19. Prepare nitrogen from ammonium nitrite (*i.e.* a mixture of potassium nitrite and ammonium chloride).

20. Explain how, in the above experiments, the gradual deoxidation of nitric acid yields the several oxides of nitrogen, and lastly, nitrogen itself.

XII.—*Sulphur*

1. Exhibit the different forms of sulphur: flour of sulphur, brimstone or stick sulphur, and crystallised native sulphur.

2. Dissolve sulphur in bisulphide of carbon, and obtain crystals by spontaneous evaporation. Indicate the identity of this form with the naturally occurring crystals, and its difference from that obtained by fusing sulphur and allowing the mass to cool.

3. Explain what is meant by allotropic modification, and point out how the one form of crystal passes into the other.

4. Show the effect of heat upon sulphur melted in a flask. Contrast the brittle mass derived from cooling the sulphur after heating slightly above its melting-point by pouring into cold water, with the plastic mass obtained when cooled in the same way from a high temperature. Point out the changes which occur as the temperature rises, and exhibit the red vapour of sulphur.

5. Show combustion in sulphur vapour. Insert a coil of copper wire into the sulphur vapour, and show that combination occurs.

6. Distil sulphur in a small retort.

7. Pass hydrogen through boiling sulphur, and demonstrate the formation of hydrogen sulphide by its blackening action on lead paper.

8. Exhibit ferrous sulphide and galena (lead sulphide). Prepare hydrogen sulphide (sulphuretted hydrogen) from the former by the action of dilute sulphuric acid. Collect by displacement and prepare a solution of the gas in water.

9. Show the combustible nature of hydrogen sulphide by burning a jar of the gas, and point out the deposition of sulphur due to incomplete combustion. Demonstrate and explain the decomposition of hydrogen sulphide by chlorine, and show the deposition of sulphur when its solution is allowed to stand exposed to the air and light.

10. Demonstrate the value of hydrogen sulphide as a means of separating the metals into groups, by adding the solution or passing the gas into solutions of the various metals, as, for example, arsenious acid, copper sulphate, lead nitrate, antimony chloride, zinc sulphate, ferrous sulphate, and magnesium sulphate.

Write down the equations in each case.

11. Prepare sulphur dioxide by heating copper with sulphuric acid and collect the gas.

12. Illustrate the condensation of a gas into a liquid by passing sulphur dioxide into a glass tube surrounded by a freezing mixture of ice and salt.

13. Pass the gas into water and demonstrate the acid properties of the solution.

14. Prepare sulphur trioxide from fuming Nordhausen sulphuric acid. Add it to water and compare its behaviour with that of the dioxide under similar circumstances.

15. Describe the formation in the above experiment of sulphuric acid, explain the properties of oil of vitriol, demonstrating its affinity for water as exhibited by the great heat evolved when the two liquids are mixed.

16. Explain the barium chloride test for sulphuric acid.

17. Add barium chloride to a solution of sulphurous acid, and then nitric acid.

18. Explain that in consequence of the readiness with which sulphurous acid takes up oxygen it acts as a bleaching agent and as a powerful reducing agent.

XIII.—*Carbon*

1. Show the presence of carbon (charcoal) in wood by carbonising a splinter of wood in a test-tube; and in white sugar by pouring strong sulphuric acid on to a syrupy solution.

2. Describe the properties and modes of occurrence of the three allotropic modifications of carbon: (*a*) the amorphous form (lamp-black and charcoal), and the two crystalline forms, (*b*) graphite, and (*c*) diamond. Describe the octahedral forms of the crystal of diamond and show glass or wood models.

3. Explain that the same weight of each of these substances when burnt gives the same weight of the same product (carbon dioxide).

4. Calculate the weight of carbon dioxide obtained from a given weight of any one of these forms.

5. Prepare carbon dioxide by treating chalk or carbonate of soda (washing soda) with an acid. Prove that the gas thus obtained really obtains carbon by heating a pellet of potassium in the dry gas contained in a small flask.

6. Demonstrate the high specific gravity of carbon dioxide by pouring it from one vessel to another, and showing that it extinguishes a taper.

7. Pass carbon dioxide over red-hot carbon in an iron tube, and show that it loses a part of its oxygen and is converted into carbon monoxide, a combustible gas, which, on combustion, again yields carbon dioxide. Collect the carbon monoxide over water containing caustic soda, and show that the gas does not render lime-water turbid. Then burn it, and show that the residual gas does possess this power.

8. Pass carbon monoxide over red-hot copper oxide to show the formation of carbon dioxide, and explain the use of carbon monoxide as a reducing agent in metallurgical operations.

9. Explain the changes which take place in an ordinary coal fire. Mention the poisonous nature of the carbon monoxide, and state that it is formed in cases of incomplete combustion from insufficient supply of oxygen.

10. Mention heat of combustion of carbon, and of carbon monoxide, and explain the value of the latter as a fuel.

11. Explain the reaction which takes place when carbon dioxide is passed into caustic soda and into lime-water, and explain the formation of a soluble carbonate in the first, and an insoluble carbonate in the second case.

CHARACTERISTICS OF THE NORTH AMERICAN FLORA[1]

WHEN the British Association, with much painstaking, honours and gratifies the cultivators of science on this side of the ocean by meeting on American soil, it is but seemly that a Corresponding Member for the third of a century should endeavour to manifest his interest in the occasion and to render some service, if he can, to his fellow-naturalists in Section D. I would attempt to do so by pointing out, in a general way, some of the characteristic features of the vegetation of the country which they have come to visit,—a country of "magnificent distances," but of which some vistas may be had by those who can use the facilities which are offered for enjoying them. Even to those who cannot command the time for distant excursions, and to some who may know little or nothing of botany, the sketch which I offer may not be altogether uninteresting. But I naturally address myself to the botanists of the Association, to those who, having crossed the wide Atlantic, are now invited to proceed westward over an almost equal breadth of land; some, indeed, have already journeyed to the Pacific coast, and have returned; and not a few, it is hoped, may accept the invitation to Philadelphia, where a warm welcome awaits them—warmth of hospitality, rather than of summer temperature, let us hope; but Philadelphia is proverbial for both. There opportunities may be afforded for a passing acquaintance with the botany of the Atlantic border of the United States, in company with the botanists of the American Association, who are expected to muster in full force.

What may be asked of me, then, is to portray certain outlines of the vegetation of the United States and the Canadian Dominion, as contrasted with that of Europe; perhaps also to touch upon the causes or anterior conditions to which much of the actual differences between the two floras may be ascribed. For indeed, however interesting or curious the facts of the case may be in themselves, they become far more instructive when we attain to some clear conception of the dependent relation of the present vegetation to a preceding state of things, out of which it has come.

As to the Atlantic border on which we stand, probably the first impression made upon the botanist or other observer coming from Great Britain to New England or Canadian shores, will be the similarity of what he here finds with what he left behind. Among the trees the White Birch and the Chestnut will be identified, if not as exactly the same, yet with only slight differences—differences which may be said to be no more essential or profound than those in accent and intonation between the British

[1] An Address to the Botanists of the British Association for the Advancement of Science; read at Montreal to the Biological Section, August 29, 1884, by Prof. Asa Gray.

speech and that of the "Americans." The differences between the Beeches and Larches of the two countries are a little more accentuated; and still more those of the Hornbeams, Elms, and the nearest resembling Oaks. And so of several other trees. Only as you proceed westward and southward will the differences overpower the similarities, which still are met with.

In the fields and along open roadsides the likeness seems to be greater. But much of this likeness is the unconscious work of man, rather than of Nature, the reason of which is not far to seek. This was a region of forest, upon which the aborigines, although they here and there opened patches of land for cultivation, had made no permanent encroachment. Not very much of the herbaceous or other low undergrowth of this forest could bear exposure to the fervid summer's sun; and the change was too abrupt for adaptive modification. The plains and prairies of the great Mississippi Valley were then too remote for their vegetation to compete for the vacancy which was made here when forest was changed to grain-fields and then to meadow and pasture. And so the vacancy came to be filled in a notable measure by agrestial plants from Europe, the seeds of which came in seed-grain, in the coats and fleece and in the imported fodder of cattle and sheep, and in the various but not always apparent ways in which agricultural and commercial people unwittingly convey the plants and animals of one country to another. So, while an agricultural people displaced the aborigines which the forest sheltered and nourished, the herbs, purposely or accidentally brought with them, took possession of the clearings, and prevailed more or less over the native and rightful heirs to the soil,—not enough to supplant them, indeed, but enough to impart a certain adventitious Old World aspect to the fields and other open grounds, as well as to the precincts of habitations. In spring-time you would have seen the fields of this district yellow with European Buttercups and Dandelions, then whitened with the Ox-eye Daisy, and at midsummer brightened by the cærulean blue of Chicory. I can hardly name any native herbs which *in the fields and at the season* can vie with these intruders in floral show. The common Barberry of the Old World is an early denizen of New England. The tall Mullein, of a wholly alien race, shoots up in every pasture and new clearing, accompanied by the common Thistle, while another imported Thistle, called in the States "the Canada Thistle," has become a veritable nuisance, at which much legislation has been levelled in vain.

According to tradition the wayside Plantain was called by the American Indian "White-Man's foot," from its springing up wherever that foot had been planted. But there is some reason for suspecting that the Indian's ancestors brought it to this continent. Moreover there is another reason for surmising that this long-accepted tradition is factitious. For there was already in the country a native Plantain, so like *Plantago major* that the botanists have only of late distinguished it. (I acknowledge my share in the oversight.) Possibly, although the botanists were at fault, the aborigines may have known the difference. The cows are said to know it. For a brother botanist of long experience tells me that, where the two grow together, cows freely feed upon the undoubtedly native species, and leave the naturalised one untouched.

It has been maintained that the ruderal and agrestial Old World plants and weeds of cultivation displace the indigenous ones of newly-settled countries in virtue of a strength which they have developed through survival in the struggle of ages, under the severe competition incident to their former migrations. And it does seem that most of the pertinacious weeds of the Old World which have been given to us may not be indigenous even to Europe, at least to Western Europe, but belong to campestrine or unwooded regions farther east; and that, following the movements of pastoral and agricultural people, they may have played somewhat the same part in the once forest-clad Western Europe that they have been playing here. But it is unnecessary to build much upon the possibly fallacious idea of increased strength gained by competition. Opportunity may count for more than exceptional vigour; and the cases in which foreign plants have shown such superiority are mainly those in which a forest-destroying people have brought upon newly-bared soil the seeds of an open-ground vegetation.

The one marked exception that I know of, the case of recent and abundant influx of this class of Old World plants into a naturally treeless region, supports the same conclusion. Our associate, Mr. John Ball, has recently called attention to it. The pampas of South-Eastern South America beyond the Rio Colorado, lying between the same parallels of latitude in the south as Montreal and Philadelphia in the north, and with climate and probably soils fit to sustain a varied vegetation, and even a fair proportion of forest, are not only treeless, but excessively poor in their herbaceous flora. The district has had no trees since its comparatively recent elevation from the sea. As Mr. Darwin long ago intimated: "Trees are absent not because they cannot grow and thrive, but because the only country from which they could have been derived—tropical and sub-tropical South America—could not supply species to suit the soil and climate." And as to the herbaceous and frutescent species, to continue the extract from Mr. Ball's instructive paper recently published in the Linnean Society's *Journal*, "in a district raised from the sea during the latest geological period, and bounded on the west by a great mountain-range mainly clothed with an alpine flora requiring the protection of snow in winter, and on the north by a warm temperate region whose flora is mainly of modified sub-tropical origin—the only plants that could occupy the newly-formed region were the comparatively few which, though developed under very different conditions, were sufficiently tolerant of change to adapt themselves to the new environment. The flora is poor, not because the land cannot support a richer one, but because the only regions from which a large population could be derived are inhabited by races unfit for emigration."

Singularly enough, this deficiency of herbaceous plants is being supplied from Europe, and the in-comers are spreading with great rapidity; for lack of other forest material even apple-trees are running wild and forming extensive groves. Men and cattle are, as usual, the agents of dissemination. But colonising plants are filling, in this instance, a vacancy which was left by Nature, while ours was made by man. We may agree with Mr. Ball in the opinion that the rapidity with which the intrusive plants have spread in this part of South America "is to be accounted for, less by any special fitness of the immigrant species, than by the fact that the ground is to a great extent unoccupied."

The principle applies here also; and in general, that it is opportunity rather than specially acquired vigour that has given Old World weeds an advantage may be inferred from the behaviour of our weeds indigenous to the country, the plants of the unwooded districts—prairies or savannas west and south—which, now that the way is open, are coming in one by one into these eastern parts, extending their area continually, and holding their ground quite as pertinaciously as the immigrant denizens. Almost every year gives new examples of the immigration of campestrine western plants into the Eastern States. They are well up to the spirit of the age: they travel by railway. The seeds are transported, some in the coats of cattle and sheep on the way to market, others in the food which supports them on the journey, and many in a way which you might not suspect, until you consider that these great roads run east and west, that the prevalent winds are from the west, that a freight-train left unguarded was not long ago blown on for more than one hundred miles before it could be stopped, not altogether on down grades, and that the bared and mostly unkempt borders of these railways form capital seed-beds and nursery-grounds for such plants.

Returning now from this side-issue, let me advert to another and, I judge, a very pleasant experience which the botanist and the cultivator may have on first visiting the American shores. At almost every step he comes upon old acquaintances, upon shrubs and trees and flowering herbs, mostly peculiar to this country, but with which he is familiar in the grounds and gardens of his home. Great Britain is especially hospitable to American trees and shrubs. There those both of the eastern and western sides of our continent flourish side by side. Here they almost wholly refuse such association. But the most familiar and longest-established representatives of our flora (certain western annuals excepted) were drawn from the Atlantic coast. Among them are the Virginia Creeper or Ampelopsis, almost as commonly grown in Europe as here, and which, I think, displays its autumnal crimson as brightly there as along the borders of its native woods where you will everywhere meet with it; the Red and Sugar Maples, which give the notable autumnal glow to our northern woods, but rarely make much show in Europe, perhaps for lack of sharp contrast between summer and autumn; the ornamental Ericaceous shrubs, Kalmias, Azaleas, Rhododendrons, and the like, specially called American plants in England, although all the Rhododendrons of the finer sort are half Asiatic, the hardy American species

having been crossed and recrossed with more elegant but tender Indian species.

As to flowering herbs, somewhat of the delight with which an American first gathers wild Primroses and Cowslips and Foxgloves and Daisies in Europe, may be enjoyed by the European botanist when he comes upon our Trilliums and Sanguinaria, Cypripediums and Dodecatheon, our species of Phlox, Coreopsis, &c., so familiar in his gardens; or when, crossing the continent, he comes upon large tracts of ground yellow with Eschscholtzia or blue with Nemophilas. But with a sentimental difference: in that Primroses, Daisies, and Heaths, like nightingales and larks, are inwrought into our common literature and poetry, whereas our native flowers and birds, if not altogether unsung, have attained at the most to only local celebrity.

Turning now from similarities, and from that which interchange has made familiar, to that which is different or peculiar, I suppose that an observant botanist upon a survey of the Atlantic border of North America (which naturally first and mainly attracts our attention) would be impressed by the comparative wealth of this flora in trees and shrubs. Not so much so in the Canadian Dominion, at least in its eastern part; but even here the difference will be striking enough on comparing Canada with Great Britain.

The Coniferæ native to the British Islands are one Pine, one Juniper, and a Yew; those of Canada proper are four or five Pines, four Firs, a Larch, an Arbor-Vitæ, three Junipers, and a Yew—fourteen or fifteen to three. Of Amentaceous trees and shrubs, Great Britain counts one Oak (in two marked forms), a Beech, a Hazel, a Hornbeam, two Birches, an Alder, a Myrica, eighteen Willows, and two Poplars—twenty-eight species in nine genera, and under four natural orders. In Canada there are at least eight Oaks, a Chestnut, a Beech, two Hazels, two Hornbeams of distinct genera, six Birches, two Alders, about fourteen Willows and five Poplars, also a Plane tree, two Walnuts, and four Hickories; say forty-eight species, in thirteen genera, and belonging to seven natural orders. The comparison may not be altogether fair; for the British flora is exceptionally poor, even for islands so situated. But if we extend it to Scandinavia, so as to have a continental and an equivalent area, the native Coniferæ would be augmented only by one Fir, the Amentaceæ by several more Willows, a Poplar, and one or two more Birches;—no additional orders nor genera.

If we take in the Atlantic United States, east of the Mississippi, and compare this area with Europe, we should find the species and the types increasing as we proceed southward, but about the same numerical proportion would hold.

But more interesting than this numerical preponderance—which is practically confined to the trees and shrubs—will be the extra-European types, which, intermixed with familiar Old World forms, give peculiar features to the North American flora—features discernible in Canada, but more and more prominent as we proceed southward. Still confining our survey to the Atlantic district, that is, without crossing the Mississippi, the following are among the notable points:—

(1) Leguminous trees of peculiar types. Europe abounds in Leguminous shrubs or under-shrubs, mostly of the Genisteous tribe, which is wanting in all North America, but has no Leguminous tree of more pretence than the Cercis and Laburnum. Our Atlantic forest is distinguished by a Cercis of its own, three species of Locust, two of them fine trees, and two Honey Locusts, the beautiful Cladrastis, and the stately Gymnocladus. Only the Cercis has any European relationship. For relatives of the others we must look to the Chino-Japanese region.

(2) The great development of the Ericaceæ (taking the order in its widest sense), along with the absence of the Ericeous tribe, that is, of the Heaths themselves. We possess on this side of the Mississippi 30 genera and not far from 90 species. All Europe has only 17 genera and barely 50 species. We have most of the actual European species, excepting their Rhododendrons and their Heaths,—and even the latter are represented by some scattered patches of Calluna, of which it may be still doubtful whether they are chance introductions or sparse and scanty survivals; and besides we have a wealth of peculiar genera and species. Among them the most notable in an ornamental point of view are the Rhododendrons, Azaleas, Kalmias, Andromedas, and Clethras; in botanical interest, the endemic Monotropeæ, of which there is only one species in Europe, but seven genera in North America, all but one absolutely peculiar; and, in edible as well as botanical interest, the unexampled development and diversification of the genus Vaccinium (along with the allied American type, Gaylussacia) will attract attention. It is interesting to note the rapid falling away of Ericaceæ westward in the valley of the Mississippi as the forest thins out.

(3) The wealth of this flora in Compositæ is a most obvious feature,—one especially prominent at this season of the year, when the open grounds are becoming golden with Solidago, and the earlier of the autumnal Asters are beginning to blossom. The Compositæ form the largest order of Phænogamous plants in all temperate floras of the northern hemisphere, are well up to the average in Europe, but are nowhere so numerous as in North America, where they form an eighth part of the whole. But the contrast between the Compositæ of Europe and Atlantic North America is striking. Europe runs to Thistles, to Inuloideæ, to Anthemideæ, and to Cichoriaceæ. It has very few Asters and only two Solidagoes, no Sunflowers, and hardly anything of that tribe. Our Atlantic flora surpasses all the world in Asters and Solidagoes, as also in Sunflowers and their various allies, is rich in Eupatoriaceæ, of which Europe has extremely few, and is well supplied with Vernoniaceæ and Helenioideæ of which she has none; but is scanty in all the groups that predominate in Europe. I may remark that if our larger and most troublesome genera, such as Solidago and Aster, were treated in our systematic works even in the way that Nyman has treated Hieracium in Europe, the species of these two genera (now numbering 78 and 124 respectively) would be at least doubled.

(4) Perhaps the most interesting contrast between the flora of Europe and that of the eastern border of North America is in the number of generic and even ordinal types here met with which are wholly absent from Europe. Possibly we may distinguish these into two sets of differing history. One will represent a tropical element, more or less transformed, which has probably acquired or been able to hold its position so far north in virtue of our high summer temperature. (In this whole survey the peninsula of Florida is left out of view, regarding its botany as essentially Bahaman and Cuban, with a certain admixture of northern elements.) To the first type I refer such trees and shrubs as Asimina, sole representative of the Anonaceæ out of the tropics, and reaching even to lat. 42°; Chrysobalanus, representing a tropical sub-order; Pinckneya, representing as far north as Georgia the Cinchoneous tribe; the Baccharis of our coast, reaching even to New England; Cyrilla and Cliftonia, the former actually West Indian; Bumelia, representing the tropical order Sapotaceæ; Bignonia and Tecoma of the Bignoniaceæ; Forestiera in Oleaceæ; Persea of the Laurineæ; and finally the Cactaceæ. Among the herbaceous plants of this set I will allude only to some of peculiar orders. Among them I reckon Sarracenia, of which the only extra-North American representative is tropical American, the Melastomaceæ, represented by Rhexia; Passiflora (our species being herbaceous), a few representatives of Loasaceæ and Turneraceæ, also of Hydrophyllaceæ: our two genera of Burmanniaceæ; three genera of Hæmodoraceæ; Tillandsia in Bromeliaceæ; two genera of Pontederiaceæ; two of Commelynaceæ; the outlying Mayaca and Xyris, and three genera of Eriocaulonaceæ. I do not forget that one of our species of Eriocaulon occurs on the west coast of Ireland and in Skye, wonderfully out of place, though on this side of the Atlantic it reaches Newfoundland. It may be a survival in the Old World; but it is more probably of chance introduction.

The other set of extra-European types, characteristic of the Atlantic North American flora, is very notable. According to a view which I have much and for a long while insisted on, it may be said to represent a certain portion of the once rather uniform flora of the Arctic and less boreal zone, from the late Tertiary down to the incoming of the Glacial period, and which, brought down to our lower latitudes by the gradual refrigeration, has been preserved here in Eastern North America and in the corresponding parts of Asia, but was lost to Europe. I need not recapitulate the evidence upon which this now generally accepted doctrine was founded; and to enumerate the plants which testify in its favour would amount to an enumeration of the greater part of the genera or subordinate groups of plants which distinguish our Atlantic flora from that of Europe. The evidence, in brief, is that the plants in question, or their moderately differentiated representatives, still co-exist in the flora of Eastern North America and that of the Chino-

Japanese region, the climates and conditions of which are very similar; and that the fossilised representatives of many of them have been brought to light in the late Tertiary deposits of the Arctic zone wherever explored. In mentioning some of the plants of this category I include the Magnolias, although there are no nearly identical species, but there is a seemingly identical Liriodendron in China, and the Schizandras and Illiciums are divided between the two floras; and I put into the list Menispermum, of which the only other species is Eastern Siberian, and is hardly distinguishable from ours. When you call to mind the series of wholly extra-European types which are identically or approximately represented in the Eastern North American and in the Eastern Asiatic temperate floras, such as Trautvetteria and Hydrastis in Ranunculaceæ; Caulophyllum, Diphylleia, Jeffersonia, and Podophyllum in Berberideæ; Brasenia and Nelumbium in Nymphæaceæ; Stylophorum in Papaveraceæ; Stuartia and Gordonia in Ternstromiaceæ; the equivalent species of Xanthoxylum, the equivalent and identical species of Vitis, and of the poisonous species of Rhus (one, if not both, of which you may meet with in every botanical excursion, and which it will be safer not to handle); the Horse-Chestnuts, here called Buckeyes; the Negundo, a peculiar offshoot of the Maple tribe; when you consider that almost every one of the peculiar Leguminous trees mentioned as characteristic of our flora is represented by a species in China or Manchuria or Japan, and so of some herbaceous Leguminosæ; when you remember that the peculiar small order of which Calycanthus is the principal type has its other representative in the same region; that the species of Philadelphus, of Hydrangea, of Itea, Astilbe, Hamamelis, Diervilla, Triosteum; Mitchella, which carpets the ground under evergreen woods; Chiogenes, creeping over the shaded bogs; Epigæa, choicest woodland flower of early spring; Elliottia; Shortia (the curious history of which I need not rehearse); Styrax of cognate species; Nyssa, the Asiatic representatives of which affect a warmer region; Gelsemium, which, under the name of Jessamine, is the vernal pride of the Southern Atlantic States: Pyrularia and Buckleya, peculiar Santalaceous shrubs; Sassafras and Benzoins of the Laurel family; Planera and Maclura; Pachysandra of the Box tribe; the great development of the Juglandaceæ (of which the sole representative in Europe probably was brought by man into South-Eastern Europe in prehistoric times); our Hemlock-Spruces, Arbor-Vitæ, Chamæcyparis, Taxodium, and Torreya, with their East Asian counterparts, the Roxburghiaceæ, represented by Croomia—and I might much further extend and particularise the enumeration—you will have enough to make it clear that the peculiarities of the one flora are the peculiarities of the other, and that the two are in striking contrast with the flora of Europe.

(*To be continued.*)

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, December 18, 1884.—Sir John Lubbock, Bart., F.R.S., President, in the chair.—The following gentlemen were elected Fellows of the Society:—Liet.-Col. W. R. Lewis, and Messrs. T. B. Blow, H. G. Greenish, A. G. Howard, L. de Niceville, C. B. Plowright, and F. Shrivell.—Mr. H. Ling Roth showed roots of sugar-cane grown in Queensland; the plant appearing to him to possess two sorts, viz. ordinary matted fibrous roots and others of a special kind.—Mr. E. Alf. Heath exhibited a wild cat found dead in a trap in Ben-Armin Deer Forest, Sutherlandshire, where they are still frequently met with.—Mr. W. H. Beeby called attention to examples of bur-reed (*Sparganium*) obtained at Albury Ponds, Surrey, the plant being quite distinct from the other British species; he proposed for it the name of *S. neglectum*.—In illustration of ornithological notes, Mr. Thos. E. Gunn showed an interesting series in varied plumage of the somewhat rare British bird, the blue-throated warbler. The examples in question were procured by Mr. G. E. Power at Cley, on the Norfolk coast, in September, 1884. Mr. Gunn also exhibited an immature female little bittern, shot at Broxbourne Bridge, Herts, on October 15 in the same year; as likewise a hybrid between a goldfinch and bullfinch, which possessed the marked characteristics of both parents.—Attention was drawn to Mr. R. Morton Middleton's examples of varieties of Indian corn (*Zea mays*, L.) from the United States, Natal, and the borders of the River Danube. The specimens showed marked differences from each other in size, colour, form, and in ornamentation of the seeds.—Mr. Thiselton Dyer exhibited life-size photographs of cones of two species of *Encephalartus* from South Africa, viz. *E. longifolius* and *E. latifrons*, neither hitherto figured in European books. He also showed tubers of *Ullucus tuberosus* from Venezuela, which, though esteemed as an esculent in South America, proved inedible when grown at Kew.—A paper was read by Mr. Henry O. Forbes, on contrivances for insuring self-fertilisation in some tropical orchids. The author described in detail the structural peculiarities of certain Orchidaceæ which had been made the subject of study by him under favourable circumstances. He arrives at the conclusion that a number of orchids are not fertilised by insects, but are so constructed as to enable them to fertilise themselves. This paper was illustrated by diagrams referring more particularly to such forms as *Phajus Blumei*, *Spathoglottis plicata*, *Arundina speciosa*, *Eria javensis*, and others.—Prof. St. G. Mivart read a paper on the cerebral convolutions of the Carnivora and Pinnipedia, and wherein were described for the first time in detail the brains of *Nandinia*, *Galidia*, *Cryptoprocta*, *Bassaricyon* (from a cast of the skull), *Mellivora*, *Galictis*, and *Grisonia*. The author, confirming the views of previous observers, gave additional reasons for a three-fold division of the Carnivora into Cynoidea, Æluroidea, and Arctoidea, though he remarked that amongst the Æluroids the section of Viverrina formed a very distinct group, judged by the cerebral characters. He specially called attention to the universal tendency amongst the Arctoidea to the definition of a distinct and conspicuous lozenge-shaped patch of brain substance defined by the crucial and precrucial sulci. This condition, which he found in no single non-arctoid Carnivora, he also found in the brain of *Otaria Gillespii*, and afterwards in *Phoca vitulina*, where it is very small and much hidden. This fact he adduced as an important argument in favour of the view that the Pinnipedia were evolved from some Arctoid, probably Ursine, form of land Carnivora.—Mr. F. O. Bower read a paper on apospory in ferns. His microscopical investigations on the growth of sporophore generation to the prothallus without the intervention of spores but confirms the statements of Mr. Chas. T. Druery on *Athyrium Filixfœmina*, var. *clarissima*, previously communicated to the Society. Mr. Bower, moreover, finds the case in point to hold good in certain other ferns, for example, *Polystichum angulare*, where there is the formation of an expansion of *undoubted prothalloid nature* bearing sexual organs by a process of purely vegetative outgrowth from the fern plant. That is, there is a transition from the sporophore generation to the oosphore by a vegetable growth, and without any connection either with spores or indeed with sporangia or sori. The author goes on to point out the bearing of these observations and cultures on the general life history of the fern, so far as the modifications of the genetic cycle are concerned; and he further compares this new phenomenon of "apospory" in ferns with similar cases in other plants, while insisting on the importance of the cases at issue.—A communication on the aërial and submerged leaves of *Ranunculus lingua*, L., was read by Mr. Freeman Roper. He shows from specimens obtained near Eastbourne that the two sets of leaves in question differ so materially from each other that they might not be suspected to belong to the same plant, the submerged being larger, broader, ovate or cordate, and possessing abundance of stomata.

Geological Society, December 14, 1884.—W. Carruthers, F.R.S., Vice-President, in the chair.—David Llewellin Evans was elected a Fellow of the Society.—The following communications were read:—On the south-western extension of the Clifton fault, by Prof. C. Lloyd Morgan, F.G.S., Assoc.R.S.M.—On the recent discovery of Pteraspidian fish in the Upper Silurian rocks of North America, by Prof. E. W. Claypole, B.A., B.Sc. Lond., F.G.S.—On some West-Indian phosphate deposits, by George Hughes, F.C.S. (Communicated by W. T. Blanford, LL.D., F.R.S., Sec.G.S.).—Notes on species of *Phyllopora* and *Thamniscus* from the Lower Silurian rocks near Welshpool, Wales, by George Robert Vine (Communicated by Prof. P. Martin Duncan, F.R.S., F.G.S.).

Victoria (Philosophical) Institute, January 5.—A paper on "The Religion of the Aboriginal Tribes of India," by Prof. Avery, was read. In it the author sketched the peculiarities of the beliefs of those tribes, so far as was known.

SYDNEY

Royal Society of New South Wales, November 5, 1884.—H. C. Russell, B.A., F.R.A.S., President, in the chair.—Five