the moraine was the débris of the mountains which had been gradually brought down, and as the melting operation went on the moraine settled down upon the bed of the valley, and it appeared as if the glacier was receding. The Tajiks, spoken of in the valley of the Zarafshan, were the more settled natives of the Aryan type. They were quite distinct from the nomad Kirghiz, who travelled over the mountain tops of the Pamir, and always lived in huts. He had met them, and travelled with them, and on one occasion lived with them for about three weeks. He found them most hospitable and agreeable people to deal with. Some of them were stated to be robbers, but he fancied they were not much worse than their neighbours.

Colonel H. H. GODWIN-AUSTEN said the Meeting was exceedingly indebted to Mr. Delmar Morgan for bringing before them the work of Russian scientific men in Central Asia. No doubt there was a great deal done in Russia which it would be of great interest to Englishmen to learn, and he hoped that Mr. Morgan would continue his labours in that direction. The subject of the glacial action in those and other regions had been written about by our ablest and best geologists and geographers, such as De Saussure, Murchison, Lyell, Tyndall, Forbes, Ramsay, Hooker, and others. In Asia glacial action was found on its grandest scale, particularly in the Himalayas. The glaciers of the Himalayas might be very well divided into three distinct groups. The first consisted of the small glaciers—almost frozen snow-beds—which were common in all high parts of the range. The second were the glaciers which filled lateral ravines reaching down into a main valley but not proceeding any further; and the third were large trunk glaciers, with which the lateral glaciers from side valleys joined at different points. Glaciers of the latter kind were only found in the Himalayas, near the Kara-korum and Mustakh, and in the range of Zarafshan. He was not sure that the glaciers north of Wardwan and along the range of the Mid Himalaya were not, in point of beauty and grandeur, quite equal to such as those described in the paper. They were certainly most striking from the steep slope at which they came down from the ridges above. The first Europeans who noticed the glaciers of the Himalayas or the Mustakh were Mr. Vigne, who visited that country in 1834 and 1838, and Dr. Falconer and Dr. Henderson in 1838; the former went to Arundo and over the Scoro La to Askole, and saw the end of the Biafo glacier. In 1857 Adolph Schlagintweit made an attempt to get into Yarkand by the Mustakh, but had to retire in consequence of the snow and severe weather. That unfortunate traveller was afterwards killed in Yarkand. Previous to 1860 and 1861 the exact length of those glaciers was unknown, till the topography of the country was taken up by the Surveyors under Captain Montgomery. In January 1864 Dr. Falconer, speaking at a meeting of the Society on a paper which he (Colonel Godwin-Austen) had written on those glaciers, was of opinion that the glaciers of the Zaskar range were as large as those of the Mustakh, but as he had only seen the terminal portions of the latter, and had never gone up them, he was

quite unable to judge of their enormous size. The Baltoro glacier was 35 miles long, measured as the crow flies, from where it took its rise to the terminal moraine or cliff. The Arindo glacier was 30 miles long, and descended to 9000 feet, which curiously enough was the same altitude as the end of the Zarafshan glacier. The conditions of their formation must therefore be very similar. The Punmah glacier, 23 miles long, descended to 10,300 feet; the Masherbrum, on the south range, 10 miles long, descended to 11,500 feet. The Kondus glacier, which was surveyed by Mr. Ryall, one of the assistants of the Survey, was 23 miles long, but he did not know to what altitude it descended. South of Zaskar, where the glaciers were of the second order, none of them filling the main valley, were the Muni La, 12 miles long; the Durang Drung, 14 miles; the Brahma, 10 miles; the Purkutze in Suru, 8 miles. The Muni La descended to 10,450 feet; the Durang Drung to 13,200 feet; the Brahma, to 12,500 feet; and the Purkutze to 11,780 feet. The difference of level to which the glaciers descended in that part of the range, as compared with the Mustakh, was quite 2000 feet. In Switzerland, the Aletsch, 15 miles long; the Görner, 9 miles long; and the Mont Blanc glacier descended to about 3600 feet. No doubt many of those present had been in the Rhone valley, and visited Zermatt and other places. The distance between the ridges in Switzerland, taking the crests of the range on one side and on the other, and also the crests of the lateral spurs, was from 10 to 12 miles; and in the Mustakh the distance was 12 miles, and of the lateral spurs from five to six miles. The width of the valleys was also very much the same as in the Rhone district, being from $1\frac{1}{2}$ to $1\frac{3}{4}$ miles, showing that the conditions which existed at one time in Switzerland were precisely the same as those now existing in the Himalayas. The Baltoro glacier would fill the Rhone valley and its tributaries down as far as Raron, five or six miles below Visp, close to where the Lotschenthal stream joined the Rhone. The paper had referred also to the extension of glaciers in the Zarafshan Valley below the present points to a distance of 30 miles. Exactly the same thing was seen in the Himalayas, but many of the glaciers there must have extended for 100 miles below their present terminal cliffs, there being ample evidence of that in the striæ marks in the valleys, and the old moraines.

Mr. DOUGLAS FRESHFIELD said he had listened with very great pleasure to the paper, because some years ago he had, with two friends, taken some pains to initiate the Russians in the art of glacier exploration in the Caucasus. The paper had borne evidence that the glaciers in Central Asia were, like those in the Alps and in the Caucasus, in retreat. It was not clearly stated in the paper whether the ancient moraines were countless centuries old, like those round the foot of the Lago di Garda, or only twenty-five years. But he understood M. Mushketof to mean that in the Zarafshan Valley the glaciers were at present in retreat, not merely that a retreat had taken place since remote ages. It might be considered, therefore, that this retreat was going on over the whole of the old world. But it must not be hastily assumed it would last. So far as the Alpine glaciers are concerned, evidence has of late years been collected proving that they have in previous centuries retreated as far as at present and again advanced. No definite period can as yet be assigned to these oscillations. The Russians did not seem as yet to have got very far in glacier knowledge. Both in scientific and practical matters they were still rather below the level of Western Europe. The author had given an account of dirt-heaps which it was impossible to accept. They were caused by the thickness of the earth-covering in certain spots protecting the ice beneath from the sun's rays, and thus raising the surface above the general level. Again, the difference in character between the smaller tributary glaciers on the two sides of the main stream could not be caused by the ice on one side being much older than that on the other. It

was probably caused by the range on one side being granite and on the other a schistose or friable rock. The author had ventured to give some advice as to the kind of boots to wear in glacier exploration, stating that there was nothing like the soft boots that the natives wore. It was very true that for difficult rock climbing such boots, which are used by peasants in the Pyrenees, are very good, but they fail on ice, and a mountaineer must be prepared to change many times a day from rock to ice. The question of how far the Russians had studied the practical needs of glacial exploration might seem trivial. But a sad point was given to it by the circumstance that the distinguished predecessor of M. Mushketof in Central Asian exploration, M. Fedchenko, perished on the Mer de Glace in Savoy under circumstances in which an experienced glacier explorer would have probably escaped. He started inadequately clad, and was caught in a storm which proved fatal to him. The small extent of the glaciers on the northern side of the Alai range, where there was comparatively little rainfall, reminded him of the fact that at the eastern end of the Caucasus chain, where also but little rain fell, there were but few and small glaciers, while at the other end there were immense glaciers, descending on the southern side almost as far down as on the northern side, the extra snow-fall caused by the vicinity of the Black Sea more than compensating for the warmer exposure. He did not agree with Sir Douglas Forsyth that it was probable that the mounds below the level of the present glaciers in Central Asia were not the moraines of ancient glaciers. It was generally not difficult to distinguish such moraines from hillocks left by drift.

Sir HENRY RAWLINSON said that in the course of his Central-Asiatic studies the district of Zarafshan had always had a particular attraction for him, involving as it did so many questions of interest ethnologically, geographically, historically, and politically. The valley of the Samarkand river was the cradle of the Perso-Aryan race. In the Zoroastrian Genesis, after the exodus from the mythic paradise of *Irán-vij*, it was said that the first place created by Ormazd for the Aryan race was in the valley of Sugd, or the Zarafshan Valley, and the Aryan population had remained there from that time to the present, a period, at the lowest calculation, of 6000 or 7000 years. In the Vendidad the valley was called Gau,* Sugd being the name of the river. That was modified by the Arabs to Jái, and the name was retained to the present day, being applied to a famous lake called the Iskanderkul, or by the geographers *Bán-jái*, which was one of the sources of the Zarafshan. It was a most romantic and picturesque spot, and was first visited by two Russian travellers, Khanikoff and Lehmann in 1842, who were attached to Butenev's Bokhara mission, and who subsequently published a very interesting description of the lake. The Fâns were a very old tribe, probably Aryan, who must have held all that part of the country in the time of Alexander, and who gave their name to all the prominent local features, the mountains south of the Zarafshan Valley being called *Fân-tâú*, the lake at the source of the river *Fân-jái* and the neighbouring lake country *Fân-mír*, whence *Fámír* or *Pámír*.

* *Gau* (acc. *Gaum*) is translated by Bournouf "terra," being compared with the Sans. *Gó*. Darmsteter reads "the plains." See Yacna, notes, &c., p. 50, and Sacred Books of the East, vol. iv. p. 5. It is, however, undoubtedly a proper name like *Vaethereta* and *Khenta*, in the same chapter of the Vendidad. For the Arabic form of *Jái*, which is the regular substitute for *Gau* (as in the old name of Isfahan, *Jái* for *Γαβα* i. e. *Gáu*), see Istakhri, p. 219, and Ibn Haukal, p. 368. In Yacút the name is misprinted *Vdi* and *Qdi*. In Edrisi alone, I believe, is found the full form of *Bán-jái* for *Pán-jái* or *Fân-jái*, i. e. *Jái* of the Fâns, whom I take to be the *Φαυροι*, said by Strabo (p. 516) to form the extreme limit of the Greek conquests in Bactria.

Historically, too, this valley was one of the most celebrated in the world, Samarkand being the place of sepulture of the great Timour. As far down as Bokhara the whole country was a garden, with an unlimited supply of water, a rich alluvial soil, and an admirable climate. It always had teemed with population, and was quoted as one of the four earthly Paradises. The Russian Government had shown great skill and judgment in taking possession of Samarkand, and not of Bokhara. By holding Samarkand and the upper valley of the Zarafshan, she really held the lives of the inhabitants of Bokhara at her disposal, being able at any time to turn the water of the river into the desert, and so deprive them of the means of subsistence. She had therefore a complete control of the people of Bokhara. At present the boundary between Samarkand and Bokhara was about half-way between the two towns, and Russia had shown no indication of going further to the west. Politically, again, the district of the Zarafshan was very important, being the nearest point of the Russian possessions to the Indian frontier. It was indeed considerably nearer to Peshawar than the Askabad frontier was to Sinde or Quetta, being about 400 miles in a straight line. Very great praise was due to Russia—and all geographers would be glad to acknowledge it—for her scientific explorations. She might have other objects in view, but geographers would look merely at the scientific results, and those were of great value, for she had explored, surveyed, and mapped the whole of the country along her frontier between the Jaxartes and the Oxus. He could only wish that England had done as much with regard to her Indian frontier, instead of leaving an enormous tract of country between the Indus and the Oxus of which they really knew nothing, except the lines of route along which the troops had passed. He did not mean that there were the same facilities for surveying Afghanistan as for surveying the Pamir and the Hissar range, but still he thought more ought to have been done by England for geography in the same direction as Russia. The region intervening between Samarkand and the Oxus was an exceedingly interesting one, but very little was known about it till the Russians went there. In Oriental histories accounts were often met with of marches through that region, though not with the details which the Russians had now supplied. The Arabs, for instance, had given wonderful accounts of volcanoes to be found there, and had stated, in fact, of one part of the country that it was a series of volcanoes on fire. Humboldt and physical geographers generally had looked upon this story as a fable, but Lehmann and Khanikoff when they went there found to their astonishment that a large tract of country near the Iskander-kul of ten or fifteen square miles was absolutely on fire, these subterranean fires being explained either by the existence of anthracite coal or by the saturation of the soil with petroleum or naphtha. Of late years nothing more had been heard of the phenomenon, but an account of it was published in Lehmann's work. The route across the mountains from the lake to Hissar was the proper high road from Samarkand to the Upper Oxus, as, if that route were not followed, the traveller would have to make a very long circuit to the westward, increasing the distance from 200 to nearly 400 miles. It had consequently been a great object to find a practicable way across the hills, and lately some Russian officers had thus passed over the hills direct from the lake down upon Hissar, opening up a route that would ultimately no doubt become the high road from Samarkand to India, for although it was difficult it was by far the shortest and the best supplied. In discussing this subject of Central Asian exploration, a tribute was due to the memory of an Englishman, Mr. Johnson, who had recently suddenly died at Jammoo. He was the first Englishman who crossed the great range of the Kuen-Luen from Tibet to the plains of Tartary. His journey at the time made a great sensation, and he subsequently (in 1875) was granted a gold watch by our Society in appreciation of his services to geography. He discovered the site of the great capital of

Ilchi or Khoten, and did a great deal of very good scientific work in connection with the Himalaya Survey. Sir Henry believed that both Sir Douglas Forsyth and Colonel Austen were acquainted with Mr. Johnson personally, and could thus speak with more authority on the subject. But he thought it only proper that on this occasion he should refer to the great loss which geography had sustained by Mr. Johnson's untimely death.

The PRESIDENT said Sir Henry Rawlinson had borne generous testimony to the labours of Russian travellers, and to the great flood of knowledge they had thrown upon regions previously little known. But before them the ground had been traversed in a more southern direction, and there were symptoms of what had been called the restless foot of English adventure in a lake in the centre of the lofty regions described by Sir Douglas Forsyth, bearing the name of the Victoria. A debt of gratitude was due to Mr. Morgan for bringing before them so graphic and accurate a description of travel in an unknown region. Mr. Morgan had resided much in Russia, and was a member of the Imperial Russian Geographical Society. It was of the greatest possible advantage to have such a connecting link with a people who were doing so much for geography as the Russians. The Russians did not look with a favourable eye upon other travellers, but they were doing their best to explore the regions themselves, and to make known the results of their researches.