

3. Professor Balfour exhibited the following specimens, which had been presented to the Museum at the Botanic Garden :—

From the Earl of Mansfield, cones of *Wellingtonia gigantea*, produced at Scone Palace.

From Mr Archibald Hepburn, a section of Sycamore, exhibiting what is known as “inbarking.”

4. Professor Balfour exhibited a spadix of female flowers of *Arenga saccharifera*, produced in the Palm House at the Botanic Garden. This palm is a native of the Malay Archipelago, and occurs on the west coast of Sumatra. It is found at a height of 3000–4000 feet above the level of the sea. It supplies a coarse black fibre called Gomuti or Goo fibre, which is used for cordage, like the coir of the Coconut palm. The juice obtained from the spadix becomes an intoxicating liquor called toddy. Sago is obtained from the stem before flowering. There are thorn-like appendages on the stem, which are used as pens for writing.

5. Mr Panton exhibited a specimen of Eozoon, from America.

11th May 1871.—ALEXANDER BUCHAN, M.A., President,
in the Chair.

The following Lady Associate was elected :—

Mrs ALEXANDER, 7 Rosebery Crescent.

The following Communications were read :—

- I. *Remarks on Plants furnishing varieties of Ipecacuan, and on the Cultivation of Cephaelis Ipecacuanha* (Rich.) in the Royal Botanic Garden of Edinburgh. By Professor BALFOUR.

Plants yielding various kinds of Ipecacuan belong to the Natural Orders Cinchonaceæ (Rubiaceæ, section Cinchonæ), Violaceæ, Polygalaceæ, Asclepiadaceæ, and Euphorbiaceæ.

In the Order Cinchonaceæ there are the following species :—

1. *Cephaelis Ipecacuanha* (Rich.), which yields the annulated or Lisbon Ipecacuan of commerce.

- 2 *Psychotria emetica* (Mut.), yielding striated Ipecacuan.
 3. *Richardsonia scabra*, St Hilaire, furnishing white or undulated Ipecacuan.
 4. *Borreria ferruginea*, DC. 5. *Borreria Poaya*, DC.
 6. *Manettia cordifolia*, Mart.

In the Natural Order Violaceæ the following species are mentioned as furnishing emetic roots :—

1. *Ionidium Ipecacuanha*, Aug. St Hil. 2. *I. microphyllum*, H.B.K. 3. *I. Poaya*, Aug. St Hil. 4. *I. parviflorum*, Vent. 5. *I. brevicaulis*, Mart. 6. *I. urticæfolium*, Mart.

In the Natural Order Polygalaceæ we find the following species :—*Polygala Poaya*, Spix. and Mart.

In the Natural Order Asclepiadaceæ we have the following species :—*Tylophora asthmatica*, W. and A.

In the Natural Order Euphorbiaceæ the following species is used :—*Euphorbia Ipecacuanha*, L.

The roots of these plants have been used as emetics in various parts of the world, and they agree to a certain extent in being more or less annulated or striated.

Cephaelis Ipecacuanha of Richard, the true Ipecacuan plant, has been cultivated in the Edinburgh Botanic Garden for at least forty years, but it was not propagated to any extent until the recent demand for it in India. This demand arose from the destruction of the plants by the collectors in Brazil, and the fear expressed that ere long this valuable remedy for dysentery might become scarce and dear. The Secretary of State for India resolved to attempt the propagation of the plant in India. Being asked for a supply of plants from the Edinburgh Botanic Garden, I set about the propagation of it. Mr M'Nab found that this could be readily done by making cuttings of the annulated root.

Auguste de Saint-Hilaire, in his "Plantes usuelles des Brésiliens," alludes to the easy propagation of the plant both by seeds and cuttings, and also refers to the risk of its eradication :—

"Quoique cette dernière espèce ait été détruite dans les environs de Rio de Janeiro, et en général dans ceux des grandes villes, elle est encore fort commune dans beaucoup d'endroits ; cependant comme on l'arrache sans prévoyance, qu'on n'attend point pour cela la maturité de ses

fruits, et que, d'un autre côté, on détruit tous les jours de vastes portions de bois vierges où elle naissait en abondance, il est incontestable qu'elle ne tardera pas à devenir rare, et il serait important que l'on songeât sérieusement à la cultiver. Des essais tentés par plusieurs personnes prouvent qu'elle se reproduit également bien par des semis, et par des boutures. Elle n'exige presque aucun soin, quand on la cultive dans les bois à l'ombre des grands arbres; mais, quand on est obligé de la cultiver dans des lieux découverts, il est nécessaire de lui procurer un ombrage artificiel."

An account of the method pursued in propagating the plant has already appeared in the Proceedings of the Society (Vol. X. p. 318). Besides greatly multiplying the plants by this method from the specimens which had been long in cultivation, means were taken for importing living specimens from South America. Dr Christison has taken a warm interest in the matter, and on our writing to Dr Gunning of Palmeiras, Rio Janeiro, a graduate of this University, he readily gave his aid, and sent to Edinburgh on two occasions boxes containing specimens, from which we were enabled to procure a large number of living plants by the mode of propagation adopted by Mr M'Nab.

On examining these new plants, there appeared to be a marked difference between them and the old plants cultivated in the garden. The latter are evidently the form figured by Sir William Hooker, in the Botanical Magazine (Tab. 4063), while the former resemble more the figure given by Martius in his "*Specimen Materiæ Medicæ Brasiliensis*" (Tab. 1).

The old garden plant figured by Hooker was sent to him by Mr Mackoy of Liege, and this form seems to be still cultivated in Belgium, as the Messrs Lawson have lately received specimens for their nursery from that country. It is distinguished from that sent by Dr Gunning, by having leaves of a firmer texture, more elliptical or oval, the apex less pointed, and the edges wavy, with fewer hairs on their surface and at the edges. The stem is more shrubby. The plant flowers readily after a year's cultivation from slips. The style is short.

In the plant recently imported from Rio Janeiro, the

leaves are more acute, more delicate in texture, and more hairy on the edges, and not wavy. The stem is not shrubby. It corresponds, apparently, with the figures and descriptions of Richard, Martius, and Auguste St Hilaire. We require the flower, however, to determine more fully the character of the plant. Judging from the figures given by the above-mentioned botanists, the style in the Ipecacuan plant is so long, that the two-lobed stigma reaches to the level of the anthers. We cannot say if this will constitute a character of importance. There may be hermaphrodite and dimorphic forms of the plant. Some may have short styles, and some long styles, and the reason why the flowering plants in the garden have never produced seed may be that long styles are required for complete fertilisation.* To this point attention will be directed should the Rio Janiero plant produce flowers in the garden. The roots of both plants correspond with the Ipecacuan root of English commerce.

The native tribes of Brazil have long known the efficacy of the Ipecacuan root in the treatment of disease. The native names for it are Poaya de Mato and Cipo. In the Minas-Geraes it is called Ipecacuanha. The Ipecacuan plant appears to have been first noticed by Samuel Purchas in "His Pilgrimes." In this work he gives an account of voyages made to South America. He states that his treatise on Brazil (Part IV. book vii. p. 1311) was written "by a Portugal friar (a Jesuit), who had lived for thirty years in those parts, from whom (much against his will) the written book was taken by Mr Francis Cooke of Dartmouth, on a voyage outward bound for Brazil, anno 1601, who sold the same to Master Hacket for twenty shillings, by whose permission it was translated out of Portugal into English." Mr C. R. Markham mentions that this treatise was signed Manoel Tristan, Enfermero de Collegio de Baya. In it there is an account of a plant called Igpecaya or Pigaya, which is said to be profitable for the bloody flux, and is supposed to be Ipecacuan.

In 1648 it was described and figured by Piso and Marcgrav in their treatises on the natural history of Brazil,

* This year (Nov. 1871) several of the old Ipecacuan plants are showing fruit for the first time.

which were published together, viz., Piso, "De Medicina Brasiliensi," p. 101, Marcgrav, "Historia Rerum Naturalium Brasiliæ," p. 17. It was then introduced into Europe. Grenier, a merchant, brought it to Paris as a pharmaceutical remedy, and as such it was used by Jean Adrien Helvetius, a medical man. It was brought under the notice of Louis XIV. Experiments were made at the Hotel Dieu as to its efficacy in diarrhœa and dysentery. The origin of the name is doubtful. Some say *Ipe* (bark), *caa* (plant), *cua* (scented), *nha* (striped), that is, bark of a scented and striped plant. Martius, in his "Specimen Materiæ Medicæ Brasiliensis," states that the name is corrupted into Picalonha, and by the Brazilians into Poaya. The latter name is applied generally in Brazil to all kinds of Ipecacuan plants. Weddell says that it is a corruption of the Indian words, Ycipo ayaca, which means a twining plant (cipo), assuming a basket form (liane à panier, a basket twiner).

From Weddell's account in the "Annales des Sciences Naturelles, Botanique," tom. xi. (1849), 3 series, p. 193 *et seq.*, we gather the following particulars:—

Ipecacuan is found in parts of Brazil, bordering on the Atlantic, Para, Maranhao, Pernambuco, Bahia, Spirito-Santo, Minas-Geraes, Rio Janeiro, and San-Paulo. The plant also extends to Bolivia; it was seen by Weddell in Matto Grosso, a large Brazilian province far inland. He found it in shady parts of the province among such plants as *Euterpe oleracea*, *Ænocarpus Bacaba*, *Cocos capitata*, species of *Mauritia*, Tree Ferns, and *Iriartea exorrhiza*.

The people who gather the Poaya (Ipecacuan) are called *Poyaeros*. When gathering the plants, the Poayero seizes several stems with one hand, while with the other he pushes into the ground obliquely a sharp-pointed stick called *saracoa*, by means of which he raises up the roots. He then pulls up the plants with their loosened roots. The Poayero then separates the roots, removes the adhering earth from them, and puts them in a bag which he carries suspended at his side. A skilled collector can pull up, in the course of a day, 15 kilogrammes (about 30 lbs.) of Ipecacuan. In general, however, the quantity collected in a day does not amount to more than from 3 to 5 kilos, *i.e.*, 6 to 10 lbs.

The Poayero gives the roots to a superintendent, who weighs them and lays them out to dry. The more rapid the drying so much the better. Hence the process is best carried on in full sunshine. In favourable weather the roots are dried in the course of two or three days. The process goes on more rapidly when the roots are protected from the night dew. When properly dried, the roots break easily with a resinoid fracture. The gathering of the Ipecacuan goes on during the year, but in general it is intermitted during the rainy season.

The flowering of the plant takes place in the months of February and March. The plants by being pulled up are often prevented from producing seed ; they, however, propagate readily by buds from the creeping rhizome. The parts of the roots from which the buds spring are shown in the plate illustrating Mr M'Nab's paper, (Trans. Bot. Soc. Vol. X. Plate IV.)

When the Poayero pulls up the roots, he breaks them at certain points, and from these ruptured parts young plants proceed, and thus the total destruction of the plant is prevented. In Matto Grosso, Weddell says that the Poayeros take some pains to protect the part of the roots left in the soil, and fill up the holes when the plants have been pulled. In this way it is probable that in the course of three to four years, the ground which has been robbed of plants may recover itself.

Dr Gunning, however, in writing to Dr Christison from Rio Janeiro, says that in that district, the plant is extensively destroyed by the operations of the Ipecacuan gatherer, and that in the course of time it becomes scarce, and altogether disappears in the searched localities. Hence the necessity for planting Ipecacuan in places where it can be protected, the collection of the roots being put under proper superintendence.

Weddell thinks that the burning of the forests in Brazil rather tends to propagate the plant. Before burning, the soil is encumbered with a great amount of vegetable debris, which accumulates to such an extent as to prevent the seed of the Ipecacuan from falling into congenial soil, and to choke any plants which may be in a growing state. The burning of the forests acts in removing this debris.

When the roots are properly dried, they are broken into small fragments. From 1835-37, Weddell says that in the neighbourhood of Villa Maria (in Upper Paraguay) 150,000 kilos. of *Ipecacuan* were gathered, and there were from 1200 to 1500 collectors in the forests. Men, women, children, free people, and slaves, went into the depths of the Paraguayan forests, and spent some months in collecting the roots. At that time the price of $14\frac{1}{2}$ kilos. was 50 to 60 francs at Villa Maria, and 78 to 90 at Rio Janeiro. This state of matters, however, soon ceased, and the Poayeros took to the usual plan of collecting.

The first figures of *Ipecacuan* were given by Piso, and by Marcgrave, but evidently from the same drawing. It was not, however, such as to enable botanists to determine the plant.

Ray believed that *Ipecacuan* was furnished by a species of *Paris*; Morison, Plukenet, and Linnæus referred it to *Lonicera*. At that time all annular emetic roots were called *Ipecacuan*. The drug of commerce was heterogeneous, and was supplied from various sources. The specimens were long distinguished by the colour, and we had brown, grey, black, and white *Ipecacuan*. In 1764, Mutis, Director of the Botanical Expedition to Santa Fe de Bogota, in New Grenada, sent to Linnæus specimens of the plant which furnish the *Ipecacuan* root of that country. In 1781, Linnæus the younger described the plant under the name of *Psychotria emetica*. In 1800 Bernardo Gomez, a Portuguese, gave an accurate scientific description of the *Ipecacuan* plant; and on 3d February 1801, his countryman Felix Avellat Brotero, Professor of Botany in the University of Coimbra, republished his description, without acknowledgment, in the Transactions of the Linnean Society (vol. vi. p. 137), and called the plant *Callicocca Ipecacuanha*. The genus was described as having an ascending, somewhat shrubby, creeping stem, with ovate lanceolate leaves, somewhat pubescent on the lower surface, a terminal pedunculate capitulum of flowers, a four-leaved involucre, with subcordate leaflets, and a 5-cleft corolla. He considered this the plant of Piso, and gave a full description of it, with an excellent figure. It was found in Pernambuco, Bahia, Rio Janeiro, San

Paulo, Marian, and other parts of Brazil. Achille Richard agreed with Brotero in regard to the plant which yielded the true annulated Ipecacuan. It was, however, referred by him to the genus *Cephaelis* of Swartz, as given in his "Prodromus Floræ Indiæ Occidentalis." The plant is placed in the Natural Order Rubiaceæ, Suborder Cinchioneæ, or, according to Lindley, the Order Cinchonaceæ.

The following are some of the genera of the Cinchonaceæ, which contain plants used as Ipecacuan:—

- A. Fruit with 1-4 seeded loculaments.
Cephaelis, Psychotria, Richardsonia, Borreria.
- B. Fruit with many-seeded loculaments.
Manettia.

Besides these, we also find plants known by the name Ipecacuanha in other Natural Orders, as already mentioned.

Let us notice some of these plants.

Cephaelis.—Calyx tube obovate, limb very short, 5-toothed; corolla somewhat funnel-shaped, with five small, rather obtuse lobes; anthers included. Style usually long,* with an exserted bifid stigma. Berry obovate-oblong, crowned with the remains of the calyx, bilocular, two-seeded. Shrubs or herbs with oval, acute, petiolate leaves; stipules 2, toothed and partite. Capitula terminal or axillary, with 2-8 bracts.

C. Ipecacuanha.—Stem ascending and afterwards erect, somewhat pubescent at the apex, leaves oblong-ovate, rough above, with slender pubescence below, stipules cleft in a setaceous manner. Capitula terminal, stalked, erect, and afterwards pendulous. Root creeping, annulate, brown or grey in colour. It is known as Ipecacuan in Europe, and as one of the Poayas in Brazil—annulated Brazilian or Lisbon Ipecacuan of commerce.

One character is omitted in the description, viz., the clusters of oblong, somewhat ovate glands, which are found on the inside of the stipules at their base. There are stomata and hairs on the epidermis. The stomata are deeply situated, and are surrounded by a series of epidermal cells. The hairs are conical, and arise from a series of 5-7 cells at the base. They are often partitioned.

* Martius says style equals length of corolla tube in *Cephaelis*.

The section of the aerial stem shows a cortical, fibrous, and medullary portion. The epidermis consists of condensed cells. Below it are cells more or less hexagonal. Then we come to the vascular circle, consisting of spiral and pitted vessels, and fusiform tubes of wood. In the centre are the hexagonal cells of pith.

The true Ipecacuan of commerce is an annulated root, occurring in pieces three to four inches long, and about the size of a small writing quill, variously bent. The rings constitute the cortical portion of the root. They can be easily separated from the central portion, and pulled off in a ring-like shape. In many pharmaceutical specimens the hard central part is seen between some of the rings. They appear like a row of rings strung on a fibrous thread, hence the name ringed or annulated.

The root has a resinous fracture. The outer portion is of a dark brown or grey colour. The epidermal portion consists of compact cells. Below these are hexagonal cells, full of starch grains of various forms—round, oval, and angular—with a distinct hilum, which is round, or angular, or elliptical. Near the hilum there is a dark shading, which seems to indicate striation. Neither Mr Sadler nor myself have been able to detect true striæ on them, even under a Ross microscope magnifying 870 diameters. In some of the cells, the starch grains are crowded together so as to fill the whole cavity.

The inner part of the cortex consists of more delicate and more transparent cells without starch, or at least with a small number of grains. Then comes the central part, called by pharmacutists the medutullium. It is of a fibrous nature, and consists of pleurenchyma and pitted vessels without any spirals. These vessels are arranged in wedge-shaped clusters, radiating from the centre. In some of the tubes of the wood starch-grains are found in large quantity. There is no true pith. From the medutullium extend spur-like processes, which are rudimentary buds. When the root is cut into pieces, these projecting portions constitute the nodes whence buds proceed. It is by means of them that plants have been propagated.

The cortical part of the root contains the active principle called emetine or emetia, which was discovered by Pelletier

and Magendie in 1817. It is a white, slightly bitter substance, is insoluble in water or ether, but is soluble in alcohol and dilute acids, as well as in chloroform. In the dose of $\frac{1}{16}$ th of a grain it acts as a violent emetic. Two grains of emetine will kill a dog.

One of the plants early used as Ipecacuan, and figured as such, under the name of striated, black, or Peruvian Ipecacuan, is *Psychotria emetica*. It differs chiefly from *Cephaelis* in the want of the common involucre, and in the flowers being stalked so as to form a sort of fascicle or corymb.

Psychotria, Linn. — Calyx gamosepalous, 5-toothed; corolla funnel-shaped, 5-cleft; 5 stamens, anthers exserted or included; style bifid; drupe with two seeds, calyx limb attached to the fruit.

P. emetica, Mutis. (*Cephaelis emetica*, of Persoon.)—Shrubby, erect, oblong acuminate leaves, ciliated; stipules short, ovate, acuminate; fruit succulent, somewhat globose, of a blue colour. It is found in New Grenada and on the banks of the Magdalena river.

The roots of the plant are perpendicular and knotted, not closely annulated, like the Ipecacuan, and they are distinctly striated. They have a slender axis or medullium, and a thick friable cortical portion. They yield nine per cent. of emetine. The stem of the plant has a remarkable septate or discoid pith, similar to what occurs in some Euphorbias, as well as in the walnut and jessamine.

Another plant supplies the white or amylaceous Ipecacuan (Poaya do Campo) found in Brazil, New Grenada, Peru, and Vera Cruz. It belongs also to Cinchonaceæ, the Tribe Spermacocidæ, and Genus *Richardsonia*.

Richardsonia, Kunth; *Richardia*, Lin. — Calyx subglobose, 4-7-partite, corolla funnel-shaped, 3-5-lobed, stamens 3-5, exserted; fruit, 3-4, dry, one-seeded cocci, forming a sort of capsule with the calyx limb on the top.

Richardsonia scabra, St Hilaire (*R. brasiliensis*, Virey).—Stem with rough hairs; leaves ovate, or ovate-lanceolate, with rough margins; the setæ of the stipules shorter than the sheath; heads many-flowered; triangular lobes of calyx ciliated; segments of corolla hairy at the apex. The fracture of the root is not resinous, but farinaceous, of a dull white

colour. There is abundance of starch in the cells. The root contains about six per cent. of emetine. Martius says that it is used as an emetic, in doses of $\bar{3}j$ to $\bar{3}ij$.

In the same section of Cinchonaceæ occur species of *Borreria*, which are used like *Ipecacuan*.

Borreria ferruginea, DC. (*Spermacoce ferruginea*, St Hilaire); *Borreria Poaya*, DC. (*Spermacoce Poaya*, var. *a* St Hilaire).

Another of the emetic roots in Brazil is the produce of a small fine-flowered twiner belonging to the Cinchonaceæ, called *Manettia cordifolia*. The genus was named after Xavier Manetti, Professor of Botany in Florence, who published in 1751 a work on Italian fruit trees.

Manettia, Mut.—Limb of calyx 4-5 lobed, often with secondary ones; corolla funnel-shaped, 4-5 lobed limb; anthers sessile, in throat of corolla; capsule ovate, crowned with calyx lobes; peltate seeds.—*M. cordifolia*, Mart. (Bot. Reg., t. 1866.) Native of Brazil, banks of the Arroyo de la China, a stream which enters the Uruguay, Entre Rios; hedges in the province of Minas-Geraes, near Villa Rica. Bark of root esteemed in Brazil as a valuable remedy in dysentery; dose, $\bar{3}ss$ to $\bar{3}iss$. It is also used as an emetic.

We now come to another Natural Order which furnishes plants having the properties of *Ipecacuan*, viz., the Order Violaceæ. Emetic properties are found in the roots of some of the common violets, such as *V. canina* and *V. sylvatica*; but it is especially in the genus *Ionidium* (*ion* a violet, and *idon* peculiar) that properties like those of the real *Ipecacuan* occur.

Ionidium, Vent.—Sepals 5, not prolonged at the base; corolla unequal, 2-lipped, 5 petals, lowest very large with a spur; 5 stamens unequal, 2 anterior with appendiculate anthers; sepals, petals, and stamens remain covering the capsule.

I. Ipecacuanha, Aug. St Hil. (*Viola Itubu*, Aubl.; *Ionidium Itubu*, H.B.K.; *Pombalia Itubu*, DC.), woods of Brazil, where it is called *Poaya branca* and *Poaya de Praga*.—Leaves alternate, lanceolate-ovate; stipules ovate-lanceolate, acute; lower petals very large; root emetic.

Several other *Ionidiums* possess emetic properties, as—

Ionidium Poaya, Aug. St Hil., Minas-Geraes, in Brazil;

called Poaya de Campo. *I. microphyllum*, H.B.K., Curichunchulli, Companion to the Botanical Magazine, i. 278. Quito, near foot of Chimborazo; specially used in Elephantiasis tuberculata. *I. parviflorum*, Vent., Tr. Mad. Bot. Soc. i. 206. *I. brevicaulis*, Mart.; *I. urticæfolium*, Mart. These are all Brazilian species.

The Natural Order Polygalaceæ supplies a plant which is called a Poaya or Ipecacuan, viz., *Polygala Poaya*, Spix and Martius. The root is perennial, perpendicular or slightly oblique, 3-5 inches long, and the size of a writing quill at the top, attenuated downwards and towards the base, divided into spreading branches, twisted in a vermicular manner, contracted at different parts, and marked by cicatrices; the epidermis pale ochre colour, sometimes transversely striated, with a pale spongy cortical portion, at first having a sweetish taste, but afterwards becoming bitter, and a central ligneous white thread, thicker than the bark. On mountain plains of San Paulo and Minas.

One of the Asclepiadaceæ yields a kind of Ipecacuan, *Tylophora asthmatica*, W. & A.; (*Cynanchum Ipecacuanha*, Willd.; *Asclepias asthmatica*, "Roxb. Fl. Ind.;" *Cynanchum vomitorium*, Lam.) It is an East Indian twiner, common in sandy places.

The leaves and roots are an efficacious substitute for Ipecacuan. Dr Roxburgh used it in dysentery, and Dr J. Anderson, of Madras, employed it in that disease with great success. It is recommended as a valuable remedy also in asthma, and has been admitted into the Pharmacopeia of India (1869), where the uses are described, pp. 142 and 458. Four other E. Indian plants of this Order have been employed for their emetic properties.

Another Order which supplies a plant known as an Ipecacuan is the Euphorbiaceæ. In this we meet with *Euphorbia Ipecacuanha*, L., a plant which grows in sandy soils in the middle and northern states of North America. It has an irregular fleshy root, very large in proportion to the plant, running into the sand, sometimes to the depth of six feet. From its stem proceed numerous dichotomous branches on the surface of the ground. The flowers are produced on long peduncles from the forkings of the

stem. The root acts as an emetic; it is also cathartic, as might be expected from the character of the Order to which the plant belongs.

II. *On the Ericaceæ of Canada and adjacent parts of British America.* By GEORGE LAWSON, LL.D., Dalhousie College, Nova Scotia. Communicated by Mr SADLER.

In referring to the general character of the plants belonging to the Ericaceæ, Dr Lawson writes:—

The order embraces plants which for beauty are not excelled by any that are known to science, and although their affinities are clear, and the order is perfectly natural and well defined, yet its members are so polymorphous that there is not only great variety within its limits in habit and foliage, but also in the structure and number of parts of the flowers, and in the real character as well as outward aspect of the fruit. Most of these plants are shrubs, some tall and erect, others dwarf and procumbent; some have deciduous leaves, others are broad-leaved evergreens, the duration of the leaves often differing in species of the same genus; some are humble herbaceous plants, with a rosette of evergreen radical leaves, and annual flower-stalks; and some are scaly leafless parasites. In the Whortleberry group, the calyx-tube is adherent to the ovary, forming a succulent fruit. In the Rhododendron and Heath group there is no adhesion, and the fruit is dry and dehiscent, except in *Arctostaphylos*, which has a succulent fruit. In the *Pyrola* group the corolla is polypetalous; in most of the other groups it is gamopetalous, and usually, but not always regular, the petaloid divisions being of equal size. In this order we have the connecting link that bridges over the gap between polypetalous and gamopetalous Exogens, for it includes some plants that must be referred to the one division, and some that as surely belong to the other, thus showing that the distinction is neither absolute nor natural when applied to Orders.

The largest and most showy plants of the Order belong to the Rhododendron tribe, of which many new species have been discovered, and introduced to gardens of late years. The genera of this tribe have been recently re-arranged in