considerably to reduce their former height. But, if this agency be taken into account, the Urals seem to come under the category of what the Germans call asymmetric *Faltengebirge,* and thus exhibit a great resemblance to the western Alps. A broad strip of granites, syenites, diorites, and porphyries, with their subordinate gneisses and crystalline slates, belonging to the Laurentian and Huronian systems, constitutes the main axis of upheaval, and this axis is invariably situated in the eastern part of the mountain region. The asymmetry thus resulting is the more pronounced as the Azoic rocks are mostly covered directly by Tertiary and Quaternary deposits on their Siberian slope ; while towards the west they are covered with vast layers of Silurian, Devonian, Carboniferous, Permian, and Triassic rocks, which are manifoldly folded so as to constitute a series of chains parallel to the main axis and mostly lifted to much greater heights than the older Azoic rocks.

The crystalline rocks which must have constituted the primary ridges mostly appear in the shape of plateaus, water- and glacier- worn, with undulating surfaces ; and the hills which rise above the plateaus are mostly dome-shaped and are seldom marked by the craggy characters which are met with in the limestone and sandstone mountains of the subsequent formations. Masses of angular *débris* and great blocks cover both the plateaus and the mountains ; and only a very few traces of the sediments which may have partially covered the Azoic crystalline rocks are sporadically met with. But, as a rule, they have remained a continent since the Huronian epoch. As for the Primary and Secondary deposits of the western slope, they are represented by Silurian, Devonian, Carboniferous, Permio-Carboniferous, Permian, and Triassic deposits, attaining great thicknesses and following one another in succession so as to appear on the surface as strips lying parallel to the Urals. The strip occupied by the Silurian quartzites, limestones, and slates is narrow, even in its northern portion. Farther south it disappears, and the deposits which formerly were assigned to the Silurian period are now considered to be mostly Devonian. These latter, mostly littoral in character and much resembling those of the Eifel and Belgium, occupy wide areas to the west of the main axis of the Urals. Their lower parts are much metamorphosed. The Car­boniferous deposits,—coal-bearing in the Middle and Southern Urals, —although appearing at the surface only as a narrow strip in the west Urals, occupy an extensive area, but are concealed by the largely developed Permian deposits, and that series of sediments which must be considered as intermediate between the Carboniferous and the Permian. These latter, described as “Permo-Carbon” by Russian and German geologists, are largely developed in the west Urals. Their fossils belong to a fauna intermediate between the Carboniferous and the Permian, which was formerly known as that of Artinsk ; but since two more series of the same intermediate character have been described the whole has been brought under the general name of Permio-Carboniferous deposits. The Permian de­posits cover a wide zone all along the western slope of the Urals from north to south, and are most important on account of their copper ores, salt-beds, and salt-springs. They are also covered with variegated marls which are almost quite destitute of fossil organ­isms, so that their age is not yet quite settled. Some Russian geologists continue to consider them as Permian, while the ma­jority of recent explorers assign them to the Triassic age.

The glaciation of the Urals is still a debated question. Even those geologists who now acknowledge that the Scandinavian ice- sheet covered middle Russia hesitate to admit the existence of an ice-cap covering the Middle and Southern Urals,—the want of polished and striated rocks being the chief argument for the nega­tive. But, if the disintegrated state of the rocks which are best fitted to maintain glacial polishing and striation, their thick coverings of *débris,* and the action of lichens and mosses in obliterating the traces of glaciation be taken into account, as also the prevalence of erratic blocks, and the character of the deposits filling up the valleys, it must be regarded as most probable that the Urals, too, must soon be included within the limits of former glaciation (as has been already done by a few explorers, such as Polyakoff). The Lacustrine (Post-Glacial) deposits are widely spread all over the slopes of the Urals. Immense marshes, which have recently emerged, in the north, and numberless lakes in the south, which are but small in comparison with their size at a recent period, as also Lacustrine deposits in the valleys, all go to show that during the Lacustrine period the Urals were as much dotted with lakes as Finland is at the present time.

*Climatic, Geo-Botanical, and Geo-Zoological Importance.—*The importance of the Urals as a climatic and geo-botanical boundary can no longer be regarded as very great. Most European species of plants freely cross the Urals into Siberia, and several Siberian species travel across them into northern Russia. But, being a zone of hilly tracts extending from north to south in a meridional direction, the Ural Mountains necessarily exercise a powerful in­fluence in driving a colder northern climate, as well as a northern flora and fauna, farther towards the south along their axis. The harshness of the climate at the meteorological stations of Bogo- stovsk, Zlatoust, and Ekaterinburg is not owing merely to their elevation a few hundred feet above sea-level. Even if reduced to sea-level, the average temperatures of the Ural meteorological stations are such as to produce a local deflexion of the isotherms towards the south. The same is true with regard to the limits of distribution of vegetable and animal species. It has been already stated that the northern limits of tree-vegetation descend to­wards more southern latitudes on the Northern Urals and in the vicinity of the chain. The same is true with regard to many other species of plants. In like manner several Arctic species of animals come much farther south than they might otherwise have done : the reindeer, for instance, is met with as far south as the 52d parallel. The Southern Urals introduce amidst the Ciscaspian steppes the forest vegetation, flora, and fauna of middle Russia.

In the distribution of the races of mankind the Urals have also played an important part. To the present day the Northern Urals are the abodes of Finnish stems (Samoyedes, Zyrians, Voguls, and Permians) who have been driven from their former homes by Slavonian colonization, while the steppes on the slopes of the Southern Urals have continued to be inhabited by the Turkish stems of the Bashkirs. The Middle Urals were also in the 9th century the abode of the Ugrians, and their land, Biarmia (now Perm), was well known to the Byzantine historians for its mineral wealth,—there being at that time a lively intercourse between the Ugrians and the Greeks. Compelled to abandon their abodes, they moved south on the Ural slopes towards the land of the Khazars, and through the prairies of south-eastern and southern Russia (the Λε*βεδία* of Constantine Porphyrogenitus) towards the Danube and to their present seat—Hungary,—leaving but a very few memorials in the Northern and Middle Urals.@@1 At present the Urals, especially the Middle and the Southern, are being more and more colonized by Great Russian immigrants, while the Finnish stems are rapidly melting away.

*Metallurgy and Mining.—*The mineral wealth of the Urals was known to the Greeks in the 9th century, and afterwards to the Novgorodians, who penetrated there in the 11th century for trade with the Ugrians. When the colonies of Novgorod (Vyatka, Perm) fell under the rule of Moscow, the Russian czars soon understood the importance of the Ural mines, and Ivan III. sent out German engineers to explore that region. In 1558 the whole of the present government of Perm was given by the rulers of Moscow to the brothers Strogonoff, who began to establish salt-works and mines for iron and copper. Peter I. gave a new impulse to the mining industry by founding several iron-works, and from 1745, when gold was first discovered, the Russian colonization of the Urals took a new departure. The colonization was, however, of a double character, being partly free—chiefly by Nonconformists in search of religious freedom in the wildernesses of the Urals—and partly compulsory,—the Government sending peasant settlers who became serfs to the iron and copper works, and were bound to supply them with ores and wood for fuel. Until 1861 all work at the mines was done by serfs belonging either to private persons (the Strogonoffs, Demidoffs, and others) or to the crown. At present (1888) only a few works, maintained for supplying the army, belong to the crown.

Gold is found both in veins and in alluvial or diluvial deposits, and is extracted from both ; but the former yield only a moderate quantity annually (2180 to 2780 lb in 1882-84). The gold from the Ural mines constitutes nearly one-fifth of the total amount obtained throughout the Russian empire. Platinum is found either in connexion with gold dust or separately, the platinum mines of the Urals being the only ones worked in Russia. Osmium, iridium, and nickel are found at several places, but their industrial import­ance is small. Silver is also met with at several places, but only 2383 lb were extracted during the years 1875 to 1884. The copper mines, chiefly in Perm, but partly also in Ufa, are very important, nearly two-thirds of the total amount of the metal mined in Russia being obtained from eight works in the Urals. The average amount of gold, platinum, and copper annually yielded by the Ural mines is given in the following table :—

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Gold. | Platinum. | Copper. |  | Gold. | Platinum. | Copper. |
|  | lb | lb | cwts. |  | lb | lb | cwts. |
| 1860-64 | 11,296 |  | 78,500 | 1875-79 | 16,114 | 4048 | 30,508 |
| 1865-69 | 13,997 | 3666 | 60,880 | 1880-84 | 18,042 | 6949 | 48,004 |
| 1870-74 | 13,845 | 3890 | 45,310 |  |  |  |  |

Iron is widely diffused and is extracted in the governments of Perm, Ufa, and Orenburg, the chief works being in Perm: Of the 198 blast furnaces in the Russian empire 103 are in the Urals, and they supply nearly two-thirds of all the pig-iron produced in Russia. One-half of the iron and one-sixth of the steel obtained both from home and foreign pig-iron in the empire are prepared in the Urals ; and, while the St Petersburg and Polish steel works, which prepare steel (chiefly for rails) from imported iron, show great fluctuations in their production, the Ural works have a steady

@@@1 Comp. *Moravia and the Madiars,* by K. J. Groth ; Zabyelin’s *History of Russian Life* and the polemics on the subject in *Izvestia* of the Russ. Geogr. Soc., xix., 1883.