Saturn, March 1.—Outer major axis of outer ring = $42''\cdot3$; outer minor axis of outer ring = $19''\cdot2$; southern surface visible.

March	h.	
6 ...	10 ...	Venus at greatest distance from the Sun.
7 ...	14 ...	Mercury in conjunction with and 1° 3′ south of Mars.

GEOGRAPHICAL NOTES

It is stated that the King of the Belgians is conferring with M. Martinie, president of the French Geographical Society, on the subject of the formation of an International Geographical Society.

The last issue of the *Izvestia* of the Eastern Siberian branch of the Russian Geographical Society contains an interesting paper by M. Doubrof on his journey to Mongolia. The author, accompanied by only one man, has explored the upper course of the Selenga and reached the hitherto unvisited source of this great tributary of Lake Baikal. Unhappily, on his return journey he was prevented from following the exploration of its middle course, the whole journey having been undertaken at so small an expense that the author had sharply to calculate every rouble he was able to expend. The want of barometrical observations on the high tablelands of the Upper Selenga is especially regretable, and it is not wholly compensated by a mere topographical description. A table of the times of the freezing of many Siberian rivers and of the breaking of the ice is given in the same fascicule, as also several notes on the Lena meteorological station—already old—and on the Yakutsk province.

The trade in children within the province of Yakutsk is the subject of an interesting note in the same journal. The Irkutsk Geographical Society had received a note from one of its members, who thus depicted the lot of girls within the province: In the last century the poorest Yakute who had no means of supporting a large family, took his new-born child in a covering of birch-bark and hung it on a tree in the forest to die from hunger. But the richer Russian merchants began to buy children from their poorer Yakute clients, and so several Russians purchased whole families of servants. This custom induced the Yakute communities to take care of the poorest children, and the community was bound to feed them, under the name of *Kumolan* children, who spent three days in the houses of the richer members of the community, two days in those of the moderately wealthy, and one day with the poorest. But of late the custom has arisen of selling children, and especially girls, to Olekminsk merchants, who sell them further to the Yakutes and Tunguses of the Olekminsk district. The parents sell girls for thirty to forty roubles (3*l.* to 4*l.*), and in Olekmir they are re-sold for sixty roubles, sometimes eighty roubles. Of course this trade is made under the cover of "taking children to bring up." The Irkutsk Society having taken interest in this communication, it has received information from Yakutsk authorities, and from a well-known student of Yakute life, M. Gorokhoff. It appears from these communications that such trade really exists, the chief impulse to it being given, less by the work a purchased girl might do than by the possibility of receiving for her the *kalym*, that is, the money paid by men for purchasing a wife. Woman labour is at so low a price that one might have a woman in his household and pay her half a piece of cotton, "for a shirt," per year. But the *kalym* reaches very high prices. One rich Yakute has recently sold his daughter to a Tungus for 3000 reindeer, and the same price was recently given by a half-idiotic Yakute for the daughter of another Yakute. Middendorff quotes also several instances of a very high *kalym* paid for girls, its average being about 500 roubles. When a Russian priest sold a girl whom he had educated for five sables and ten skins, it was considered as a very low price. Altogether, the *kalym* is the chief cause of maintaining the trade in girls, together with the gradual impoverishment of the Yakutes.

The *Japan Gazette* publishes a brief statement from Mr. Gowland, technical adviser to the Imperial Mint at Osaka, on his observations during a recent journey through part of Corea. He spent ten days at Seoul, the capital, and twenty days on the overland route between that place and the port of Fusan. He did not observe any indication of mineral wealth. There were no signs of mines, and nothing beyond doubtful indications of mineral veins in one or two places. There are no mountains exceeding about 4000 feet in highest elevation, and no characteristic volcanic cones. The central range was crossed by a pass 2300 feet above the sea-level. The forests were of no great extent, but very extensive tracts of cultivated ground, evidently yielding a large surplus production of rice, barley, and beans, were noticeable throughout. There was a marked absence of any manufacturing industry, or of indications that anything beyond food-products receives attention. The traffic on the roads was limited to that between neighbouring districts only, and this was very little. The beasts of burthen employed were rarely horses, frequently bullocks, and chiefly men. There is a total absence of any signs of wealth, and the resources of the country appear to lie solely in agriculture. There is no money, and no prospects of any foreign trade.

The last number of *Le Mouvement Géographique* has some interesting information about the celebrated first letter from Columbus. All interested in the early history of America know of the different editions of this letter, which was first published in 1493. Bibliographers mention seven of them: (1) one in Rome by Stephen Plannck; (2) one called the Libri Lennox; (3) one in Rome by Eucharius Argenteus; (4) a second by Plannck at Rome; (5) a Paris copy; (6) a second Paris copy; (7) one discovered in Turin by Harisse. To these an eighth has just been added by Ruelens, who discovered the only copy of it known to exist in the Royal Library at Brussels. It is a small pamphlet of four leaves in quarto, of thirty-eight lines, without figures or signature, in semi-Gothic characters. It appears to have been purchased between 1815 and 1830 by the Royal Library. Its title is: "Epistola Christophori Colom: cui etas nostra multum debet." The title then goes on as follows: "De Insulis Indie supra Gangem puper [for ruper] inventis. Ad quas perquirendas octavo ante mense auspiciis et ere inuictissimi Ferdinandi Hispaniorum Regis missus fuerat: ad magnificum Dominum Raphaelem Sauxis: ejusdem serenissimi Regis Tesaurarium missa: quam nobilis ac litteratus vir Aliander de Cosco ab Hispano idiomate in latinum convertit: tertio Maii MCCCC. XC. III. Pontificatus Alexandri Sixti Anno primo." Although the little pamphlet does not bear the name of a publisher, M. Ruelens, by comparing the works of the great Flemish printers, has discovered that Martens was the person. This individual distinguished himself among all his fellows about the end of the fifteenth century, at Antwerp, by his intelligent and progressive character. He was a great publisher of his day; he issued more than fifty writings of Erasmus, More's "Utopia," works of Savonarola, and many others. Facsimiles of the letter have been printed by M. Ruelens, and fifty of them, numbered and paged, are offered for sale. The discovery of this relic of geographical discovery, as well as of early Flemish printing, is an event of great interest.

The *Echo du Japan* reports the arrival in Japan, at the beginning of the year, of M. Joseph Martin, a French traveller, who has just been exploring the parts of Siberia hitherto very little known. His principal journey was from the Lena to the Amoor, across the Stanowai chain of mountains. During his explorations he was able to make geographical and geological collections, which are intended for the Paris museums. In consequence of hardships endured on the journey, two of his native followers died and one lost his reason.

In a paper read before the Statistical Society on the 17th inst. Sir Richard Temple endeavoured to check the various official returns of the population of China by applying the results obtained from the population statistics of British India. The various statements made by the Chinese Government as to the numbers of people under its rule show violent fluctuations, those of the last century and a half varying between 436 and 363 millions. These returns, as Prof. Douglas pointed out, varied with the purposes for which the enumerations were made. China proper and India, said Sir Richard Temple, are about the same area—a million and a half of square miles. Both countries are under similar conditions, physical, technical, climatic, geographical. In both there is a strong tendency to multiplication of the race. In both the population loved to congregate in favoured districts, to settle down and multiply there till the land could scarcely sustain the growing multitudes, and to leave the less favoured districts with a scanty though hardy population. The average population of the whole of India is 184 to the square mile, and if this average be applied to China (exclusive of the Central plateau) it gives a population of 282,191,600 souls. The writer then compared, one by one, the eighteen provinces of China proper with the districts in India corresponding nearly in physical characteristics and cultivable area, and, summarising these computations, he found that, over a total area of 1,500,650 square miles, the population, according to this estimate from the Indian averages, would be 282,161,923, or, say, 183 persons to the square mile, while the latest official returns obtained from China show 349,885,386, or 227 inhabitants to the square mile. The general conclusion, he said, might be that the latest Chinese returns, though probably in excess of the reality, did not seem to be extravagant or incredible on the whole if tested by the known averages of the Indian census.

THE FORMS OF LEAVES[1]

SIR JOHN LUBBOCK said that, greatly as we all appreciated the exquisite loveliness of flowers, we must admit that the beauty of our woods and fields was as much due to the marvellous grace and infinite variety of foliage. How is this inexhaustible richness of forms to be accounted for? Does it result from an innate tendency of the leaves in each species to assume some particular shape? Has it been intentionally designed to delight the eyes of man? Or has it reference to the structure and organisation, the wants and requirements of the plant itself?

Now, if we consider first the size of the leaf, we shall find that it is regulated mainly with reference to the thickness of the stem. This was shown, for instance, by a table giving the leaf area and the diameter of stem of the hornbeam, beech, elm, lime, Spanish chestnut, ash, walnut, and horse-chestnut. When strict proportion is departed from, the difference can generally be accounted for.

The size once determined exercises much influence on the form. For instance, in the beech the leaf has an area of about 3 square inches. The distance between the buds is about $1\frac{1}{4}$ inches, and the leaves lie in the general plane of the branch, which bends slightly at each internode. The basal half of the leaf fits the swell of the twig, while the upper half follows the edge of the leaf above, and the form of the inner edge being thus determined decides that of the outer one also. In the lime the internodes are longer and the leaf consequently broader. In the Spanish chestnut the stem is nearly three times as stout as that of the beech, and consequently can carry a larger leaf surface. But the distances between the buds are often little greater than those in the beach. This determines, then, the width, and, by compelling the leaf to lengthen itself, leads to the peculiar form which it assumes. Moreover, not only do the leaves on a single twig admirably fit one another, but they are also adapted to the ramification of the twigs themselves, and thus avail themselves of the light and air, as we can see by the shade they cast without large interspaces or much overlapping.

In the sycamores, maples, and horse-chestnuts the arrangement is altogether different. The shoots are stiff and upright, with leaves placed at right angles to the plane of the branch, instead of being parallel to it. The leaves are in pairs, and decussate with one another, while the lower ones have long petioles, which bring them almost to the level of the upper pairs, the whole thus forming a beautiful dome.

For leaves arranged as in the beech, the gentle swell at the base is admirably suited; but in a crown of leaves, such as those of the sycamore, space would be thereby wasted, and it is better that they should expand at once, as soon as their stalks have carried them free from the upper and inner leaves. Hence we see how beautifully the whole form of these leaves is adapted to the mode of growth and arrangement, of the buds in the plants themselves.

In the black poplar the arrangement of the leaves is again quite different. The leaf-stalk is flattened, so that the leaves hang vertically. In connection with this it will be observed that, while in most leaves the upper and under surfaces are quite unlike, in the black poplar, on the contrary, they are very similar. The stomata or breathing-holes, moreover, which in the leaves of most trees are confined to the under surface, are in in this species nearly equally numerous on both. The "compass" plant of the American prairies, a yellow composite not unlike a small sunflower, is another plant with upright leaves, which, growing in the wide open prairies, tend to point north and south, thus exposing both surfaces equally to the light and heat. It was shown by diagrams that this position also affected the internal structure of the leaf.

In the yew the leaves are inserted close to one another, and are long and linear; while in the box they are further apart and broader. In the Scotch fir the leaves are linear, and $1\frac{1}{2}$ inch long; while in other pines, as, for instance, the Weymouth, the stem is thicker and the leaves longer.

In the plants hitherto mentioned one main consideration appears to be the securing of as much light as possible; but in tropical countries the sun is often too powerful, and the leaves, far from courting, avoid the light. The typical acacias have primate leaves, but in most Australian species the true leaves are replaced by a vertically flattened leaf-stalk. It will be found, however, that the seedlings have leaves of the form typical in the genus. Gradually, however, the leaf becomes smaller and smaller, until nothing is left but the flattened leaf-stalk or phyllode. In one species the plant throughout life produces both leaves and phyllodes, which give it a very curious and interesting appearance. In eucalyptus, again, the young plant has horizontal leaves, which in older ones are replaced by scimitar-shaped phyllodes. Hence the different appearances of the young and old trees which must have struck every visitor to Algiers or the Riviera.

We have hitherto been considering mainly deciduous trees. In evergreens the conditions are in many respects different. It is generally said that leaves drop off in the autumn because they die. This, however, is not strictly correct. The fall of the leaf is a vital process connected with a change in the cellular tissues at the base of the leaf-stalk. If the leaves are killed too soon they do not drop off. Sir John illustrated this by some twigs which he had purposely broken in the summer; below the fracture the leaves had been thrown off, above they still adhered, and so tightly that they could support a considerable weight. In evergreen trees the conditions are in many respects very different. It is generally supposed that the leaves last one complete year. Many of them, however, attain a much greater age: for instance, in the Scotch fir, three or four years; in the spruce and silver, six or seven; in the yew even longer. It follows from this that they require a tougher and more healthy texture. When we have an early fall of snow our deciduous trees are often much broken down; glossy leaves have a tendency to throw it off, and thus escape, hence evergreen leaves are very generally smooth and glossy. Again, evergreen leaves often have special protection either in an astringent or aromatic taste, which renders them more or less inedible; or by thorns and spines. Of this the holly is a familiar illustration; and it was pointed out that in old plants above the range of browsing quadrupeds, the leaves tend to lose their spines and become unarmed. The hairs on leaves are another form of protection; on herbs the presence of hairs is often associated with that of honey, as they protect the plants from the visits of creeping insects. Hence perhaps the tendency of water species to become glabrous, *Polygonum amphibium* being a very interesting case, since it is hairy when growing on land, and smooth when in water. Sir John then dealt with cases in which one species mimics another, and exhibited a striking photograph of a group of stinging nettles and dead nettles, which were so much alike as to be hardly distinguishable. No one can doubt that the stinging nettle is protected by its poisonous hairs, and it is equally clear that the innocuous dead nettle must profit by its similarity to its dangerous neighbour. Other similar cases were cited.

He had already suggested one consideration, which in certain cases determined the width of leaves; but there were others in which it was due to different causes, one being the attitude of the leaf itself. In many genera with broad and narrow-leaved species, drosera and plantago, for instance, the broad leaves formed a horizontal rosette, while the narrow ones were raised upwards. Fleshy leaves were principally found in hot and dry countries, where this peculiarity had the advantage of offering a smaller surface, and therefore exposing the plant less to the loss of water by evaporation.

Sir John then passed to aquatic plants, many of which have two kinds of leaves: one more or less rounded, which floats on the surface; and others cut up into narrow filaments, which remain below. The latter thus presents a greater extent of surface. In air, however, such leaves would be unable to support even their own weight, much less to resist any force such as that of the wind. In perfectly still air, however, for the same reason, finely divided leaves may be an advantage, whereas in

[1] Abstract by the Author of a Lecture delivered at the Royal Institute, Feb. 13 by Sir John Lubbock, Bart., M.P., D.C.L., LL.D., F.R.S., &c.