

very hard to approach. They seem to prefer especially the saline districts, and to be able to do long without water.

The pursuit of this wild horse can only be carried on in winter, because the hunter must live in the waterless districts, and must depend upon a supply of water from melted snow. As may well be believed, such an expedition during the severest cold of winter into the most remote part of the desert, must take at least a month. During the whole time of his stay in the Dsungarian Desert, Przevalsky met with only two herds of this wild horse.

In vain he and his companions fired at these animals. With outstretched head and uplifted tail the stallion disappeared like lightning, with the rest of the herd after him. Przevalsky and his companions could not keep near them, and soon lost their tracks. On the second occasion they came upon them from one side, yet one of the herd discovered their presence, and they were all gone in an instant.

The single specimen of Przevalsky's horse subsequently procured is now in the Museum of the Academy of Sciences of St. Petersburg, and is the only example of this species in Europe.

THE DIFFERENCE BETWEEN THE SEA AND CONTINENTAL CLIMATE WITH REGARD TO VEGETATION

THE difference in vegetation between the sea and continental climate is no doubt best observed in the growth of plants generally cultivated in the temperate zone for different purposes, as every climate has its own region or flora. Whether the climate of a country is favourable to those plants or not is shown, in the first place, by their extension to the north; therefore we shall first endeavour to trace the northern limits of the most important plants, either cultivated in one country and growing wild in another, or cultivated everywhere.

To the first class trees mostly belong; to the second, annual or perennial plants. We begin with trees:—

Pinus sylvestris, L. (Scotch pine). Scotland, 59°; Norway, 70° 20'; Kola, 69°; Petchora region, 67° 15'; Ob River, 66°; Turukansk, 65°. The Verkhoyansk Mountains, east of the Lena River (64°), are the eastern limits of this tree.¹

Betula odorata, Bechst. (*alba*, L., var.) (birch). Greenland, 61° (shrub); Iceland, 65° (shrub to ten feet high); Britain, 59°; Norway, 70° 50'; Kola Peninsula, 69° 30'; Kanin Peninsula, 67°; to the Ob River (66°), and from the River Kolyma (68°) to the Peshina Gulf (63°) and Kamchatka; on this peninsula it is a large tree.

Quercus pedunculata, Ehrh. (*Q. robur*, L., var.) (common oak). England, 58°; Norway (wild), to 62° 55', and cultivated to 65° 54'; Finland (coast), 61° 30' (Bjorneborg); St. Petersburg, Yaroslav, Perm, 58°.²

Larix europæa, Dec. (including *L. sibirica*, Ledeb., and *L. dahurica*, Turcz.) (common larch). Norway (*europæa*, Dec.), 66° 5'; (*dahurica*, Turcz.), 59° 55', both cultivated; Onega River, White Sea, south-western shore of Onega Lake, Mesen (Kanin Peninsula), 67°; Petchora River, 67° 30'; Ural Mountains, 67° 15'; Kara River, 68° (northern limit in Europe); Yenisei River, 70°; Boganida River, 71° 15'; Chatanga River, 72° 30' (most northern limit of trees on the globe); Anabar, 71°; Olenek and Lena, 72°; Yana, 71°; Indigirka, 70° 45'; Kolyma, 69°; Anadyr, 65°; between Okotsk and Gishiga, 61°; Sakalin Peninsula, 49°; to Jeddo and the island of Kunaschir, 43° 45'. On the shores of Kamchatka the larch is nowhere to be found; in the valleys of this peninsula, however, protected from sea winds, it is a very large tree.³

Pyrus Malus, L. (apple-tree). Shetland Isles (cultivated); Britain, 57°; Norway, cultivated, 65° 28', wild, 63° 40'; Gulf of Bothnia, 63° 45' (cultivated); Finland, 63° (cultivated), 60° (wild); northern shore of Onega Lake (wild); Narva, 59° 30' (wild); Tver, 56° 45' (wild); Nijni Novgorod, 56° (wild); Kasan, 56° (wild); south-west of Orenburg, 50°; Kopal, Asia, 45°.

Fagus sylvatica, L. (common beech). Britain, 58°; Norway, 59°, cultivated, 67° 56'; Sweden, 57°; Königsberg, Poland, South-West Russia, Crimea, Caucasus, Persia.

Castanea vesca, Grtn. (chestnut). South Britain, Germany (to the island of Rügen), Austria, Caucasus.

Populus alba, L. (abele tree). Britain (wild and cultivated), 56°; Norway (cultivated), 67° 56'; Germany (wild and cultivated), Austria, Russia: Volhynia, Kieff, Charkoff, Tambov, Kasan, Ufa, Altai Mountains.

Populus tremula, L. (aspens). Britain, 59°; Norway, 70° 37'; Russia: Kola Peninsula, 69° 30'; eastern shores of the White Sea, 66°; Yenisei, 66°; Kolyma River, 67° 30';¹ Amur River.

Alnus incana, W. (hoary-leaved elder). Canada, Norway, 70° 30'; Kola, 69° 30'; Yenisei, 67°; Amur region, Petropaulovsk on Kamchatka.

Ulmus campestris, L. (common elm-tree). Britain, 57°; Norway (cultivated), 63° 26'; Russia: Ilmen Lake, south of Moscow, Riazan, south of Kazan and Ufa to the Ural Mountains.

Tilia europæa, L. (including *parvifolia*, *grandifolia*, and *intermedia*) (lime-tree). Britain, 57° (*parvifolia*); Norway (wild), 62° 9', (cultivated) 67° 56'; St. Petersburg, Kargopol, Ust Süssolsk, about 62°; Solikamsk, Ural Mountains, about 58° 50'; Verkhoturgi.

Vitis vinifera, L. (common grape). Bretagne, 47° 30'; Liège, 50° 45'; Thuringia to Silesia, 51° 55'; South Galicia, South Russia, between about 48° and 49°; Astrakan, Bokhara in Turkestan, 40° (here the vine is cultivated in the open fields²); Khiva, 42°; China, 40°; California. This plant cannot stand the extreme continental climate on account of the frost in winter, but wants a very warm or a very long summer (as in California), therefore it cannot be cultivated generally in Britain. California is warmer in summer than some latitudes in Europe.

Triticum vulgare, Vill., var. *æstivum* (summer wheat). Britain; Norway, in the fields, 64° 40', in gardens, 69° 28'; Finland, 65°;³ Dwina River, 63°; Yakutsk, western shores of North America, 55°; Fort Liard, 60° 5' (North-West Territory of Canada);⁴ Peace River, 56° 6'; Ontario, East Canada.

Hordeum vulgare, L. (including *hexastichum*) (barley). Færoe Isles, 62° 15' (grain seldom ripens); Norway, 70°; western shores of the White Sea, 67°; Ob River, 61°; Yakutsk, 62°; Udskoi Ostrog, near the Okotsk Sea, 54° 30'; Kamchatka (inland), 53° to 54°; North-West American shore, south of Sitka, 57°; Fort Norman, Mackenzie River, 65°;⁵ east of Winnipeg, 50°; St. Lawrence Bay, 50°.

Avena sativa, L. (oat). Scotland; Norway, 69° 28'; Finland, 69°; Asia, the same latitude as *Hordeum vulgare*; Yenisei, 61°; Yakutsk, Kamchatka (inland); North America, the same latitude as *Hordeum vulgare*.

Secale cereale, L. (common rye). Britain; Norway, 69° 30'; Finland, 67°; Mesen River, 65° 45'; Petchora region, 65° 45'; Ural Mountains, 57°; Ob River, 60°; Yenisei, 59° 30'; Yakutsk, Kamchatka (inland); North America, a little south of the latitude of the barley, eastern shores, 50°.

Solanum tuberosum, L. (potato). Britain; Norway, 71° 7'; Russia, Pinega River, 65°; Turukansk, 65°; Yakutsk, shores of the Okotsk Sea, Kamchatka, Kadjah Island,

¹ Middendorff, p. 573.

² Grisebach, "Die Vegetation der Erde," vol. i. p. 407.

³ Middendorff, p. 709.

⁴ Richardson, "Searching Expedition through Rupert's Land," vol. ii. p. 267. Fort Liard has an altitude between 400 and 500 feet above sea-level.

⁵ Richardson, p. 269.

¹ Middendorff, "Sibirische Reise," Bd. iv. Th. i, p. 556.

² *Ib.* p. 567.

³ *Ib.* p. 536.

Sitka Island; Mackenzie River, 65°; Canada; Labrador, 58° 45';¹ Greenland.

Zea mays, L. (Indian corn). This plant requires also a very warm summer to ripen its seeds. In England it can only be cultivated as a green vegetable; on the western shores of Europe we can say that the cultivation is only profitable to the 46th degree N. lat., and in the valley of the Rhine it reaches to 49°. In North Germany the grain usually does not ripen. In North America, however, it is cultivated in certain regions with profitable returns up to 51° N. lat.² The period of vegetation varies there between seven and three months. To cultivate the varieties of such a short period in Europe is tried, but without result; they were transformed after a few generations into the common corn.

Thus we see that, of the plants just named, the larch, the pine, the birch, and the aspen grow in Siberia, with its excessive continental climate, farthest to the north; yet many of the cultivated plants mentioned above, and almost all those of the temperate zone, are either cultivated or grow wild in the sea climate of Norway, to very high latitudes.

On the north-western shores of America the pine attains a considerable size (island of Sitka), in a climate with continual rain, but partly the same size is observed on the Rocky Mountains (eastern slope), where the climate is wholly changed.

In British Columbia the climate is continental, very cold in winter; yet the same gigantic trees as on the coast are to be found here; precipitation takes place in spring, but the amount is very great.

In California, with its largest coniferous trees of the world (*Wellingtonia gigantea*), rain falls chiefly in winter (November to April). The enormous differences of coast and inland climates of California are not apparently known.

In the southern parts of the Amur region in Asia there is in summer a luxuriant vegetation; the annual precipitation amounts to 27.56 inches (about the same amount as in Germany), the plants much resembling those of Central Europe,³ and this notwithstanding a winter temperature much lower than observed in the most northern parts of Lapland; but the summer here is much warmer than in Europe under the same latitude, and precipitation occurs only in summer.

In the interior of Siberia the vegetation consists chiefly of coniferous trees; thus the luxurious growth in the region just named must be caused by the influence of the sea climate, as Middendorff suggests,⁴ though there is a mountain chain on the east coast. The extensive forests of Russia and Siberia prove that an extreme continental climate is resisted by some coniferous and other trees, but it is evident that in general a sea climate with mild winters, and thus a long period of vegetation, suits them best.

As we have seen, the northern limit of the cultivation of corn reaches on the continent a much higher latitude than on the shores. On the north-west coast of North America the island of Sitka (57° N. lat.) and Kadjak are on the extreme limit. On the Færoe Isles, barley (this can only be the coarse variety) is cultivated, but the grain very seldom ripens;⁵ the cause is absence of sunlight on account of the continual cloudy sky, storms and precipitation, causing low temperature in summer (mean temperature at Thorshaven, July, 49°·8), for corn wants a sunny climate, and to be under the direct influence of the sun's rays. This explains why it can be cultivated within the Polar Circle (Norway), where the sun in the summer season remains constantly above the horizon.

In North America, on the shores of Hudson's Bay, the tree limit goes down to 59°; the corn limit to 50° (Ontario).

¹ Petermann, *Geogr. Mittheilungen*, 1859, p. 124.

² Richardson, vol. ii. p. 267.

³ Kittlitz, "Vierundzwanzig Vegetationsansichten von Küstenländern und Inseln des Stillen Oceans," p. 53.

⁴ Middendorff, p. 763.

⁵ Martins, "Sur la Végétation de l'Archipel des Féroé."

On the shores of the Okotsk Sea corn cannot be cultivated at all, even on the south coast, under 50° N. lat. In Greenland the culture of corn is also impossible. The causes are the same as said above: the sea winds, wet climate, and fog in summer—thus want of sunlight.

Of all the cultivated vegetables, *Raphanus sativus*, L., et var. (radish), *Brassica rapa*, L., et var. (turnip), and *Brassica Napus*, L., et var. (rape), grow as far north as there are settlements—in Norway beyond 70° N. lat.; in Siberia to the Polar Circle; on the north-west coast of America to 64° 45' (Nulato), and Redoute St. Michael, 63° 30', in the interior to 67° (Fort Good Hope).¹ In Greenland rapes, turnips, cabbage, and salad are cultivated under 70° N. lat. (Island Disko).

The potato follows the above-named plants in their distribution to the north, and belongs also to the sea climate; at its northern limit in Siberia, however, as well as in North America, it is the size of a walnut.² In Greenland only the most careful treatment can produce eatable ones. The plant never blossoms here.³

When comparing the vegetation of the extreme continental climate with that of the extreme sea climate on the globe, the continental has the advantage; the South Shetland Isles, in 60°-63° S. lat., are at the most southern limit of phanerogamous plants (only a grass, *Aira antarctica*, Forst., is found here), and on Cockburn Island (64° S. lat.) the last trace of vegetation is found (cryptogamous plants). At this latitude north there is in Siberia a forest of very high coniferous trees. In the Antarctic regions there are several causes why vegetation ceases at such a low latitude, but these are all consequences of the chief cause, viz. the fact that the whole southern hemisphere, with the exception of relatively small spaces, is covered with water; severe storms⁴ combined with a very low summer temperature⁵ banish all vegetation.

The extreme continental climate has also its disadvantages, but chiefly with relation to the cultivation of corn. In the first place corn is very often destroyed by night frosts; they make the harvest uncertain.

The constantly frozen ground is the chief cause why corn cannot be cultivated in Siberia beyond 62° (Yakutsk). The temperature of the soil in which the roots vegetate varies between 36° and 41°. Thus notwithstanding the mean temperature of June at Yakutsk being 57° and that of July 62°⁶, the vegetation is relatively slow, though its period is the same as observed in Central Europe (ten to twelve weeks).⁷ The same period is observed in North America, at 63° (Fort Simpson), of the barley (wheat does not come to maturity here). But harvests of thirty to forty times the amount of what was sown alternate in this climate with years of no harvest at all.⁸ It is known that the native plants withstand the lowest temperatures of the Siberian winter.

Returning to Europe, we have seen that even the climate of the northern parts of the British Isles is not suited for many vegetables and other cultivated plants. It is Germany which has a climate where we can find almost all the plants of the temperate zone and those commonly cultivated; we see the vine in this country ascend farthest to the north, while corn and all vegetables ripen their seeds perfectly. It is clear that the climate is best suited for the vegetation of this latitude.

Now if we compare the mean temperature of July in Germany with the mean for the latitude (for 50° N. lat. 62°) calculated by Dove, we find that even in this country

¹ Richardson, vol. i. p. 214.

² Middendorff, p. 700.

³ Von Etzel, "Grönland geographisch und statistisch beschrieben," p. 282 (Stuttgart, 1860).

⁴ Lowest reading of the barometer by the United States Exploring Expedition under Wilkes in lat. 65° 15', 27° 50' (see "Narrative of the Expedition," vol. ii. p. 281 (London, 1852)).

⁵ In lat. 64° 5' mean temperature of January 1843, 31°; in 62°-66° in February, 34° (see Ross, "Voyage in the Southern and Antarctic Regions," vol. ii. pp. 352, 360).

⁶ Middendorff, p. 772.

⁷ *Ib.* p. 718.

⁸ *Ib.* p. 720.

the summer temperature in general is only a few degrees above the calculated; Germany is crossed in July by the isotherm of 68°, and Britain by that of 59°; but the difference in vegetation is not caused by a difference in mean temperature of 9°, but by the difference in the amount of sunshine.

Thus we come to the conclusion that a mixed climate, with relatively mild winters (the anomaly of temperature for January is for Germany about 19° on the 50th parallel of latitude) and warm sunny summers, is the best suited for the vegetation of the temperate zone.

Flushing

M. BERGSMAN

NOTES

THE International Congress of Hygiene will sit at the Hague from to-day till the 27th inst. Papers will be read by Messrs. Pasteur of Paris, Finkelberg of Bonn, Stephen Smith of New York, Marcy of Paris, W. H. Corfield of London, Emile Tielat of Paris, J. Crocq of Brussels, and A. Corradi of Pavia.

THE International Medical Congress at Copenhagen has been a great success. The next meeting will be held at Washington in September 1887. On behalf of the Collective Investigation Committee of the British Medical Association, Sir William Gull delivered an interesting lecture on the International Collective Investigation of Disease. A resolution for the establishment of a Permanent International Committee for the Collective Investigation of Disease was received with acclamation.

In an interesting descriptive article in the *Times* of yesterday on the Health Exhibition Biological Laboratory, the writer makes some forcible remarks on the position of research in this country. "Just as the advantages of such an institution as the projected Marine Biological Laboratory were illustrated and brought home to the mind by the International Fisheries Exhibition of 1883, so the present Health Exhibition should, as one outcome of its usefulness, lead to the foundation of some such institution for the extended and systematic study of the minute organisms which there is reason to believe are the causes of many forms of disease in plants, in animals, and in man. In Germany the State, recognising the value of the labours of Dr. Koch, contributes, though not very largely, to the prosecution of researches which give promise of invaluable results to all mankind. France, too, has acknowledged the practical character of the benefits which have in some measure already resulted from the experiments of M. Pasteur. In this country, where the State endowment of research is hardly admitted in principle, and where we have, perhaps too long, been content to leave all scientific research which was not directly remunerative to be pursued, with few attempts at organisation, by the few private individuals who, having the means, care to devote time and money to such objects, students of biological science are wondering whether the Royal College of Surgeons will apply some portion of the splendid bequest of Sir Erasmus Wilson to the purposes of research in this comparatively little-known but interesting field of inquiry. Without entering upon debatable ground, it may be said that in the small model laboratory for biological research, fitted up under the direction and now under the charge of Mr. Watson Cheyne at the Health Exhibition, the public may see and learn enough to convince the most sceptical of the vital importance of the knowledge which it is the purpose of such observations and experiments as are there exemplified to obtain."

PROF. G. F. ARMSTRONG, of the Yorkshire College, Leeds, and formerly of Montreal University, writes to the *Times* of Monday last, drawing attention to the liberal provision made for technical education in America. The Americans, he maintains, are a generation ahead of us in this respect. At the same time he

draws attention to the danger of neglecting the preliminary general culture which is absolutely necessary as a sound foundation for any special training.

It is worthy of note that the Roman Catholic Church of St. John, built by the Marquis of Bute, at Old Cumnock, Ayrshire, has recently been fitted throughout with the electric light under the personal superintendence of Mr. William Massey, of Twyford. There are in all about seventy glow lamps of twenty candles each, and the effect is very perfect, the architectural features of the building having been carefully studied and the lamps arranged with due regard to the religious character of the place. The necessary current is supplied by means of a dynamo and steam-engine placed in a small house hidden among the trees of the churchyard, where it is also intended to generate electricity for working the organ bellows.

THE inauguration of the Jouffroy statue at Besançon took place on Aug. 17. According to the French notion the Marquis de Jouffroy is believed to have been the real inventor of steam navigation, and the precursor of Fulton. M. de Lesseps was present at the ceremony.

THE effect of cheap interior telegraphy has been felt most happily in France, where the number of telegrams has multiplied in the most extraordinary manner. Last year there were 58 telegrams for each 100 inhabitants.

A FRENCH surveying vessel, the *Henri Rivière*, so called after the great explorer who lost his life in Tonquin, is to be sent to the higher waters of the Songkoi or Red River, not only to keep order among the pirates there, but also to survey the districts adjoining, and correct the inexactness of existing maps of the course of the river. As the ancient Khmer kingdom, Cambodia, has now been practically annexed to France, we may soon expect that the centre and eastern coast of the Indo-Chinese peninsula will be as well known to us as British India now is, for the French spare no money or pains to study their colonial possessions thoroughly.

AT the last meeting of the Paris Academy of Sciences, M. F. A. Forel described some peculiar luminous phenomena frequently observed by him and others during the spring and summer of this year at Morges on the Lake of Geneva, and especially on the Alps. When the sun was half veiled in white vapours, the clouds at Morges presented a reddish appearance at a distance of 20° or 25° from the solar disk. But the light effects were far more vivid when seen in the pure atmosphere of the Alpine regions; and in clear weather, that is to say, almost every day during the last fortnight, they were distinctly observed in the upland valley of Saas-Fée, Canton of Valais. The sun appeared as if encircled by a silvery white halo, very bright and lustrous, somewhat similar in appearance to the weird glow noted in the first phase of the crepuscular displays so frequently observed during last winter. This halo, whose radius may perhaps have measured some 12°, was itself surrounded by a broad, reddish corona with badly defined limits, whose orange or violet tints blended on the inner side with the silver halo, and outwardly with the azure sky. In breadth this corona was about equal to the radius of the halo. For a considerable distance from the sun the sky beyond these effects was of a deeper blue than usual, as was evident especially in the evening, when the setting sun disappearing behind the snowy Alpine crests seemed to impart to the western regions the shifting hues of a stormy sky. One might fancy the sun visited by a great dust-cloud, but for the fact that, beyond these displays of colour, it was as luminous as ever, the firmament itself as serene, with deep azure tints, the transparency of which nothing seemed to impair. The phenomenon attained its greatest intensity on July 23, a lovely midsummer day, when it was also observed at Sand-Alp in the