

Lobengule stated that the Bushman warned them that the water was of a deleterious quality, but that impelled by thirst they drank of it abundantly, and perished in consequence. Captain Patterson's friends and Mr. Serjeant's friends did not believe any warning was given, and they considered that most probably the springs were poisoned by the bushmen for the purpose of killing game, although he (Sir H. Barkly) had never heard in South Africa of any poison being possessed by the Bushmen sufficiently powerful to kill a man in such a short space of time. At all events there seemed nothing to connect Lobengule with the unfortunate occurrence. It took place at a very great distance from Lobengule's residence: it was almost impossible that he could know in what direction the party would pass, and according to his own account the water in that part of the country was, at certain seasons of the year, of a very poisonous nature. The only conclusion that could be come to was that this sad catastrophe, which had left three families to deplore the loss of young men in the prime of life, and had deprived the Geographical Society of a valued member, who no doubt would have been a very useful explorer, was due to natural or accidental causes, and that no further light could be thrown upon it by any investigation which could be instituted. That was the conclusion at which Sir Bartle Frere had arrived, and at which everyone who read the papers would arrive.\*

The PRESIDENT was sure the Meeting was greatly indebted to Sir Henry Barkly for having read Captain Patterson's interesting paper. To that paper an additional interest had been communicated by the sad tragedy in which the expedition ended. They would all join with Sir Henry Barkly in a desire to pay a tribute of respect to such an enterprising and honoured member of the Society.

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*The Mountain Passes leading to the Valley of Bamian.*

By Lieutenant-General E. KAYE, C.B.

(Read at the Evening Meeting, February 24th, 1879.)

In direction W.N.W. from the city of Kabul,† and distant from it about one degree and twenty minutes of longitude, in a straight line, but some 112 miles by the mountain road connecting the two places, lies the valley of Bamian. Nearly forty years ago I traversed this route, with troops (six horse-artillery guns, a few cavalry, and a regiment of Goorkha infantry); and now, to the best of my memory, aided by such imperfect notes as I made at the time, I will endeavour to describe the country intervening between the capital of the Amir and the idols of Bamian.

Leaving the city, we pursued the Ghazni road through the beautiful valley of Kabul, bright with its orchards, and groves, and green meadows, watered by the river, or by smaller streams, the banks shaded by tall poplars and by willows. After passing Kila Kazi at the ninth mile, we quitted that road and inclined to the right towards the village of

\* According to a letter since received from Sir Bartle Frere, statements have been subsequently made to Sir Theophilus Shepstone which throw doubt upon Lobengule's story, and afford but too much reason for suspecting that the unfortunate explorers were the victims of a foul conspiracy.

† For map, consult that of the Hindu Kush, in February number of the 'Proceedings,' p. 160.

Argandi, situated at the foot of a spur of the Paghman Range, which runs south-westerly from Charikar in the higher part of the Kohistan of Kabul. The route from Ghazni to the capital does not pass through Argandi, but leaves that village at some distance to the left, and thus avoids much rugged country, passing over a gentle rise in its progress to Kila Kazi.

From Argandi a narrow gorge with stony bed, interspersed with large boulders, leads by a steep ascent to the plateau which here surmounts the spur, and over which the road continues for some two and a half miles, in a westerly direction, thence descending to Rustum Khail in the valley of the Kabul River, which flows round the southernmost point of the spur just crossed, towards Maidan, on the road to Ghazni; and thence bending towards the north-east, visits the city whence it takes its name.

From Argandi to Rustum Khail is 8 miles. The valley is here about a mile broad, well-cultivated, and sprinkled with villages and orchards, while rows of poplars here and there mark the course of the stream. The valley narrows as Jalraiz (10 miles) is approached, and passing that place, the lower offshoots from the Paghman spurs sweep down to the banks of the river, terminating often in precipitous rocks, confining the road to the narrow stream which receives a small tributary brook, flowing from the north-west. Sir-i-Chushma, the principal source of the Kabul River, is 10 miles above Jalraiz, but a small feeder flows from the foot of the Unah Pass, some 9 miles in advance.

Above Sir-i-Chushma, the spurs sweep down, almost meeting on the banks of the brook; indeed, in many places the road necessarily mounts the hill-side, there being insufficient space below. There is but little cultivation above Sir-i-Chushma, but all available ground seems to be utilised; the population is scanty, but there are villages and forts also in occasional nooks among the mountains—of the latter, there was one picturesquely situated on a slight eminence below the lofty hills to the right, guarding, as it were, the approach to the higher part of the valley. As we neared the foot of the Unah Pass, the ascent became heavy. The general direction of the valley from Jalraiz is westerly.

It was on the 19th September that we reached the pass. Winter had commenced, though the crops had not yet been cut; we found ice on the ground on our arrival, somewhat late in the morning. At this point the elevation above sea-level was estimated at nearly 10,000 feet. The valley now terminated, and we ascended the pass. It was not one continuous pass, but a succession of several short but steep ascents and descents, the general features of the summit of the Paghman Chain being that of a broken, rugged table-land, riven by several deep chasms, and the breadth of the plateau from 4 to 5 miles. We encamped on the height, at an elevation of 11,400 feet; the Koh-i-Baba Mountain (18,000 feet) being visible, the centre peak bearing W.N.W. from our camp.

There was much snow on the ridges of this mountain, even at some distance below its summit. Around us nought could be seen, but a tumbled succession of bleak and barren hills, raising their bare heads one beyond the other in dreary confusion, save where snow-topped Koh-i-Baba dominated over all, black rocks protruding here and there prominently from its sides, too steep to form a resting-place for snow-flakes. A few patches of cultivation, still uncut, were to be seen in recesses having sunny aspects among the hills. Barley, wheat, lucerne, and vetches are grown in terraces on these mountains. Not a tree or a bush was visible to break the desolate monotony of the scene. In the distance ahead, a little west of north, the lofty range, in which are the passes of Kalu, Hajikak, and Irak, bounds the view.

Clearing the Unah, we passed over four spurs branching from the mountain on our left, and emerged into the valley of the River Helmund at Gardan-i-Diwar. This river, rising some 20 miles to the north-east, here divides the Hindu Kush and Paghman ranges, receiving the small streams flowing from the base of both.

The Helmund is but a shallow stream at this point, and the valley narrow, but every inch of ground is cultivated. The banks of this river, unlike those of the Kabul, are bare of trees and shrubs; but tolerably well-clothed with grass.

Fording the river at its junction with a small but rapid stream flowing from the Hindu Kush, we entered the glen of the Siah Sung ("black rock"). The defile is narrow, the hills rising abruptly; and the stream meanders greatly, having a rough, stony bed. At about  $6\frac{1}{2}$  miles from the Helmund, a wall of black rock (giving its name to the glen and to the stream) stretches across the defile, leaving but a narrow passage for the brook; and half a mile beyond it, on a small plateau, above the channel, there stands (or stood at that time) the small mud fort, called Siah Kila. Between this place and the Helmund, we had crossed the little rivulet more than twenty times, and frequently had to leave the bottom of the valley, and pursue a track running along the hill-side.

At Siah Kila another defile, branching from the west, opens into that by which we had ascended from Gardan-i-Diwar, and through this opening we had a fine view of Koh-i-Baba, bearing W.  $15^{\circ}$  S.

Six miles higher up the valley of the Siah Sung stands the fort of Kharzar. Our route generally led along the bottom of the defile, crossing the rocky stream frequently, but occasionally we ascended the hill-side to avoid marshy ground, and then again were compelled to leave the higher road by the occurrence of ravines, the channels of small feeders flowing from Koh-i-Baba on our left. The spurs shooting down from this mountain generally terminate in plateau or terrace ground, some 60 feet above the stream, but those from the east continue nearly unbroken to the very edge of the rivulet, so that all the available land that the

nature of the country allows to the mountaineers is generally to be found on the western slopes, but for some distance between Siah Kila and Kharzar, the spurs of the Koh sweep down in continuous slopes from the eastern peak to the brook itself.

The fort of Kharzar, like that of Siah Kila, is on some elevated tableland above the valley. Koh-i-Baba bears S.S.W. Much snow appears on the face of the mountain present to our view. The direction of the valley from the Helmund to Kharzar is generally north-west, though variations are frequent owing to the sinuosities of the route.

The foot of the Irak Kotul (pass) is  $5\frac{1}{2}$  miles north of Kharzar; the slopes of the mountains on either hand now unbroken by plateaux. We found the passage of the mountain by no means difficult; there was a good road at an incline of from  $25^{\circ}$  to  $30^{\circ}$ , which had been lately made or improved under the direction of some British officers. The ascent was about a mile and a quarter, and of course the transit of artillery entailed much labour, but the mountaineers were friendly, and gave great assistance. The descent on the western face was steeper, but of less length. Last year's snow still existed at the foot of the pass on either side: on the east, round the source of the Siah Sung rivulet, 1000 feet below the summit: and at the further base a small stream there rising had forced its way through the snow, and an arch or tunnel had been formed, through which a man might walk; this stream flows to the north, and eventually the water enters the basin of the Oxus. The summit of the pass was estimated at 13,000 feet above the sea. Hence there is an extensive mountain view, on all sides brown, bare mountain tops and slopes succeeding each other, like the following waves of a stormy sea, no forests, brushwood or verdure to relieve the poverty of the view. The snow of Koh-i-Baba offers a little change to the aspect, and the lower hills stretching towards Turkistan are more red in hue than those through which we had lately passed.

The road from the foot of the pass continues in the narrow valley, through which flows the small stream above mentioned; lofty and precipitous are the hills which enclose the defile, so that the sun even at the autumnal equinox fails to reach the bottom for more than half its allotted time. The Irak hill itself is smooth and almost free from rock, but lower down, descending rapidly and frequently crossing the brook, which flows generally to the N.N.W., the hill-sides become more rugged and abrupt, rising in places like iron walls, a stupendous height.

The small valley of Mian-i-Irak is about 10 miles distant from the pass. Here we found some open ground, well cultivated, the crops just cut (4th October); and the hills which surrounded it of no great altitude. There were several small forts to be seen in the valley, and some caves in the hill-sides, forming dwelling-places for some of the inhabitants. Here too again, for the first time since leaving Sir-i-Chushma and the pretty valley of the Kabul River near Jalraiz, we

· saw trees on the banks of the stream (now increased in volume), willows and poplars, but of stunted growth. However, such as they were, they gladdened the sight, too long wearied with barren hills. There are excellent trout in the river, some about 2 lbs. in weight. In the stream flowing towards the south there are no trout, but small barbel. A small pool at Sir-i-Chushma was crowded with these fish, eagerly looking for crumbs from anyone approaching the margin; indeed, the fish were so numerous and so tame, that they could be caught easily by the hand. However, they were quite respected, and no one thought of injuring them.

After leaving Mian-i-Irak, the road does not continue to follow the course of the stream, which flows through deep chasms in the hills, till it empties itself into the river, which, after watering the Bamian Valley, flows eastward, and subsequently to the north, under the name of the Kunduz River. Quitting the small valley, our route led us more westerly, across a rugged spur of the Hindu Kush, separating the water channel of the Irak from that of Kalu. Though the height of this mountain ridge is insignificant, yet it gave us an infinitude of toil from the rocky nature of the spur, and the steepness of the incline, in several ascents and descents. Ultimately the track led us into the valley of Bamian, at its eastern extremity. Though the distance was only 6 miles from Mian-i-Irak, the march was not accomplished in less than thirteen hours.

At night, on the 5th October, our camp was formed on the left bank of the Kalu stream, and on the right of that flowing from Bamian, at the junction of the two waters. The gorge of the defile leading from the Kalu Pass was on our left, as we looked to the west; and at its entrance on the summit of a lofty insulated rock, with perpendicular faces, frowned down the ruined fortress of the Emperor Zohauk, whence the place takes its name. At this extremity the valley is about a quarter of a mile in breadth, and well-cultivated, the immediate hills bordering on it of no great height. The Bamian River, rapid and of some volume, though generally fordable, hides itself in a rocky passage, dividing the spurs branching down from the southern and northern ranges. It takes its rise from the foot of the westernmost extremity of Koh-i-Baba, as do also, I conjecture, the rivers which water the parallel valleys of Saighan and Kamard.

The great image cut in the face of the cliff bounding the valley on the north is 9 miles from Zohauk. The valley winds much, varying in width, generally not more than a quarter of a mile broad, until Bamian is reached, where it opens out considerably. It is well cultivated, but there are few trees. Several narrow glens, the channels of streams flowing from the Koh, on the south, fall into this valley; one of them is at Topchi, or Ahinghar, a small fort about half-way from Zohauk. But the largest, which is indeed a valley itself, having numerous

terraces of fields on either side of the rivulet, joins that of Bamian nearly opposite the images: this is the Fouladi Vale. The two streams converge in the main valley, and unite near a small fort situated in the fork itself.

Higher up, near the idols (of which I have little to say except that they are very large and very ugly), there are, or more correctly there stood at the time whereof I write, three forts, forming together a triangle: two of these, having four towers (one at each corner of the square), were assigned to the infantry; and the third, a double fort, with six towers and a dividing wall in the middle, to the artillery, for the accommodation, one part, of the men, the other of the gun horses: the cavalry were sent back to Kabul. The political officers and their escort were lodged at the confluence of the rivers.

Near the foot of the great image, on some rising ground, there were the ruins of a fort, which must have been of considerable magnitude, much stronger and more capacious than any of those still existing in the valley. Between the images and at their sides, peeping over their shoulders, and some even above their heads, were many caves in the cliff side, having intricate connecting approaches, and galleries cut within the rock. These formed dwellings for many Bamianchis, and also for some camp followers of the British.

On the opposite side of the valley, about a mile to the west, a stony gully leads into the hills: a short way up this, there is a nearly insulated rock, on the flat summit of which there is in relief a recumbent figure bearing a rude resemblance to a huge lizard, and near the neck of the reptile there is a red splash, as of blood. This is called the Azdahar, or dragon, said to have been slain by Ali or some Mahomedan saint of by-gone days, and an indentation in the rock close by is held to be the gigantic footprint of the slayer.

Higher up the valley (the direction of which looking from Zohauk, was generally, taking its bends into consideration, W.S.W.) were several other forts jotted here and there, until at about 5 or 6 miles from the position we had taken up, the open cultivated land terminates at the Surkh Durwazai ("Red Gate").

It was here, near the forts just mentioned, that the Amir Dost Muhammad, with his Usbeg army, suffered defeat at the hands of a small detachment under Brigadier Dennie, C.B., on the 18th September, 1840.

The mountain ridges north and south of the valley, differ much in appearance and in character. Those to the north are of reddish hue, of no great height and irregular in outline, easily worked by pick-axe and crowbar, but incapable of cultivation: there are, however, recesses in their depths, where long, coarse grass is to be found. On the other side the Koh-i-Baba forms the main object in the range of sight, rising in several magnificent peaks, pointing sharp and rigid against the clear blue sky, the rock, where the sides are too steep to receive snow,

being black invariably. From these peaks grand spurs slope downwards towards the valley in great regularity, separated from each other by the water furrows. I have previously mentioned two of these beds, one at Topchi, the other from Fouladi to Bamian; between these are others, of less width than the last, some of them dry except at certain seasons of the year. At the mouth of one of these, lower down the valley than the forts inhabited by the British, is a curious conical hill, with a spiral road round it, and several old ruins, both at the summit and on the sides. This goes by the name of Gulgula, so called, it is said, from the noise made by the labourers while employed on the works.

Before these spurs reach the valley near our position, there at its greatest breadth (from half to three-fourths of a mile), they merge into spacious table-lands, rising in terraces towards the higher parts of the dividing spurs, but flat, where they overhang the larger valley, into which they terminate by a steep drop of 50 or 60 feet, but practicable to climb. These plateaux and terraces are all well cultivated and irrigated in scientific fashion. The husbandmen in these mountains (and indeed I may say in Afghanistan generally) are excellent practical hands at finding the true incline which will cause water to flow without wasting the slope. The water is brought from the head of the spring, at the foot of the mountain, and, by channels cut in the hill-side, is conducted at last to the fields and terraces on the spurs. Six or seven miles up the Fouladi Valley there is a group of small forts, known by that name, some on points of spurs, some in the valley below; and on the plateau just above Bamian there are others, one of them, Allahdad Khan-ka-kila, larger and of better construction than those usually met with.

There are but few trees or bushes in the valley of Bamian; but each fort has a tree or two near its gate; and between the two rivers, opposite the débouchure of the Fouladi Valley, there is a Ziarut, where a stone wall encloses a thick grove of handsome silver ash, and beneath the trees there are a few old tombs.

The inhabitants of the valley are Tajiks, but those of the Hindu Kush mountain chain are Hazáras: I think the Dehzungi and Yek Olung Hazáras are two principal tribes. At the time whereof I write, there was feud between them. But during our sojourn of a year and a day in those regions, we found Tajiks and Hazáras peaceful and well disposed, except that there was a temporary quarrel with some people at Fouladi. To the north there are Tatar Hazáras, and in the Saighan and Kamard valleys Usbega, Tajiks, and Ajurees; but I have not a very accurate knowledge of the many tribes dwelling in those mountains and their valleys. The Tajiks and Hazáras about Bamian are fair in complexion, the children, many of them, as white as our own.

Sheep are plentiful, browsing on the hill-side, where aromatic herbs are to be found. In the hills northward of the valley, there are wild sheep and goats, but they are difficult to reach. The hill partridge,

or chikore, is to be met with in the gullies to the south, and a large bird on the higher mountains, where there is eternal snow, which I have heard named the snow pheasant, but is more like grouse in plumage, and in being feathered low down the legs; the flesh, however, is white, and somewhat coarse. Teal I have found on the rivers, but only for a short time in autumn and spring. In the winter, when snow was on the ground, there were large flocks of blue pigeon, which formed a pleasant change on our table, our almost invariable food being the dumba or broad-tailed sheep. In some places I have seen emerging from or retreating into burrows in the hill-side, small animals resembling a tailless rat, rather larger, with ears nearly as long as a rabbit, but smaller than that animal, though in colour more resembling it.

The rivers abound in fish—barbel, and trout—the former I had seen before in the Kabul River, the latter are only indigenous in the streams flowing to the north; neither of them grow to any great size, as a general rule, but I have seen a few trout exceeding one and up to two pounds in weight: they have black and red spots, and the flesh of the larger fish is of salmon hue. I was informed that in the Kamard Valley trout were to be seen of double that weight or more. In the summer months the rivers were seldom clear enough for fly-fishing owing to the melting of the snows; but both kinds took the worm readily.

Wheat, barley, the field pea, turnips, lucerne, and some Indian corn were grown at Bamian: there was very little grass procurable, and in the winter our horses were fed on barley, dried lucerne, and chopped straw.

Winter set in early; a few flakes of snow fell in the valley on 6th October, but the first heavy fall was on the 15th. The valley was clothed in snow for some months, during which time for the most part the sky was perfectly clear, without a breath of air; the exceptions were previous to a fresh fall of snow, when clouds rolled up, and the temperature rose somewhat: then the snow came down, and the same calm weather recurred. In January the thermometer stood frequently at 12° below zero (Fahrenheit) at sunrise. The rivers, rapid as they were, froze hard, and British officers skated at Bamian (our skates were manufactured by a soldier of the 18th L.I., which regiment was quartered at Kabul). At the end of February the river ice broke in the centre, owing to the force of the stream below it, and the blocks were thrown up on either bank; but it was some time before they melted. For four or five months the mountains intervening between our position and Kabul were impassable except by pedestrians. An officer (Captain Garbett, appointed to the troop of horse artillery), journeying from Kandahar to Bamian, was compelled to walk from Argandi to Zohauk, which he reached on 1st March. Sometimes, indeed, even footmen (Hazáras) could not cross the mountains. At one time we received no post or messenger from Kabul for three weeks, and at another we



were fourteen days without intelligence from the south, though the passes to the north were open. From time to time we were informed of the progress of the Russians towards Khiva; and we had reason to believe that Usbegs and others, between Saighan and Khulm, had no friendly feelings towards us. We had not been idle, however, before the extreme severity of winter came upon us, but had constructed a trilateral, connecting the three forts containing our barracks, with fieldworks, which would have withstood any surprise from neighbouring Begs.

In the summer the climate of the valley was excessively pleasant, the thermometer in the shade being rarely above 68° or 69°. A few days it mounted to 75°, but in the neighbouring valley of Saighan it was 10° higher than that temperature.

Dr. Lord, a traveller of no mean note, was our political agent. He had great knowledge of the country and of the people, but as a politician, he was of a restless spirit; so that he soon discovered that a "rectification of frontier" was desirable. In December, therefore, he caused Saighan to be occupied; and in the early summer, Bajgah ("eagle's resting-place"), in the Kamard Valley, became our most advanced post. But in urging these forward moves, Lord had in view that they would facilitate greatly our ultimate establishment on the Oxus, for there, he held, we should find our only scientific frontier. And to Khulm I believe we should have marched some day, had affairs proved propitious; but as Dost Muhammad travelled southward, he shut the road to the north against us.

I have mentioned at a previous page the "Red Gate," where the Bamian Valley closes some 5 or 6 miles up the stream. The road to Ak-Robat here enters the Surkh Darra, a narrow defile enclosed by red cliffs of no great altitude. For about 5 miles the route continues along the banks of the stream, crossing it occasionally, then mounts, by a winding road, by no means difficult, the hill-side on the right; and then for some miles passes over an undulating table-land, until crossing a small spur, it descends into the valley of Ak-Robat, very confined in space, being merely a small basin among the hills. The cold was great in December—thermometer at 4° (or 28° of frost); distance from Bamian 15 miles nearly north-west. To the north of the small fort, scarce half a mile distant, rises a lofty mountain, over which the road to Saighan continues; the passage by no means difficult, as the hill is smooth, and free from rock. We had no guns with us, however, on this march.

From Ak-Robat to Saighan is a continuous descent, the distance 22 miles; as the road leaves the foot of the pass, the defile decreases in width, and the enclosing rocks increase in height. I cannot venture to give their height, but in this descent they are more stupendous and abrupt than in any of the marches previously described. The glen is excessively tortuous, so that the traveller often finds himself as it were

enclosed within four black walls of rock, like a dungeon, allowing only a small square of blue sky to appear at the summit. During the short days of mid-winter, the sun's rays could not reach the bottom of such gloomy defiles. Consequently, the rapid rivulet running through it became blocked by ice, then, overflowing its banks, spread over the surface from wall to wall, and the base of the glen became a sheet of ice. Burnes, in his *Travels*, mentions defiles of this nature, but I do not remember whether he wrote of those leading towards Saighan, or of some more in advance beyond the Kara Kotul: he traversed these mountains in the summer, I think.

About 14 miles from Ak-Robat, the road enters the small valley of Pliatoo,\* well cultivated, larger than that last visited, but scarce a mile in extent at its greatest measurement; then again, rapidly descending, the track follows the stream, generally on its right bank, passing into a defile, the bounding walls of which are lofty indeed, but less imposing in their altitude than those which we had left.

The fortress of Sir-i-Sung is perched on an insulated rock, at the spot where the route just described enters the valley of Saighan. Here the stream flowing from the base of the Ak-Robat Pass joins the river, which waters the larger valley, nearly parallel to that of Bamian, but of less extent from west to east and of less general breadth. Sir-i-Sung ("the summit of the rock") is about 22 miles north of Ak-Robat: its position is imposing, as it dominates over the vale, but it is itself commanded by the northern hills, at a distance of only 200 yards. In this fort a garrison of Goorkhas was quartered. Subsequently, in the month of August, 1840, when our occupation of Bajgah had aroused the slumbering hornets, the small detachment at Saighan was strengthened by the addition of two horse-artillery guns.

There was no difficulty in the march of artillery from Bamian to Saighan, but the passage of the Ak-Robat Kotul caused much labour; less, however, than that of Irak. Saighan is a cheerful green valley in summer, and it possesses a few orchards, of which Bamian is destitute. It is separated from the valley of Kamard by a rocky mountain ridge of no great height or breadth, across which there are two passes, both impassable by wheeled carriages, one leading from the west of Sir-i-Sung, direct upon Kamard; the other commencing some miles down the valley to the eastward, and conducting to Bajgah, the fortress in British occupation, which is situated near the entrance to the defile leading to the Kara Kotul. The first mentioned of these passes is the Dandan-i-Shikan ("teeth-breaker"), the second is termed Nal-i-Ferash ("carpet of horse-shoes"). It was by this latter pass that the Goorkha regiment marched, when it proceeded to occupy Bajgah at the close of June. The detachment took with it one 3-pounder gun and two 5½-inch mortars on mules; but the pass was difficult under any circumstances; and when

\* Identical with Sokhta Chumar, I believe.

the post was abandoned in September, these pieces of ordnance were sunk in the deep river of Kamard, which in its after course, like those of Bamian and Saighan, joins the river of Kunduz, flowing northward into the Oxus. From Bajgah a steeply ascending defile leads to the Kara Kotul. This was reconnoitred in May, and found to be one of great difficulty, the ascent over huge layers of rock, quite impracticable for artillery on wheels.

About 3 miles from the fort of Sir-i-Sung, the road to the west enters a hill gully, and reaches the foot of the Dandan-i-Shikan ascent: this is the direct route to Kamard, as the path over the Nal-i-Ferash is to Bajgah; the two places are 9 miles apart.

Towards the end of August, it appeared to Dr. Lord advisable that the 6-pounder guns should be advanced into the Kamard Valley. Accordingly trunks of trees were hollowed and prepared for the conveyance of the pieces themselves, while it was intended that the ammunition and the carriages taken to pieces should be transported on camels over the difficult pass intervening between the valleys. Circumstances compelled the political officer to forego this proposed forward movement. The intention, however, rendered it advisable that we should examine the ascent. The guns and the regiment (an Afghan levy in the service of Shah Shuja) had reached the foot of the pass, and the reconnoissance was effected before any change of plan had been considered necessary.

The ascent of the pass we found to be a mere bridle-path, narrow and tortuous, in the rocky scarp of the hill-side; so narrow that the outer stirrup at times hung over the precipice edge, and the bends so frequent as to occur within a few horses' lengths. It would have been difficult to draw the guns in their cradles, formed of hollow trees, up such a pass, as there was not length for a good pull at the ropes. At the summit we rode over a broad undulating table-land, over which guns could have moved freely: the breadth of this plateau is from 4 to 5 miles. We did not attempt the descent leading to Kamard, as the holders of the forts at the foot of the pass were hostile to us. The valley of Kamard is a deep, narrow glen, with many orchards and walled gardens.

In some recent maps, I have observed that the ascent to the plateau is termed the Saighan Pass, while the descent only is marked as the Dandan-i-Shikan; but at the time whereof I write, certainly the whole pass, ascent, table-land, and descent, was known by the latter name. It is in fact only one pass, extensive indeed, but so is the Unah Pass, in which occur several ascents and descents, and intervening ridges and plateaux. The entire distance from Sir-i-Sung to Kamard is from 10 to 12 miles. I have also seen mention made of late years of the "Bamian Pass"; the Russians, I think, use the term. But I do not know which of the Kotuls it may be intended to so designate: there are the Kalu, Hajikakk

and Irak passes over the Hindu Kush chain, and the smaller ghaut over a spur leading down upon Zohauk, known by the Hazáras as the Kuski—an appropriate name enough.

I have before stated that the lofty passes of Unah, Irak, and Ak-Robat, being over rounded hills, tolerably free from rock, although laborious to surmount, yet entailed no real difficulty. They were, however, far more serious obstacles than we had to encounter in other parts of Afghanistan, such as the Bolan, the Kojuk, and the Khaibar. The Kuski, considering its low elevation and the shortness of the ascent, gave more trouble than the great passes; and the passes northward of Saighan would require much engineering skill devoted to their improvement, to render the passage of any save mountain artillery feasible. When we crossed the great range, we had all the advantage of doing so not only unopposed, but with the assistance of a friendly population. To fight the march would be a different matter; and the poverty of the country, and narrow nature of the glens and defiles would prove a serious obstacle to the progress of an army.

The following discussion ensued on the conclusion of the above paper, and that of Mr. Markham's on The Basin of the Helmund ('Proceedings,' March number, p. 191), read the same evening:—

The Chairman (Sir RUTHERFORD ALCOCK) said it was rather difficult for those who were not specially acquainted with the districts treated of in the papers just read, to seize the many points of great interest which they contain, but at the present moment important political questions were connected with those regions, and the movements of the British troops through their intricate passes were objects of national concern. The authors of the papers had therefore rendered a service in aiding them to understand as far as possible the various details of a country so complicated in its physical features.

General THUILLIER (late Surveyor-General of India) said as he had had something to do with the original construction of all the maps that had been issued from the Survey Department in India for the last thirty years, from which all the new maps of Afghanistan had been taken, the meeting would perhaps permit him to say a few words on the subject. His chief object in rising was to beg the kind consideration of the Society for the attempts that were now being made by the band of survey officers, unsurpassed by any in the world, who were accompanying the forces that had recently penetrated into Afghanistan. The great difficulty that had been experienced in India in attempting to make maps of Afghanistan, was the absence of authentic data, and of a great portion of the materials that were collected by such men as Durand and Sale of the Engineers, and others, who took routes and made sketches of the country in the first war; the consequence being that in such an extensive area as that represented in the general map before the Meeting there was much of a conjectural character, inevitable where regular surveys could not be conducted beyond our frontiers. Unfortunately, from the want of organization in India, and of a systematic deposit of all geographical materials in the surveyor-general's office at that time, those sketches and route maps were not looked after. Since then great efforts had been made, though it was only within the last few years that it had come to his knowledge that through the indefatigable exertions of their excellent Secretary, Mr. Clements Markham, many valuable documents had turned up

which were deposited thirty or forty years ago. The work of Captain Fraser Tytler, attached to the Quartermaster-General's Department in the first war, had come to the front, and various other less important materials. They had all been incorporated and put together recently under the orders of the Topographical Department of the War Office by Major Wilson, R.E. In the present campaign every precaution had been taken to send with each force a band of officers and assistants who, he was sure, would do everything in their power to lay down as much of the country as possible. With General Browne's force there was Major Tanner, a splendid topographer, one of the best men for sketching ground to be found in any country. With him was Captain Samuels, who did excellent service at Ali Musjid, with his plane-table before him, under the fire of twenty-four of the enemy's guns. A cannon ball passed between the legs of his plane-table, but he never flinched from laying down the ground. He grieved to say that from the toil and exposure to which he was subjected this excellent officer caught a fever, and was carried back to Peshawur, where he recently died. A greater loss to the department could not be. He was happy to see that the 'Times' that day had done the justice of inserting an account of the services of this officer. With General Roberts' column there was another excellent surveyor, Captain Woodthorpe, R.E. The newspapers had recently recorded an admirable feat by that gallant young officer. Notwithstanding his duties with his plane-table, and his sketching and observations, he was one of the first to enter a stockade that had just been taken. But unfortunately he jumped in before the enemy were out of it, and having found out his mistake he very quickly jumped back again; but his coat was riddled, his pistol knocked to pieces, his pouch-box pierced, his back grazed with a ball that ran round inside his coat, and yet he escaped, and General Roberts did him the honour of saying that he was one of the best men in his column. With the third column was Captain Rogers, R.E., who was carrying on a triangulation from Sakkar, on the Indus, where the line of the great triangulation of India extended from Karáchi, and he was in great hopes that the triangulation would be continued through the Bolan and Quetta, and that on that triangulation the topography of a great portion of that part of the country would be based. By the services of these officers he hoped that when the army came back, such an amount of information would be obtained as would materially modify the existing maps, and he could assure the Geographical Society that whatever was possible, would be done by the officers who were connected with the Survey of India.

Sir T. DOUGLAS FORSYTH said that he was personally acquainted only with that part of the region, embraced in maps of Afghanistan, which lay far to the north of the Bamian Pass. He wished to bear his humble testimony to the accuracy of one part of General Kaye's paper, and that was with reference to the character of the passes in those parts. One of these passes was at least 13,000 feet high. People who were accustomed to the hilly districts of England, Scotland, or even Switzerland, might think there must be great difficulty in getting over such high altitudes, which appeared great heights for a pass, but he had observed in the Himalaya that altitude really had nothing to do with the difficulties of an ascent. Much depended on the position of the mountains—whether they were acted upon chiefly by great rains or were merely subject to the influence of snow. The monsoon rains did not fall on this part of Afghanistan with that strength with which they fell on the Himalaya, and where mountains were only subjected to the influences of winter snows, there were no such deep ravines or abrupt slopes, and the undulations were more easy, rendering it comparatively easy to get over the great altitudes. That was a point of very great importance, whether they have to consider the matter politically with reference to the advance of armies, or commercially, with reference to the opening out of roads for caravans. In reading a paper which Mr. Markham had contributed

to the last number of the 'Proceedings,' in which the heights of the passes were given, he was much struck by the fact that the pass leading from the Pamir, viz. the Baroghil Pass over the Hindu Kush above Chitral, was only about 13,000 feet. Major Biddulph, who was one of the officers who accompanied him (Sir D. Forsyth) to Cashgar, on his way to Wakhan ascended Baroghil Pass, and reported it as one of the easiest passes in the world, in fact, almost no pass at all. The ground rose to it in a succession of undulating slopes which could be crossed by wheeled carriages with perfect ease. This was a matter of great importance when it was remembered that this route led direct from Peshawar up the Chitral Valley over the Pamir into the country of Cashgar. The difficulties of the passes, therefore, must be estimated not with reference to the actual heights but with reference to other considerations.

SIR WILLIAM L. MEREWETHER had lived for nearly forty years in a part of India which lay near Afghanistan, west of the Indus, and he had paid great attention to it. His home was the dry part of Sind (Scinde), south of the mountains, between the sea and the mouth of the Bolan Pass. In the present state of affairs he considered that region to be one of great importance, as it was really the direct line between England and Candahar. Artillery and troops could be embarked on the London docks, taken down the Thames and the Channel, by the Mediterranean to the Suez Canal, down the Red Sea and so on to Karachi. From that point to the Indus there was a line of railroad, 105 miles long, to Kotri. It had then been carried along the right bank of the Indus to Sakkar. That was the line of railroad which was very aptly called by Sir John Lawrence, when he was Viceroy of India, "the missing link." He was happy to say there was no longer a missing link, for the Indus Valley Railway was now completed to Multán. A force at Quetta or Candahar could be readily reinforced from Karachi and Multán (Karachi being the proper base), from Bombay and from England. Communication from Karachi to Sakkar would be a matter of sixteen hours; from Sakkar to the mouth of the Bolan was 150 miles, which, if a light railway was laid down, as he hoped soon would be the case, would be a matter of ten hours more. From the mouth of the Bolan to Quetta was about 82 miles. From thence to Candahar there were no great difficulties which an army could not easily surmount, as had recently been proved by General Stewart's column, which merely experienced a slight check at the Kholuk Pass, and not only met with no opposition from the people, but received cordial assistance. Sind held a very important position with regard to the future support of troops at Candahar. With regard to the question of supplies at Candahar, the valley of the Indus was one of the richest with which he was acquainted, except the valley of the Nile. It was similar to Egypt in most respects, and has for long borne the name of Young Egypt. That being so, it afforded an admirable market for the demands of the troops above the Bolan Pass, and as long as these remained at Candahar, he thought there need be no difficulty in furnishing them with all things requisite for camp or cantonment life. He wished to bear testimony to the excellence of one of the officers whom General Thuillier had alluded to, namely, Major Tanner, who was one of the first surveyors of the hills of Beluchistan, and his survey was so absolutely accurate, that when some years ago he (Sir W. Merewether) spent two months among those hills, he could always on the maps furnished by the Surveyor-General's Department point with a pin to the exact spot where his tent ought to be pitched. He did not think there could be better testimony to a surveyor's care and accuracy than that.

SIR HENRY RAWLINSON said Mr. Markham's paper had been put together with a great deal of skill and care. It gave a very accurate representation of the country which it described, and altogether was a very valuable contribution to geography. There were, however, a few small points on which, *en passant*, he might offer some

corrections. In the first place, the estimate of the size of the Argandáb was rather exaggerated. He did not believe that that river ever joined the Helmund, but was all absorbed in irrigation. About 15 miles indeed from the Helmund a large embankment had been made by Emir Timúr to arrest the water, and he had always understood that no portion of the stream now passed the *Bend-i-Timír*. Of course the Argandáb was technically an affluent of the Helmund, because if there was sufficient water in the bed it would reach that river, but in those countries it required a very large body of water indeed to meet the calls of irrigation, and the absorbing nature of the sand through which it passed. Then again, the Tarnak Valley could hardly be called a ravine. For the greater part of its extent it was at least 10 miles wide. It was indeed a good open valley, with the high road between Kabul and Candahar running along it. Mr. Markham had hardly drawn sufficient attention to the main features of the orography of the region, the great point being that between the Helmund and the Suliman Range, the elevation of the hills was much less than that of the two culminating ridges. The intermediate hills indeed were not more perhaps than 2000 or 3000 feet above the plain, and presented no obstacles to an army. These were small matters, but it was as well to notice them, and he was sure Mr. Markham would take his corrections in good part. He further thought the great range, the continuation of the Koh-i-Baba, had been examined by Arthur Conolly, who passed direct from Bamian along the skirts of the mountains, and whose journal had been published in the 'Calcutta Review' many years ago. Conolly was the only person who had actually followed the skirts of the hills from Bamian to Maimeneh, though several officers had passed from Herat to Kabul by the route through Afghán Turkistan. The River Helmund was one of the most famous in Asia. In the *Vendidad Sadé*, one of the earliest of the books of Zoroaster, the Helmund was given as one of the original settlements of the Aryan race, being in fact the only river mentioned in the whole ethnographical scheme. From that time to the present it had always been a great geographical and political feature. In recent history it had been considered the boundary between Persia and India. The Mogul Emperors indeed were accustomed to say, "The Helmund is the ditch and Candahar is the fort which guard India from the west," and that was undoubtedly a true description of those great physical features. Of course political accidents might for a time distort such features, but ultimately the old principle of distribution must be revived, the Helmund to the west, and the Hindu Kush to the north being the natural boundaries of India. General Thuillier had expressed his regret that in former times so little attention was paid to the geography of the country. Now he (Sir H. Rawlinson) had been in Afghanistan for three years during the old war, and received the medal of the Royal Geographical Society during our occupation of the country, so that he naturally took considerable interest in geography and did everything in his power to obtain information, but he really could not do much. He was usually engaged for eighteen hours out of the twenty-four on hard official work, having to feed the army and govern the country over and above his ordinary political duties. Under such circumstances it was quite impossible for him to spend his time in surveying. During the greater part of the time he was at Candahar, there was not an engineer officer in the place, the only two with the force, Captain Saunders and Lieutenant North, being employed at Herat, so that at Candahar he was entirely dependent for collecting geographical intelligence on the Quartermaster-General's Department. There were, it is true, some accomplished officers in that department, Fraser Tytler being one, and he (Tytler) did obtain a considerable amount of information, and embodied it in the map of the Helmund Valley to which Mr. Markham had recently given publicity. He (Sir Henry) was pleased to know now that the claims

of geography had come to the front. In sending the forces into the field, the Government, inspired no doubt in a great measure by General Thuillier, had provided, it seemed, ample means for obtaining geographical information which would last for all time, and probably would be the most valuable result of the present expedition. He himself was now in correspondence with General Biddulph, who had already sent home some very valuable reconnaissance maps of the southern part of the country. The General indeed had conducted a reconnoitring force 50 miles to the east of Quetta as far as Amadun, and his sketch map of that region contained entirely new geographical information. Sir Henry had recently received a letter from General Biddulph which was written just as he was starting from the Helmund, and in that letter the General said he would take care to get a sketch map of that region, so that as far as the western part of Afghanistan was concerned a considerable accession to our geographical knowledge might confidently be expected.

General THUILLIER wished to add that two other officers of the Survey Department of India, Captain Holdich, R.E., and Captain Maxwell Campbell, R.E., having received a telegram offering them employment with the army in Afghanistan, had left London at two or three days' notice for that express purpose. Lieutenant E. P. Leach, R.E., had likewise returned to India for a similar purpose.

Sir HENRY RAWLINSON, in reply to a question put by Mr. J. L. HADDAN respecting the height of Lake Sistan above the sea-level, said he believed it was between 800 and 1000 feet.

The CHAIRMAN congratulated the Meeting on the large amount of interesting information which had been elicited by the discussion. Sir Henry Rawlinson had spoken of the ditch and the fort which were considered by the great Mogul conquerors long ago to be the true defences of Western India. No doubt this view was right, but it was one which Englishmen were only within the last few years apparently beginning to appreciate at its full value. Whatever might be the political results of the present movement of military forces in Afghanistan, it must be very satisfactory to find that at all events a great deal of accurate topographical and scientific knowledge would be obtained.

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*On the Colouring of Maps.* By Professor CAYLEY.

THE theorem that four colours are sufficient for any map, is mentioned somewhere by the late Professor De Morgan, who refers to it as a theorem known to map-makers. To state the theorem in a precise form, let the term "area" be understood to mean a simply or multiply connected\* area: and let two areas, if they touch along a line, be said to be "attached" to each other; but if they touch only at a point or points, let them be said to be "appointed" to each other. For instance, if a circular area be divided by radii into sectors, then each sector is attached to the two contiguous sectors, but it is appointed to the

\* An area is "connected" when every two points of the area can be joined by a continuous line lying wholly within the area; the area within a non-intersecting closed curve, or say an area having a single boundary, is "simply connected"; but if besides the exterior boundary there is one or more than one interior boundary (that is, if there is within the exterior boundary one or more than one *enclaves* not belonging to the area), then the area is "multiply connected." The theorem extends to multiply connected areas, but there is no real loss of generality in taking, and we may for convenience take the areas of the theorem to be each of them a simply connected area.