At the same time it must be remarked that exploring parties of Russian officers, botanists and others, are being constantly heard of penetrating into China and Tibet, in the hope perhaps of finding the long-sought El Dorado further eastward.

M. Severtsof's Journey in Ferghana and the Pamir in 1877–8.*

THE party which General von Kaufmann in 1877 directed to explore Ferghana and the Pamir, consisted of M. N. Severtsof, who, besides the general control of the expedition, paid especial attention to physical geography and zoology, M. Schwarz, director of the Tashkend Observatory, who determined astronomical positions and took magnetic observations, M. Skassy, as topographer, who in 1878 also undertook M. Schwarz's functions, and M. T. T. Skorniakof, as chief of the escort and assistant to M. Severtsof in his zoological, botanical, and geological researches. In the spring of 1878, Colonel Kushakewitch also joined the expedition as botanist and entomologist.

At the end of September 1877, the expedition started from Tashkend, and completing their preparations at Osh by October 17th, directed their course to the south through Gulcha,† and ascended the Alai on October 26th by the Shart Pass, which had not been previously explored. The general opinion hitherto had been that the Alai passes were inaccessible from the end of September till late in the spring, but M. Severtsof was enabled to prove the contrary, and thus confirm the view which he entertained from his previous experience in the Tien-shan in October 1867. On October 25th, indeed, the Shart Pass is stated to have been free from snow to a height of 13,000 feet, and no snow was seen on the neighbouring summits of the Alai.

At Sufi Kurgan, near Gulcha, there are four roads leading to the Alai passes, which further to the south and south-east unite into two. The first two lead to Kashgar through the passes of Terek (12,500 feet) and Shart (13,000 feet), and join close to the outpost of Irkeshtam, near the eastern Kizyl-su, one of the many sources of the Tarim. The second pair of roads lead through the Archat (11,500 feet) and Taldyk (11,800 feet) passes, and after uniting on the Alai at the western Kizyl-su, the northern head of the Amu-darya, lead through the Kizyl Yart gorge and passes (14,000 feet) to the Pamir. Kizyl Yart is the pass leading through the Trans-Alai Range to the Pamir, while at an angle to it is another road from Shart which was the one followed by

* From a translation by M. Alexis Lomonossof, F.R.G.S., Assistant Secretary of the Imperial Russian Geographical Society.—This memoir is that alluded to in the present volume of the 'Proceedings,' p. 137.

† Some part of the route will be found on the map at p. 528; but the best map to refer to is that of Trotter, in 'Journal R. G. S.,' vol. xlviii. p. 173.

M. Severtsof.—On October 26th there was a heavy fall of snow, which, however, melted, and two days later the southern slopes of Kizyl Yart were free from snow. Although the season was so far advanced, M. Severtsof was here able to make a collection of sixteen species of migratory birds, wintering in the locality, among which were redwings (*Sylvia curruca*) common in European and Asiatic Russia. After making themselves acquainted with the general character of the northern Pamir between Kizyl Yart and Kara Kul, and having laid down on the map the unexplored upper portion of the Markhan-su, the affluent of the Kashgar-darya (eastern Kizyl-su), the expedition on November 1st retraced their steps to the Kizyl Yart defile and the junction of the roads from the Archat and Taldyk passes. During some fine clear weather they took astronomical observations, and also measured the peaks of the Trans-Alai Range. The highest to the west of Kizyl Yart is the Kaufmann Peak (22,800 feet), seen by M. Fedchenko, and to the east the three-peaked mountain Gurumdy, the western summit of which was found to be 20,300 feet high. Proceeding through the Taldyk Pass, the expedition were occupied during November in exploring the mountain ranges between the Kurshab and Tara rivers and the upper portion of the Kara-darya. The month of December was chiefly occupied by M. Severtsof in making zoological observations in the neighbourhood of Gulcha, Osh, and Andijan. Then, leaving M. Skorniakof to make collections of birds at Balyk Chach, at the junction of the Kara-darya and the Naryn, he went to Tashkend to present the preliminary report on his explorations to General von Kaufmann, and to obtain further instructions as to the work to be undertaken in 1878.

In the spring of 1878, the expedition, which was now accompanied by M. Kushakewitch as botanist, explored the Ferghana Valley and the mountains to the north and east. Owing to the unusual severity of the winter and spring, an early start for the Pamir was impossible; but in the middle of July the expedition advanced in several detachments, and assembled near the Kara Kul early in August, one of the chief objects of the journey being a series of levellings from the Ferghana Valley to Kara Kul. M. Skorniakof, meantime, proceeding through the Kara Kazyk Pass (14,000 feet), traversed the whole length of the Alai, where he made collections of much value, and determined the height of fifteen positions by boiling-point. On July 10th, the Kara Kazyk Pass was impenetrable from deep snow, though in most years, notwithstanding its great elevation, it is entirely free from snow during three months, from early in August to the beginning of October. M. Skassy began the levelling from Osh on July 17th, and on August 9th reached Kara Kul. MM. Severtsof and Kushakewitch with M. Rudnef—who was obliged to make surveys on the Pamir to enable M. Skassy to carry his levelling beyond Kara Kul—started from Osh on July 17th, and on the 27th reached the Alai through the Archat Pass

(10,300 feet). The journey was very difficult, owing to an unusually late high flood on the Kurshab, along which their route lay. Several of the bridges were carried away and the fords were impassable; in one place the members of the expedition were swept off the ford into deep water, and had considerable difficulty in reaching the bank without injury to their instruments and collections. On the Alai, MM. Severtsof and Kushakewitch separated, the former devoting the early part of August to the exploration of the upper portion of the Kashgar-darya (eastern Kizyl-su), while the latter and M. Rudnef proceeded to Kara Kul, and occupied themselves, the one with botanising, and the other with completing his surveys begun in 1876. After making himself thoroughly acquainted with the summer condition of the Alai, M. Severtsof passed through the Tong Murun Pass (11,300 feet), and examined the tertiary formation at the sources of the Kashgar-darya, as far as the Kara Bel ridge on the north, determining also the southern limit of the fir. He found the country about Irkeshtam near the Kara Bel in a state of desolation, having been devastated by locusts for three consecutive years. He traced the line of migration of these locusts through Tong Murun and the Alai to Kara Kul, where they were stopped by frosts, but isolated specimens were met with in the interior of the Pamir. On his return, near the entrance of the Kizyl Yart gorge, M. Severtsof was successful in obtaining an ornithological rarity, *Falco Hendersonii*, in connection with which he has pointed out the differences between the faunas of the Pamir and the Tien-shan, remarking that many Tibetan and Himalayan species inhabit the Alai and Pamir which do not reach the Tien-shan.

Though some of the neighbouring parts of the Pamir are barren, there is more vegetation at Kara Kul, where the expedition assembled on August 12th. The approach to Kara Kul from the last pass is very picturesque, and there is a good carriage road, notwithstanding its elevation of 14,000 feet. The surface of the lake is divided into two basins, joined by a narrow strait between two hilly peninsulas, the northern of which appears to be an island, but is joined to the shore by a narrow, low sandbank, which is covered whenever the water in the lake rises. Round the lake are snow-clad heights, which, on the western sides and in parts also on the north and south, descend abruptly to the water's edge, while on the east there is a broad, sandy, salt steppe, with bright green bands of meadow-land at the mouths of the rivulets which fall into the lake. The beauty of the scenery is heightened by the peculiar shape of the mountains, the blue colour of the lake waters, and the general tint of colour pervading the whole locality, notwithstanding the comparative scantiness of vegetation, which on the Kara Kul, as on the Pamir, is only found in places. Indeed, the greater part of the whole surface of the Pamir is denuded of vegetation, the ground being covered with pebbles, sand, and saline incrustations. At the

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d sketched by Colonel Gordon from Tash-Kurgan. The principal ammit rises to a height of about 26,800 feet, and is the highest peak of the Pamir. These two mountain masses are separated by a distance of 5 miles, and between them are mountains not capped with snow, through which runs the Taman-ata River. According to M. Severtsof's observations, a continuous meridional snowy range positively does not exist here. From Rang Kul the expedition continued their course to the Alishur Pamir, along the Ak Baital River, and crossed the Ak-su which in Shignan is called the Murghab. This river flows in a broad grassy valley with salines scattered about near its banks.

On the Ak-su M. Severtsof determined barometrically the lowest elevation recorded in the Pamir, viz. 12,000 feet. Further on, the road rises along the Kara-su, where at Djaman-Tal was found the first willow grove in the Pamir at a height of 12,300 feet, and higher up the river, at 13,200 feet, tamarisk bushes were met with. This vegetation is due to the nature of the valley of the Kara-su, which is a narrow and in parts zigzag defile; in the wider parts the stream runs in a deep ravine, and the vegetation appears only in spots protected from the gales of the Pamir. In a similar protected defile of an affluent of the Alishur River, near Yashil Kul, another willow grove was found at 12,700 feet. The road to Ali Chur rises gradually along the Kara-su and the dry bed of its tributary, the Neza Tash, to the pass of the same name. Further on, beyond Yashil Kul, the river enters an inaccessible gorge in a meridional range, which closes the Alishur Pamir on the west. Making its way through this range, it flows to the N.N.W. along the western base, and joins the Ak-su in the Roshan country, 35 or 40 miles above the junction of the Ak-su and the Piandj, at the Roshan town of Kila Wamur. Several roads lead from Yashil Kul to Roshan, Shignan, and Badakshan, all passing through the mountains which occupy the space between Ali Chur, Ak-su, and Piandj. Of these the road to Badakshan, from Yashil Kul to the south-west, is regarded by M. Severtsof as the true route of Marco Polo to the Pamir. In this region the expedition obtained specimens of the wild sheep, thus disproving the assertion of M. Kostenko that these animals were extinct in 1871–4 owing to an epidemic. If there was an epidemic, numbers of the sheep must have survived and are now multiplying. The winter of 1877–8, it is true, proved a very severe one for them as well as for the nomads on the Pamir and the Tien-shan, where animals died in large numbers from the extreme cold, and were seen by the Kashgarians in their passage through Terek-davan and the Alai, after the capture of Kashgar by the Chinese in December 1877.

In the swamps near Ali Chur M. Severtsof's party found very thick deposits of peat, and among the marsh plants of which it was composed M. Kushakewitch detected several northern species, the same as occur in the neighbourhood of St. Petersburg. From the collections and observa-

tions of the same officer it is also clear that the flora and insect fauna of the Pamir are more varied and numerous in species than might have been expected, considering the severity of the climate and the great elevation (12,000 to 15,000 feet). The vegetation presents an exceedingly original combination of Alpine plants with those of the northern Tundras and the southern Russian steppes. In this flora are seen East Siberian, Tibetan, and Mongolian species, intermingled with those of Western Siberia and the Persian mountains. In addition to the variety of plants and insects, M. Severtsof found the Pamir rich in vertebrates; he met with more than twenty species of mammalia, about one hundred and twenty species of birds, six of fishes, and in the swamps of the Alishur Pamir two species of amphibia, at a height of 12,700 feet.

M. Skassy determined astronomically the position of Yashil Kul, at the end of the peninsula between two bays on the west side of the lake. The expedition afterwards explored the other lakes of the Alishur Pamir, viz. Bulun Kul, Tuz Kul, Sassyk Kul, and Sary Kul. The surveys of M. Skassy were thus joined on to those of Captain Trotter, and one of the principal objects of the expedition was thus accomplished, viz. the connection of the Russian and English surveys on the Pamir. M. Severtsof, therefore, determined not to proceed further, but to complete the map of the Pamir by surveys and personal examination of its unexplored parts north of the Ak-su, and more particularly to the north and north-east of Rang Kul. As the provisions were insufficient for the maintenance of the expedition until their return, and as they had no means of purchasing any in Wakhan, he wrote to the Alai detachment, requesting them to forward fresh supplies. Retracing their steps from Sary Kul, the expedition were able to enrich their collections by many valuable acquisitions, and M. Severtsof collected much information in regard to the development of the glacial formation in the west of the Alishur Pamir, and also in the valley of the southern Ak Baital and in the valleys adjacent to Kara Kul. During this time M. Skassy was engaged in completing his survey along the route of the expedition and in determining the height of the various mountains. The messengers who had been despatched for provisions, failed in their errand, and instead of their bringing in anything, news was received on the northern Ak Baital that they had been plundered by a band of Kirghiz robbers. It therefore became necessary to postpone the explorations which it had been intended to make from the Ak Baital to the north-east and north-west, and even by taking the most direct route, the main body of the expedition only succeeded in reaching the Alai after enduring some privations. In spite of these difficulties, M. Skassy with a small party remained behind at Kara Kul at the point previously determined by him, in order to complete his levelling from the Kizyl Yart gorge in the Alai, a distance of about 47 miles. On the return journey of the

expedition additional surveys and explorations were made at the south-west of Kara Kul, which indeed constituted some of the most important geographical work of the season, and in opposition to some previously expressed opinions, it was clearly determined that Kara Kul is not an enclosed basin without an outlet. Previous to M. Severtsof's visit to the Pamir, the opposite view had been taken by M. Kostenko, who based his opinion on an imperfect exploration of the region. M. Severtsof always entertained doubts on this subject, and on reaching the lake his doubts became stronger, when he remarked in the mountains surrounding Kara Kul two openings at the south-western and north-eastern ends of the lake. On his return journey he examined both these openings, and found that the supposed enclosed basin of Kara Kul is in reality the central widening of a very long valley, open at both ends, on the north-east to the Kok-su, the source of the Markhan-su, an affluent of the Kashgar-darya, and on the south-west to the Ak-su, the northern source of the Amu-darya. At the south-western end also there opens out to the south-east of the main valley of Kara Kul a side valley of the northern Ak Baital or Chon-su, which thus joins the Uz Bel-su. Except during high floods, the bifurcation is marked by dry beds only, under which the Chon-su sinks down through enormous deposits of sand and pebbles, coming up again near Kara Kul in springs, which are called *sary* in the Kirghiz language. During high floods these low places are submerged by the waters of Kara Kul as far as the Chon-su, and then the water flows to the south-west to the Ak-su along the bed of the lower Chon-su, rarely flowing to the south-east, as some have stated on Kirghiz authority. At the north-east the outflow of water from the lake has entirely ceased, but there remained traces of its having previously existed, which were investigated by M. Severtsof. On the steep parts of the lake-shore there were everywhere visible traces of a higher level of its waters.

The topography of the Kara Kul Valley, as observed by the expedition over the whole area between the Amu and Tarim river systems, is in striking accord with the information given by ancient geographers and travellers, and has led M. Severtsof to the conclusion that Kara Kul and the Dragon Lake of the old Chinese traveller are identical, and also that there has been a continual rise of the northern Pamir, especially to the north and north-east of Kara Kul, an opinion which is confirmed by his own geological observations and those of M. Mushketof. Other observations made by M. Severtsof on the Alishur Pamir will tend to the solution of the moot question of the route taken by the Chinese general to Badakshan in 1759, in pursuit of the Kashgarians who escaped at the time of the Chinese conquest of Eastern Turkistan.

M. Severtsof's expedition returned to Gulcha at the end of September, having solved the main questions relating to the geography of the Pamir and its orographical peculiarities. Instead of its being a high

desert plateau, intersected by few and insignificant ranges, as was believed by some, even after the English and Russian surveys of 1873–6, the expedition found a system of high valleys—not a line of valleys extending from east to west, between comparatively low ranges having the same direction, as had been supposed by the late M. Fedchenko, but a network of valleys, intersected at different angles by the ranges which form the vast mountain masses. Many questions, therefore, relating to the physical geography of this region, which were before a cause of much difference of opinion, have been set at rest by M. Severtsof's expedition; besides this, much new ground has been explored, and collections made which will afford rich material for the study of its flora and fauna.

GEOGRAPHICAL NOTES.

The Society's East African Expedition.—By telegram from Dr. Kirk on the 17th of July, we learn that Mr. Thomson had completed his explorations, and left Zanzibar, by mail steamer, for England. He has successfully carried out the whole programme of the Expedition, and in a wonderfully short space of time. Since writing from Ujiji (where he obtained fresh supplies for his party) on the 16th of January, he had crossed the lake to the Lukuga outlet, and followed it down for many days' journey, being prevented from tracing it to its junction with the Lualaba (or Congo) only by the hostility of the natives. Returning then to the station of the London Missionary Society on the western side of the lake, he embarked in a native boat for the southern end, and rejoining Chuma and the rest of his followers who were there awaiting him, struck across to the east coast by a new route, exploring the hitherto unvisited Hikwa Lake on his way. Mr. Thomson may be expected in England towards the end of August.

The Climate of the Matabele Country.—A member of the missionary expedition to the Upper Zambesi region (*ante*, p. 482), in a letter which is published in 'Les Missions Catholiques,' states that the climate of the high Alps of the Matabeles, the Amatope or Matoppo Mountains, is one of the most healthy in Africa, and perhaps in the whole world; and although Gubuluwayo lies within the torrid zone, the temperature is similar to that of Naples and of Sicily in the spring. The heat is never very intense, as the thermometer shows a mean temperature of 77° F. in the summer (from October to March), while in the winter (April to September) it is 68° F. During the latter season not a drop of rain falls to refresh the earth, but from November to March the rains are extremely heavy. Terrible storms, but of short duration, succeed one another almost without intermission, and as many as seven have been