

was, that those people left to themselves without their passions being aroused by mutually inflicted sufferings and horrors, were naturally amiable, cheerful, and lively, as the inhabitants of Papua itself had been described, and their own worst faults arose from enmities and wars partly arising among themselves, but very often fomented by injustice and wrong committed by the white men who went among them. Human nature was less degraded and more amenable to civilising and elevating influences than it was commonly supposed to be, but they must be brought to bear by the right hands, and not by the wrong ones, as was unfortunately too often the case. Anyhow Mr. Forbes had shown them what a single traveller could do by great nerve, self-possession, and courage, and also how his strength was increased and his heart no doubt sustained by the devoted lady who accompanied him. It was impossible to give him their thanks for the paper which he had read without associating with those thanks that lady.

With regard to the second paper, and a diagram of Krakatoa exhibited by Mr. Forbes, the Chairman said the more they knew about this strange line of fissure that ran in a north-easterly and south-easterly direction through the Archipelago, the sooner they would get to an understanding of those calamitous explosions which from time to time occurred. And from that point of view the observations made by Mr. Forbes were of extreme interest, that Krakatoa was only a secondary symptom after all, that the real primary symptom was an eruption unobserved and unrecorded, but of which the effects alone had been seen, which must have occurred in the Indian Ocean some hundred of miles to the south-west, and that the vast volume of pumice stone which covered tens of thousands of miles of the ocean did not come from one vent but from a subaqueous eruption in that spot. This was a new fact and did not appear in any of the previous discussions relating to the great eruptions of Krakatoa. It was highly interesting because it at once let them into part of the secret of a vast explosive force, for if a fissure occurred there they must have the generation of a tremendous amount of steam under enormous pressure calculated to find its way through every fissure open to it, and to break out where it found the line of least resistance.

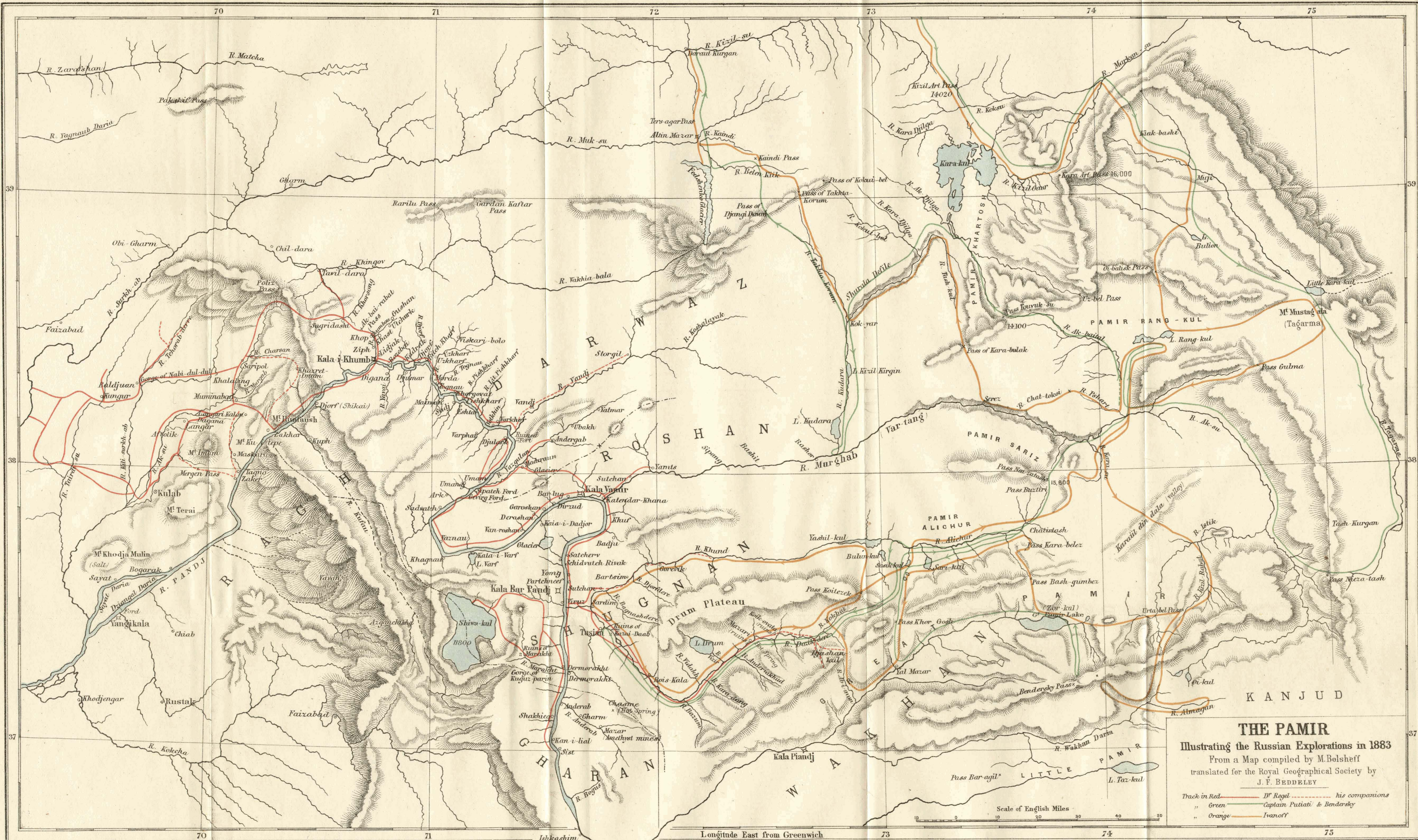
The Russian Pamir Expedition of 1883.

Map, p. 176.

WE present our readers with the following translation of a paper in the *Isvestia* of the Russian Geographical Society,* on the chief results of the Pamir Expedition of 1883:—

The year 1883 will be memorable in the annals of the geographical exploration of the Pamir. The scientific expeditions and travels directed in recent times towards the Pamir from Russia as well as from India, usually embraced but insignificant tracts of country separated by vast districts disconnected and unexplored. What travellers in the Pamir gave us was never more than a very small part of what was expected from them. It was long felt that a larger expedition was wanted—one sufficiently well equipped to solve once for all the mass of problems still

* *Isvestia Imp. Rusk. Geogr. Obshchestva Vvupusk 4.* Our map is a reproduction (translated) of the one which accompanies the paper.



presented to geographers by the Pamir. Such an expedition—at least so far as concerns the eastern portion of the Pamir—was that fitted out last year (1883) by order of the Governor-General of Turkistan, its members being Captain Putiata, of the General Staff, M. Ivanoff, geologist, and M. Bendersky, topographer. To their energy we owe it that the eastern half of the Pamir has now been traversed in every possible direction, whilst on its southern border, the long wished-for connection has been established between our labours and the route-maps of English travellers.

The first announcement of the successful termination of the labours of this expedition was contained in a letter from Ivanoff to J. V. Mushketof, by whom it was obligingly communicated to the editor of the *Isvestia*. This letter contains only an abstract of the routes followed by the members of the expedition—and that with some omissions; but the bare summary is so suggestive that we felt bound to communicate it at once to our readers without waiting for further information, which would involve a preliminary elaboration of the materials collected.

At the same time that the members of the great Pamir Expedition were making their difficult journeys to the north and east from Pandja, another Russian traveller, Dr. Regel, was continuing his excursions through Darwaz and Shugnan. The sketch-map of his routes, lately received, is extremely interesting, although unfortunately unaccompanied by any explanatory text. It is true that Dr. Regel's maps must be accepted with great caution since he is no surveyor. Nevertheless, admitting even that his sketch requires considerable correction, it is useful if only in that it gives us the first hint of new and unexpected geographical details in places hitherto only visited by pundits—natives from India, who received instructions in surveying in the British Governmental Department of Topography.

Here it will be well to refer to the last of these pundits, known under the initial letters M— S—, who explored Badakhshan and the neighbouring districts from 1878 to 1881. The detailed map of the routes traversed by this explorer we received at the beginning of the current year; it has been published with a brief explanatory text in the Report of the Indian Survey Department for 1881-2. The most important novelty in this map relates to the river Aksu, which is given by the pundit as the upper course, not of the Murghab, as was hitherto thought, but of the Suchan, which falls into the Pandj a little way above Kala-Bar-Pandj.

The result of Dr. Regel's inquiries contradicts this opinion. On his sketch we find that the river Aksu, taking its rise from the lake Suman-Kul, is indeed the upper course of the Murghab. The contradiction between Dr. Regel and all previous Russian travellers on the one hand and the pundit M— S—, who had actually been there, on the other, has now been finally decided by the great Pamir Expedition in favour

of the former. It seems that the Aksu is really the upper course of the Murghab, and that M—— S—— having reached the Sariz-Pamir, mistook the true direction of the ravine through which the Aksu there forces its way.

The work of the great Pamir Expedition, as well as that of Dr. Regel, requires an explanatory map, which is given with this part of the *Investia*, the scale being 30 versts (20 miles) to the inch. The eastern part, containing the region explored by Putiata, Ivanoff, and Bendersky, was necessarily compiled from old data; it includes but a few new names occurring in Ivanoff's letter and a lake discovered by the expedition on the watershed between the Istik, the left confluent of the Aksu, and the great Pamir river. The western part reproduces in general Dr. Regel's map on a reduced scale. We have only ventured to diverge from his indications where inquiries in regard to places visited by other travellers take the place of personal observation. Besides this, we have filled in, in greater detail, the bend of the valley of the Pandj between Kala-i-Khumb and Vandj, taking advantage for this purpose of the survey of Kosiakoff, a scientific topographer, who accompanied Dr. Regel in 1882.

The most interesting points in Dr. Regel's map are undoubtedly the vast bend in the course of the Pandj between Murghab and Vandj, and the lake Shiwa, as represented by him. These two geographical novelties we leave as they are on his map, the responsibility resting with the traveller himself. Where we have departed from Dr. Regel's map we have been guided in the southern portion chiefly by Colonel Mattvieyeff's route-map of his journey in 1878 from Kulab to Faizabad, and in the northern parts of Badakhshan by the work of the pundit M—— S——.

We have by no means, however, made unconditional use of the pundit's map. Not a little doubtful, for instance, is the lower course of the river Doab, or Shiwa, as there shown, along the upper part of which lay the route of the Indian surveyor when going from Ragh to Kala-Bar-Pandj. M—— S—— extends this river—as a suggestion only, it is true—as far as Kala-i-Khumb, which cannot possibly be admitted as correct.

If we turn to the map forwarded by Regel from Kala-i-Khumb in 1881, we find that he there shows a mountain range extending to the south of Darwaz, in a south-easterly direction, with separate peaks attaining a height of 20,000 feet. If we now add to that the fact that Lake Shiwa, according to Regel, lies at an altitude of 11,000 feet, we are irresistibly led to the conclusion that we are here on the western border of the Pamir, and this conclusion is also in conformity with existing orographical knowledge.

This border appears, on the western edge of our map, to form its watershed between the left confluent of the river Khingob and the rivers watering the countries ruled by the Begs of Kulab and Baldjuan;

further to the south-east its position is defined by the southern bank of Lake Shiwa, which evidently lies on the plateau, and finally by the eastern sources of the river Kokcha, i. e. partly by the pass into Ishkashim. Such being the position of this border, the outlet of the river Doab must be sought, not at Kala-i-Khumb, but below that place. On our map we have taken the river Doab for the upper course of the river Kufau, partly on the strength of an article by Mr. Arendarenko, in which, enumerating the rivers of Darwaz, he speaks of the Kufau as the principal left confluent of the Pandj, having a length of 150 versts. In making this alteration we have ventured to differ with Regel, who marks the Kufau only as an insignificant stream on the Pamir plateau.

In conclusion, we will add (1) that the ranges barely indicated in Regel's map retain in ours their undecided character; only some few passes and heights are defined, which one traveller (Ivanoff) points out; (2) the boundaries of Darwaz and Shugnan are likewise taken from Regel; and (3) the appellations *Azgantchikha* and *Yavan*, due to inquiries not made on the spot, are given by us also as open to grave doubt.

We will now proceed to give the contents of Ivanoff's letter:—

* * * * *

Leaving Tashkend 24th May, the expedition completed its equipment in the town of Osh, whence it commenced its labours on the 8th June. The route chosen to the Great Kara-kul was that by the passes of Taldik and Kizil-art, and from the Great Kara-kul eastward by the lofty pass of Kara-art (about 16,000 feet) and down the river of that name almost to its confluence with the Markan. Thence turning sharp to the right by a double pass, the expedition visited the sources of one of the more considerable rivers, the Sarikolagezi, which flows through the wide and lofty valleys of Kiak-bashi and Muji. Here we may consider the expedition as entering the region of the Pamirs (not counting Alai). The visit to this entirely unknown eastern border of the Pamir is especially important in regard to the connection between the orography of Western Kashgaria and that of the Pamir and neighbouring regions.

At Muji, wishing to make the most of its forces and time, the expedition divided: MM. Putiata and Bendersky descending the valley through Bulion-kul, Little Kara-kul, and the valley of Tagharma to Tashkurgan; * and thence by the Pass of Stun and Niezatash down the course of the Aksu to Ak-baital; Ivanoff turning westward by the pass Oi-balisk to Rang-kul, through the basin of which he continued eastward to the Little Kara-kul, connecting the former survey of Rang-kul of Skassi

* At Tashkurgan astronomical observations were made connecting the English and Russian surveys.

with the latest surveys of Bendersky. After examining the gigantic treble peak of Mustag-alá (the Tagharma of Severtsof) with its beautiful range of moving glaciers, Ivanoff, crossing Gulma, reached the Aksu and followed its course to the Ak-baital, where he rejoined his companions.

Visiting Rang-kul a second time, the expedition, after a short delay caused by the arrival of a Chinese detachment, returned by way of the Ak-baital to its junction with the Aksu (Murghab), where it again divided—Putiata going down the Murghab to an impassable defile, thence reaching Alichur by way of Buztiri, and continuing as far as Yashil-kul; from there going due south to the Pass of Koitezek, down the river Toguzbulak (southern source of the Shugnan river Suchan), to within one day's journey of its junction with the Khund (the northern source of the Suchan), and returning to the Eastern Alichur. Ivanoff and Bendersky meantime travelled south-east to the Great and Little Pamirs, with the main object of filling up the large blank occasioned by the utterly unknown regions lying between the middle course of the Aksu, Alichur, and the Great Pamir. From the river Karasu, where it touches the ravine Chokubai leading from the Alichur Niezatash, they turned south-east through the wide waterless valley of Karaül-dindala, and having withstood on July 13th a violent snowstorm, the following day reached by a double pass the left confluent of the Aksu—the Istik or Issik, at the spot where on the English maps it is made to join the Kizil-rabat (the lower course bears the name of Chish-Tiube). Having followed the current of the Istik they turned up the Chish-Tiube, and reaching the part where its many sources join (amongst them the Kizil-rabat and Urta-bel), issued at the lake on the upper Aksu, one day's journey from its source. Thence having journeyed to the source of the Wakhan-Daria, they endeavoured to find the supposed pass of Varram-kotal, leading to the lake Great Pamir, but after several reconnaissances they were obliged to conclude that the mountains separating the Great and Little Pamirs were absolutely inaccessible in this direction.

Having made an excursion up along the river Almagan (rising in Kanjud, and falling into the Wakhan-daria from the left), which must certainly be accounted the beginning of the river Wakhan, Ivanoff turned back to the Urta-bel, whence with his party, turning sharp to the left, he reached the Istik at the point on its upper course where the stream makes an elbow at a right angle,* and spent the night on the watershed dividing this river from the river Great Pamir, the place being full of lakes. Having made considerable corrections in the English survey, which was taken in winter when the ground was covered with snow, and having made sure that the sources both of the

* On the English maps this place is called Shakhtiupe, although no such mound as the name implies can be found.

Istik and the Great Pamir are in the southern mountains, and that in the pass between them there is an independent lake, without any visible out-flow, they went westward to the Great Lake. Having stayed here two days amongst the countless flocks of Argali (*Ovis Ammon*) which roam over all the mountain slopes and valleys of the Great Pamir, Ivanoff continued westward, turned north half a day's journey from the lake, and reached the river Bashgumbez (which flows into the Alichur) by the extremely difficult pass of the same name. Not going quite to the Alichur, the party crossed by the new pass of Karabelez-su to the neighbouring river Utchkol, which they followed to the Alichur at Chatirtash, where they met Putiata and his companions.

From the Alichur the whole expedition, now united, journeyed again to the Great Pamir by the Pass of Khor Gosh, at once the most interesting and most practicable, and the following day reached Yal Mazar (a place visited by the English Expedition under Captain Trotter), the position of which was precisely determined by astronomical observations.

Leaving the Great Pamir, the expedition once more divided: Putiata and Bendersky directed their course across the Great Lake, and by a new, hitherto unknown pass (to the west of the Urta-bel), discovered by the practised eye of Bendersky (and therefore called after him), crossed to the Little Pamir, with the intention of endeavouring thence to penetrate through Bar-agil into Chitral; Ivanoff followed the Great Pamir down to its right confluent, the Mass, up which he went to the river Shakhdere, and then up one of the sources of that stream to Kokbai to the north, not far from the Pass of Koitezek, whence he reached the southern bank of the Yashil-kul, which interesting lake he skirted to its western end, where the river Khund flows out of it. Down this river he passed to its confluence with the Toguzbulak, where stands the uppermost *kishlak* of Shugnan—Sardim. Finding that further progress through Shugnan, just occupied by the Afghans, was impossible, Ivanoff returned by the Toguzbulak to the Alichur, traversing this time a new and interesting route direct to the Sasik-kul, whence, by the right bank of the Alichur through Naizatash (obtaining geological materials of the very greatest importance) to where the Ak-baital falls into the Murghab. Here unfortunately he received information from his colleagues that at that time of year Bar-agil was impassable, and that the political condition of Wakhan had compelled them to renounce further exploration to the south, and return without reaching Pandj. Knowing that the provisions of the other returning party were already exhausted, Ivanoff hastened, according to the programme arranged upon, to visit the village of Serez, on the Murghab, to obtain flour from this the nearest and only point where it could be had. From the right confluent of the Ak-baital, the Pshart, the favourite wandering place of the local Kirghiz, he crossed to one of the right affluents of the Murghab, called in its lower part Chat-tokoi, and through its narrow valley reached the

Murghab. Following the downward course of this river, running through an almost impassable defile, he reached with great difficulty picturesque Serez, and having brought flour by the pass of Karabulak (one of the most difficult in the whole journey), he came out to the north on the Great Pamir, lying to the west of the Ak-baital, and by the valley of the river Tash-kul reached the mouth of the Takht-kurum where he found his colleagues, who had come from the Murghab across the upper Ak-baital, and past the Kukui-bel, through the defile Shurala, debouching at Kok-yar on the Takht-kurum.

At Kok-yar, the remarkable dwelling place of the old barantatch * Sahib-Naza, well known in all this district, the expedition once more divided: Putiata and Bendersky went down the valley of the river Kudara with the object of, if possible, exploring that part of the Murghab which is called Bartang or Roshan; but after two days they were compelled to return, owing to information received as to the political condition of Roshan, and to the difficulty of the route along the Murghab, and then went northward through the Pass of Djangi-davan, a little to the west of the Takht-kurum. Having experienced here unusual difficulties the explorers travelled to the Belen-kük, which Bendersky followed down to the glacier Fedshenko, a feat of great danger which the expedition of Oshanin, in 1878, had failed to accomplish. Ivanoff from Kok-yar also went north through the Pass of Takhta-kurum, and having done one day's journey down the river Belen-kük, crossed the glacier to the river Kaindi, descending the latter to Altin-Mazar on the Muk-su; having made an excursion to the glacier Fedshenko and seen the gold-washing works there, he reached Daraut-kurgan by the Pass of Ters-agar, there to await the transport from Margelan with the necessary purchases.

At Daraut-kurgan the different divisions of the expedition reunited in order to replenish their stores and continue their explorations. It was proposed that Ivanoff should undertake the exploration of Darwaz and Northern Karateghin, returning afterwards through Margelan, whilst Putiata and Bendersky, journeying through Gharm to Kala-i-Khumb, should go down the Amu through Kulab, and return home by way of Samarkand, which would take about a month and a half in either case.

The results obtained by the expedition are very considerable. A five-verst map of the whole of this extensive region; numerous barometrical determinations of heights † (by aneroid and by calculation); considerable geological collections, throwing light, in connection with former geological discoveries, on the formation of the region; observations upon the general physical characteristics of the country; thermometrical data; flora; about a hundred drawings by Ivanoff; and many observations in

* i. e. leader of "baranta," or robber band.

† Ivanoff's party took observations, whenever it touched upon unknown parts, in connection with the labours of Bendersky.

other departments of science, as well as the astronomical determination of many points by Captain Putiata; all this forms a very considerable amount of material obtained by the expedition. When the expedition terminates its labours this winter, Mr. Ivanoff will return to St. Petersburg to reduce to order the various materials collected by him in the vast regions constituting the highest portion of Central Asia, which has long borne the name of "the Roof of the World."

The Volcanic Eruption of Krakatau.

With a Map.

CONSIDERING that the volcanic eruption, of which the Straits of Sunda have been for the last eight months the centre, is among the most stupendous of our times, and that the attendant phenomena have given rise to many questions of the highest scientific, and we may add, geographical, interest, a *resumé* of the facts compiled from all the latest available sources may be interesting to our readers.

The island of Krakatau (such, and not Krakatoa, is the native name) is situated in latitude $6^{\circ} 7' S.$, longitude $105^{\circ} 26' E.$, in the fair-way of the Sunda Straits, about equally distant from Java and Sumatra, close on 26 miles W.S.W. from the village and lighthouse of Anjer, the call-port or signal station, prior to the present eruption, for all vessels passing through that frequented channel. It was a small uninhabited island about five miles in length and three in breadth, culminating in two elevations, the taller of which, known as the Peak of Krakatau, rises (or did rise) some 2750 feet above the sea. Surrounding it on all sides are numerous volcanic cones. The Tengamoes (or Kaiser's Peak) to its north-west is situated at the head of the Semangka Bay, and the quiescent Rajabasa to its north-east in the southern promontory of Sumatra; in the east by south the Karang smoulders in Bantam, and south-east rise the active cones of the Buitenzorg Mountains. Standing in the Straits and very little to the north of Krakatau are the two dormant or dead cones of Sebesie and Sebooko. A line drawn from Rajabasa, passing along the western side of Krakatau and continued thence to Prince's Island, which lies off Java Head, would mark the boundary on the eastward side of the shallow Java Sea, which rarely exceeds fifty fathoms, and on the west side of the deep Indian Ocean. On looking at the accompanying map of the locality before the eruption it will be seen that close to the east and north-west sides of Krakatau, there are two small fragments of land, Lang and Verlaten islands respectively. It is Mr. Norman Lockyer's opinion that these are two higher edges of the old rim of a subsided crater, overflowed in part by the sea through inequalities in the margin between them; that the heights on Krakatau itself, the