the upper parts of the Zeya flowing on the plateau, while the Ud flows at its base; so that, as shown elsewhere with greater detail,[1] we must admit the Okhotsk coast-range to be a continuation of the Great Khingan. The Stanovoi range was drawn on old maps to connect the Okhotsk range with the Yablonovoi; but the journeys of the great Siberian expedition have shown that in reality no such range exists,—the upper tributaries of the Gilui (tributary of the Amur) and those of the Konam (basin of the Lena) having their sources in common marshes on the plateau.

A narrow alpine region (40 to 50 miles), consisting of a series of short secondary ridges parallel to the border-ridge, fringes this latter on its eastern slope. Two such plications may be distinguished, corresponding on a smaller scale to the belt of alpine tracts fringing the plateau on the north-west. The resemblance is further maintained by a broad belt of elevated plains, ranging from 1200 to 1700 feet, which follow the eastern border of the plateau. The eastern Gobi, the occasionally fertile and occasionally sandy plains between the Nonni and the Sungari, and the rich plains of the Bureya and Selimja in the Amur province belong to this belt, 400 miles in breadth, the surface of which is diversified by the low hills of the Ilkhuri-alin, the Khutuñ, and the Turan. These high plains are bordered on the south-east by a picturesque chain of mountains (the Amur gorge of which has been often described),—the Bureya Mountains (also Little Khingan). It extends, with unaltered character, from Moukden and Ghirin (Kirin) to Ulban Bay in the Sea of Okhotsk (close by the Shantar Islands), its peaks covered from top to bottom with a rich forest vegetation rising to a height of 4500 to 6000 feet. A lowland belt about 200 miles broad runs in the same direction from south-west to north-east along the outer border of the above chain. The lower Amur occupies the northern part of this broad valley. These lowlands, covered with numberless marshes and lakes, seem to have emerged from the sea at a quite recent geological period; the rivers that lazily flow over their surface are still excavating their valleys. They are shut off from the Pacific by an alpine belt as yet but imperfectly known, in which at least two separate high chains (the Tribrezhnyi and the Tatar) can be distinguished,—their continuations probably appearing in SAGHALIN (*q.v.*), while Kamchatka contains several chains, the orography of which is almost quite unknown.

The geology of Siberia is still but incompletely known; some detached regions have been explored, while the vast intermediate spaces remain untouched. Viewed broadly,[2] the great plateau with the alpine tracts fringing it on the north-west and south-east is built up of Palæozoic rocks. On the Vitim and Selenga plateaus immense tracts are composed exclusively of granite, grenatite, and syenite, with subordinate layers of gneisses, which very often are mere modifications, more or less stratified, of the granites and syenites. In some of the ridges that run over the surface of the plateau we find a variety of metamorphic slates, with subordinate layers of crystalline limestones. Extensive beds of lava occur in some parts of the plateau, and in the valleys of the rivers layers of Tertiary sands with petrified wood (*Cupressonoxylum aleuticum*). The plateaus of the Vitim and the Selenga are covered with erratic boulders brought from great distances and show unmistakable traces of glaciation; and immense lakes—small in comparison with their former size—and extensive marshes cover large areas. Besides older metamorphic slates and granites, Silurian and most probably Devonian rocks are widely spread on the lower plateau and in the low chains of mountains which rise above its surface. Silver, lead, gold, and iron are found in these mountains, as also precious stones. Jurassic deposits, yielding many species of fossil insects and plants, occupy several large depressions. They are all of fresh-water origin and were deposited in great lakes. Like the Jurassic beds of China and Turkestan, they contain layers of coal. The alpine tracts in the north-west of the plateau are built up of granites, syenites, gneisses, and chiefly of metamorphic slates, the age of which cannot yet be precisely ascertained (Laurentian, and possibly also Silurian, or even Devonian). Talc schists, and especially clay slates, both intersected with veins of quartz, have also a very great development here. The alluvial and glacial deposits of the valleys contain a rich percentage of gold, derived from the trituration of the clay slates and their quartz veins. Conglomerates, belonging probably to the Tertiary period, fill several valleys. Unmistakable traces of glaciers have been found in West and East Sayan, as also in the Olekma and Vitim regions. In the Altai the mountains are built up of granites, syenites, and diorites covered with metamorphic slates belonging to the Laurentian, Silurian, Devonian, and Carboniferous periods. The Jurassic strata on the outskirts are all fresh-water deposits and contain coal, as in Eastern Siberia and China. The Ala-tau are of more modern origin, containing extensive Jurassic beds, no longer deposited in depressions, but entering into the structure of the hills. The elevated plains of Western and Eastern Siberia have a more varied structure. On the Lena and the Yenisei we find Silurian, Devonian, Carboniferous, and Triassic marine deposits, covered here and there with fresh-water Jurassic. Immense tracts on the upper Lena are covered with horizontal sheets of red sandstone, the age of which is not yet determined, but seems to be Devonian; while in the government of Irkutsk large areas are covered with Jurassic coal-bearing sandstones. The same structure is found on the outskirts of the Altai, the Carboniferous and older slates having depressions covered with horizontal strata of Jurassic coal-bearing sandstones. The hilly tracts which rise amidst the Eastern Siberian plains on the Angara and Yenisei consist also of granites, syenites, and diorites covered with Palæozoic rocks up to the Carboniferous, while Jurassic strata are found in the Vilui Mountains. The broad lowlands of Western Siberia are covered throughout with Post-Pliocene deposits which conceal the older rocks,—shells from this period having been found as far south as Omsk (55° N. lat.). The lowlands and plains of Eastern Siberia exhibit a greater variety of structure,—Carboniferous, Triassic, marine Jurassic, and Chalk deposits being met with both in the deeper ravines and in the few ridges which appear beyond 60° N. lat. Extensive layers of fresh-water Tertiary have been found in depressions of the plateau, in some valleys of the alpine region, and in the plains and lowlands.

Glaciation.

There has been much discussion as to the extent of the glaciers in Siberia during the Glacial period,—the want of polished and scratched surfaces like those of Scandinavia having been urged as proof that they cannot have been considerable. It must nevertheless be held that the high plateau was at one time covered with a vast ice-sheet, and that in the alpine regions of the Altai, Sayan, Olekma, and Aldan glaciers had a much greater extension than at present, descending in the valleys to at least a level of 2000 feet above the sea, and covering the subordinate swellings between the mountain ranges. Thick layers of Post-Glacial deposits, indicating a climate somewhat more genial than the present, and containing numberless remains of extinct mammals, are extensively spread both in valleys throughout the lowlands and on the islands of the Arctic Ocean; while in the tundras of the north well-preserved carcases of the mammoth and rhinoceros are occasionally found in the frozen soil.

Traces of Palæolithic man have not as yet been met with in Siberia; but relics of the Neolithic period are exceedingly numerous. One may almost say that they have been found wherever they were looked for, especially on the banks of the numberless lakes with which Siberia was dotted during the Lacustrine period (see below).

Volcanoes.

Volcanic formations, so far as is known, appear chiefly along the north-western border-ridge of the great plateau. Ejections of basaltic lava have been found on the southern slope of this ridge, extending over wide areas on the plateau itself, on a stretch of more than 600 miles;—namely, in East Sayan about Lake Kossogol and in the valley of Tunka (river Irkut), in the vicinity of Selenghinsk, and widely spread on the Vitim plateau (rivers Vitim and Tsipa). Extensive layers of trap cover more than 1200 miles along the Tunguzka; they appear also in the Noril Mountains on the Yenisei, whence they extend towards the Arctic Ocean. Basaltic lavas are also reported to have been found in the Aldan region. On the Pacific slope extinct volcanoes (mentioned in Chinese annals) have been found in the Ilkhuri-alin Hills to the east of Mergeñ.

Minerals.

The mineral wealth of Siberia is considerable. Gold-dust is found in almost all the alpine regions fringing the great plateau, where clay slates, talc slates, and dioritic slates, intersected by quartz veins, make up the bulk of the mountains. The chief gold-mining regions in these tracts are the Altai, the upper (or Nijne-Udinsk) and the lower (or Yeniseisk) *taigas*, and the Olekma region. Gold is found on the high plateau in the basin of the upper Vitim, on the lower plateau in the Nertchinsk district, and on the upper tributaries of the Amur (especially the Oldoi) and the Zeya, in the north-east continuation of the Nertchinsk Mountains. It has been discovered also in the Bureya range, and in its north-east continuation in the Amguñ region. Auriferous sands, but not very rich, have been discovered in the feeders of Lake Khangka and the Suifun river, as also on the smaller islands of the Gulf of Peter the Great. Silver and lead ores are found in the Altai and the Nertchinsk Mountains, as well as copper, cinnabar, and tin. Iron-ores are known at several places on the outskirts of the alpine tracts (as about Irkutsk), as well as in the Selenghinsk region and in the Altai. The chief iron-works of the Urals are situated on the Siberian slope (see URAL). Coal occurs in many Jurassic fresh-water basins,—namely, on the outskirts of the Altai, in south Yeniseisk, about Irkutsk, in the Nertchinsk district, at many places in the Maritime Province, and on the island of Saghalin. Beds of excellent graphite have been found in the Kitoi Alps (Mount Alibert) and in the Turukhansk district. Rock-salt occurs in thinner deposits at several places on the Lena and in Transbaikalia, and salt-springs are numerous,—those of Ust-kut on the Lena and of Usolie near Irkutsk being the chief. A large number of lakes, especially in Transbaikalia and in Tomsk, yield salt. Lastly, from the Altai region, as well as from the Nertchinsk Mountains, precious stones, such as jasper, malachite, beryl, dark quartz, and the like, are exported. The Ekaterinburg stone-polishing works in the Urals and those of Kolyvañ in the Altai are well known.

[1] "Orographical Sketch of East Siberia," *ut supra*.

[2] For further details, see the descriptions of the different provinces of Siberia.

Rivers.

The orography sketched above explains the great development of the river-systems of Siberia and the uniformity of their course. The three chief rivers—the Ob, the Yenisei, and the Lena—take their rise on the high plateau or in the alpine regions fringing it, and, after descending from the plateau and piercing the alpine regions, flow for a few thousands of miles over the high plains and lowlands before they reach the Arctic Ocean. The three smaller rivers of north-eastern Siberia—the Yana, Indighirka, and Kolyma—have the same general character, their courses being, however, much shorter, as in these latitudes the plateau approaches the Arctic Ocean. The Amur, the upper tributaries of which rise in the eastern border-ridge of the high plateau, is similar. The Shilka and the Arguñ, which form it, flow first towards the north-east, through the bendings of the lower terrace of the great plateau; from this the Amur descends, traversing the Great Khingan and flowing down the terraces of the eastern slope towards the Pacific. A noteworthy feature of the principal Siberian rivers is that each is formed by the junction of a pair of great rivers. Examples are the Ob and the Irtish, the Yenisei and the Angara (itself a double river formed by the Angara and the Lower Tunguzka), the Lena and the Vitim, the Arguñ and the Shilka, uniting to form the Amur, which in its turn receives a tributary as large as itself,—the Sungari. Owing to this twofold composition and to the circumstance that, the alpine regions once crossed, their course lies over the high plains and lowlands and crosses the few ridges which rise above the plains (as, for example, the Yenisei below Yeniseisk), instead of following the valleys between them, the rivers of Siberia offer immense advantages for inland navigation, not only in the line of their main direction from north to south but also across it, *i.e.*, from west to east. It is this circumstance that has facilitated the rapid invasion of Siberia by Russian Cossacks and hunters: they followed the courses of the double rivers in their advance towards the east, and discovered short portages which permitted them to transfer their boats from the system of the Ob to that of the Yenisei, and from the latter to that of the Lena, a tributary of which—the Aldan—brought them close to the Sea of Okhotsk. At the present day steamers ply from Tyumeñ, at the foot of the Urals, to Semipalatinsk on the border of the Kirghiz steppe and to Tomsk in the very heart of Siberia. And the time is not far distant when the Ob and the Yenisei, both traversing the high plains on nearly the same level and separated only by low hills, will be connected by a canal, thus permitting steamers to reach Krasnoyarsk and Irkutsk. As the population becomes denser no difficulty should be found in connecting some of the navigable tributaries of the Yenisei with one of those of the Lena, for they flow within a short distance from one another on the high plain, and Cossack boats have already been transported from the Yenisei to the Lena. An uninterrupted water communication will then have been established from Tyumeñ to Yakutsk, Aldansk, and the gold-mines of the Vitim. Owing to the great plateau separating the Lena from the Amur, no easy water communication can be established between the latter and other Siberian rivers. The tributaries of the Amur (the Shilka with its affluent the Ingoda) become navigable only on the lower terrace of the plateau. But the trench of the Uda to the east of Lake Baikal offers an easy access for a railway up to and across the high plateau; and at the very foot of its eastern border-ridge lie Tchita, whence boats are floated down (in spring) to the Pacific, and Nertchinsk, whence steamers may ply to the mouth of the Amur, as also up the Sungari to Ghirin and up the Usuri to Lake Khangka. Unfortunately all the rivers are frozen for many months every year. Even in lower latitudes (52° to 55° N.) they are ice-bound from the beginning of November to the beginning of May[1]; while in 65° N. lat. they are open only for 90 to 120 days, and only for 100 days (the Yenisei) or even 70 days (the Lena) in 70° N. lat. During the cold winter the smaller tributaries freeze to the bottom, and about 1st January Lake Baikal becomes covered with a solid crust of ice capable of bearing files of loaded sledges.

Water communication.

The chief rivers of Siberia are the following. (1) The Ob (Obi) is formed by the confluence of the Biya and the Katuñ (400 miles), both of which rise in the Altai Mountains; it flows north-west and north for 2120 miles, past Barnauł, Tomsk, and Narym, and enters the great Ob Bay of the Arctic Ocean. Its tributary (2) the Irtish, which joins it in 60° N. lat., has an even greater length (2520 miles). It rises in the high plateau, under the name of Black Irtish (500 miles); then, descending from the highlands, it enters Lake Zaisan, whence it flows north and north-west, past Semipalatinsk, Omsk, and Tobolsk, to join the Ob. It receives a great number of tributaries, the chief being the Tobol, the Ishim, and the Tara. Tyumeñ on the last-named will soon be connected by rail with Perm on the Kama, and is already the head of a great line of water communication; navigation is also open to Lake Zaisan and for a considerable distance up the Black Irtish. The chief tributaries of the Ob are the Anui (160 miles), Tcharysh (230), Tom (450), Tchulym (600), Ket (240), and Sosva (200),—all for the most part navigable. (3) The Yenisei rises on the high plateau in north-western Mongolia, where it is formed by the confluence of two great rivers—the Shishkit and the Bei-khem—and has the name of Ulu-khem. After descending the high plateau on the Chinese frontier, it flows north and enters the Arctic Ocean in a deep bay situated close by that of the Ob. The area of its basin is estimated at 1,380,000 square miles. It receives (4) the Upper Tunguzka or Angara (1100 miles), which itself has a basin of 275,000 square miles, (5) the Podkamennaya Tunguzka, and (6) the Lower Tunguzka. The Angara, whose tributaries on the left (Irkut, Oka, and Uda) are each large rivers, flows from Lake Baikal (40 miles above Irkutsk) and, describing a huge bend to the north-east, joins the Yenisei a little above Yeniseisk. (7) The Selenga, which enters Lake Baikal from the east, might be considered as the real source of the Angara. It is a very large river and rises on the high Mongolian plateau, entering Siberia about Kiachta. Its length may be estimated at more than 600 miles; it receives (8) the Uri (outflow of Lake Kossogol), (9) the Orkhon, (10) the Tchikoi (300 miles), (11) the Khilok (300), (12) the Uda (130), and (13) the Djida (200). Lake Baikal has two other considerable feeders—the Barguzin and the Upper Angara. (14) The Lena is also an immense river, having an estimated length of not less than 3000 miles. It rises in the Baikal Mountains, some scores of miles from the lake, and flows north and east past Kirensk, Olekminsk, and Yakutsk. Thence it turns to the north-west and enters the Arctic Ocean, forming a wide delta. It receives several large tributaries—(15) the Vitim, which has a greater length (about 1400 miles) than the Lena above the point of junction, (16) the Olekma (about 800), (17) the Aldan (about 1300)—which receives in its turn (18) the Utchur (350), (19) the Maya, and (20) the Amga—and (21) the Vilui (about 1300). (22) The Taz (about 750), (23) the Khatanga (400), (24) the Anabara (670), and (25) the Olenek (1200), which enter the Arctic Ocean to the west of the Lena, and (26) the Yana (1000), (27) the Indighirka (950), and (28) the Kolyma (1000) to the east of it are also considerable rivers, but small in comparison with the former. (29) The Anadyr enters the gulf of the same name in the Sea of Behring. (30) The Okhota (270) and (31) the Ud (350) are relatively small streams flowing into the Sea of Okhotsk. Of the rivers flowing to the Pacific the chief is (32) the Amur, which is navigable for more than 2400 miles from its entrance into the Tartar Strait (between the mainland and the island of Saghalin) to Sryetensk on the Shilka,—boats being floated from Tchita on the Ingoda. It bears the name Amur after the confluence of (33) the Shilka and (34) the Arguñ (see TRANSBAIKALIA) at Ust-Stryelka, and from this point flows east and south-east until its junction with its great tributary the Sungari; thence it flows north-east and north, and finally (for some 50 miles) east, before entering the Pacific. Its length, taking the Onon for its source, is about 2700 miles, and its basin is at least 785,000 square miles in area, but has diminished recently,—the waters of the Dalai-nor no longer reaching the Arguñ. It receives a great many large tributaries,—(35) the Zeya, whose affluent (36) the Selimja is itself a considerable river, (37) the Bureya, (38) the Kur, (39) the Gorin, and (40) the Im from the left; while from the right it receives (41) the Sungari and (42) the Usuri, whose affluent, the navigable Sungatcha, brings the Amur into steam communication with Lake Khangka. The rivers flowing into the Sea of Japan are mostly short, only (43) the Suifun being worthy of particular mention.

Lakes.

Numberless lakes occur in both Eastern and Western Siberia. There are wide areas in the plains of Western Siberia, or on the high plateau of Eastern Siberia, where the country may be said to be still passing through the Lacustrine period; but the total area now under water bears but a trifling proportion to the immense extent which the lakes had even at a very recent period, when Neolithic man already inhabited Siberia. All the valleys and depressions bear traces of immense Post-Pliocene lakes. Even within historical times and during the 19th century the desiccation of lakes has gone on at a very rapid rate.[2] The chief lake is Lake Baikal, more than 400 miles long, from 20 to 53 broad, and 12,430 square miles in area. Its surface is 1560 feet above sea-level, and it reaches in its south-west part a maximum depth of 751 fathoms. Another great lake, Lake Kossogol, on the Mongolian frontier, is 120 miles long and 50 broad, 5000 feet above the sea. The large Lake of Oron on the Vitim has not yet been visited by geographers. Vast numbers of small lakes stud the Vitim and upper Selenga plateaus; the lower valley of the latter river contains the Goose Lake (Gusinoye). In the basin of the Amur are Lake Khangka (1692 square miles), connected with the Usuri; Lakes Kada and Kizi, by which the lower Amur once flowed to the Pacific; and very many smaller ones on the left bank of the lower Amur. Numerous lakes and extensive marshes cover the low plains of Western Siberia; the Baraba steppe is dotted with lakes and ponds,—Lake Tchany (1300 square miles) and the innumerable smaller lakes that surround it being but trifling

[1] The Lena at Verkholensk is navigable for 170 days, at Yakutsk for 153 days; the Yenisei at Krasnoyarsk for 180 days; see *Izvestia* of the Eastern Siberian Geographical Society, vol. xii. *sq.*

[2] See Yadrintseff, in *Izvestia* of the Russian Geogr. Soc., 1886, No. 3 (with maps).

remains of former lacustrine basins; while at the junction of the Irtish and Ob impassable marshes extend for many thousands of square miles. Several alpine lakes, of which the picturesque Teletskoye may be specially mentioned, fill up the depressions of the valleys of the Altai.

The coast-line of Siberia is very extensive both on the Arctic Ocean and on the Pacific. The former ocean is ice-bound for at least ten months out of twelve; and, though navigation along its shores has been proved by Nordenskjöld to be possible, it is exceedingly doubtful whether it can ever become a commercial route of any importance. The coast-line has few indentations, the chief being the double bay of the Ob and the Taz, separated from the Sea of Kara by an elongated peninsula (Samoyede), and from the bay of the Yenisei by another. The immense peninsula of Taimyr—a barren tundra intersected by the wild Byrranga Hills—projects in Cape Tcheluskin as far north as 77° 46′ N. lat. The bay of the Yana, east of the delta of the Lena, is a wide indentation sheltered on the north by the islands of New Siberia. The bays of the Kolyma, the Tchaun, and Kolutchin are of little importance. The group of four larger and several smaller islands called New Siberia, situated off the mouth of the Yana, are occasionally visited by a few hunters, as is also the small group of the Bears' Islands opposite the mouth of the Kolyma. Kellett's or Wrangel's Land is still quite unknown. The Strait of Behring at the north-east extremity of Siberia and the Sea of Behring between the land of the Tchuktchis and Alaska, with its great Gulf of Anadyr, are often visited by seal-hunters, and the Commander Islands off Kamchatka are valuable stations for this pursuit. The Sea of Okhotsk, separated from the Pacific by the Kurile Archipelago and from the Sea of Japan by the islands of Saghalin and Yesso, is notorious as one of the worst seas of the world, owing to its dense fogs and its masses of floating ice. The Shantar Islands in the bay of the Ud are worthy of notice only for their geological interest. The double bay of Ghijiga and Penjinsk, as well as that of Tani, would be useful as harbours were they not frozen seven or eight months every year and covered with dense fogs in summer. The northern part of the Sea of Japan, which borders the shores of the Usuri region, has, besides the smaller Bays of Olga and Vladimir, the beautiful Gulf of Peter the Great, on which stands Vladivostok, the chief Russian naval station on the Pacific (see MARITIME PROVINCE). Okhotsk and Ayan on the Sea of Okhotsk, Petropavlovsk on the east shore of Kamchatka, Nikolaievsk, Konstantinovsk, and Vladivostok on the Sea of Japan, and Dui and Korsakovo on SAGHALIN (*q.v.*) are the only ports of Siberia.

Although Siberia is nearly all included between 50° and 72° N. lat.,[1] its climate is extremely severe, even in its southern parts. This severity arises chiefly from the orographical structure: the vast plateau of Central Asia prevents the moderating influence of the sea from being felt. The extensive lowlands which cover more than one-half of its area, as well as the elevated plains, lie exposed to the influence of the Arctic Ocean. The warm south-west winds have to cross the elevated plateau of Persia before reaching the Aral-Caspian depression, and there they deposit nearly all their moisture. And, if a current of warmer air flows from the west over Siberia (several data, such as meteorological observations on Mount Alibert and at the Voznesensk mine in the Olekma region render its existence most probable in Eastern Siberia), it only makes its influence felt in the higher parts of the hilly tracts, by raising the line of perpetual snow in Eastern Siberia to the unusual height of 10,000 feet,[2] and by elevating by a few degrees the temperature of places situated in the alpine regions above the 3000 or 4000 feet level. The air, after being refrigerated on the plateaus during the winter, drifts, owing to its greater density, down upon the lowlands; hence in the region of the lower Lena we find an exceedingly low temperature throughout the winter, and at Verkhoyansk, in 67° N. lat., the pole of cold of the eastern hemisphere.[3] Nevertheless Siberia enjoys a warm summer; owing to the dryness of the climate, the unclouded sun fully warms the earth during the long summer days in those high latitudes, and gives a short period of warm and even hot days in the immediate neighbourhood of the pole of cold. The Siberian winter may be said to last from the end of October until March, and it is exceedingly severe. As early as November mercury freezes in the latitude of Irkutsk (51° to 52° N. lat.), while in December, January, and even February it remains frozen for weeks together in south Siberia. Frosts of −13° to −18° Fahr. are not uncommon at Krasnoyarsk, Irkutsk, and Nertchinsk; even in the warmer southern regions of Western Siberia and of the Amur the average winter temperature is respectively 2°·4 Fahr. and −10°·2; while at Yakutsk and Verkhoyansk the thermometer occasionally falls as low as −75° and −85° Fahr. Trees, as observed by Middendorff, become frozen to their very heart, and the axe, which becomes as fragile as glass, can hardly make any impression upon them. Rivers are frozen to the bottom, and water flowing over the ice adds new layers. The soil freezes many feet deep over immense areas even in southern Siberia. The atmosphere becomes laden with frozen vapours. Man, however, successfully resists these rigours, provided he adopts the customary costume of Siberia (two dresses of fur, the upper of which has the hair turned outside), and this all the more as the hardest frosts occur only when an absolute stillness of the air prevails. More dreaded than the frosts are the terrible *burans* or snow-storms, which occur in early spring and destroy thousands of horses and cattle that have been grazing in the steppes throughout the winter. Although there are very heavy falls of snow in the alpine tracts—especially about Lake Baikal—on the other side, in the steppe regions of the Altai and Transbaikalia and in the neighbourhood of Krasnoyarsk, the amount of snow is so small that travellers use wheeled vehicles, and cattle can find food in the steppe. Spring sets in with remarkable rapidity and charm at the end of April; but in the second half of May come the "icy saints' days," so blighting that it is impossible to cultivate the apple or pear. After this short period of frost and snow summer comes in its full beauty; the days are very hot, and, although they are always followed by cold nights, vegetation advances at an astonishing rate. Corn sown about Yakutsk in the end of May is ripe in the end of August. Still, at many places night frosts set in as early as the second half of July. They become quite common in August and September. Nevertheless September is much warmer than May, and October than April, even in the most continental parts of Siberia. By the end of October the rivers begin to freeze, and in the first days of November they are all frozen; even the Amur becomes a highway for sledges, while the Baikal is usually frozen before the middle of January. The isotherms are exceedingly interesting. That of 32° Fahr. crosses Western Siberia in its middle parts and Eastern Siberia in its southern parts, running through Bogoslovsk, Tobolsk, a little above Omsk and Tomsk, close by Irkutsk, Tchita, Nertchinsk, Blagovyeschensk, and Konstantinovsk. The isotherms of July run as follows. That of 68° Fahr., which in Europe passes through Cracow and Kaluga, here traverses Omsk, Krasnoyarsk, and Irkutsk, whence it turns north to Yakutsk, and then south again to Vladivostok. Even the mouths of the Ob, Yenisei, Lena, and Kolyma in 70° N. lat. have in July an average temperature of 40° to 50°. Quite contrary is the course of the January isotherms. That of 14° Fahr., which passes in Europe through Uleåborg, only touches the southern part of Western Siberia in the Altai Mountains. That of −4° Fahr., which crosses Nova Zembla in Europe, passes through Tobolsk, Tomsk, Krasnoyarsk, and Irkutsk, and touches 45° N. lat. at Urga, turning north in the Amur region and reaching the Pacific at Nikolaievsk. The isotherm of −22° Fahr., which touches the north point of Nova Zembla, passes in Siberia through Turukhansk and descends as low as 55° N. lat. in Transbaikalia, whence it turns north to the Arctic Ocean. The following figures will give a more complete idea of the climate:—

	N. lat.	Height above Sea in Feet.	Average Temperature in Degrees Fahr.			Yearly Rainfall in Inches.	Nebulosity, per cent.
			Year.	Jan.	July.		
Ust Yansk (Yana)	70° 55′	30	8°·4	−42°·7	56°·0	..	..
Verkhoyansk ..	67° 34′	160	2°·0	−56°·0	59°·8	..	..
Turukhansk	65° 55′	70	20°·8	−16°·1	59°·5	..	..
Berezoff (Ob) ...	63° 56′	100	28°·7	− 8°·0	62°·0	..	..
Yakutsk.....	62° 2′	520	12°·0	−46°·7	65°·8	..	..
Okhotsk.....	59° 21′	10	22°·8	−10°·7	55°·2	..	..
Naryn (Ob)	58° 55′	200	28°·5	− 8°·0	67°·1	..	..
Voznesensk mine	58° 45′	2800	21°·8	−12°·5	61°·9	..	..
Yeniseisk	58° 27′	260	28°·0	−12°·0	66°·0	15·4	55
Tobolsk	58° 12′	160	31°·9	− 2°·2	66°·7	12·6	50
Tomsk	56° 29′	230	30°·9	− 3°·5	66°·3	..	59
Ishim	56° 6′	380	31°·9	− 4°·1	66°·0	12·6	59
Krasnoyarsk	55° 1′	560	33°·0	− 3°·5	67°·0	..	..
Barnaul	53° 20′	460	32°·5	− 2°·8	67°·5	9·4	64
Nikolaievsk	53° 8′	70	27°·2	− 9°·8	61°·8	18·9	..
Irkutsk	52° 17′	1486	32°·0	− 4°·1	65°·6	17·3	..
Nertchinsk mine	51° 19′	2170	25°·3	−21°·0	65°·1	15·4	34
Semipalatinsk ..	50° 24′	590	36°·2	− 0°·6	72°·5	9·4	..
Blagovyeschensk	50° 16′	370	29°·8	−13°·8	69°·1	..	..
Khabarovka	48° 28′	250	32°·1	−12°·8	67°·8	..	..
Urga (Mongolia)	47° 56′	3770	27°·2	−12°·7	62°·6	10·2	30
Vladivostok	43° 7′	100	40°·1	− 4°·5	67°·3	12·6	42

The flora of Siberia presents very great local varieties, not only on account of the diversity of physical characteristics through this wide territory, but also in consequence of the intrusion of new species in various proportions from the neighbouring tracts, as widely different as the arctic littoral, the dry steppes of Central Asia, and the wet monsoon regions of the Pacific littoral. A complete description of the flora of Siberia would have to treat of (1)

[1] Only the narrow fringe of the tundras extends beyond 70° N. lat.

[2] Although rising to heights ranging from 6000 to 10,000 feet, the mountain peaks of Eastern Siberia do not reach the snow-line, which is found only on the Munku-Sardyk in East Sayan, above 10,000 feet. Patches of perpetual snow occur in Eastern Siberia only on the mountains of the far north. On the Altai Mountains the snow-line is about 7000 feet.

[3] The average temperature of winter (December to February) at Yakutsk is −40°·2 Fahr., at Verkhoyansk −58°·1. At the polar meteorological station of Sagastyr, in the delta of the Lena (72° 23′ N. lat.), the following average temperatures were observed in 1882 and 1883—January −34°·3 Fahr. (February −43°·6), July 40°·8, year 2°·1. The lowest average temperature of a day is −61°·6 Fahr.

the high plateau; (2) the alpine tracts—(*a*) the Altai and (*b*) East Sayan, with a sub-region to the east of Lake Baikal; (3) the steppe regions of Western Siberia; (4) the Ishim and Baraba plains of the same; (5) the high plains of Eastern Siberia, with the sub-region (6) of Minusinsk; (7) the Daurian flora of the lower terrace of the plateau in Transbaikalia; (8) the Amur; (9) the Usuri and Pacific littoral region; (10) the arctic tundras, which, as shown by the "Vega" expedition, may be subdivided into those (*a*) west of Yenisei and (*b*) east of the same to Behring Strait; and (11) Kamchatka. Each of these has distinct features; nevertheless, if the basin of the Amur and Kamchatka be set aside, all have so much in common that the "Siberian flora" may be spoken of as a whole. Siberia is situated for the most part in the great domain which Grisebach describes as the "forest region of the Eastern continent."[1] The northern limit of this region must, however, be drawn nearer to the Arctic Ocean. Only a narrow strip, 60 to 200 miles wide (becoming broader in the Taimyr and Samoyede peninsulas), is totally devoid of tree vegetation. The last trees, it is true, which struggle for existence on the edge of the tundras are crippled dwarfs and almost without branches; a few buds each summer are the only evidence that life has not left their frozen stems; and trees a hundred years old are only a few feet long and a few inches thick, concealed amidst lichens.[2] Some 200 species of flowering plants are still found in the tundra region,—the frozen ground and the want of humus militating more against them than the want of warmth.[3] From this northern limit to the Aral-Caspian and Mongolian steppes we have all over Siberia the forest region, where, however, forests are very unequally distributed, covering from 50 to 99 per cent. of the areas of the separate districts. In the hill tracts and the marshy depression of the Ob they are unbroken, except by the bald summits of the loftier mountains (*goltsy*); they have the aspect of agreeable bosquets in the Baraba; and they are thinly scattered through the south-eastern corner of Transbaikalia, where the dryness of the Gobi steppe is so much felt; while immense marshy plains covered with the dwarf birch take their place in the north as the tundras are approached. Over this immense area the trees are for the most part the same as we are familiar with in Europe. The larch becomes predominant and presents itself in two new species (*Larix sibirica* and *L. dahurica*). The fir appears in the Siberian varieties *Picea obovata* and *P. ayanensis*. The silver fir (*Abies sibirica*, *Pinus Pichta*) and the stone-pine (*P. Cembra*) are quite common; they reach the higher summits, where the last-named becomes a recumbent species (*Cembra pumila*), while the larch and the silver fir also acquire a tendency to spread their side branches instead of rising in height. The willow at high altitudes grows only two inches high, but still bears a few leaves and fully developed flowers. The birch in the loftier alpine tracts and plateaus becomes a shrub (*Betula nana*, *B. fruticosa*), or in Transbaikalia assumes a new and very elegant aspect with a dark bark (*B. dahurica*). In the deeper valleys or on the lowlands of Western Siberia the larches, pines, and silver firs, mixed with birches and aspens, reach a great size, and the streams are fringed with thickets of poplar and willow. The alpine rose (*Rhododendron dahuricum*) flourishes in large masses on the higher mountains; *Juniper*, *Spiræa*, *Sorbus*, the pseudo-acacia (*Caragana sibirica* and *arborescens*, *C. jubata* in some of the higher tracts), various *Rosaceæ*—*Potentilla fruticosa* and *Cotoneaster uniflora*—the cherry-plum (*Prunus Padus*), and many other shrubs fill up the spaces between the trees. Berry-yielding plants are found everywhere, even on the *goltsy*, at the upper limit of tree vegetation; on the lower grounds they are an article of diet to the hunter, and even to the agriculturist. The red whortleberry (*Vaccinium Vitis idæa*), the bog whortleberry (*V. uliginosum*), the bilberry or cowberry (*V. Myrtillus*), and the arctic bramble (*Rubus arcticus*) extend very far northwards; raspberries and red and black currants form a rich undergrowth in the forests, together with the *Ribes dikusha* in Eastern Siberia. The oak, the lime, the maple, disappear to the east of the Urals, to reappear, however, in new varieties on the eastern slope of the border-ridge of the great plateau (timidly penetrating west for some little distance up the valleys of the Amur and the Argun).[4] There we have the oak (*Q. mongolica*), the maple (*Acer ginala*, Max.), the ash (*Fraxinus mancharica*), the elm (*Ulmus montana*), the hazel (*Corylus heterophylla*), and several other European acquaintances. Farther east, in the Amur region, a great number of new species of European trees, and even new genera, such as the cork-tree (*Phellodendron amurensis*), the walnut (*Juglans manchurica*), the acacia (*Maackia amurensis*), the graceful climber *Maximowiczia amurensis*, the Japanese *Trochostigma*, and many others—all unknown to Siberia proper—make their appearance.

The greatest uniformity prevails on the high plateau, where the larch predominates over all other species of conifers or deciduous trees; the wide and open valleys—or rather shallow depressions—are covered with *Betula nana* and *B. fruticosa* in the north and with thick grasses (poor in species) in its southern and drier parts. The same Siberian larch covers the alpine tracts fringing the plateau on the north; but the tree assumes different characters in development and growth according to the physical features of the region; and the fir, the stone-pine, the aspen, and the birch also become mixed with it; in the narrow sheltered valleys the forests attain their full development. In the drier parts, on the slopes covered with sand or with a richer soil, the Scotch fir (*Pinus sylvestris*) makes its appearance. In the alpine tracts of the north the narrowness of the valleys (*padi*) and the steep stony slopes covered with débris, on which only lichens and mosses can grow, make each green plot of grass (even if it be only of *Carex*) valuable to the gold-diggers and hunters. For days consecutively the horse of the explorer can get no other food than the dwarf birch. But even in these districts the botanist and geographer can easily distinguish between the *tcherñ* of the Altai and the *taiga* of different parts of Eastern Siberia. The lower plateau exhibits, of course, new characteristics. Its open spaces are lovely prairies, on which the Daurian flora appears in its full beauty. In spring the traveller crosses a sea of grass from which the flowers of the pæony, aconite, *Orobus*, *Carallia*, *Saussurea*, and the like rise to a height of 4 or 5 feet. As the Gobi desert is approached the forests disappear, the ground becomes chiefly covered with dry *Gramineæ*, and *Salsolaceæ* make their appearance on a gravelly clay impregnated with salt. The high plains of the west slope of the plateau are also covered with rich prairies diversified with woods. Nearly all the species of these prairies are common also to Europe (pæonies, hemerocallis, asters, pinks, gentians, violets, *Cypripedium*, *Aquilegia*, *Delphinium*, aconites, irises, and so on); but here the plants attain a much larger size,—so large indeed that a man standing erect is concealed by the grasses. The flora of Minusinsk—the Italy of Siberia—is well known; the prairies on the Ishim and of the Baraba (see TOMSK) are adorned with the same rich vegetation, so vividly described by Middendorff and Finsch. Farther north we again reach the domain of forests; but these once more present new characteristics. They are the *urmans* of Western Siberia, into which the hunter does not venture to penetrate far from his village,—immense tracts covered with thickets of trees closely packed and therefore poor in aspect, and often rising from a treacherous carpet of thickly woven grass which conceals deep marshes (*zybuny*), where even the bear has to tread circumspectly. The prairies of the middle Amur and the rich plains of the Selimja and Zeya, where Russian Raskolniks are so successful as agriculturists, belong to Manchuria.

Fauna.

The fauna of Siberia is closely akin to that of central Europe and the Ural Mountains, although the habitat of a few species which warrant the naturalist in regarding the south Urals as a separate region, are not so important a boundary zoologically as they are botanically. As in European Russia, so in Siberia, three great zones—the arctic, the boreal, and the middle—may be distinguished; and these, according to M. Syevertsoff,[5] may be subdivided into several sub-regions. The arctic (hyperboreal) zone has the same characters as the tundra zones of European Russia. The boreal (circumboreal) zone, which corresponds to the forest region of Russia, embraces Western Siberia, with the exception of the Urals and the southern steppes, and a notable part of Eastern Siberia,—Transbaikalia and the hilly tracts to the north of it being distinguished as a separate "Eastern Siberian" sub-region. The middle zone, extending from south Russia to south Siberia, has two separate sub-regions,—the Ural-Baraba and the Daurian. The zone of the steppes extends from the Caspian Sea through Central Asia, only touching Western Siberia and the neighbourhood of the Gobi in Transbaikalia. Finally, the Amur region shares the characteristics of the north Chinese fauna. On the whole, we may say that the arctic and boreal faunas of Europe extend over Siberia, with a few additional species in the Ural and Baraba region,—a number of new species also appearing in Eastern Siberia, some spreading along the high plateau and others along the lower plateau from the steppes of the Gobi. The arctic fauna is very poor. According to Nordqvist,[6] it numbers but twenty-nine species of mammals, of which seven are marine and only seventeen or eighteen may be safely considered as living beyond the forest limit. Of these, again, four are characteristic of the land of the Tchuktchis. The wild reindeer, the arctic dog (*Canis lagopus*), the fox, the hare, the wolf, the lemming (*Myodes obensis*), the collar-lemming (*Cuniculus torquatus*), and two species of voles (*Arvicolæ*) are the most common on land. The avifauna is very rich in migratory water and marsh

[1] According to Engler's *Versuch einer Entwickelungsgeschichte der Pflanzenwelt* (1879), we should have in Siberia—(*a*) the arctic region; (*b*) the sub-arctic or conifer region,—north Siberian province; (*c*) the Central-Asian domain,—Altai and Daurian hilly regions; and (*d*) the east Chinese, intruding into the basin of the Amur.

[2] Middendorff's observations on vegetable and animal life on the borders of and in the tundras—so attractively told in vol. iv. of his *Sibirische Reise*—will long remain classical.

[3] M. Kjellmann (*Vega Exp. Vet. Iakttagelser*) reckons their number at 182; 124 species were found by Middendorff on the Taimyr peninsula, 219 along the borders of the forest region of Olenek, and 344 species within the forest region of the same; 470 species were collected by M. Maack in the Vilui region.

[4] Nowhere, perhaps, is the change better seen than on crossing the Great Khingan. The change in the flora witnessed by the present writer on his way from Transbaikalia to Mergeñ was really astonishing.

[5] "Horizontal Distribution of Animals," in the Bulletin (*Izvestia*) of the Society of Friends of Natural Science, vol. viii., 1873.

[6] "Anteckningar och Studier," &c., in *Vega Exp. Vet. Iakt.*, vol. ii.

fowl (*Grallatores* and *Natatores*), which come to breed in the coast region; but only five land birds—the ptarmigan (*Lagopus alpinus*), the snow-bunting, the Icelandic falcon, the snow-owl, and the raven—are permanent inhabitants of the region. The boreal fauna is of course much richer; but here also the great bulk of species, both of mammals and birds, are common to Europe and Asia. The bear, the badger, the wolverene, the pole-cat, the ermine, the common weasel, the otter, the wolf, the fox, the lynx, the mole, the hedgehog, the common shrew, the water-shrew, and the lesser shrew (*Sorex vulgaris*, *fodiens*, and *pygmæus*), two bats (the long-eared and the boreal), three species of *Vespertilio* (*V. daubentoni*, *nattereri*, and *mystacinus*), the flying and the common squirrel (*Tamias striatus*), the brown, common, field, and harvest mouse (*Mus decumanus*, *musculus*, *sylvaticus*, *agrarius*, and *minutus*), four voles (*Arvicola amphibius*, *rufocanus*, *rutilus*, and *schistocolor*), the beaver, the variable hare, the wild boar, the roebuck, the stag, the reindeer, the elk, and the *Phoca annelata* of Lake Baikal,—all these are common alike to Europe and to Siberia; while the bear, the musk-deer (*Moschus moschiferus*), the ermine and the sable, the ground squirrel (*Spermophilus eversmanni*), *Arvicola obscurus*, and *Lagomys hyperboreus*, also spread over Siberia, may be considered as belonging to the arctic fauna. In addition to the above we find in Eastern Siberia *Mustela alpina*, *Canis alpinus*, the sable antelope (*Ægocerus sibiricus*), several species of mouse (*Mus gregalis*, *œconomus*, and *saxatilus*), two voles (*Arvicola russatus* and *macrotus*), *Sypheus aspalax*, and the alpine *Lagomys*, which penetrate from the Central Asian plateaus; while the tiger makes incursions not only in the Amur region but occasionally as far as Lake Baikal. In all, of fifty-seven species of Siberian mammals forty-one are common also to Europe, twenty-seven common to the arctic region, and only sixteen special to Asia. On the lower terrace of the great plateau we find an admixture of Mongolian species, such as *Canis corsac*, *Felis manul*, *Spermophilus daurieus*, the jerboa (*Dipus jaculus*), two hamsters (*Cricetus songarus* and *furunculus*), three new voles (*Arvicolæ*), the Tolai hare, the Ogotona hare (*Lagomys ogotona*), *Ægocerus argali*, *Antilope gutturosa*, and *Equus hemionus* (*jighitai*); while the number of species common to Asia and Europe diminishes notably. The same is true with respect to birds. No less than 285 species have been observed in Siberia, but of these forty-five only are absent from Europe. In south-east Siberia we find forty-three new species belonging to the north Manchurian or Amur fauna; and in south-east Transbaikalia, on the borders of the Gobi steppe, only 103 species were found by Radde, among which the most numerous are migratory birds and the birds of prey which pursue them. The rivers and lakes of Siberia abound in fish; but little is known of their relations with the species of neighbouring regions.[1]

The insect fauna is very similar to that of Russia; but a few genera, as the *Tentyria*, do not penetrate into the steppe region of Western Siberia, while the tropical *Colasposoma*, *Poplia*, and *Languria* are found only in south-eastern Transbaikalia, or are confined to the southern Amur. On the other side, several American genera (*Cephalaon*, *Ophryastes*) extend into the north-eastern parts of Siberia.[2] As in all uncultivated countries, the forests and prairies of Siberia become almost uninhabitable in summer on account of the mosquitoes. Eastern Siberia suffers less from this plague than the marshy Baraba; but on the Amur and the Sungari large gnats become an unsupportable plague, and travellers who have had experience of the mosquitoes of the tropics readily admit that they yield to those of Siberia. Burning the prairie is the only expedient for destroying them, and is freely resorted to, with the result that the forest is frequently set on fire.

In Molluscs Siberia is much richer than had been supposed. The dredgings of the "Vega" expedition in the Arctic Ocean disclosed an unexpected wealth of marine fauna, and those of L. Schrenck in the north of the Japanese Sea have led to the discovery of no fewer than 256 species (Gasteropods, Brachiopods, and Conchifers). Even in Lake Baikal Dr Dybowski and Dr Godlewski have discovered no fewer than ninety-three species of Gammarides and twenty-five of Gasteropods.[3] The Sea of Okhotsk is very interesting in this respect, owing to its local species and the general composition of its fauna (70 species of Molluscs and 21 of Gasteropods). The land Molluscs, notwithstanding the unfavourable conditions of climate, number about seventy species,—Siberia in this respect thus being not far behind north Europe.

The Siberian fauna is very unequally distributed. The alpine tracts of Eastern Siberia and the *urmans* of Tobolsk are from the zoologist's point of view exceedingly poor, owing to the want of grass and of a mouldy soil. It is on the plateau, and especially on the lower plateau, as well as on the high plains, where the grazing grounds become numerous, that the fauna appears in its full richness. Much remains to be done in the way of investigating the distribution of animals over Siberia with reference to the physical conditions of its different parts. Although differing little from the European, the fauna of Siberia possesses great interest for the zoologist and geographer. The increase of many animals in size (becoming twice as large as in Europe); the appearance of white varieties among both mammals and birds, and their great prevalence among domesticated animals (Yakut horses); the migrations of birds and mammals over immense regions, from the Central Asian steppes to the arctic coast, performed not only in connexion with the usual rotation of seasons but also as a result of occasional climacteric conditions which are not yet fully known (*e.g.*, the occasional migration of thousands and thousands of roebuck from Manchuria across the Amur to the left bank of the river, or the migration of reindeer so well related by Wrangel); the various coloration of many animals according to the composition of the forests they inhabit (the sable and the squirrel are well-known instances); the mixture of northern and southern faunas in the Amur region and the remarkable consequences of that mixture in the struggle for existence;—all these render the study of the Siberian fauna most attractive. Finally, the laws of distribution of animals over Siberia cannot be made out until the changes undergone by its surface during the Glacial and Lacustrine periods are well established and the Post-Tertiary fauna is better known. The remarkable finds of Quaternary mammals about Omsk and their importance for the history of the *Equidæ* are but a hint of what may be expected in this field.

Population. The great bulk of the population are Russians, whose number has increased with great rapidity during the 19th century: although not exceeding 150,000 in 1709 and 500,000 a century later, they now (1887) number more than 3,000,000, and not far from 4,000,000 if the eastern slopes of the Urals are reckoned to Siberia. At the same time the entire indigenous population does not exceed 700,000 if the Kirghizes of Semipalatinsk are reckoned to Turkestan, and many indigenes are rapidly dying out. **Russian immigration.** The Russians, issuing from the middle Urals, have travelled as a broad stream through south Siberia, sending lateral branches to the Altai, to the Ili river in Turkestan, and to Minusinsk, as well as down the chief rivers which flow to the Arctic Ocean, the banks of which are studded with villages 15 to 20 miles apart. As Lake Baikal is approached the stream of Russian immigration becomes narrower, occupying only the valley of the Angara, with a series of villages up the Irkut; but it widens again in Transbaikalia, sending lateral branches up the Selenga and its tributaries. It follows the course of the Amur, again in a succession of villages some 20 miles apart, and can be traced up the Usuri to Lake Khangka and Vladivostok, with an extension of villages on the plains between the Zeya and the Selinja. Small Russian settlements also occur on a few bays of the North Pacific and the Sea of Okhotsk, as well as on Saghalin (see SAGHALIN). The Russians have thus occupied all the best agricultural tracts in Western and Eastern Siberia.

Indigenous races. As to the indigenous races, the Ugrian stocks which occupy the north-west of Siberia are represented by (1) the Voguls (about 6400), on the eastern slopes of the Urals, in Perm and Tobolsk, extending partly over the western slope; they closely resemble the Ostiaks, in some features approximating the Mongol race, and speak the same language; (2) the OSTIAKS (*q.v.*); and (3) the SAMOYEDES (*q.v.*).

Turkish stocks. Survivals of Turkish stocks, once much more numerous, are spread all over south Siberia as far as Lake Baikal. Their territories are rapidly being occupied by Russians, and their settlements are cut in two by the Russian stream,—the Baraba Tatars and the Yakuts being to the north of it, and the others having been driven back to the hilly tracts. According to M. Radloff,[4] they are as follows:—(1) the Karagases in the Yeniseisk and Irkutsk spurs of the Sayan Mountains (about 500); (2) the Abakan Tatars (about 10,000),—driven from the Irtish, they occupied the Abakan steppes after the emigration of the Kalmucks; (3) those of the Tcholym scattered amidst Russians (500); (4) the Tatars of the north and north-east Altai, in all about 20,000,—(*a*) the Kumandintsy, (*b*) the Lebed Tatars, (*c*) the *tchernī* or forest Tatars, (*d*) the Shorghintses; (5) those of the Altai proper,—(*a*) Altaians (11,800), (*b*) Dvoedantsy (2000), who until 1865 paid tribute to both Russia and China, and (*c*) the Teleutes (5800), mostly Russified; (6) the Soyotes and Uryankhes of East Sayan, of whom a few families are in Siberian territory; (7) the Baraba Tatars (4650), mostly driven northwards to the forest and marsh region; (8) the Irtish and Tobolsk Tatars (some 7000 to 10,000 on the Tara and 15,700 in the Tobolsk district). In all they number about 78,000, to whom should be added a number of Kirghiz from Turkestan. The great Turkish stock of the Yakuts (see YAKUTSK) in the basin of the Lena numbers about 200,000. Most of these Turkish stocks live by cattle-breeding and some by agriculture, and are a most laborious and honest population.

Mongols. The Mongols (about 350,000) extend into Western Siberia from the high plateau,—nearly 20,000 Kalmucks living in the eastern Altai. In Eastern Siberia the Buriats occupy the Selenga and Uda, parts of Nertchinsk, and the steppes between Irkutsk and the upper

[1] Czekanowski (*Investia Sib. Geog. Soc.*, 1877) has described fifty species from the basin of the Amur; he considers that these constitute only two-thirds of the species inhabiting that basin.

[2] L. Schrenck, *Reisen und Forschungen im Amurlande*, 1858-80.

[3] [illegible] *Acad. des Sc. de St Pétersb.*, vol. xxii., 1876.

[4] *Aus Sibirien*, 2 vols., Leipsic, 1884; also in *Jivopisnaya Rossiya*, vol. xii.

Lena, as also the Baikal Mountains and the island of Orkhon; they support themselves chiefly by stock-breeding, but some of them, especially in Irkutsk, are agriculturists (see TRANSBAIKALIA). On the left of the Amur there are about 10,000 Chinese and Manchurians about the mouth of the Zeya, and nearly 3000 Coreans on the Pacific coast. The Tunguses, although few in numbers (50,000), occupy as their hunting-grounds an immense region on the high plateau and its slopes to the Amur, but their limits are yearly becoming more and more circumscribed both by Russian gold-diggers and by Yakut settlers.

Finally, in the north-east we find a group of stocks whose ethnological place is not yet accurately determined. They are united into a separate North Asian linguistic group, and include the Tchuktchis, who may number 12,000, the Koryaks (5000), and the Kamchadales (3000), the Ghilyaks (nearly 5000) of the lower Amur and north Saghalin, and the Ainos (3000) of south Saghalin. The Yukaghirs (1600) seem to be merely Tunguses. Some 5000 Gipsies wander about Siberia.

Much has been written of late about the sad state of the indigenous populations of Siberia.[1] They are pitilessly deprived of their hunting and grazing grounds and compelled to resort to agriculture,—a modification exceedingly hard for them, not only on account of their poverty but also because they are compelled to settle in the less favourable regions. European civilization has made them familiar with all its worst sides and with none of its best. Taxed with a tribute in furs (*yasak*) from the earliest years of the conquest, they often revolted in the 17th century, but were cruelly reduced to obedience. The tribute was never great (about 1¼ roubles per head); but the official valuation of furs was always only one-third to one-fourth of their real value and the exactions of the authorities trebled it again. In 1824 the settled indigenes had to pay the very heavy rate of 11 roubles per head, and the arrears, which soon became equal to the sums levied, were rigorously exacted. It must be fully acknowledged that severe measures taken by the Government in the last two centuries prevented the growth of anything like legalized slavery on Siberian soil; but the people, ruined as they were both by the intrusion of agricultural colonists and by the exactions of Government officials, fell into what was practically a kind of slavery (*kabala*) to the merchants. Even the best-intentioned Government measures, such as the importation of corn, the prohibition of the sale of spirits, and so on, became new sources of oppression. The action of missionaries, who cared only about nominal Christianizing, had no better effect. It is worthy of notice that the spread of Mohammedanism among the Tatars and Kirghizes and of Lamaism among the Buriats took place under the Russians and was favoured by the Government.

Russian immigration. The Russians of Siberia differ to some extent from those of the mother-country. They might have been expected to intermix largely with the Finnish, Turkish, and Mongol elements with which they came in contact; but, in consequence of causes already mentioned under RUSSIA (vol. xxi. p. 78), the mixture is much less than might be supposed; and the continuous arrival of new immigrants contributed to lessen the effects of mixtures which really took place. One is accordingly struck to find in Western Siberia compact masses of Russians who have lost so little of their primitive ethnographical features, and to hear throughout Siberia a language which differs from that of northern Russia only by a slight admixture of words borrowed from the natives (mostly relating to hunting or cattle-rearing), and a few expressions of Polish origin. The case is otherwise, however, on the outskirts. Castrén characterized Obdorsk (mouth of the Ob) as a true Samoyedic town, although peopled with "Russians." The Cossacks of Western Siberia have the features and customs and many of the manners of life of the Kalmucks and Kirghiz. Yakutsk is thoroughly Yakutic; marriages of Russians with Yakut wives are common, and some forty years ago the Yakut language was predominant among the Russian merchants and officials. At Irkutsk and in the valley of the Irkut the admixture of Tungus and Buriat blood is obvious, and still more in the Nertchinsk district and among the Transbaikalian Cossacks settled for the last two centuries on the Arguñ. They speak the Buriat language as often as Russian, and in a Buriat dress the Arguñ Cossack can hardly be distinguished from a Buriat. In separate parts of Siberia, on the borders of the hilly tracts, the mixture with Tatars was quite common. Of course it is now rapidly growing less, and the settlers who entered Siberia in the 19th century married Russian wives and remained thoroughly Russian. There are accordingly parts of Siberia, especially among the Raskolniks, where the north Russian, the Great Russian, and the Ukrainian types have maintained themselves in their full purity, and only some differences in domestic architecture, in the disposition of their villages, and in the language and character of the population remind the traveller that he is in Siberia. The Russians in Siberia have emigrated from all parts of European Russia; but the special features of the language and partly also of the national character are due to the earliest settlers, who came mostly from northern Russia.

Population. The natural rate of increase of population is very slow as a rule, and does not exceed 7 or 8 per 1000 annually. The great mortality, especially among children, is one of the causes of this, the birth-rate being also lower than in Russia. In Western Siberia the former is 38 per 1000 in towns and 30 in villages, while the births are 43 in towns and 44 in villages. The climate of Siberia, however, cannot be called unhealthy, except in certain localities where goitre is common (on the Lena, in several valleys of Nertchinsk, and in the Altai Mountains). The rapid growth of the actual population is chiefly due to immigration.

Agriculture. Agriculture is the chief occupation both of the settled Russian and of the native population. South Siberia has a very fertile soil and yields rich crops, but immense tracts are utterly unfit for tillage. In the lowlands of Western Siberia it is carried on up to 61° N. lat.[2] On the high plains fringing the alpine tracts on the north-west it can be carried on only in the south, farther north only in the valleys, reaching 62° N. lat. in that of the Lena, and in the alpine tracts in only a few valleys, as that of the Irkut. On the high plateau all attempts to grow cereals have failed,—only the wide trenches (Uda, Selenga, Djida), already described, giving encouragement to the agriculturist. On the lower plateau, in Transbaikalia, grain is successfully raised in the Nertchinsk region,—with serious risks, however, from early frosts in the valleys of the mountain-ridges which rise above its surface. South-east Transbaikalia suffers from want of water, and the Buriats irrigate their fields. Although agriculture is carried on on the upper Amur, where land has been cleared from virgin forests, it really prospers only below Kumara and on the rich plains of the Zeya and Selimja. In the depression between the Bureya range and the coast-ranges it suffers greatly from the heavy July and August rains, and from inundations; while on the lower Amur the agriculturists barely maintain themselves by growing cereals in clearances on the slopes of hills, so that the settlements on the lower Amur and Usuri continually require help from Government to save them from famine. The chief grain-producing regions of Siberia are—the Tobol and Ishim region, the Baraba, the region about Tomsk, and the outskirts of the Altai, which cover an aggregate of 330,000 square miles (155,000 in the Altai); they have a thoroughly Russian population of nearly 2,000,000 inhabitants, and nearly 8,600,000 acres are under crops. The Tobolsk region, mostly covered with *urmans*, but having nearly 1,000,000 acres cultivated, and the northern districts of Semipalatinsk, which are being rapidly colonized, must be added to the above. On the whole, in the basins of the Ob and Irtish, the annual yield is about 2,350,000 quarters of summer wheat, 1,260,000 of summer rye, 3,240,000 of oats, and 6,000,000 bushels of potatoes. The figures for Eastern Siberia are not so reliable,—about 1,100,000 quarters of various grains in Irkutsk (one-third raised by the Buriats), 400,000 in Transbaikalia, 40,000 in Yakutsk, about 100,000 in the Amur province, and 25,000 in the Maritime Province; and the Yeniseisk peasants sell every year about 700,000 cwts. of corn. The Minusinsk district, one of the richest in Siberia (45,000 inhabitants, of whom 2800 are settled and 24,000 nomadic), has more than 45,000 acres under crops; and in the whole province of Yeniseisk about 3,000,000 acres are cultivated.

Cattle-breeding. Cattle-breeding is extensively carried on in many parts. In the Ob and Irtish region of Western Siberia there are about 2,000,000 horses, 1,500,000 head of horned cattle, 3,000,000 sheep, and 100,000 reindeer; for Eastern Siberia the figures are approximately 850,000 horses, 1,100,000 horned cattle, 1,120,000 sheep, and about 50,000 reindeer. The industry is, however, carried on in the most primitive manner. In Transbaikalia little hay is made, and the Buriat horses seek their food throughout the winter beneath the thin sheet of snow which covers the steppes. A single snowstorm in spring sometimes destroys in a few days thousands of horses thus weakened. In Western Siberia the "Siberian plague" makes great ravages, and the average losses are estimated at about 37,500 head of cattle annually.

Bee-keeping. Bee-keeping is widely diffused, especially in Tomsk and the Altai. Honey is exported to Russia. The seeds of the stone-pine are collected for oil in Western Siberia.

Hunting. Hunting still continues to be a profitable occupation, the male population of whole villages in the hilly and woody tracts setting out in October for a month's hunting. The sable, however, which formerly constituted the wealth of Siberia, is now so scarce that four sables per man is the maximum in the best districts. Squirrels, bears, foxes, snow-foxes, antelopes, and especially deer in spring are at present the principal objects of the chase. But even in Yakutsk the total produce of hunting was in 1879 only 65 sables, 2360 snow-foxes, 23,440 ermines, 140,550 squirrels, 1780 foxes, 145 bears, 1310 reindeer, and 26,780 hares. The forests on the Amur yielded a rich return of furs during the first years of the Russian occupation, and the Amur sable, although much inferior to the Yakutsk and Transbaikalian, was largely exported. In 1862 1800 sables and 40,000 squirrels were killed in the province of Amur.

[1] Yadrintseff's *Siberia as a Colony* contains a summary of this literature with bibliography.

[2] The northern limits of agriculture are 60° N. lat. on the Urals, 62° at Yakutsk, 61° at Aldansk, 54° 30' at Udskoi, and 53° to 54° in the interior of Kamchatka (Middendorff, *Sibirische Reise*, vol. iv.).