* According to Taxonomic Literature, 2nd edition p. 54, this is the 2nd edition of Lindley's Introduction to the Natural System of Botany.

A

NATURAL SYSTEM OF BOTANY;

OR,

A SYSTEMATIC VIEW

OF

THE ORGANISATION, NATURAL AFFINITIES, AND GEOGRAPHICAL DISTRIBUTION,

OF THE WHOLE

VEGETABLE KINGDOM;

TOGETHER WITH THE USES OF THE MOST IMPORTANT SPECIES IN MEDICINE, THE ARTS, AND RURAL OR DOMESTIC ECONOMY.

By JOHN LINDLEY, Ph. D. F.R.S. L.S. G.S.

MEMBER OF THE IMP. ACAD. NAT. CUR., BOT. SOC. RATISB., PHYSIOG. SOC. LUND. LINN. SOC. STOCK.; HONORARY MEMBER OF THE DUTCH SOC. OF SCIENCE, ROYAL PRUSS. HORT. SOC., LYCEUM NAT. HIST. N. YORK; CORRESPOND. MEMBER OF THE ROYAL ACAD. SC. BERL.; &c. &c.

PROFESSOR OF BOTANY IN THE UNIVERSITY OF LONDON, IN THE ROYAL INSTITUTION OF GREAT BRITAIN, AND TO THE SOCIETY OF APOTHECARIES.

"C'est ainsi que sont formées les familles très naturelles et généralement avouées. On extrait de tous les genres qui composent chacune d'elles les caractères communs à tous, sans excepter ceux qui n'appartiennent pas à la fructification, et la réunion de ces caractères communs constitue celui de la famille. Plus les ressemblances sont nombreuses, plus les familles sont naturelles, et par suite le caractère général est plus chargé. En procédant ainsi, on parvient plus sûrement au but principal de la Science, qui est, non de nommer une plante, mais de connoître sa nature et son organisation entière." —JUSSIEU.

SECOND EDITION,

WITH NUMEROUS ADDITIONS AND CORRECTIONS, AND A COMPLETE LIST OF GENERA, WITH THEIR SYNONYMS.

LONDON;

LONGMAN, REES, ORME, BROWN, GREEN, AND LONGMAN,

PATERNOSTER ROW.

M.DCCC.XXXVI.

Ex plantarum partium facie vires nancisci docuimus; sequitur ergo ex his, ut quæ alterius effigie similis fuerit, et viribus quoque par, ut altera alterius loco cedat, quas Medici vicarias, vel succedaneas vocant.—Nec solum ex partium similitudine compares virtutes cognoscuntur, sed odoris, coloris, fructificandi modi, florescendi, crescendique. BAPTISTÆ PORTÆ, *Phytognomonica*, c. 39. (1588).

Verùm quod alias dixi illud hic repeto et inculco, non sperandam a me Methodum undequaque perfectam et omnibus suis numeris absolutam, quæ et plantas in genera ita distribuat ut universæ species comprehendantur, nullâ adhuc anomalâ et sui generis reliquâ, et unumquodque genus notis suis propriis et characteristicis ita circumscribat, ut nullæ inveniantur species incerti, ut ita dicam, laris et ad plura genera revocabilis. Nec enim id patitur Natura rei. Nam, cum *Natura* (ut dici solet) *non faciat saltus*, neque ab extremo ad extremum transeat nisi per medium, inter superiores et inferiores, rerum ordines nonnullas mediæ et ambiguæ conditionis producere solet, quæ de utroque participent, et utrosque velut connectant, ut ad utrum pertineant omnino incertum sit. Præterea eadem alma parens in methodi cujuscunque angustias coerceri repugnat, sed ad libertatem et *ἀνονομίαν* suam nullis legibus obnoxiam ostentandam in unoquoque rerum ordine nonnullas species creare solet, tanquam exceptiones a regulis generalibus, singulares et anomalas. RAII, *Historia Plantarum, vol.* 1. *Præf.* (1686).

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TO

THE COURT OF EXAMINERS

OF

THE SOCIETY OF APOTHECARIES,

LONDON;

IN ACKNOWLEDGEMENT OF THE WELL-DIRECTED ZEAL
WITH WHICH THEY HAVE USED THEIR POWER

FOR THE ENCOURAGEMENT OF BOTANY IN THE
MEDICAL PROFESSION,

THIS WORK IS RESPECTFULLY DEDICATED BY

THE AUTHOR.

PREFACE

TO THE SECOND EDITION.

The principles upon which the natural system of Botany is founded are to a great extent self-evident, and require little illustration. That those plants which are most alike should be arranged next each other, and that on the other hand those which have the smallest mutual resemblance should be placed at the greatest distance in the system, is obviously the method of classification pointed out by nature and reason. And accordingly we find that the oldest arrangements, rude and imperfect as they may be, are founded exclusively upon this principle. When our forefathers spoke of "grass, and herbs yielding seed, and fruit trees yielding fruit, of moving creatures that have life in the water, of fowl that fly above the earth, and cattle and creeping thing," they employed the same principles of arrangement as are now in use,—rudely sketched, indeed, but not more so than was to be expected from the imperfect knowledge they possessed of science in general. At first no means existed of appreciating the value of minute or hidden organs, the functions or even existence of which were unknown; but objects were collected into groups, characterised by common, external, and obvious signs. From such principles no naturalists except botanists have deviated; no one has thought of first combining under the name of the animal kingdom quadrupeds and birds, insects and fishes, reptiles and mollusca, and then of subdividing them by the aid of a few arbitrary signs, in such a way that a portion of each should be found in every group—quadrupeds among birds and fishes, reptiles amongst insects and mammalia; but each great natural group has been confined within its own proper limits. Botany alone, of all the branches of natural history, has been treated otherwise; and this in modern times.

The first writers who acknowledged any system departed in no degree from what they considered a classification of plants according to their general resemblances. Theophrastus has his water-plants and

parasites, pot-herbs and forest trees, and corn-plants; Dioscorides, aromatics and gum-bearing plants, eatable vegetables and corn-herbs; and the successors, imitators, and copiers of those writers, retained the same kind of arrangement for many ages.

At last, in 1570, a Fleming, of the name of Lobel, improved the vulgar modes of distinction, by taking into account characters of a more definite nature than those which had been employed by his predecessors; and thus laid the foundation of the modern mode of studying vegetation. To this author succeeded many others, who, while they disagreed upon the value to be ascribed to the small number of modifications of structure with which they were acquainted, adhered to the ancient plan of making their classification coincide with natural affinities. Among them the most distinguished were Cæsalpinus, an Italian, who published in 1583, the celebrated Tournefort, and especially our countryman, John Ray, who wrote in the end of the seventeenth century. The latter added so much to the knowledge of his predecessors, and had so clear and philosophical a conception of the true principles of classification, as to have left behind him in his *Historia plantarum* the real foundation of all those modern views which, having been again brought forward, at a more favourable time, by Jussieu, are generally ascribed exclusively to that most learned botanist and his successors. Ray, however, laboured under the great disadvantage of being too far in advance of his contemporaries, who were unable to appreciate the importance of his views or the justness of his opinions; and, who therefore, instead of occupying themselves with the improvement of his system, set themselves to work to discover some artificial method of arrangement, which should be to Botany what the alphabet is to language, a key by which the details of the science might be readily ascertained. With this in view, Rivinus invented, in 1690, a system depending upon the formation of the corolla; Kamel, in 1693, upon the fruit alone; Magnol, in 1720, on the calyx and corolla; and finally, Linnæus, in 1731, on variations in the sexual organs. The method of the last author has enjoyed a degree of celebrity which has rarely fallen to the lot of human contrivances, chiefly on account of its clearness and simplicity; and in its day it undoubtedly effected its full proportion of good. Its author however, probably intended it as a mere substitute for the Natural System, for which he found the world in his day unprepared, to be relinquished as soon as the principles of the latter could be settled; as, indeed, is obvious from his writings, in which he calls the Natural

System *primum et ultimum in botanicis desideratum.* He could not have expected that his artificial method should exist when the science had made sufficient progress to enable botanists to revert to the principles of natural arrangement, the temporary abandonment of which had been solely caused by the difficulty of defining its groups. This difficulty no longer exists; means of defining natural assemblages, as certain as those employed for limiting artificial divisions, have been discovered by modern botanists; and the time has arrived when the ingenious expedient of Linnæus, which could only be justified by the state of Botany when he first entered upon his career, must be finally relinquished. We now know a great deal of the phenomena of vegetable life; by modern improvements in optics, our microscopes are capable of revealing to us the structure and the combinations of the minutest organs; repeated observations have explained the laws under which the external forms of plants are modified; and it is upon these considerations that the Natural System depends.

In the first edition of this work I entered into some explanation of the fallacy of the common opinion that the artificial system of Linnæus is easy, and the Natural System difficult of application. Within the last five or six years, however, the sentiments of the public have undergone so great a change upon this subject that I no longer find it necessary to go into such details. All, therefore, that I propose to do on this occasion is to offer a few very general remarks upon the Natural System itself.

The principle upon which I understand the Natural System of Botany to be founded is, that the affinities of plants may be determined by a consideration of all the points of resemblance between their various parts, properties, and qualities; that thence an arrangement may be deduced in which those species will be placed next each other which have the greatest degree of relationship; and that consequently the quality or structure of an imperfectly known plant may be determined by those of another which is well known. Hence arises its superiority over arbitrary or artificial systems, such as that of Linnæus, in which there is no combination of ideas, but which are mere collections of isolated facts, not having any distinct relation to each other.

This is the only intelligible meaning that can be attached to the term, Natural System, of which Nature herself, who creates species only, knows nothing. Our genera, orders, classes, and the like, are mere contrivances to facilitate the arrangement of our ideas with regard

to species. A genus, order, or class, is therefore called natural, not because it exists in Nature, but because it comprehends species naturally resembling each other more than they resemble any thing else.

The advantages of such a system, in applying Botany to useful purposes, are immense, especially to medical men, with whose profession the science has always been identified. A knowledge of the properties of one plant is a guide to the practitioner, which enables him to substitute with confidence some other that is naturally allied to it; and physicians, on foreign stations, may direct their inquiries, not empirically, but upon fixed principles, into the qualities of the medicinal plants which nature has provided in every region for the alleviation of the maladies peculiar to it. To horticulturists it is not less important: the propagation or cultivation of one plant is frequently applicable to all its kindred; the habits of one species in an order will often be those of the rest; many a gardener might have escaped the pain of a poisoned limb, had he been acquainted with Natural affinity; and, finally, the phenomena of grafting, that curious operation, which is one of the grand features of distinction between the animal and vegetable kingdoms, and the success of which is wholly controlled by ties of blood, can only be understood by the student of the Natural System.

As to any difficulties that the student may encounter in the study of Botany upon the principles of the Natural System, it is to be observed in the first place that they are only such as it is always necessary to remove in all branches of human knowledge; and secondly, that they have been very much exaggerated by persons who have written upon the subject without understanding it.

It is said that the primary characters of the classes are not to be ascertained without much laborious research; and that not a step can be taken until this preliminary difficulty is overcome. But it is hardly necessary to say, that in natural history many facts which have been originally discovered by minute and laborious research, are subsequently ascertained to be connected with other facts of a more obvious nature, and of this Botany is perhaps the most striking proof that can be adduced. One of the first questions to be determined by a student of Botany, who wishes to inform himself of the name, affinities, and uses of a plant, appears to be, whether his subject contains spiral vessels or not, because some of the great divisions of the vegetable kingdom are characterised by the presence or absence of these minute organs. It is true, we have learned by careful observation, and multiplied mi-

croscopical analyses, that some plants have spiral vessels, and others have none; but it is not true, that in practice so minute and difficult an inquiry needs to be instituted, because it has also been ascertained that all plants that bear flowers have spiral vessels; and that vegetables which have no flowers are usually destitute of spiral vessels, properly so called; so that the inquiry of the student, instead of being directed in the first instance to an obscure but highly curious microscopical fact, is at once arrested by the two most obvious peculiarities of the vegetable kingdom.

Among flowering plants two great divisions have been formed; the names of which, Monocotyledons and Dicotyledons, are derived from the former having usually but one lobe to the seed, and the latter two, —a structure much more difficult to ascertain than the presence or absence of spiral vessels, and more subject to exceptions. But no botanist would proceed to dissect the seeds of a plant for the purpose of determining to which of these divisions it belonged, except in some special cases. We know that the minute organisation of the seed corresponds with a peculiar structure of the stem, leaves, and flowers, the most highly developed, and most easily examined parts of vegetation; a botanist, therefore, prefers to examine the stem, or the leaf of a plant, to see whether it is a Monocotyledon or a Dicotyledon, and does not find it necessary to anatomise the seed.

The presence or absence of albumen, the structure of the embryo, the position of the seeds or ovules, the nature of the fruit, the modifications of the flowers, are not to be brought forward as other difficult points peculiar to the study of the Natural System, because, whatever system is followed, the student must make himself acquainted with such facts, for the purpose of determining genera. The common Toad-flax cannot be discovered by its characters in any book of botany, without the greater part of this kind of inquiry being gone through.

In the determination of genera, however, facility is entirely on the side of the Natural System. Jussieu has well remarked, "that whatever trouble is experienced in remembering, or applying the characters of natural orders, is more than compensated for by the facility of determining genera, the characters of which are simple in proportion as those of orders are complicated. The reverse takes place in arbitrary arrangements, where the distinctions of classes and sections are extremely simple and easy to remember, while those of genera are in proportion numerous and complicated."

But really all considerations of difficulty ought to be put aside when it is remembered how much more satisfactory are the results to which we are brought by the study of Nature philosophically, than those which can possibly be drawn from the most ingenious empirical mode of investigation. This will be sufficiently apparent from a brief explanation of the distinctions of the classes into which the vegetable kingdom is divided in the following pages.

One of the first things that strikes an enquirer into the structure of plants, is the singular fact, that while all species are capable of propagating their race, the mode in which this important function is accomplished is essentially different in different cases. The great mass of plants produces flowers which are succeeded by fruits, containing seed, which is shed or scattered abroad, and grows into new individuals. But in Ferns, Mosses, Mushrooms, and the like, neither flowers nor seeds, properly so called, can be detected, but propagation is effected by the dispersion of grains or spores which are usually generated in the substance of the plant, and which seem to have little analogy with true seeds. Hence the vegetable world separates into two distinct groups, the FLOWERING and the FLOWERLESS. Upon examining more closely into the respective peculiarities of these two groups, it is found that flowering plants have sexes, while flowerless plants have none; hence the former are are also called *SEXUAL*, and the latter *ASEXUAL*. Then again the former usually possess a highly developed system of spiral or other vessels, while the latter are either altogether destitute of them, or have them only in the highest orders, and then in a peculiar state; for this reason flowering plants are also *VASCULAR*, and flowerless plants *CELLULAR*. More than this, all flowering plants, when they form stems, increase by an extension of their ends, and a distension or enlargement of their sides; but flowerless plants appear to form their stems simply by the addition of new matter to their points; for this reason while the former are principally *EXOGENS* or *ENDOGENS*, the latter are called *ACROGENS*. Flowering plants also are for the most part furnished with respiratory organs or stomates, while flowerless plants are to a great extent destitute of them. No one then can doubt that in the vegetable kingdom two most essentially distinct divisions exist, the FLOWERING and the FLOWERLESS, and that these differ not in one circumstance only, but are most essentially unlike in a number of points both of organization and physiology.

In like manner, FLOWERING PLANTS are themselves divisible

into equally well marked groups. Some of them grow by the addition of new woody matter to the outside of their stem beneath their bark; these are EXOGENS; others grow by the addition of new woody matter to the inside of their stem near the centre: those are ENDOGENS. But Exogens have two or more cotyledons to their embryo, and hence are called *DICOTYLEDONS*, while Endogens have only one cotyledon, and are, therefore, *MONOCOTYLEDONS*. Exogens have the young external wood connected with the centre by medullary processes; Endogens having no occasion for such a provision are destitute of it. In Exogens the leaves have their veins disposed in a netted manner; in Endogens the veins run parallel with each other. The number of parts in the flower of an Exogen is usually five, or its multiples; in an Endogen it is as usually three, or its multiples. In germination the young root of Exogens is a mere extension of the radicle; but of Endogens it is protruded from within the radicle; hence the former have been named *EXORHIZÆ*, and the latter *ENDORHIZÆ*. In this case then, as in the last, we have two groups differing entirely from each other in their germination, the structure of their stem and leaves, their mode of growth, the arrangement of the parts of the flower, and in the organization of their embryo. It is impossible, therefore, not to recognize such groups also as natural.

To this separation of the vegetable kingdom into Exogens, Endogens, and Acrogens, or by whatever synonymous names those groups may be known, many Botanists confine themselves. But there are two others, of subordinate importance perhaps, but nevertheless characterized by circumstances of a similar nature, and, therefore, I think to be esteemed of equal dignity with them. In true Exogens and Endogens the fertilizing principle of the pollen is communicated to the young seeds through the medium of a stigma which terminates a case or pericarp in which they are enclosed. But in some plants otherwise Exogens, the fertilizing influence of the pollen is applied immediately to the seeds, without the intervention of any pericarpial apparatus, and they bear the same relation to other Exogens as frogs and similar reptiles to other animals. These plants, therefore, are separated as a distinct class under the name of GYMNOSPERMS. Like the other groups of the same grade, these are also found to possess peculiarities of a subordinate nature. For instance, they have in many cases more cotyledons than two, whence they have been called *POLYCOTYLEDONS*, their radicle usually

adheres to the albumen in which their embryo lies, and that circumstance has given rise to the name *SYNORHIZÆ*. The veins of their leaves, when they have any veins, are either simple or forked, in which respect they approach Endogens on the one hand, and Acrogens on the other. And finally, their vascular system is very imperfect compared with that of other Exogens of an equal degree of developement.

The other group, called **RHIZANTHS**, is far less correctly known, but it seems to stand as it were between Endogens and Acrogens of the lowest grade, agreeing with the latter in the absence, or very imperfect state of the vascular system, in a general resemblance to Fungi, and in the apparent seeds being mere masses of sporules; but apparently according with Endogens in the ternary number of their floral envelopes, and in the presence of fully developed sexes.

Certainly there is no possibility of obtaining such important primary groups as these by any kind of artificial contrivance.

With regard to the groups subordinate to these, their nature will be found sufficiently explained in the body of the work. I would only here observe, that as the number of their characters is necessarily smaller than what are available for the higher classes, the distinctions between them are consequently less strongly marked, and apparently of a more artificial nature. It has, however, been a great object with me to render the groups as perfect as possible, in order, firstly, to simplify the explanation of vegetable affinity; and secondly, to offer what facilities the subject will allow of in analyzing the natural orders. It is here, indeed, that Botanists have most to do; and it is most earnestly to be hoped that those whose leisure and knowledge will allow them to do so, will occupy themselves in defining, or at least, in limiting with all practicable accuracy, those collections of orders which are subordinate to the primary classes. My reasons for rejecting those of the French school have been already briefly explained in the *Nixus plantarum*, and will be the subject of special discussion in another place, where I shall have an opportunity of going into the general question of the principles to be observed in Botanical Classifications further than would be possible on the present occasion. This, therefore, and all similar considerations I abandon for the present, confining myself now to a general explanation of the points to which this edition differs from the last, the bulk of which it very considerably exceeds.

The characters of the orders, &c. have been carefully revised and corrected, partly from my own observations, and partly from the suggestions or descriptions of others.

I have availed myself of the numerous monographs, and other publications that have appeared since 1830, for augmenting the work not only with many additions to the sensible properties of the different natural orders,but also with new, more correct, or more extensive views of their affinities and analogies.

With reference to collecting the orders into alliances and other groups, in the hope of obviating some of the greatest inconveniences of a lineal arrangement, I have endeavoured to develope and illustrate those views which I first attempted to sketch in the *Nixus plantarum*, and subsequently in the *Key to Botany*. Notwithstanding the assistance that I have occasionally derived from the similar attempts of Agardh and Bartling, I feel that this part of the work is exceedingly imperfect, and will require many great changes and improvements before it can be considered at all established. Nevertheless, I feel confident that even in its present state it will be found to be attended with numerous advantages, and that every step which may be taken in determining the limits of natural groups, subordinate to the primary classes, must be a decided gain to the science; for I think there can be among Botanists only one opinion as to the absolute necessity of more attention being paid to the synthetical principles of classification. So rapid is the advance of our knowledge of the vegetable kingdom, and so numerous are the new types of structure that present themselves to the systematic Botanist, that it is to be feared lest another chaos should be brought on by the masses of imperfectly grouped species with which the science will soon abound.

In connection with this subject, I have ventured upon a reformation of the nomenclature of the natural system, by making all the names of divisions of the same value end in the same way. The orders are here distinguished by ending in *aceæ*, the sub-orders in *eæ*, the alliances in *ales*, and the groups in *osæ*. To some it may seem that such alterations are fanciful, but I think it will be found that many advantages and conveniences will attend the establishment of uniformity in these matters. I fear, however, that I have in some cases been obliged to offend against the laws of construction in order to carry this into effect; but I trust it will be found that I have done so only in cases of inevitable necessity.

The diagnoses which in the first edition were prefixed to the characters of the orders, are here struck out; I have been disappointed in their utility, and I do not see how to improve them enough to render them much better.

The analytical table has been entirely reconstructed, and I trust upon a better principle. One of the great faults of that prefixed to the first edition consisted in no provision being made by it to meet cases of exceptional structure. This has now been attended to.

Finally, I have collected under each natural order all the genera that I find referred to it in books; to these I have added their synonyms; and of the whole a copious index has been prepared. This has been a task of no small difficulty, and certainly could not have been executed with less assistance than I have received through the kindness of my friends and correspondents. When I state that the lists of *Labiatæ* and *Scrophulariaceæ* have been furnished by Mr. Bentham, of *Compositæ* by Professor De Candolle, of *Algæ* by Dr. Greville, of *Amaryllidaceæ* by Mr. Herbert, of *Ferns* and *Mosses* by Dr. Hooker, of *Lauraceæ*, *Acanthaceæ*, *Graminaceæ*, and *Hepaticæ* by Professor Nees v. Esenbeck, and finally, of *Chamælaucieæ* by Mr. Schauer, of Breslau, it will at once be seen that some of the greatest impediments in the way of forming a complete list of genera have been removed for me. Nevertheless, I am extremely apprehensive lest this part of my work should be found more defective than I expect; very defective it must necessarily be; and I do hope that Botanists will do me the kindness to point out such errors or omissions as they are acquainted with, so that in a future edition a greater degree of accuracy may be ensured.

As the lists of genera in some cases contain names which now appear for the first time, I have given the characters of such genera in an appendix, referring to them by numbers affixed to the names.

It was my wish to have added to these introductory remarks an abridgment of the characters of the classes, sub-classes, groups, alliances, and orders, so as to bring their resemblances and differences more closely into view. But I find that my matter already exceeds the limits of a work which is chiefly intended as a class book; so that I am constrained to refer the reader to the short characters already given in my *Key to Botany;* and to some general observations upon classification, of which I contemplate the speedy publication.

ARTIFICIAL ANALYSIS

OF

THE ORDERS.

Class I.—EXOGENS, or DICOTYLEDONOUS FLOWERING PLANTS.

Leaves reticulated. Stem with wood, pith, bark, and medullary rays. Flowers usually with a quinary division. Seeds in a pericarp. Cotyledons 2 or more, opposite.

Sub-Class I.—POLYPETALOUS.

* Polyandrous. *Stamens more than* 20.

§ *Ovary inferior, or partially so.*

† *Leaves furnished with stipules.*

‡ *Carp. more or less distinct (at least as to the styles) ; or solitary* Pomeæ, p. 145.
‡‡ *Carpels wholly combined into a solid pistil, with more placentas than one*
Placentas central.
Leaves opposite . . . . . Rhizophoraceæ, p. 40.
Leaves alternate; Flowers irregular . . Lecythidaceæ, p. 46.
Placentas parietal . . . . . Homaliaceæ, p. 55.

†† *Leaves without stipules.*

‡ *Carp. more or less distinct (at least as to the styles) ; or solitary*
Carpels 2, polyspermous, nearly superior . . Baueraceæ, p. 161.
Carpels numerous, quite inferior . . . Anonaceæ, p. 18.
‡‡ *Carpels wholly combined into a solid pistil, with more placentas than one.*
Placentas spread over the surface of the dissepiments . Nymphæaceæ, p. 10.
Placentas parietal.
Petals definite in number, distinct from calyx . Loasaceæ, p. 53.
Petals indefinite in number, confused with the calyx . Cactaceæ, p. 53.
Placentas in the axis.
Leaves marked with little transparent dots . Myrtaceæ, p. 43.
Leaves dotless.
Petals indefinite in number, very numerous . Ficoideæ, p. 56.
Petals definite in number,
narrow and strap-shaped . . . Alangiaceæ, p. 39.
round and concave . . . . Philadelphaceæ, p. 47.

§§ *Ovary wholly superior.*

† *Leaves furnished with stipules.*

‡ *Carp. more or less distinct (at least as to the styles); or solitary*
Stamens hypogynous.
Leaves dotted . . . . . Winteraceæ, p. 17.
Leaves without transparent dots . . . Magnoliaceæ, p. 16.

Stamens perigynous.
Styles from the apex of the carpels . . . Rosaceæ, p. 143.
Styles from the base of the carpels . . . Chrysobalanaceæ, p. 158.
‡‡ *Carpels wholly combined into a solid pistil, with more pla-*
[centas than one.
Placentas parietal.
Leaves marked with round transparent dots . . Bixaceæ, p. 72.
Leaves marked with round and linear transparent dots
[intermixed Samydaceæ, p. 64.
Placentas in the axis.
Calyx with an imbricated æstivation.
Flowers unisexual . . . . . Euphorbiaceæ, p. 112.
Flowers hermaphrodite.
Ovary 1-celled. Sepals 2 . . . . Portulacaceæ, p. 123.
Ovary with more cells than one.
Calyx double . . . . . Chlenaceæ, p. 90.
Calyx single . . . . . Cistaceæ, p. 91.
Calyx with a valvate æstivation.
Stamens monadelphous. Anthers 2-celled . . Sterculiaceæ, p. 95.
Stamens monadelphous. Anthers 1-celled . . Malvaceæ, p. 95.
Petals lacerated. Anthers bursting by pores . . Elæocarpaceæ, p. 97.
Stamens monadelphous. Calyx irregular and enlarged
[in the fruit Dipteraceæ, p. 98.
Stamens quite distinct . . . . . Tiliaceæ, p. 99.

†† *Leaves without stipules.*

‡ *Carp. more or less distinct* (*at least as to the styles*); *or solitary*
Carpels immersed in a fleshy table-shaped disk . . Nelumbiaceæ, p. 13.
Carpels not immersed in a disk.
Stamens perigynous . . . . . Rosaceæ, p. 143.
Stamens hypogynous.
Embryo very minute.
Seeds with an aril . . . . . Dilleniaceæ, p. 20.
Seeds without an aril. Albumen fleshy . . Ranunculaceæ, p. 7.
Seeds usually without an aril. Albumen aromatic and
[ruminate Anonaceæ, p. 18.
Embryo nearly as long as seed.
Calyx much imbricated.
Seeds smooth . . . . . Hypericaceæ, p. 77.
Seeds hairy . . . . . Reaumuriaceæ, p. 91.
Calyx but little imbricated.
Carpels several . . . . . Surianaceæ, p. 142.
Carpel solitary . . . . . Anacardiaceæ, p. 166.
‡‡ *Carpels wholly combined into a solid pistil, with more pla-*
[centas than one.
Placentas parietal, in distinct lines.
Anthers versatile. Juice watery . . . . Capparidaceæ, p. 61.
Anthers innate. Juice milky . . . . Papaveraceæ, p. 7.
Placentas parietal spread over the lining of the fruit . . Flacourtiaceæ, p. 70.
Placentas spread over the dissepiments . . . Nymphæaceæ, p. 10.
Placentas in the axis.
Stigma large, broad, and petaloid, . . . Sarracenniaceæ, p. 34.
Stigma simple.
Ovary 1-celled, with free central placenta . . Portulacaceæ, p. 123.
Ovary many-celled.
Calyx much imbricated.
Leaves compound . . . . . Rhizobolaceæ, p. 76.
Leaves simple.
Petals equal in number to sepals.
Seeds few . . . . . Clusiaceæ, p. 75.
Seeds numerous. Petals flat . . . Marcgraaviaceæ, p. 76.
Seeds numerous. Petals crumpled . . Cistaceæ, p. 91.
Calyx but little, or not at all, imbricated.
Stamens perigynous. Calyx tubular . . Lythraceæ, p. 100.
Stamens hypogynous. Calyx many leaved . Humiriaceæ, p. 104.

** OLIGANDROUS. *Stamens fewer than* 20.

§ *Ovary inferior, or partially so.*

† *Leaves furnished with stipules.*

Placentas parietal . . . . . . HOMALIACEÆ, p. 55.
Placentas in the axis.
  Flowers completely unisexual . . . . BEGONIACEÆ, p. 56.
  Flowers hermaphrodite or polygamous.
    Stamens equal to the petals and opposite them . . RHAMNACEÆ, p. 107.
    Stamens, if equal to the petals, alternate with them.
      Leaves opposite . . . . . RHIZOPHORACEÆ, p. 40.
      Leaves alternate . . . . . HAMAMELACEÆ, p. 48.

†† *Leaves destitute of stipules.*

Placentas parietal.
  Flowers completely unisexual . . . . CUCURBITACEÆ, p. 51.
  Flowers hermaphrodite or polygamous . . GROSSULACEÆ, p. 26.
Placentas in the axis.
  Flowers in umbels. Styles 2 . . . . APIACEÆ, p. 21.
  Flowers in umbels. Styles 3 or more . . ARALIACEÆ, p. 25.
  Flowers not in umbels.
    Carpel solitary.
      Petals strap-shaped. Stamens distinct . . ALANGIACEÆ, p. 39.
      Petals very narrow. Stamens growing on them . LORANTHACEÆ, p. 49.
      Petals oblong. Leaves insipid . . COMBRETACEÆ, p. 38.
      Petals oblong. Leaves balsamic . . ANACARDIACEÆ, p. 166.
    Carpels divaricating at the apex . . SAXIFRAGACEÆ, p. 162.
    Carpels parallel, combined.
      Calyx valvate. Petals opposite stamens . RHAMNACEÆ, p. 107.
      Calyx valvate. Petals alternate with stamens . CORNACEÆ, p. 49.
      Calyx not valvate.
        Stamens doubled downwards. Leaves ribbed . MELASTOMACEÆ, p. 41.
        Stamens doubled downwards. Leaves not ribbed . MEMECYLACEÆ, p. 40.
        Stamens only curved. Anthers short
          Leaves dotted . . . . . MYRTACEÆ, p. 43.
          Leaves not dotted.
            Parts of flower 4 . . . . ONAGRACEÆ, p. 35.
            Parts of flower not 4. Seeds many . . ESCALLONIACEÆ, p. 27.
            Parts of flower not 4. Seeds few . . BRUNIACEÆ, p. 28.

§§ *Ovary wholly superior.*

† *Leaves furnished with stipules.*

‡ *Carpels of the ovary distinct or solitary.*
Anthers with recurved valves . . . . BERBERACEÆ, p. 29.
Anthers with longitudinal valves.
  Style from base of carpel . . . . . CHRYSOBALANACEÆ, p. 158.
  Style from apex of carpel. Fruit leguminous . LEGUMINOSÆ, p. 148.
  Style from apex of carpel. Fruit drupaceous or capsular . ROSACEÆ, p. 143.
‡‡ *Carpels of the ovary wholly combined; with more placentas than one.*
Placentas parietal.
  Flowers with a ring of appendages . . PASSIFLORACEÆ, p. 67.
  Flowers without any ring of appendages.
    Leaves with round and oblong transparent dots . SAMYDACEÆ, p. 64.
    Leaves dotless, circinnate when young . . DROSERACEÆ, p. 66.
    Leaves dotless, straight when young. Fruit capsular . VIOLACEÆ, p. 63.
    Leaves dotless, straight when young. Fruit siliquose . MORINGACEÆ, p. 65.
Placentas in the axis.
  Styles distinct to the base.
    Calyx in a broken whorl, much imbricated.
      Flowers calyculate . . . . . HUGONIACEÆ, p. 89.
      Flowers naked . . . . . ELATINACEÆ, p. 88.
    Calyx but little imbricated, in a complete whorl.
      Flowers unisexual . . . . . EUPHORBIACEÆ, p. 112.
      Flowers hermaphrodite or polygamous.
        Petals minute . . . . . ILLECEBRACEÆ, p. 127.

Petals obvious. Stamens hypogynous . . MALPIGHIACEÆ, p. 121.
Petals obvious. Stamens perigynous. Lvs. opposite CUNONIACEÆ, p. 161.
Petals obvious. Stamens perigynous. Lvs. alternate SAXIFRAGACEÆ, p. 162.
Calyx valvate . . . . . ELÆOCARPACEÆ, p. 97.
Styles more or less combined. Gynobasic.
Gynobase fleshy . . . . OCHNACEÆ, p. 129.
Gynobase dry. Leaves regularly opposite . ZYGOPHYLLACEÆ, p. 133.
Gynobase dry. Leaves alternate more or less.
Fruit beaked . . . . . GERANIACEÆ, p. 137.
Fruit not beaked . . . . OXALIDACEÆ, p. 140.
Styles more or less combined. Not gynobasic.
Calyx much imbricated, in a broken whorl.
Flowers spurred . . . . VOCHYACEÆ, p. 87.
Flowers not spurred, calyculate . . CHLENACEÆ, p. 329.
Flowers not spurred, naked . . SAPINDACEÆ, p. 81.
Calyx but little imbricated, in a complete whorl.
Leaves compound. Sepals more than two . STAPHYLEACEÆ, p. 121.
Leaves simple. Sepals more than two . MALPIGHIACEÆ, p. 121.
Leaves simple. Sepals only two . . PORTULACACEÆ, p. 123.
Calyx valvate or open.
Stamens opposite with petals if equal to them in number.
Perigynous . . . . . RHAMNACEÆ, p. 107.
Hypogynous . . . . . VITACEÆ, p. 30.
Stamens alternate with petals if equal to them in number.
Anthers opening by pores . . . ELÆOCARPACEÆ, p. 97.
Anthers opening by slits. Petals split . CHAILLETIACEÆ, p. 108.
Anthers opening by slits. Petals undivided . BURSERACEÆ, p. 110.

†† *Leaves destitute of stipules.*

‡ *Carpels of the ovary more or less distinct, or solitary.*
Anthers with recurved valves . . . BERBERACEÆ, p. 29.
Anthers with longitudinal valves.
Fruit leguminous. Radicle next hilum . . LEGUMINOSÆ, p. 148.
Fruit leguminous. Radicle remote from hilum . CONNARACEÆ, p. 157.
Fruit not leguminous.
Carpels each with an hypogynous scale . . CRASSULACEÆ, 163.
Carpels each with two hypogynous scales . FRANCOACEÆ, p. 33.
Carpels without hypogynous scales.
Albumen very abundant. Embryo minute.
Herbs. Albumen solid . . . RANUNCULACEÆ, p. 5.
Shrubs. Albumen ruminate . . ANONACEÆ, p. 18.
Albumen in small quantity or wholly wanting.
Carpels several all perfect:
enclosed in the tube of the calyx . . CALYCANTHACEÆ, p. 159.
naked. Flowers hermaphrodite . . CORIARIACEÆ, p. 141.
naked. Flowers unisexual . . MENISPERMACEÆ, p. 214.
Carpels solitary, or all but one imperfect.
Leaves dotted . . . . AMYRIDACEÆ, p. 165.
Leaves dotless . . . . ANACARDIACEÆ, p. 166.
‡‡ *Carpels of the ovary combined into a solid pistil.*
Placentas parietal.
Stamens tetradynamous . . . . BRASSICACEÆ, p. 60.
Stamens not tetradynamous.
Flowers with a ring or crown of sterile stamens.
Sexes distinct . . . . . PAPAYACEÆ, p. 69.
Sexes combined. Placentæ lining the fruit . FLACOURTIACEÆ, p. 70.
Sexes combined. Placentæ in rows. Ovary stalked . MALESHERBIACEÆ, p. 71.
Flowers without sterile stamens.
Hypogynous disk large. Stamens indefinite . CAPPARIDACEÆ, p. 61.
Hypogynous disk large. Stamens definite . RESEDACEÆ, p. 62.
Hypogynous disk small or wanting.
Albumen very abundant. Embryo minute . PAPAVERACEÆ, p. 7.
Albumen in small quantity, or wholly wanting.
Calyx 5-leaved . . . . TURNERACEÆ, p. 71.
Calyx tubular . . . . FRANKENIACEÆ, p. 67.
Placentas covering the dissepiments . . . NYMPHÆACEÆ, p. 10.
Placentas in the axis.

Styles distinct to the base.
Calyx in a broken whorl, much imbricated.
Seeds hairy . . . . . REAUMURIACEÆ, p. 91.
Seeds smooth. Stamens polyadelphous . HYPERICACEÆ, p. 77.
Seeds smooth. Stamens monadelphous or free LINACEÆ, p. 89.
Calyx but little imbricated, in a complete whorl.
Carpels each with an hypogynous scale . CRASSULACEÆ, p. 163.
Carpels destitute of hypogynous scales.
Carpels 2, divaricating at the apex . . SAXIFRAGACEÆ, p. 162.
Carpels not divaricating at apex. Calyx tubular . SILENACEÆ, p. 124.
Carpels not divaricating at apex. Calyx many leaved ALSINACEÆ, p. 125.
Styles more or less combined. Gynobasic.
Stamens arising from scales . . . SIMARUBACEÆ, p. 129.
Stamens not arising from scales.
Styles wholly combined. Flowers hermaphrodite . RUTACEÆ, p. 130.
Styles wholly combined. Flowers unisexual . XANTHOXYLACEÆ, p. 135.
Styles divided at point. Flowers irregular . BALSAMINACEÆ, p. 138.
Styles divided at point. Flowers regular . LIMNANTHACEÆ, p. 142.
Styles more or less combined. Not gynobasic.
Calyx much imbricated, in a broken whorl.
Flowers symmetrical . . . . CLUSIACEÆ, p. 75.
Flowers unsymmetrical.
Fruit indehiscent. Petals without appendages . ACERACEÆ, p. 81.
Fruit indehiscent. Petals with appendages . SAPINDACEÆ, p. 81.
Fruit indehiscent. Flowers papilionaceous . POLYGALACEÆ, p. 84.
Fruit dehiscent . . . . ÆSCULACEÆ, p. 84.
Calyx but little imbricated, in a complete whorl.
Carpels 4 or more. Anthers opening by pores . ERICACEÆ, p. 220.
Carpels 4 or more. Anthers opening by slits.
Monadelphous. Seeds wingless . . MELIACEÆ, p. 101.
Monadelphous. Seeds winged . . CEDRELACEÆ, p. 103.
Leaves dotted. Fruit succulent . . AURANTIACEÆ, p. 105.
Stamens perigynous. Disk very large . SPONDIACEÆ, p. 106.
Carpels fewer than 4.
Flowers unisexual . . . . EMPETRACEÆ, p. 117.
Flowers hermaphrodite.
Sepals 2 . . . . PORTULACACEÆ, p. 123.
Sepals more than 2.
Stamens hypogynous.
Seeds comose . . . TAMARICACEÆ, p. 126.
Seeds naked . . . PITTOSPORACEÆ, p. 31.
Stamens perigynous.
Ovules ascending . . . CELASTRACEÆ, p. 119.
Ovules suspended . . . BRUNIACEÆ, p. 28.
Calyx valvate or open.
Anthers opening by pores . . . TREMANDRACEÆ, p. 109.
Anthers opening by slits.
Stamens if equal in number to petals opposite them RHAMNACEÆ, p. 107.
Stam. if equal in number to pet. alternate with them
Leaves pinnate . . . . BURSERACEÆ, p. 110.
Lvs. simple. Calyx tubular. Stam. hypogynous OLACACEÆ, p. 32.
Lvs. simple. Calyx tubular. Stam. perigynous LYTHRACEÆ, p. 100.
Lvs. simple. Sepals distinct or nearly so . NITRARIACEÆ, p. 110.

SUB-CLASS II. INCOMPLETÆ, OR APETALOUS.

* ACHLAMYDEOUS. *No calyx.*
† *Leaves furnished with stipules.*

Ovules very numerous.
Seeds winged . . . . . BALSAMACEÆ, p. 188.
Seeds comose . . . . . SALICACEÆ, p. 186.
Ovules solitary or very few.
Flowers hermaphrodite.
Stamens unilateral . . . . CHLORANTHACEÆ, p. 183
Stamens whorled . . . . SAURURACEÆ, p. 184.

Flowers unisexual.
Carpels solitary Ovule erect . . . . MYRICACEÆ, p. 179.
Carpels solitary. Ovule pendulous . . . PLATANACEÆ, p. 187.
Carpels triple . . . . . EUPHORBIACEÆ, p. 112.

†† *Leaves destitute of stipules.*

Ovules very numerous . . . . . PODOSTEMACEÆ, p. 190.
Ovules solitary or very few.
Flowers hermaphrodite . . . . . PIPERACEÆ, p. 185.
Flowers unisexual.
Flowers naked. Carpel single . . . MYRICACEÆ, p. 179.
Flowers naked. Carpels double . . . CALLITRICHACEÆ, p. 191.
Flowers in an involucre. Anther-valves recurved . ATHEROSPERMACEÆ, p. 189.
Flowers in an involucre. Anther-valves slit . . MONIMIACEÆ, p. 188.

** MONOCHLAMYDEOUS. *A calyx present.*

§ *Ovary inferior, or partially so.*

† *Leaves furnished with stipules.*

Flowers hermaphrodite . . . . . ARISTOLOCHIACEÆ, p. 205.
Flowers unisexual. Fruit in a capsule . . CORYLACEÆ, p. 170.
Flowers unisexual. Fruit naked . . . . BEGONIACEÆ, p. 56.

†† *Leaves destitute of stipules.*

Flowers unisexual, amentaceous.
Leaves simple, alternate . . . . MYRICACEÆ, p. 179.
Leaves simple, opposite . . . . GARRYACEÆ, p. 173.
Leaves compound . . . . . JUGLANDACEÆ, p. 180.
Flowers unisexual not amentaceous.
Seeds immersed in pulp . . . . CUCURBITACEÆ, p. 51.
Seeds dry . . . . . DATISCACEÆ, p. 182.
Flowers hermaphrodite or polygamous.
Leaves with transparent dots . . . MYRTACEÆ, p. 43.
Leaves without dots.
Ovary 3-6-celled, polyspermous . . ARISTOLOCHIACEÆ, p. 205.
Ovary 1-celled. Anther-valves recurved . ILLIGERACEÆ, p. 202.
Ovary 1-celled. Anther-valves slit.
Embryo straight; cotyledons convolute . COMBRETACEÆ, p. 38.
Embryo straight; cotyledons flat . . ONAGRACEÆ, p. 35.
Albumen none.
Albumen fleshy . . . . SANTALACEÆ, p. 193.
Embryo curved; cotyledons flat . . CHENOPODIACEÆ, p. 208.
Ovary 1-celled. Anther many-celled . . LORANTHACEÆ, p. 49.
Ovary with more cells than 1, but neither 3 nor 6.
Embryo straight . . . . ONAGRACEÆ, p. 35.
Embryo curved . . . . TETRAGONIACEÆ, p. 209.

§§ *Ovary superior.*

† *Leaves furnished with stipules.*

Flowers hermaphrodite.
Sepals 2 . . . . . PORTULACACEÆ, p. 123.
Sepals more than 2.
Carpels more than 1, combined into a solid pistil.
Stamens hypogynous. Placentas parietal . BIXACEÆ, p. 72.
Stamens hypogynous. Placentas in the axis.
Calyx valvate. Stamens monadelphous . STERCULIACEÆ, p. 92.
Calyx valvate. Stamens distinct . . TILIACEÆ, p. 99.
Calyx imbricated. Fruit beaked . . GERANIACEÆ, p. 137.
Calyx imbricated. Fruit not beaked . MALPIGHIACEÆ, p. 121.
Stamens perigynous. Placentas parietal . PASSIFLORACEÆ, p. 67.
Stamens perigynous. Placentas in the axis.
Leaves opposite. Stamens more than sepals . CUNONIACEÆ, p. 161.
Leaves alternate. Stamens alternate with sepals . RHAMNACEÆ, p. 107.
Leaves alternate. Calyx membranous and ragged . ULMACEÆ, p. 178.
Carpels solitary, or quite separate.
Calyx membranous (Stamens hypogynous) . . ILLECEBRACEÆ, p. 127.

Calyx firm and herbaceous.
Styles from the base of carpels . . . CHRYSOBALANACEÆ, p. 158.
Styles terminal; one to each ovary.
Fruit leguminous . . . . LEGUMINOSÆ, p. 148.
Fruit not leguminous . . . . ROSACEÆ, p. 143.
Styles terminal; three to each ovary.
Stipules ochreate . . . . POLYGONACEÆ, p. 211.
Stipules simple . . . . . PETIVERIACEÆ, p. 212.
Flowers unisexual.
Carpels more than 1, combined into a solid pistil.
Flowers amentaceous. Seeds arillate . . . SCEPACEÆ, p. 171.
Flowers amentaceous. Seeds not arillate . . BETULACEÆ, p. 171.
Flowers amentaceous. Seeds numerous. Plac. parietal LACISTEMACEÆ, p. 183.
Flowers not amentaceous. . . . . EUPHORBIACEÆ, p. 112.
Carpels solitary.
Cells of anthers perpendicular to the filament . . STILAGINACEÆ, p. 179.
Cells of anthers parallel with the filament . . URTICACEÆ, p. 175.

†† *Leaves destitute of stipules.*

Flowers hermaphrodite.
Sepals 2 . . . . . PORTULACACEÆ, p. 123.
Sepals more than 2.
Carpels more than 1, combined into a solid pistil.
Placentas parietal, in lines . . . . PAPAVERACEÆ, p. 7.
Placentas parietal, lining the pericarp . . FLACOURTIACEÆ, p. 70.
Placentas in the axis.
Ovary with a very small number of ovules.
Calyx short, herbaceous. Gynobasic . . RUTACEÆ, p. 130.
Calyx short, herbaceous, not gynobasic.
Embryo curved round mealy albumen . PHYTOLACCACEÆ, p. 210.
Embryo straight . . . . CELASTRACEÆ, p. 119.
Calyx tubular coloured . . . . PENÆACEÆ, p. 203.
Ovary with numerous ovules.
Two divaricating carpels . . . SAXIFRAGACEÆ, p. 162.
Carpels not divaricating. Stamens hypogynous.
Leaves opposite. Calyx tubular . . SILENACEÆ, p. 124.
Leaves opposite. Calyx 5-leaved . . ALSINACEÆ, p. 125.
Leaves alternate . . . . PODOSTEMACEÆ, p. 190.
Carpels not divaricating. Stamens perigynous.
Fruit 1-celled . . . . . PRIMULACEÆ, p. 223.
Fruit many-celled . . . . LYTHRACEÆ, p. 100.
Carpels solitary or quite separate.
Carpels several. Stamens hypogynous . . RANUNCULACEÆ, p. 5.
Carpels several. Stamens perigynous . . CEPHALOTACEÆ, p. 14.
Carpels single.
Anther-valves recurved. Leafy . . . LAURACEÆ, p. 200.
Anther-valves recurved. Leafless . . CASSYTHACEÆ, p. 202.
Anther-valves slit.
Fruit a legume . . . . . LEGUMINOSÆ, p. 148.
Fruit not a legume.
Calyx long or tubular, with a hardened base . NYCTAGINACEÆ, p. 213.
Calyx long or tubular, with a hardened tube . SCLERANTHACEÆ, p. 213.
Calyx long or tubular, no where hardened.
Stamens in the points of the sepals . . PROTEACEÆ, p. 197.
Stamens not in the points of the sepals.
Ovules erect . . . . ELÆAGNACEÆ, p. 194.
Ovules pendulous.
Fruit 2-valved . . . . AQUILARIACEÆ, p. 196.
Fruit indehiscent. Calyx calyculate . HERNANDIACEÆ, p. 195.
Fruit indehiscent. Calyx naked . THYMELACEÆ, p. 194.
Calyx short, not tubular, or but little so.
Leaves dotted . . . . AMYRIDACEÆ, p. 165.
Leaves not dotted. Flowers in involucels . POLYGONACEÆ, p. 212.
Leaves not dotted. Flowers naked.
Calyx dry and coloured . . . AMARANTACEÆ, p. 207.
Calyx herbaceous . . . . CHENOPODIACEÆ, p. 208.

Flowers unisexual.
  Carpels more than one, combined into a solid pistil.
    Ovules indefinite in number.
      Stamens distinct . . . . . HENSLOVIACEÆ, p. 173.
      Stamens columnar . . . . . NEPENTHACEÆ, p. 204.
    Ovules definite in number.
      Leaves opposite . . . . . TREWIACEÆ, p. 174.
      Leaves alternate, dotted . . . . XANTHOXYLACEÆ, p. 135.
      Leaves alternate, not dotted . . . EUPHORBIACEÆ, p. 112.
  Carpels solitary, or quite separate.
    Calyx tubular trifid . . . . . MYRISTICACEÆ, p. 15.
    Calyx open, carpels several . . . . MENISPERMACEÆ, p. 214.
    Calyx open, carpel solitary . . . . CASUARACEÆ, p. 181.

SUB-CLASS III. MONOPETALÆ.

* *Ovary superior. Flowers regular.*

‡ *Ovary* 3-4-5-*lobed.*
  Leaves dotted . . . . . RUTACEÆ, p. 130.
  Leaves dotless. Inflorescence gyrate . . . BORAGINACEÆ, p. 274.
  Leaves dotless. Inflorescence straight.
    Corolla with a plaited æstivation . . NOLANACEÆ, p. 229.
    Corolla with a flat æstivation . . . STACKHOUSIACEÆ, p. 118.
‡‡ *Ovary not lobed.*
Carpels from 4 to 5, or none.
  Anthers opening by pores.
    Seeds winged. Herbs . . . . . PYROLACEÆ, p. 219.
    Anthers 2-celled. Seeds wingless. Shrubs . . ERICACEÆ, p. 220.
    Anthers 1-celled. Shrubs . . . . EPACRIDACEÆ, p. 222.
  Anthers opening by slits.
    Stamens equal in number to petals and opposite.
      Shrubs . . . . . MYRSINACEÆ, p. 224.
      Herbs . . . . . PRIMULACEÆ, p. 223.
    Stamens not opposite the petals if of the same number.
      Seeds indefinite.
        Carpels distinct . . . . . CRASSULACEÆ, p. 163.
        Carpels combined.
          Shrubs . . . . . BREXIACEÆ, p. 218.
          Brown parasites . . . . MONOTROPACEÆ, p. 219.
      Seeds definite.
        Carpels distinct . . . . . ANONACEÆ, p. 18.
        Carpels combined.
          Ovules erect.
            Æstivation of corolla imbricate . . SAPOTACEÆ, p. 225.
            Æstivation of corolla plicate . . CONVOLVULACEÆ, p. 281.
          Ovules pendulous.
            Stamens twice as numerous as petals . EBENACEÆ, p. 226.
            Stamens same number as petals . . AQUIFOLIACEÆ, p. 228.
Carpels usually three.
  Inflorescence gyrate . . . . . HYDROLEACEÆ, p. 234.
  Inflorescence straight.
    Seeds winged . . . . . FOUQUIERACEÆ, p. 118.
    Seeds wingless.
      An hypogynous disk . . . . POLEMONIACEÆ, p. 232.
      No hypogynous disk . . . . DIAPENSIACEÆ, p. 233.
Carpels only two.
  Diandrous. Corolla valvate . . . OLEACEÆ, p. 307.
  Diandrous. Corolla imbricate . . . JASMINACEÆ, p. 308.
  Stamens 4 or more. Inflorescence gyrate.
    Fruit 1-celled . . . . . HYDROPHYLLACEÆ, p. 271.
    Fruit 2-celled. Style bifid . . . EHRETIACEÆ, p. 273.
    Fruit 2-celled. Style dichotomous . . CORDIACEÆ, p. 272.
  Stamens 4 or more. Inflorescence straight.
    Flowers symmetrical. Carpels ⊃.
      Corolla valvate . . . . CESTRACEÆ, p. 296.
      Corolla plicate . . . . SOLANACEÆ, p. 293.

** *Ovary superior. Flowers irregular.*

*** *Ovary inferior.*

Stipules between the leaves.
Albumen abundant . . . . Cinchonaceæ, p. 243.
Albument absent . . . . Lygodysodeaceæ, p. 247.

Class II. GYMNOSPERMS.

Leaves with parallel or forked veins. Stem with wood, pith, bark, and medullary rays. Floral envelopes absent. Seeds naked. Cotyledons 2 or more, opposite.

Stems without articulations.
Stem conical with numerous buds and branches.
Fruit single . . . . . Taxaceæ, p. 316.
Fruit in cones . . . . . Coniferæ, p. 313.
Stem cylindrical unbranched . . . Cycadaceæ, p. 312.
Stems articulated.
Flowers complete . . . . . Gnetaceæ, p. 311.
Flowers very incomplete . . . . Equisetaceæ, p. 317.

Class III. ENDOGENS, or MONOCOTYLEDONOUS FLOWERING PLANTS.

Leaves with parallel veins. Stem without any distinction of wood, pith, bark, and medullary rays. Flowers usually with a ternary division. Seeds in a pericarp. Cotyledons solitary, or if two, unequal and alternate with each other.

* *Flowers complete (having distinct floral envelopes).*

§ *Ovary inferior.*

† *Flowers gynandrous.*

Ovary 1-celled. Seed-coat loose . . . Orchidaceæ, p. 335.
Ovary 1-celled. Seed-coat tight . . . Vanillaceæ, p. 341.
Ovary 3-celled . . . . . Apostasiaceæ, p. 342.

†† *Flowers not gynandrous.*

Veins of leaves diverging from the midrib.
Anther 1, with 1 cell . . . . Marantaceæ, p. 324.
Anther 1, with 2 cells . . . . Zingiberaceæ, p. 322.
Anthers 5 or 6 . . . . . Musaceæ, p. 326.
Veins of leaves parallel with midrib.
Stamens 3.
Anthers turned outwards . . . Iridaceæ, p. 332.
Anthers turned inwards. Fruit winged . Burmanniaceæ, p. 330.
Stamens 6.
Leaves flat.
Fruit 3-celled. Sepals corolline . . Amaryllidaceæ, p. 328.
Fruit 3-celled. Sepals calycine . . Bromeliaceæ, p. 334.
Fruit 1-celled . . . . Taccaceæ, p. 331.
Leaves equitant . . . . Hæmodoraceæ, p. 330.
Stamens more than 6 . . . . Hydrocharaceæ, p. 335.
Veins of leaves reticulated . . . . Dioscoreaceæ, p. 359.

§§ *Ovary superior.*

Leaves with parallel veins.
Sepals calycine, or glumaceous.
Carpels separate, more or less.
Placentæ spread over the dissepiments . Butomaceæ, p. 355.
Placentæ narrow . . . . Alismaceæ, p. 355.

Carpels combined in a solid pistil.
Petals quite distinct from the calyx . . . COMMELINACEÆ, p. 354.
Petals undistinguishable from the calyx . . JUNCACEÆ, p. 356.
Sepals corolline.
Carpels more or less separate.
Seeds solitary . . . . . PALMACEÆ, p. 343.
Seeds numerous.
Anthers turned outwards . . . . MELANTHACEÆ, p. 347.
Anthers turned inwards.
Floral envelopes 6 . . . . BUTOMACEÆ, p. 355.
Floral envelopes 2 . . . . PHILYDRACEÆ, p. 357.
Carpels combined in a solid pistil.
Petals rolled inwards after flowering . . PONTEDERACEÆ, p. 347.
Petals not rolled inwards after flowering.
Flowers with external appendages. . . . GILLIESIACEÆ, p. 348.
Flowers without external appendages.
Leaves equitant . . . . HÆMODORACEÆ, p. 330.
Leaves flat . . . . LILIACEÆ, p. 351.
Leaves with netted veins.
Fruit 1-celled . . . . . ROXBURGHIACEÆ, p. 360.
Fruit 3-celled . . . . . SMILACEÆ, p. 359.

** *Flower incomplete (having no distinct floral envelopes except leaves).*

§ *Flowers glumaceous.*

Stems hollow . . . . . GRAMINACEÆ, p. 369.
Stems solid.
Carpel solitary. Seed erect . . . CYPERACEÆ, p. 384.
Carpel solitary. Seed pendulous . . . RESTIACEÆ, p. 386.
Carpels several, distinct . . . . DESVAUXIACEÆ, p. 386.
Carpels several, combined.
Placentæ parietal . . . . XYRIDACEÆ, p. 388.
Placentæ central . . . . RESTIACEÆ, p. 386.

§§ *Flowers naked; or with a few verticillate leaves.*

† *Flowers on a spadix.*

Flowers in spires alternately male and female . CYCLANTHACEÆ, p. 362.
Flowers not in spires.
Fruit drupaceous . . . . . PANDANACEÆ, p. 361.
Fruit berried. Leaves in the bud convolute . ARACEÆ, p. 363.
Fruit dry. Leaves in the bud equitant . . ACORACEÆ, p. 365.
Fruit dry. Anthers clavate on weak filaments . TYPHACEÆ, p. 365.

†† *Flowers not on a spadix.*

Floaters. Ovules pendulous . . . . NAIADACEÆ, p. 366.
Terrestrial. Ovules erect . . . . JUNCAGINACEÆ, p. 367.
Floaters. Ovules erect . . . . PISTIACEÆ, p. 367.

CLASS IV. RHIZANTHS.

Leaves, if any, scale-like. Stem homogeneous, with scarcely any trace of a vascular system. Flowers with sexes. Seeds having no embryo, but consisting of a homogeneous sporuliferous mass.

Sepals several. Placentæ parietal . . . RAFFLESIACEÆ, p. 392.
Sepals 4. Placentæ parietal . . . . CYTINACEÆ, p. 392.
Sepals 0. Stamens combined. Placentæ central . BALANOPHORACEÆ, p. 393.
Sepals 0. Stamens distinct. Placentæ central . CYNOMORIACEÆ, p. 394.

Class V. ACROGENS, or ACOTYLEDONOUS, or CRYPTOGAMIC PLANTS.

Sexes absent. Sporules in lieu of leaves.

§ *With a distinct axis of growth; leafy.*

Thecæ seated on the leaves.
- Ring of the thecæ vertical . . . . Polypodiaceæ, p. 400.
- Ring of the thecæ transverse . . . . Gleicheniaceæ, p. 401.
- Ring wanting.
  - Thecæ 1-celled, veinless . . . . . Ophioglossaceæ, p. 402.
  - Thecæ 1-celled, ribbed . . . . . Osmundaceæ, p. 402.
  - Thecæ as if many-celled . . . . Danæaceæ, p. 402.

Thecæ arising from the stem.
- Thecæ enclosed in involucres.
  - Involucres of the same form . . . . Marsileaceæ, p. 404.
  - Involucres of two different forms . . . Salviniaceæ, p. 405.
- Thecæ naked.
  - Thecæ sessile in the axil of leaves or bracts . . Lycopodiaceæ, p. 403.
  - Thecæ stalked.
    - Thecæ valveless, with an operculum . . Bryaceæ, p. 407.
    - Thecæ opening into valves, with an operculum . Andræaceæ, p. 411.
    - Thecæ opening into valves, without an operculum . Jungermanniaceæ, p. 412.

§§ *With a distinct axis of growth; leafless.*

Characeæ, p. 415.

§§§ *With no distinct axis of growth.*

Surface with stomates.
- Thecæ opening into valves, with an operculum . . Jungermanniaceæ, p. 412.
- Thecæ valveless, without an operculum . . . Marchantiaceæ, p. 412.

Surface without stomates.
- Aquatics . . . . . Algaceæ, p. 430.
- Terrestrial or aerial.
  - With a thallus . . . . . Lichenaceæ, p. 426.
  - Without an evident thallus . . . . Fungaceæ, p. 419.

THE

NATURAL ORDERS OF PLANTS.

Class I. EXOGENS; or DICOTYLEDONS.

Dicotyledones, *Juss. Gen.* 70. (1789); *Desf. Mem. Inst.* 1. 478. (1796).—Exorhizeæ *and* Synorhizeæ, *Rich. Anal.* (1808.)—Dicotyledoneæ *or* Exogenæ, *DC. Theor.* p. 209. (1813.)—Phanerocotyledoneæ *or* Seminiferæ, *Agardh. Aph.* 74. (1821).

Essential Character. *Elementary organs* consisting of both cellular and vascular tissue, a portion of the latter being elastic spiral vessels. *Cuticle* with stomates. *Trunk* more or less conical, consisting of three parts, one within the other; viz. bark, wood, and pith, of which the wood is enclosed between the two others; increasing by an annual deposit of new wood and cortical matter between the wood and bark. *Leaves* always articulated with the stem, often opposite, their veins, if present, composed in part at least of spiral vessels, and branching and reticulated. *Flowers*, if with a distinct calyx, often having a quinary division. *Propagation* effected by the agency of stamens and pistils, which are analogous to the sexes of animals. *Ovules* always enclosed before fertilization in a pericarp, and fertilized by the action of pollen upon a stigma; finally becoming seeds, containing an *embryo* with two or more opposite cotyledons, which often become green and leaf-like after germination; radicle naked, *i. e.* elongating into a root without penetrating any external case.

The plants belonging to this class constitute by far the most considerable portion of the Vegetable Kingdom; and they may be considered to be in some respects the most highly developed; not that they possess any organs which are not found elsewhere, but because of the much greater diversity of combinations into which their organs enter, and because of the more complicated nature of their woody and venous systems. While Gymnosperms have no vasiform cellular tissue (*See Introduction to Botany, 2d Edit. p.* 15), only a small supply of spiral vessels, and but an imperfectly constructed sexual apparatus, Exogens have an abundance of both these elementary organs, and their parts of reproduction are in the most complete condition. Endogens on the other hand, in which the latter are equally perfect, have their woody system arranged in a confused manner, and not disposed in the symmetrical way which is characteristic of Exogens. As to Rhizanths, the very imperfect state of their vascular system and reproductive organs places them lower down in the scale of structure than either of the others; while the total absence of sexes, the general want of a vascular system, except in such highly developed orders as the Filical and Lycopodal alliances, the gradual loss in the lowest tribes of even symmetrical form, till at last in the simplest forms of Algaceæ and Fungaceæ the very elementary parts are disintegrated, reduce Acrogens to little more than a mere vesicular state of existence, and place the vegetable kingdom not only in contact with the microscopic animalcules of the animal world, but even bring it to the limits of inorganic matter.

Practically their reticulated leaves distinctly articulated with the stem, usually distinguish Exogens from Endogens, from which they are also known by the following points: Exogens have a distinct deposition of pith, wood, and bark; Endogens have all these parts confounded: Exogens, if trees, are conical and branched (as an Oak); Endogens are cylindrical and simple-stemmed (as a Palm). Besides which, the following characters deserve attention: Exogens in germination protrude their radicle at once; while in Endogens it is contained within the substance of the embryo, through which it

ultimately bursts: Exogens have two or more cotyledons: Endogens have but one. In this country the trees and shrubs, and larger herbaceous plants, are nearly all Exogenous; while our native Endogens are chiefly confined to grasses, sedges, orchises, bulbs, and submerged water-plants. To this it may be added, that the flowers of Exogens are usually formed upon a quinary or quaternary type, while those of Endogens are most commonly ternary.

Although the difference between Exogens and the other four classes is in general very precise, yet there are certain points at which the distinctive characters become less obvious than usual; and where, in fact, Exogens seem to be in a state of transition to other parts of the system. For instance, some species of Ranunculus are strikingly similar to the genus Alisma, both in general appearance and in structure, and thus establish a transition to Endogens; Nymphæaceæ on the one hand, and Hydrocharaceæ on the other, Menispermaceæ and Smilaceæ, Aristolochiaceæ and Araceæ, are further examples of the same fact; while Callitrichaceæ or Ceratophylleæ are instances of a reduced state of organization in Exogens, analogous to that of Pistiaceæ among Endogens; and all these three, especially the last, connect their several classes more or less obviously with those forms of Acrogens, which like Marchantiaceæ have their stems and leaves all fused as it were into one homogeneous mass.

It is a point of great difficulty to form any good natural divisions of Exogens which shall at the same time be tolerably well defined, and yet not offer violence to strong natural affinities. The Monopetalous, Apetalous, or Polypetalous structure of the flowers, is what is generally adopted; but it must be confessed that the numerous exceptions which occur to the characters of these divisions, render them sometimes embarrassing to the student. For instance, Stackhousiaceæ, which are by common consent placed in the vicinity of the Polypetalous Rhamnaceæ, and Euphorbiaceæ, are to all appearance Monopetalous; Glaux, again, which is Apetalous, is unquestionably a genus of the Monopetalous Primulaceous order; and the cases of Apetalous genera and species belonging to Polypetalous orders are extremely numerous. Yet I doubt whether any better method of division than that of Polypetalæ, Apetalæ or Incompletæ, and Monopetalæ, is likely to be devised; and at all events nothing with the slightest claim to adoption has as yet been brought before the public. I therefore adhere to the customary division in the following arrangement, premising only that the various exceptions that have just been mentioned produce in a much greater degree theoretical than practical difficulties, and that the student will do well to dismiss them altogether from his mind until he has become in some degree familiar with his subject.

Sub-Class I. POLYPETALÆ.

Essential Character.—Floral envelopes consisting of both calyx and corolla; the latter composed of distinct petals.

Whatever reasons there may be for adhering to the characters of the French school for the sub-classes of Exogens, there does not appear to me to be any sufficient motive for following their system in regard to the groups subordinate to the sub-classes. In Polypetalæ there are only two, or at the most three, distinguished by the origin of the stamens; which are either hypogynous, perigynous, or epigynous. Now such groups have neither the merit of being well defined, nor of forming natural combinations, nor of breaking up the orders into assemblages of small extent; on the contrary they abound in exceptions, and are practically liable to much uncertainty; they place side by side plants having but slight affinity, as Papaveraceæ and Cruciferæ, which correspond in little except the form of the fruit of certain species, they separate orders like

Ranunculaceæ and Umbelliferæ, or Euphorbiaceæ and Rhamnaceæ, which are often scarcely distinguishable, and they break up the orders generally so very little, as to afford by no means so much assistance in the analysis of the subclass, as is to be desired.

For these reasons I have ventured to propose an abandonment of the old mode of subdivision, and the adoption of some new principles; in particular, I have altogether neglected the distinctions between hypogynous and perigynous stamens, considering them practically as the same thing, except in certain special cases, and in fact comprehending them both under the general term hypogynous. The presence or absence too of albumen in seeds, is viewed as a matter of altogether subordinate value, unless when the quantity of albumen is so great as to become apparently a subject of physiological importance. The new characters are derived from the parietal or central mode of placentation, from the syncarpous or apocarpous state of the pistil, and from the nature of the arrangement of the calycine leaves; all very obvious circumstances, and readily ascertained. The groups they give rise to are the following; which in general are obviously natural, and which, I trust to be able to prove are so in those cases also where the close natural affinity of the orders collected under them is less apparent. I would only beg the reader to dismiss from his mind those prejudices which unfortunately sometimes stick as closely to the skirts of abstract scientific qnestions, as to other matters whether social or political.

1. **Albuminosae.** Embryo very considerably shorter and smaller than the albumen.
2. **Epigynosae.** Ovary inferior, usually having an epigynous disk.
3. **Parietosae.** Placentation parietal.
4. **Calycosae.** Calyx incompletely whorled; two of the sepals being exterior.
5. **Syncarposae.** None of the characters of the other groups, and with the carpels compactly united.
6. **Gynobaseosae.** Carpels not exceeding 5, diverging at the base, arranged in a single row around an elevated axis or gynobase. Stamens usually separate from the calyx.
7. **Apocarposae.** None of the characters of the other groups, but with the carpels distinct; or separable by their faces; or solitary.

Group I. Albuminosæ.

Essential Character.—The albumen very considerably larger than the embryo, and forming the great mass of the seed.

The first and last parts of this group consist of a portion of De Candolle's thalamiflorous cohort of Polypetalous Exogens, the central part is taken from out of his Calyciflorous cohort. The presence of a very considerable quantity of albumen seems to indicate a need, on the part of the embryo of these plants, of some efficient source of nutriment before it is able to extract its food from the soil; a remarkable physiological fact, which is by no means to be confounded with those instances in which a small quantity, a sort of casing, of albumen is left around an embryo, when it appears to be a mere residuum instead of a great vital deposit. The former is to all appearance of little phy-

siological importance, and its once supposed systematic value is daily diminishing more and more, the latter is apparently of as much systematic as physiological interest.

If we consider what the plants are which are brought together by this circumstance, we shall find that they are obviously in many cases very clearly akin, and that in others they leave the series of orders from which they are extracted far more natural than while they were among them. Moreover, plants are thus brought together which although they have the closest possible relationship cannot be grouped together upon any other known principle. For instance, Umbelliferæ are so nearly the same as Ranunculaceæ, as will be shewn under the former order, that they are in reality little more than epigynous or hypogynous forms of each other, and yet they are most widely divided by the French school. So again with Vitaceæ and Araliaceæ, and with Pittosporaceæ and Dilleniaceæ. These orders, which are mutually connected by so many different characters, are not, so far as I know, capable of being even approximated, except by taking the peculiarity of the albumen into account. It may appear paradoxical enough to place the Vine in the same category with the Crowfoot, and the Gooseberry with Celery; but it is to be remembered that resemblances or differences, affinities or discrepancies, are not to be measured in science by the standard of popular prejudice, but by the cool investigation of actual structure. It appears most strange to an ordinary observer that the Nettle and the Fig should be associated in the same natural order; but the Botanist is well aware how slender the structural differences between these plants really are, and consequently how extremely close their relationship undoubtedly is. What discrepancies or anomalies are to be found in this albuminous group are certainly not appreciable by any but a Botanist. They chiefly attach to the genus Dionæa and to Francoaceæ, whose relationship to the orders with which they are associated is less evident than could be wished. But in addition to what is stated under those plants in the proper place, it is to be remembered that the group is by no means complete, and that there is nothing very violent in the supposition that the links which may be wanted to connect the plants in question with their neighbours still remain to be discovered.

It may be urged that if the presence of a very large quantity of albumen is really so important a physiological circumstance as it is here represented to be, I ought, to be consistent, to have added to the albuminous group those orders of Incompletæ and Monopetalæ in which albumen is equally abundant. I am by no means disposed to deny the justice of such an observation: on the contrary, it is unquestionable that Cinchonaceæ, Stellatæ, Caprifoliaceæ, Menispermaceæ, and Piperales, to which the observation would principally apply, would be better associated with Albuminosæ than with the groups in which they at present stand. But I confess myself for the present unprepared to work out the principle to its full extent, and I hope that it is no objection to the arrangement I am proposing, that whatever merit it may possess it is capable of being rendered better.

Alliance I. *RANALES.*

Essential Character.—Herbaceous, rarely woody, plants, either with the carpels more or less distinct; or if that is not the case, with parietal placentæ.

This alliance may be considered to be in some respects little more than an herbaceous form of Anonales, from which it is almost impossible to separate it by any very positive character.

Order I. RANUNCULACEÆ. The Crow-Foot Tribe.

Ranunculi, *Juss. Gen.* (1789.)—Ranunculaceæ, *DC. Syst.* 1. 127. (1818); *Prodr.* 1. 2. (1824); *Lindl. Synops.* p. 7. (1829); *Bartling. Ord.* 253. (1830).

Essential Character.—*Sepals* 3-6, hypogynous, deciduous, generally imbricate in æstivation, occasionally valvate or duplicate. *Petals* 3-15, hypogynous, in one or more rows, distinct, sometimes deformed. *Stamens* definite or indefinite in number, hypogynous; *anthers* adnate. *Carpels* numerous, seated on a torus, 1-celled or united into a single many-celled pistil; *ovary* one or more seeded, the *ovules* adhering to the inner edge; *style* one to each ovary, short, simple. *Fruit* either consisting of dry akenia, or baccate with one or more seeds, or follicular with one or two valves. *Seeds* albuminous; when solitary, either erect or pendulous. *Embryo* minute. *Albumen* corneous.—*Herbs*, or very rarely *shrubs*. *Leaves* alternate or opposite, generally much divided, with the petiole dilated and forming a sheath half clasping the stem. *Stipules* occasionally present. *Hairs*, if any, simple. *Inflorescence* variable.

Anomalies.—In Garidella and Nigella, the carpels cohere more or less. In Thalictrum, some species of Clematis, and some other genera, there are no petals. Pæonia has a persistent calyx. Some species of Casalea have a definite number of stamens.

Affinities. This order has a strong affinity with some others which are widely apart from each other. Its most immediate resemblance is with Dilleniaceæ, Magnoliaceæ, and their allies, to which it approaches in the position, number, and structure of its parts of fructification generally, differing however in an abundance of particulars; as from Dilleniaceæ, in the want of aril, deciduous calyx, and whole habit; from Magnoliaceæ, in the want of stipules, and sensible qualities; from Papaveraceæ and Nymphæaceæ, in the distinct, not concrete, carpels; watery, not milky, fluids; acrid, not narcotic, properties. More distant analogy may be traced with Rosaceæ, with which Ranunculaceæ agree in their numerous carpels, the number of their floral divisions and indefinite stamens; but differ in those stamens being hypogynous instead of perigynous, in the presence of large albumen surrounding a minute embryo, want of stipules and acrid properties. With Umbelliferæ they accord in the last particular, and also in their sheathing leaves, habit, and abundant albumen, with a minute embryo; but those plants differ in their calyx being concrete with the ovary, and in their stamens being invariably definite. Another analogy has been indicated by botanists between this order and Alismaceæ, with which it agrees in its numerous carpels, in habit, and sometimes in the ternary structure of the flowers; but that order is monocotyledonous. Many of the genera are destitute of petals, but in such cases the calyx is so highly developed, that it evidently performs the combined functions of itself and the corolla. A great peculiarity of Ranunculaceæ consists in the strong tendency exhibited by many of the genera to produce their sepals, petals, and stamens, in a state different from that of other plants; as, for example, in Delphinium, Aquilegia, and Aconitum, in which the petals are furnished with a spur, and in Ranunculus itself, which has a nectariferous gland at the base of the petals. An instance is described of the polypetalous regular corolla of Clematis viticella being changed into a monopetalous irregular one, like that of Labiatæ. *Nov. Act. Acad. N. C.* 14. p. 642. t. 37.

The Clematideous section is remarkable for its apetalous flowers and opposite leaves. In these plants, however, the calyx is developed as much as a corolla usually is.

Geography. The largest proportion of this order is found in Europe, which contains more than 1-5th of the whole; North America possesses about 1-7th, India 1-25th, South America 1-17th; very few are found in Africa, except upon the shores of the Mediterranean: eighteen species have, accord-

ing to De Candolle, been discovered in New Holland. They characterise a cold damp climate, and are, when met with in the Tropics, found inhabiting the sides and summits of lofty mountains: in the lowland of hot countries they are almost unknown.

Properties. Acridity, causticity, and poison, are the general characters of this suspicious order, which, however, contains species in which those qualities are so little developed as to be innoxious. The caustic principle is, according to Krapfen, as cited by De Candolle, of a very singular nature; it is so volatile that, in most cases, simple drying, infusion in water, or boiling, are sufficient to dissipate it: it is neither acid nor alkaline: it is increased by acids, sugar, honey, wine, spirit, &c. and is only effectually destroyed by water and vegetable acids. The leaves of Knowltonia vesicatoria are used as vesicatories in Southern Africa. Ranunculus glacialis is a powerful sudorific; Aconitum Napellus and Cammarum are diuretic. The Hepatica, Actæa racemosa, and Delphinium consolida, are regarded as simple astringents. *DC.* The roots of several Hellebores are drastic purgatives; those of the perennial Adonises are, according to Pallas, emmenagogues; and those of several Aconitums, especially Napellus and Cammarum, are acrid in a high degree. *Ibid.* The root of the Aconitum of India, one of the substances called Bikh, or Bish, is a most virulent poison. *Trans. Med. and Phil. Soc. Calc.* 2. 407. According to Hamilton, the Bishma, or Bikhma, is a strong bitter, very powerful in the cure of fevers: the Bish, Bikh, or Kodoya Bikh, has a root possessing poisonous properties of the most dreadful kind, whether taken into the stomach, or applied to wounds: the Nir Bishi, or Nirbikhi, has no deleterious properties, but is used in medicine. *Brewster*, 1. 250. For some important information on this Bikh, Vish, Visha, or Ativisha, which Wallich considers his Aconitum ferox, see *Plant. As. Rar.* vol. 1. p. 33. tab. 41., and especially *Royle's Illustrations*, 40. The root of Pæony is acrid and bitter, but is said to possess antispasmodic properties. Ranunculus flammula and sceleratus are powerful epispastics, and are used as such in the Hebrides, producing a blister in about an hour and a half. Their action is, however, too violent, and the blisters are difficult to heal, being apt to pass into irritable ulcers. *Ed. Ph. J.* 6. 156. Beggars use them for the purpose of forming artificial ulcers, and also the leaves of Clematis recta and flammula. The root of Ranunculus Thora is reported to be extremely acrid and poisonous, its juice having been formerly used by the Swiss hunters of wild beasts to envenom their darts, whose wound by that means became speedily fatal and incurable. *Smith in Rees.* From the seeds of Delphinium staphysagria, the chemical principle called Delphine was procured by Lassaigne and Fenuelle; it exists in union with oxalic acid. *Ed. Ph. J.* 3. 305. The root of Hydrastis canadensis has a strong and somewhat narcotic smell, and is exceedingly bitter; it is used in North America as a tonic, under the name of *Yellow root*. *Barton*, 2. 21. The root of Coptis trifolia, or Gold-thread, is a pure and powerful bitter, devoid of any thing like astringency; it is a popular remedy in the United States for aphthous affections of the mouth in children. *Ibid.* 2. 100. The wood and bark of Xanthorhiza apiifolia are a very pure tonic bitter. The shrub contains both a gum and resin, each of which is intensely bitter. *Ibid.* 2. 205. The seeds of Nigella sativa were formerly employed instead of pepper; those of Delphinium Staphisagria are vermifugal and caustic; those of Aquilegia are simply tonic. *DC.*

GENERA.

§ 1. Clematideæ, DC.
Clematis, L.
Atragene, L.
Naravelia, DC.
Tetractis.
§ 2. Anemoneæ, DC.
Thalictrum, L.
Anemone, L.
Pulsatilla, Bauh.
Hepatica, Dill.
Hydrastis, L.
Warneria, Mill.

Knowltonia, Salisb.
Anamenia, Vent.
Adonis, L.
Hamadryas, Comm.
§ 3. RANUNCULEÆ, DC.
Myosurus, L.
Casalea, A. St. H.
Aphanostemma, ASH.
Ranunculus, L.
Ceratocephalus, M.
Batrachium, Presl.
Krapfia, DC.
Hecatonia, Lour.
Ficaria, Dill.
Callianthemum, Mey.
§ 4. HELLEBOREÆ, DC.
Platystemon, Benth.
Caltha, L.
Trollius, L.
Gaissenia, Rafin.
Eranthis, Salisb.
Kœllea, Bir.
Robertia, Merat.
Helleborus, L.
Chrysocoptis, Nutt.
Pterophyllum, Nutt.
Coptis, Salisb.
Chrysa, Rafin.
Isopyrum, L.
Olfa, Adans.
Enemion, Rafin.
Garidella, L.
Nigella, L.
Nigellastrum, Mnch.
Aquilegia, L.
Delphinium, L.
Aconitum, L.
§ 5. PÆONIEÆ, DC.
Actæa, L.
Botrophis, Raf.
Macrotis, Raf.
Actinospora, Turcz.
Trautvetteria, F. & M.
Cimicifuga, L.
Xanthorrhiza, Marsh.
Pæonia, L.

From these is by some distinguished the following

SUB-ORDER. PODOPHYLLEÆ. THE MAY APPLE TRIBE.

PODOPHYLLACEÆ, § Podophylleæ, *DC. Syst.* 2. 32. (1821); *Prodr.* 1. 111. (1824); *Von Martius H. Reg. Monac.* (1829); *a sect. of Papaveraceæ.*—PODOPHYLLEÆ, *Mart. Conspect. No.* 171. (1835).

ESSENTIAL CHARACTER.—*Sepals* 3 or 4, deciduous or persistent. *Petals* in two or three rows, each of which is equal in number to the sepals. *Stamens* hypogynous, 12-18, arranged in two, three, or more rows; *filaments* filiform; *anthers* linear or oval, terminal, turned inwards, bursting by a double longitudinal line. *Torus* not enlarged. *Ovary* solitary; *stigma* thick, nearly sessile, somewhat peltate. *Fruit* succulent or capsular, 1-celled. *Seeds* indefinite, attached to a lateral placenta, sometimes having an aril; *embryo* small, at the base of fleshy albumen.—*Herbaceous* plants. *Leaves* broad, lobed. *Flowers* radical, solitary, white.

These seem to differ in no solid character from Ranunculaceæ, and are perhaps best considered a transition group to Papaveraceæ with which Von Martius formerly associated them. They are nearly allied to the herbaceous genera of Berberaceæ, from which they scarcely differ, except in the dehiscence of their anthers. From Papaveraceæ they are known by their watery, not milky juice, by their solitary unilateral placentæ, and by their fleshy, not oily, albumen.

GEOGRAPHY. All inhabitants of the marshes of North America.

PROPERTIES. The root of the May Apple, Podophyllum peltatum, is one of the most safe and active cathartics that is known. *Barton*, 2. 14. Jeffersonia is also purgative. *DC.* These properties appear to be in both cases owing to the presence of irritating qualities like those of Ranunculaceæ proper, only in a milder form.

GENERA.

Podophyllum, L. Jeffersonia, Bart.

ORDER II. PAPAVERACEÆ. THE POPPY TRIBE.

PAPAVERACEÆ, *Juss. Gen.* 236. (1789) *in part*; *DC. Syst.* 2. 67. (1818); *Prodr.* 1. 117. (1824); *Lindl. Synops.* 16. (1829); *Bernhardi in Linnæa.* 8. 401. (1833).

ESSENTIAL CHARACTER.—*Sepals* 2, deciduous. *Petals* hypogynous, either 4, or some multiple of that number, placed in a cruciate manner. *Stamens* hypogynous, either 8, or some multiple of 4, generally very numerous, often in 4 parcels, one of which adheres to the base of each petal; *anthers* 2-celled, innate. *Ovary* solitary; *style* short, or none; *stigmas* alternate with the placentæ, 2 or many; in the latter case stellate upon the flat apex of the ovary. *Fruit* 1-celled, either pod-shaped, with 2 parietal placentæ, or capsular, with several placentæ. *Seeds* numerous; *albumen* between fleshy and oily; *embryo* minute, straight, at the base of the albumen, with plano-convex *cotyledons.*—*Herbaceous plants* or *shrubs*, with a

milky juice. *Leaves* alternate, more or less divided. *Peduncles* long, 1-flowered; *flowers* never blue.

Anomalies.—Bocconia has no petals, and a monospermous capsule. Macleaya has 3 or even 4 cotyledons (*Bernh.*) Eschscholtzia has perigynous stamens.

Affinities. The siliquose-fruited genera, such as Glaucium and Eschscholtzia, have been supposed to indicate the near affinity of this order to Cruciferæ; but the totally different structure of their seeds is such as to neutralize what little affinity may be indicated by the form of the fruit. Through Papaver the order approaches Nymphæaceæ, and through Sanguinaria Podophylleæ, from all which it is distinguished with facility. To Cistaceæ an unexpected relationship has been established by the discovery of Dendromecon. The greatest affinity is, however, with Ranunculaceæ, from which it is sometimes extremely difficult to know this order, without ascertaining that the juice is milky and narcotic. Platystemon is the connecting link between the two orders. Bernhardi indeed denies that true Papaveraceæ are universally lactescent plants, and he quotes Hunnemanna, Eschscholtzia, and Glaucium, as instances to the contrary; but in reality they are all furnished with milk, as every gardener well knows. The anomalies in the order are of little importance, with the exception of Eschscholtzia, which has its stamens arising from the throat of a flatly campanulate calyx, instead of being hypogynous. A comparison of the structure of Papaveraceæ and Cruciferæ, by Mirbel, is to be found in the *Ann. des Sc.* 6. 266.

Geography. Europe, in all directions, is the principal seat of Papaveraceæ, almost two-thirds of the whole order being found in it. Two species only are, according to De Candolle, peculiar to Siberia, three to China and Japan, one to the Cape of Good Hope, one to New Holland, and six to Tropical America. Several are found in North America, beyond the tropic; and it is probable that the order will yet receive many additions from that region. Most of them are annuals. The perennials are chiefly natives of mountainous tracts.

Properties. Every one knows what narcotic properties are possessed by the poppy, and this character prevails generally in the order. The seed is universally oily, and generally in no degree narcotic. The oil obtained from the seeds of Papaver somniferum is found to be perfectly wholesome, and is, in fact, consumed on the continent in considerable quantity. It is also employed extensively for adulterating olive oil. Its use was at one time prohibited in France by decrees issued in compliance with popular clamour; but it is now openly sold, the government and people having both grown wiser. *See Ed. P. J.* 2. 17. Meconopsis napalensis, a Nipal Plant, is described as being extremely poisonous, especially its roots. *Don. Prodr.* 98. The Sanguinaria canadensis, or Puccoon, is emetic and purgative in large doses, and in smaller quantities is stimulant, diaphoretic, and expectorant. *Barton*, 1 37. The seeds of Argemone Mexicana are however said to be narcotic, especially if smoked with tobacco. *Gardener's Mag.* 6. 315. They are used in the West Indies as a substitute for ipecacuanha; and the juice is considered by the native doctors of India as a valuable remedy in ophthalmia, dropt into the eye and over the tarsus; also as a good application to chancres. It is purgative and deobstruent. *Ainslie*, 2. 43. The Brazilians administer the juice of this plant, their Cardo santo, to persons or animals bitten by serpents, but, it would appear, without much success. *Prince Max. Trav.* 214. The narcotic principle of opium is an alkaline substance, called Morphia. The same drug contains a peculiar acid, called the Meconic; and a vegetable alkali, named Narcotine, to which the unpleasant stimulating properties are attributed by Magendie, *Turner*, 647.

GENERA.

Papaver, L.	Sanguinaria, L.	Glaucium, Tourn.	Hunnemannia, Sweet.
Argemone, L.	Bocconia, L.	Chelidonium, L.	Dendromecon, Benth.
Meconopsis, DC.	Macleaya, R. Br.	Eschcholtzia, Cham.	Platystigma, Benth.
Stylophorum, Nutt.	Rœmeria, Medic.		

It is usual to distinguish the following as a special natural order, on account of the irregularity of the flowers, the diadelphous stamens, and watery sap. But Auguste de St. Hilaire, and Moquin Tandon (*Ann. Sc.* 20. 324), have long since recommended the combination of Fumariaceæ and Papaveraceæ on account of the genus Hypecoum, and more recently Bernhardi has followed those botanists in a special memoir upon this subject (*Linnœa*, 8. 401).

Sub-Order. FUMARIEÆ. The Fumitory Tribe.

Fumariaceæ, *DC. Syst.* 2. 105. (1821); *Prodr.* 1. 125 (1824); *Lindl. Synops.* 18 (1829); *Martius Conspectus. No.* 205. (1835).

Essential Character.—*Sepals* 2, deciduous. *Petals* 4, cruciate, parallel; the 2 outer, either one or both, saccate at the base; the 2 inner callous and coloured at the apex, where they cohere and enclose the anthers and stigma. *Stamens* 6, in 2 parcels, opposite the outer petals, very seldom all separate; *anthers* membranous, the outer of each parcel 1-celled, the middle one 2-celled. *Ovary* superior, 1 celled; *ovules* horizontal; *style* filiform; *stigma* with two or more points. *Fruit* various; either an indehiscent 1 or 2-seeded nut, or a 2-valved or succulent indehiscent polyspermous pod. *Seeds* horizontal, shining, crested. *Albumen* fleshy. *Embryo* minute, out of the axis; in the indehiscent fruit straight; in those which dehisce somewhat arcuate.—*Herbaceous plants*, with brittle stems and a watery juice. *Leaves* usually alternate, multifid, often with tendrils. *Flowers* purple, white, or yellow.

Affinities. The following are De Candolle's remarks upon this subject (*Syst.* 2. 106.): "Fumariaceæ are very near Papaveraceæ, on account of their two-leaved deciduous calyx, of the structure of the fruit of such species as dehisce, and of their fleshy albumen; but they differ, firstly, in their juice being watery, instead of milky; secondly, in their petals being usually irregular and in cohesion with each other; thirdly, in their diadelphous stamens, which bear indifferently 1- and 2-celled anthers." I am, however, inclined to suspect, that the floral envelopes of Fumarieæ are not rightly described. I am by no means sure that it would not be more consonant to analogy to consider the parts of their flower divided upon a binary plan; thus understanding the outer series of the supposed petals as calyx, and the inner only as petals; while the parts now called sepals are perhaps more analogous to bracts; an idea which their arrangement, and the constant tendency of the outer series to become saccate at the base, which is not uncommon in the calyx of Cruciaceæ, but never happens, as far as I know, in their petals, would seem to confirm. Of this, some further evidence may be found in the stamens. Those organs are combined in two parcels, one of which is opposite each of the divisions of the outer series, and consists of one perfect 2-celled anther in the middle and two lateral 1-celled ones: now, supposing the lateral 1-celled anthers of each parcel to belong to a common stamen, the filament of which is split by the separation of the two parcels, an hypothesis to which I do not think any objection can be entertained, we shall find that the number of stamens of Fumarieæ is 4, one of which is before each of the divisions of the flower; an arrangement which is precisely what we should expect to find in a normal flower consisting of 2 sepals and 2 petals, and the reverse of what ought to occur if the divisions of the flower were really all petals, as has been hitherto believed.

The economy of the sexual organs of Fumarieæ is remarkable. The sta-

mens are in two parcels, the anthers of which are a little higher than the stigma; the two middle ones of these anthers are turned outwards, and do not appear to be capable of communicating their pollen to the stigma; the four lateral ones are also naturally turned outwards, but by a twist of their filament their face is presented to the stigma. They are all held firmly together by the cohesion of the tips of the flower, which, never unclosing, offer no apparent means of the pollen being disturbed, so as to shed upon the stigmatic surface. To remedy this inconvenience, the stigma is furnished with two blunt horns, one of which is inserted between and under the cells of the anthers of each parcel, so that without any alteration of position on the part of either organ, the mere contraction of the valves of the anthers is sufficient to shed the pollen upon that spot where it is required to perform the office of fecundation. The arguments of Bernhardi for the combination of Papaveraceæ and Fumarieæ are remarkably unsatisfactory, and certainly have produced no impression upon my mind. But the seeds, and very often the fruit, of these plants are so much the same, and the genus Hypecoum, is so exactly intermediate between the two, that I think it is more advisable on the whole to consider Fumarieæ a reduced and irregular form of Papaveraceæ than a distinct natural order. If, however, it should be thought better to retain them separate, it will be requisite that the characters of Fumarieæ should be so far enlarged as to comprehend Hypecoum.

Fumarieæ offer every gradation, from monospermous to polyspermous fruit, and between indehiscence, as in Fumaria itself, and dehiscence, as in Corydalis.

Geography. Their principal range is in the temperate latitudes of the northern hemisphere, where they inhabit thickets and waste places. Two are found at the Cape of Good Hope.

Properties. The character of Fumarieæ is, to be scentless, a little bitter, in no degree milky, and to act as diaphoretics and aperients. *D C.* The root of Fumaria cava and Corydalis tuberosa has been found to contain a peculiar alkali called Corydalin. *Turner*, 653.

GENERA.

Hypecoum, L.	*Cucullaria*, Rafin.	Phacocapnos, Bnh.	Eucapnos, Bernh.
Chiazospermum, Brnh.	Adlumia, Rafin.	Sarcocapnos, DC.	Bulbocapnos, Bernh.
Dielytra, Borkh.	Cysticapnos, Bœrh.	Discocapnos, Cham.	Dactylicapnos, Wall.
Dicentra, Borkh.	Corydalis, Vent.	Fumaria, L.	Macrocapnos, Royle (1)
Capnorchis, Borkh.	*Neckeria*, Scop.	Platycapnos, Bernh.	

Order III. NYMPHÆACEÆ. The Water Lily Tribe.

Nymphæaceæ, *Salisbury, Ann. Bot.* 2. p. 69. (1805); *DC. Propr. Med. ed.* 2. p. 119. (1816); *Syst.* 2. 39. (1821); *Prodr.* 1. 113. (1824); *Lindl. Synops.* 15. (1829).

Essential Character.—*Sepals* and *petals* numerous, imbricated, passing gradually into each other, the former persistent, the latter inserted upon the disk which surrounds the pistil. *Stamens* numerous, inserted above the petals into the disk, sometimes forming, with the combined petals, a superior monopetalous corolla; *filaments* petaloid; *anthers* adnate, bursting inwards by a double longitudinal cleft. *Disk* large, fleshy, surrounding the ovary more or less. *Ovary* polyspermous, many-celled, with the stigmas radiating from a common centre upon a sort of flat urceolate cap. *Fruit* many celled, indehiscent. *Seeds* very nnmerous, attached to spongy dissepiments, and enveloped in a gelatinous aril. *Albumen* farinaceous. *Embryo* small, on the outside of the base of the albumen, enclosed in a membranous bag; *cotyledons* foliaceous.—*Herbs*, with peltate or cordate fleshy leaves, arising from a prostrate trunk, growing in quiet waters.

Affinities. There exists a great diversity of opinion among botanists

as to the real structure of this order, and, consequently, as to its affinities. This has arisen chiefly from the anomalous nature of the embryo, which is not naked, as in most plants, but enclosed in a membranous sac or bag. By some, among whom was the late L. C. Richard, this sac or bag was considered a cotyledon, analogous to that of grasses, and enveloping the plumule; and hence the order was referred to Endogens, or Monocotyledons, and placed in the vicinity of Hydrocharaceæ. By others, at the head of whom are Messrs. Mirbel and De Candolle, the sac is considered a membrane of a peculiar kind; and what Richard and his followers denominate plumule, is for them a 2-lobed embryo, wherefore they place the order in Exogens, or Dicotyledons. I do not think it worth citing all the arguments that have been adduced on each side the question, as botanists seem now to be generally agreed upon referring Nymphæaceæ to Dicotyledons. I observe moreover that Von Martius who once adhered to the opinion that Nymphæaceæ are monocotyledonous, and nearly related to Hydrocharaceæ, (see *Hortus Regius Monacensis*, p. 25.) now places the order in its true position near Ranunculaceæ (see *Conspectus*, *No.* 188.) Those who are curious to investigate the subject are referred to De Candolle's Memoir, in the first volume of the Transactions of the Physical and Natural History Society of Geneva. In this place it will be sufficient to advert briefly to the proof that is supposed to exist of Nymphæaceæ being Dicotyledons. In the first place, the structure of the stem is essentially that of Exogens, according to Mirbel's examination of the anatomy of Nuphar luteum, in the *Annales du Museum*, vol. 16, p. 20; and of Nelumbium, the close affinity of which with Nymphæaceæ no one can possibly doubt, in the same work, vol. 13, t. 34. In both these plants the bundles of fibres are described as being placed in concentric circles, the youngest of which are outermost; but they all lie among a great quantity of cellular tissue: between each of these circles is interposed a number of air-cells, just as is found in Myriophyllum and Hippuris, both undoubted Dicotyledons in the opinion of every body except Link, who refers the latter to Endogens (see *Gewächsk*, 6, p. 288). Secondly, the leaves are those of Dicotyledons, and so is their convolute vernation, which is not known in Monocotyledons, and their insertion and distinct articulation with the stem. Thirdly, the flowers of Nymphæaceæ have so great an analogy generally with Dicotyledons, and particularly with those of Magnoliaceæ, and their fruit with Papaveraceæ, that is difficult to doubt their belonging to the same group. Fourthly, the reasons which have been offered for considering the embryo monocotyledonous, however plausible they may have appeared while we were unacquainted with the true structure of the ovule of other plants, have no longer the importance that they were formerly supposed to possess. The sac, to which I have already alluded, to which so much unnecessary value has been attached, and which was mistaken for a cotydelon by Richard, is no doubt analogous to the sac of Saururus and Piper, and is nothing more than the remains of the innermost of the membranous coats of the ovule, usually indeed absorbed, but in this and similar cases remaining and covering over the embryo. Brown (*Appendix to King's Voyage*) considers it the remains of the membrane of the amnios. De Candolle assigns a further reason for considering Nymphæaceæ Dicotyledons, that they are lactescent, a property not known in Monocotyledons. But in this he is mistaken; Limnocharis, a genus belonging to Butomaceæ, is lactescent. It must moreover be observed, that the arrangement of the woody matter of Nuphar luteum is far less obviously exogenous than would be supposed from the manner in which it is described by Mirbel.

Independently of the peculiarities to which I have now alluded, this order

is remarkable in some other respects. It offers one of the best examples which can be adduced of the gradual passage of petals into stamens, and of sepals into petals: if attentively examined, the transition will be found so insensible that many intermediate bodies will be seen to be neither precisely petals nor stamens, but both in part. The developement of the disk, which is so remarkable in Nelumbiaceæ, takes place here in various degrees. In some, as in Nuphar, it is merely an hypogynous expansion, out of which grow the stamens and petals; in others, as Nymphæa, it elevates itself as high as the top of the ovary, to the surface of which it is adnate, and as the stamens are carried up along with it, we have these organs apparently proceeding from the surface of the ovary: in the genus Barclaya, the petals are also carried up with the stamens, on the outside of which they even cohere into a tube, so that in this genus we have a singular instance of an inferior calyx and a superior corolla in the same plant.

Supposing this order to be exogenous and dicotyledonous, a fact about which there appears to me to be no doubt, its immediate affinity will be with Papaveraceæ, with some genera of which it agrees in the very compound nature of the fruit, from the apex of which the sessile stigmas radiate, in the presence of narcotic principles and a milky secretion, and in the great breadth of the placentæ. Nymphæaceæ are also akin to Magnoliaceæ, with which they agree in the imbricated nature of the petals, sepals, and stamens; to Nelumbiaceæ their close resemblance is evident; with Ranunculaceæ they are connected through the tribe of Pæonies, with which they agree in the dilated state of of the disk which, in Pæonia papaveracea and Moutan, frequently rises as high as the top of the ovaries, and in the indefinite number of their hypogynous stamens; but in Ranunculaceæ the placentæ only occupy the edge of each of the carpels of which the fruit is made up; so that in Nigella, in which the carpels cohere in the centre, the seeds are attached to the axis, while in Nymphæaceæ the placentæ occupy the whole surface of each side of the individual carpels, of which the fruit is composed. But if such are the undoubted immediate affinities of Nymphæaceæ, it is certain that some strong analogies exist between them and Hydrocharaceæ, to the vicinity of which they are referred by those who believe them to be Monocotyledonous. Taking Nelumbiaceæ for a transition order, they have some relation to Alismaceæ, the only monocotyledonous order in which there is an indefinite number of carpels in each flower, and to Hydrocharaceæ, with which they agree in the structure, though not the vernation, of their leaves, and their habit. An analogy of a similar nature with this last may be also traced between them and the monopetalous sub-order Menyantheæ.

Geography. Floating plants, inhabiting the whole of the northern hemisphere, occasionally met with at the southern point of Africa, but generally rare in the southern hemisphere, and entirely unknown on the continent of South America.

Properties. The whole of this order has the reputation of being antiaphrodisiac, sedative, and narcotic, properties not very clearly made out, but generally credited. Their stems are certainly bitter and astringent, for which reason they have been prescribed in dysentery. They contain a considerable quantity of fæcula, and after repeated washings, they are capable of being used for food. *DC. A. R.* The seeds are eagerly sought after in times of scarcity, by the wild people in whose countries they grow. They taste like poppy seeds, and are used either boiled or raw like Millet. The stems are esteemed by the negroes of Senegal, who roast and eat them like Potatoes (*Fl. Senegamb.* 1, 17). In India the farinaceous seeds are eaten either in a raw state, or after having been roasted in heated sand (*Royle*, 65). It is

said that the stems of Nymphæa alba, are better than oak galls for dying gray; they have also been long employed advantageously for tanning leather; and a tolerable sort of beer has been prepared from them. *Fée*, 1, 412.

GENERA.

Euryale, Salisb. Nymphæa, L. Nuphar, Sibth. Barclaya, Wall.
Anneslea, Andr. *Castalia*, Salisb. *Nenuphar*, Hayne.

Sub-Order. HYDROPELTIDEÆ.

Cabombeæ, *Rich. Anal. Fr.* (1808.)—Podophyllaceæ, § Hydropeltideæ, *DC. Syst.* 2. 36. (1821); *Prodr.* 1. 112. (1824).

Essential Character.—*Sepals* 3 or 4, coloured inside. *Petals* 3 or 4, alternate with the sepals. *Stamens* definite or indefinite, hypogynous, arising from an obscure torus; *anthers* linear, turned inwards, continuous with the filament. *Ovaries* 2 or more, terminated by a short style. *Fruit* indehiscent, tipped by the hardened style. *Seeds* definite, pendulous; *embryo* fungilliform, seated at the base of firm, somewhat fleshy *albumen*.—*Aquatic* plants, with floating leaves. *Flowers* axillary, solitary, yellow or purple.

Affinities. These appear to be in reality nothing more than Nymphæaceous plants with definite seeds and distinct carpels. From Podophylleæ, to which they are united by De Candolle, they differ in their floating habit, definite seeds, and numerous ovaries. According to Richard, Cabomba is a monocotyledon: Hydropeltis is clearly related closely to Caltha.

Geography. American water-plants, found from Cayenne to New Jersey.

Properties. Unknown.

GENERA.

Cabomba, Aubl. Hydropeltis, Mich.
Nectris, Schreb. *Brasenia*, Pursh.

Order IV. NELUMBIACEÆ.

Nymphæaceæ, § Nelumboneæ, *DC. Syst.* 2. 43. (1821); *Prodr.* 1. 113. (1824)—Nelumboneæ, *Martius Conspectus. No.* 187. (1835.)

Essential Character.—*Sepals* 4 or 5. *Petals* numerous, oblong, in many rows, arising from without the base of the disk. *Stamens* numerous, arising from within the petals, in several rows; *filaments* petaloid; *anthers* adnate, bursting inwards by a double longitudinal cleft. *Disk* fleshy, elevated, excessively enlarged, enclosing in hollows of its substance the *ovaries*, which are numerous, separate, monospermous, with a simple style and stigma. *Nuts* numerous, half buried in the hollows of the disk, in which they are, finally, loose. *Seeds* solitary, or rarely 2; *albumen* none; *embryo* large, with two fleshy cotyledons and a highly developed *plumule*, enclosed in its proper membrane.—*Herbs*, with peltate, fleshy, floating *leaves* arising from a prostrate trunk, growing in quiet waters.

Affinities. The relationship of this order to Nymphæaceæ is so obvious, that no one ever thinks of disjoining them. And yet its numerous distinct ovaries are quite different from the fruit of Nymphæaceæ, and the seeds have no albumen. This latter circumstance forms the only important exception to the character of the Albuminous group.

Geography. Natives of stagnant or quiet waters in the temperate and tropical regions of the northern hemisphere, both in the Old and the New

World; most abundant in the East Indies. They were formerly common in Egypt, but are now extinct in that country, according to Delile.

Properties. Chiefly remarkable for the beauty of the flowers. The fruit of Nelumbium speciosum is believed to have been the Egyptian bean of Pythagoras. The nuts of all the species are eatable and wholesome. The root, or, more properly, the creeping stem, is used as food in China.

GENUS.

Nelumbium, Juss.
Nelumbo, Gærtn.
Cyamus, Salisb.

Order V. CEPHALOTACEÆ.

Cephaloteæ, *R. Brown, Phil. Mag.* (1832); *Martius Conspectus*, No 178. (1835).—Cephalotaceæ, *Lindl. Key*, No. 5. (1835).

Essential Character.—*Calyx* coloured, six parted, with a valvate æstivation. *Corolla* 0. *Stamens* 12, those opposite the sepals shortest, inserted into the edge of a deep glandular perigynous disk; *anthers* with a thick granular connective. *Carpels* 6, distinct, one seeded; *ovule* erect. *Akenia* membranous, opening by the ventral suture, surrounded by the persistent calyx and stamens. *Seed* solitary (very seldom two) erect. *Embryo* minute, in the base of the axis of a fleshy friable somewhat oily *albumen*.—A stemless *herb* with exstipulate leaves, among which are mingled operculate pitchers. *Scape* simple, bearing a compound terminal *spike*. *Flowers* small.

Affinities. Allied according to Labillardiere to Rosaceæ, and according to Jussieu, to Crassulaceæ; according to Brown the order should be placed between Crassulaceæ and Francoaceæ. Its very copious albumen and apocarpous fruit seem however to fix it far from the former of those orders, in the Ranal alliance, from which it forms a natural transition to Francoaceæ in the Pittosporal alliance, and through those plants to Sarraceniaceæ, in which the leaves are in like manner transformed into pitchers. The paradoxical genus, Dionæa, where in like manner a strong tendency exists to the formation of pitcher, does really seem to be the type of an order differing in little from Cephalotaceæ except in the presence of petals, and in the syncarpous fruit with the seeds collected upon a flat central placenta.

Geography. Marsh plants, found in New Holland, (and the southern states of North America?)

Properties. Unknown.

GENERA.

Cephalotus, R. Br.

§ ? Dionæaceæ.
Dionæa, L.

Alliance II. *ANONALES.*

Essential Character.—Woody plants in all cases, often trees, with the fruit composed of distinct carpels, which occasionally grow together into a solid mass. The valves of the anthers separating by a perpendicular line.

This alliance is hardly to be separated from Ranales by any better general character than its constantly woody and often arborescent stems; to which may be added a great tendency to be aromatic. It is known from Berberales by the dehiscence of its anthers, from Pittosporales by its apocarpous fruit, and from the Umbellal and Grossal alliances by its stamens being hypogynous.

The genus Eupomatia is however an exception to this, but the great number of the carpels of that genus distinguishes even it from the two last-mentioned alliances. Magnoliaceæ are probably the most immediately akin to Ranunculaceæ, and Dilleniaceæ to Pittosporaceæ; while Schizandreæ tend towards the far distant (?) Menispermaceæ; and Anonaceæ themselves assume something the state of Berberaceæ in the genus Bocagea.

Order VI. MYRISTICACEÆ. The Nutmeg Tribe.

Myristiceæ, *R. Brown, Prodr.* 399. (1810). *Bartling, Ord. Nat.* 244. (1830); *Martius Conspectus*, No. 78. (1835).

Essential Character.—*Flowers* completely unisexual. *Calyx* trifid, rarely quadrifid; with valvular æstivation. Male. *Filaments* either separate or completely united in a cylinder. *Anthers* 3-12, 2-celled, turned outwards, and bursting longitudinally: either connate or distinct. Female. *Calyx* deciduous. *Ovary* superior, sessile, with a single erect ovule; *style* very short; *stigma* somewhat lobed. *Fruit* baccate, dehiscent, 2-valved. *Seed* nut-like, enveloped in a many-parted *aril; albumen* ruminate, between fatty and fleshy; *embryo* small; *cotyledons* foliaceous; *radicle* inferior; *plumule* conspicuous.—*Tropical trees*, often yielding a red juice. *Leaves* alternate, without stipules, not dotted. quite entire, stalked, coriaceous; usually, when full grown, covered beneath with a close down. *Inflorescence* axillary or terminal, in racemes, glomerules, or panicles; the *flowers* often each with one short cucullate bract. *Calyx* coriaceous, mostly downy outside, with the hairs sometimes stellate, smooth in the inside.—*R. Br.* chiefly.

Affinities. Usually placed, on account of their apetalous flowers, in the vicinity of Lauraceæ, from which they are distinguished by the structure of their calyx, anthers and fruit. Brown places them between Proteaceæ and Lauraceæ, remarking, that they are not closely akin to any other order. They appear, however, to be in reality an apetalous form of Anonaceæ, with which their trimerous flowers, arillate seed, ruminated albumen, minute embryo, and sensible properties almost identify them; to say nothing of their resemblance to the Schizandreous section of Anonaceæ in their unisexual flowers. Bocagea, which is usually considered as a connecting link between the latter and Berberaceæ, must also be looked upon as one of the cases of transition from Anonaceæ to Virola among Myristicaceæ. Another and much more interesting instance is afforded by Wallich's Anonaceous genus Hyalostemma, which would be almost an involucrated Myristica if it had an aril. That plant has unisexual apetalous flowers, and a trifid calyx surrounded by an involucre of six subulate bracts.

This view was suggested in the first edition of the present work, and about the same time by Bartling, who however is silent as to the motives which led him to bring Myristicaceæ and Anonaceæ into contact.

Geography. Natives exclusively of the tropics of India and America.

Properties. The bark abounds in an acrid juice, which is viscid and stains red; the rind of the fruit is caustic; the aril and albumen, the former known under the name of Mace, and the latter of Nutmeg, are important aromatics, abounding in a fixed oil of a consistence analogous to fat, which, in a species called Virola sebifera, is so copious as to be extracted easily by immersing the seeds in hot water. The common Nutmeg is the produce of Myristica moschata; but an aromatic fruit is also borne by other species. The Nutmeg of Santa Fé is the Myristica Otoba. *Humb. Cinch. For.* p. 29. *Eng. ed.* Another species is the M. tomentosa, and a third the M. officinalis, which is reckoned in Brazil an energetic tonic. *Fée.*

GENERA.

Myristica, L.
Virola, Aubl.
Knema, Lour.
Horsfieldia, Willd.

Order VII. MAGNOLIACEÆ. The Magnolia Tribe.

Magnoliæ, *Juss. Gen.* 280. (1789); Magnoliaceæ, *DC. Syst.* 1. 439. (1818) *Prodr.* 1. 77. (1824.); *Blume Fl. Jav.*

Essential Character.—*Sepals* 3-6, deciduous. *Petals* 3-27, hypogynous, in several rows. *Stamens* indefinite, distinct, hypogynous. *Anthers* adnate, long. *Ovaries* numerous, simple, arranged upon the torus above the stamens, 1-celled; *ovules* either ascending or suspended; *styles* short; *stigmas* simple. *Fruit* either dry or succulent, consisting of numerous carpels, which are either dehiscent or indehiscent, distinct or partially connate, always numerous, and arranged upon an elongated axis, sometimes terminated by a membranous wing. *Seeds* solitary, or several attached to the inner edge of the carpels, from which, when ripe and open, they often hang suspended by a delicate umbilical chord. *Embryo* minute, at the base of fleshy albumen.—Fine *trees* or *shrubs*. *Leaves* alternate, not dotted, coriaceous, articulated distinctly with the stem: with deciduous stipules, which, when young, are rolled together like those of Ficus. *Flowers* large, solitary, often strongly odoriferous. *Scales of the leafbud* formed of stipules either placed face to face or rolled up.

Affinities. Nearly related to Dilleniaceæ, from which they are chiefly distinguished by the ternary, not quinary, arrangement of the parts of the flower; from Anonaceæ, to which they also approach, the stipules and solid albumen separate them. Their stipulation points out an analogy with Urticaceæ; their imbricate petals and sepals, and numerous ovaries, with Calycanthaceæ, and through them with Monimiaceæ. According to Blume, the umbilical chord which is so remarkably extensible in these plants, is wholly composed of a multitude of delicate spiral vessels. (*Fl. Jav.* 8.)

Geography. The focus of this order is undoubtedly North America, where the woods, the swamps, and the sides of the hills, abound with the species. Thence they straggle, on the one hand, into the West India Islands, and, on the other, into India, through China and Japan. Brown remarks *(Congo,* 465*)*, that no species have been found on the continent of Africa, or any of the adjoining islands.

Properties. The general character of the order is to have a bitter tonic taste, and fragrant flowers. The latter produce a decided action upon the nerves, which, according to De Candolle, induces sickness and headache from Magnolia tripetala, and on the authority of Barton, is so stimulating on the part of Magnolia glauca as to produce paroxysms of fever, and even an attack of inflammatory gout. The bark has been found to be destitute of tannin and gallic acid, notwithstanding its intense bitterness. The bark of the root of Magnolia glauca is an important tonic. *Barton*, 1. 87. The same property is found in Liriodendron tulipifera, which has even been said to be equal to Peruvian bark. Michelia Doltsopa is one of the finest trees in Nipal, yielding an excellent fragrant wood, much used in that country for house-building. *Don. Prodr.* 226. Magnolia excelsa has a valuable timber called *Champ*, at first greenish, but soon changing into a pale yellow; the texture is fine. *Wallich. Tent.* 7. The cones of Magnolia acuminata yield, in Virginia, a spirituous tincture, which is employed with some success in rheumatic affections; and the seeds of most species are remarkable for their bitterness: those of M. Yulan are employed in China as febrifuges, under the name of *Tsin-y. DC.* Blume remarks that Magnoliaceæ are absolutely known from Dilleniaceæ by their bitter aromatic properties; the latter never being any thing beyond styptics. *Fl. Jav.*

GENERA.

Michelia, L.	Aromadendron, Bl.	Magnolia, L.	Talauma, Juss.
Manglietia, Bl.	Sphenocarpus, Wall.	*Gwillimia*, Rottl.	Liriodendron, Juss.

Order VIII. WINTERACEÆ. The Winter's Bark Tribe.

Wintereæ, *R. Brown in De Cand. Syst.* 1. 548. (1818.)—Illicieæ, *DC. Prodr.* 1. 77. (1824.) *a section of* Magnoliaceæ.

Essential Character.—*Flowers* hermaphrodite or unisexual. *Sepals* 2-6, sometimes not distinguishable from the petals, either deciduous or persistent. *Petals* 2-30, in several rows when more than 5. *Stamens* short, indefinite, hypogynous, distinct. *Anthers* adnate. *Ovaries* definite, arranged in a single whorl, 1-celled, with several suspended or erect ovules, which are attached to the suture. *Stigmas* simple, sessile. *Fruit* either dry or succulent, consisting of a single row of carpels, which are either dehiscent or indehiscent, and distinct. *Seeds* solitary or several, with or without aril. *Embryo* very small, straight, in the base of fleshy albumen.—*Shrubs* or small *trees*. *Leaves* alternate, dotted, coriaceous, persistent, with convolute deciduous stipules. *Flowers* solitary, often brown or chocolate colour, and sweet-scented.

Anomalies. The flowers of Tasmannia are dicœcious or polygamous, and the carpels solitary.

Affinities. Closely related to Magnoliaceæ, from which they differ chiefly in their dotted leaves and aromatic qualities. A. de St. Hilaire, however, states that some Michelias have dotted leaves, and so destroy the limits between this order and Magnoliaceæ. (*Fl. Bras.* 1. 27.) According to St. Hilaire, the supposed stipules of Winteraceæ are only imperfectly developed leaves which enfold the buds. *Pl. Usuelles*, no. 26-28. But what are stipules except starved leaves? The same author remarks, that Bonpland considered the embryo as destitute of albumen, which was, however a mistake, it being undoubtedly as it is here described. For several good remarks upon Drimys, see the *Pl. Usuelles* as quoted.

Geography. A small order, with an extensive range. Of the 10 species enumerated by De Candolle, 2 are found in New Holland, 2 in the hotter parts of America, 2 in the southern and 2 in the northern territories of the same continent, 1 in China and Japan, and 1 in New Zealand.

Properties. All that writers have stated about the aromatic stimulant properties of Magnoliaceæ should be applied to this order, formerly confounded with them. The seeds of Illicium anisatum are considered in India to be powerfully stomachic and carminative. The fruit of that plant is the star-anise of the shops. A very fragrant volatile oil is also obtained from the seeds. The Chinese burn them in their temples, and Europeans employ them to aromatise certain liquors, such as the Anisette de Bourdeaux. Drimys Winteri yields the Winter's Bark, which is known for its resemblance to that of cinnamon. *A. R.* A bark called Melambo Bark, possessing similar properties, is described by Cadet in the *Journal de Pharmacie*, 1815, p. 20. The bark of Drimys granatensis, called *Casca d'Anta* in Brazil, is much used against colic. It is tonic, aromatic, and stimulant, and resembles, in nearly all respects, the Drimys Winteri, or Winter's Bark. *Plantes Usuelles*, 26-28.

GENERA.

Illicium, L.	Drimys, Forst.	Tasmannia, R. Br.
Temus, Mol.	*Wintera*, Murr.	
	Winterana, Sol.	

Order IX. ANONACEÆ.

Anonæ, *Juss. Gen.* 283. (1789.)—Anonaceæ, *Rich. Anal. Fr.* 17. (1808); *Dunal Monogr.* (1817); *DC. Syst.* 1. 462. (1818); *Prodr.* 1. 83. (1824); *Bl. Fl. Jav.*; *Alph. De Cand. in Mem. Phys. Genev.* (1832.)—Glyptospermæ, *Vent. Tabl.* 3. 75. (1799.)

Essential Character.—*Sepals* 3-4, persistent, usually partially cohering. *Petals* 6, hypogynous, in two rows, coriaceous, with a valvular æstivation, sometimes united in a monopetalous *corolla*. *Stamens* indefinite or definite, covering a large hypogynous torus, packed closely together, very rarely definite. *Filaments* short, more or less angular. *Anthers* adnate, turned outwards, with an enlarged 4-cornered connective, which is sometimes nectariferous. *Ovaries* usually numerous, closely packed, separate or cohering, occasionally definite; *Styles* short; *stigmas* simple; *ovules* solitary, or a small number, erect or ascending. *Fruit* consisting of a number of carpels, which are either succulent or dry, sessile or stalked, 1-or many seeded, distinct or concrete into a fleshy mass. *Seeds* attached to the suture in one or two rows, sometimes furnished with an aril; *testa* brittle; *embryo* minute, in the base of hard, fleshy, ruminate *albumen*.—*Trees* or *shrubs*. *Leaves* alternate, simple, almost always entire, without stipules. *Flowers* usually green or brown, axillary, solitary, or 2 or 3 together, shorter than the leaves; the *peduncles* of abortive flowers sometimes indurated, enlarged, and hooked.

Anomalies. Monodora has a solitary carpel. In Hyalostemma the flowers are diœcious, apetalous, with an involucre. In Anona palustris the ovaries are not distinct. Rollinia, &c. have the petals united. Stamens and carpels definite in Bocagea. Flowers pentamerous in Hentschelia. Ovaries inferior in Eupomatia.

Affinities. No doubt can be entertained of the close affinity of this order to Magnoliaceæ, from which, however, it differs in the want of stipules, in the form of the anthers, and in the peculiar condition of the ovary: agreeing in the ternary division of the parts of fructification, and the indefinite stamens and ovaries. An affinity has been pointed out between them and Menispermaceæ; but it appears to me to be very weak. The great feature of the order is its ruminated albumen, to which there is no exception, and scarcely any parallel. The parietal insertion of ovules, ascribed to this order by De Candolle, is not universal. The ovules are erect in Anona, Guatteria, and Anaxagorea. *A. St. H. in Pl. Usu.* 33. A remarkable plant is described by Brown, in the Appendix to Flinders's Voyage, under the name of Eupomatia laurina, in which the stamens are manifestly perigynous, and the tube of the calyx coherent with the ovaries. I have remarked in Anona laurifolia that the pollen is arranged in two distinct rows in each cell of the anther, and that when that organ bursts, the grains of pollen fall out, cohering in a single row, so as to have the appearance of a necklace. Supposing Winteraceæ not to be stipulate, as St. Hilaire asserts, this order will be more nearly related to them than to Magnoliaceæ. Connected with Berberaceæ through Bocagea. I also think there can be no doubt of the close alliance of this order to Myristicaceæ (see that order); as has already been indicated by Blume *(Fl. Jav.)* who, however, does not attach so much importance to the resemblances as I do.

Geography. The tropics of the old and new world are the natural land of these plants: thence they spread, in a few instances, to the northward and the southward.

Properties. The general character is, to have a powerful aromatic taste and smell in all the parts. The bark of Uvaria tripetaloidea yields, being tapped, a viscid matter, which hardens in the form of a fragrant gum. *DC.* The flowers of many species, especially of Artabotrys odoratissima and Guatteria virgata, are exceedingly fragrant. The dry fruits of many species are very aromatic; those of Habzelia aromatica are the Piper æthiopicum of the shops, and are commonly used as pepper by the African negroes. *Fl. Seneg.* 1. 9. The leaves of Anona squamosa have a heavy disagreeable odour,

and the seeds contain a highly acrid principle fatal to insects, on which account the natives of India use them powdered and mixed with the flour of *Gram*, or *Cicer arietinum*, for occasionally washing their hair. *Royle.* Xylopia sericea, a large tree found in forests near Rio Janeiro, where it is called *Pindaïba*, bears a highly aromatic fruit, with the flavour of pepper, for which it may be advantageously substituted. Its bark is tough, and readily separated into fibres, from which excellent cordage is manufactured. *Plantes Usuelles*, no. 33. Blume remarks that the Javanese species require, notwithstanding their powerful properties, to be employed with caution; for if they are administered for too great a length of time, or in too large doses, they produce vertigo, hæmorrhage, or even abortion, in pregnant women. The carpels are chewed after dinner in Java for dispelling flatulence. (See Blume.) Of some species the fruit is succulent and eatable, containing a sugary mucilage, which predominates over the slight aromatic flavour that they produce. Of this kind are the Custard Apples of the East and West Indies, the Cherimoyer of Peru, and others. In Asimina triloba an acid is present of a very active nature, according to Duhamel; but this is not certain. The Anona sylvatica, called *Araticu do mato*, in Brazil, has a light white wood, very fit for the use of turners, and for the same purposes as the lime-tree of Europe. Its fruit is described as good for the dessert. *Plantes Usuelles*, 29. The wood of the root of A. palustris is employed in Brazil for corks. *Ib.* 30. The Indians on the Orinoco, particularly in Atures and Maypura, have an excellent febrifuge, called *Frutta de Burro*, which is the fruit of Uvaria febrifuga. *Humboldt, Cinch. Forests*, p. 22. *Eng. ed.*

GENERA.

Anona, L.
Rollinia, A. St. H.
Lobocarpus, W. et A.
Monodora, Dun.
Uvaria, L.
Asimina, Adans.
Orchidocarpum, Mx.
Porcelia, R. et P.
Mitraphora, Bl.
Unona, L.
Bulliarda, Neck.
Krockeria, Neck.
Desmos, Lour.
Melodorum, Lour.
Marenteria, Nor.
Artabotrys, R. Br.
Habzelia, A.DC.
Cœlocline, A.DC.
Xylopia, L.
Anaxagorea, A. St. H.
Hexalobus, A.DC.
Miliusa, A.DC.
Orophea, Bl.
Bocagea, A. St. H.
Trigynæa, Schlecht.
Polyalthia, Bl.
Duguetia, A. St. H.
Guatteria, R. P.
Aberemoa, Aubl.
Cananga, Aubl.
Hentschelia, Presl.
Hyalostemma, Wall. (2)
Eupomatia, R. Br.

Blume distinguishes

SCHIZANDREÆ

From Anonaceæ and some other orders in the following manner. They differ from Magnoliaceæ in their unisexual flowers, and in the form of their stamens, which in Magnoliaceæ are never monadelphous; moreover the different nature of the vegetation and the different properties form a great distinction between the two orders. For Magnoliaceæ are erect trees or shrubs with gemmaceous stipules and entire leaves, and bitter aromatic properties, while on the other hand Schizandreæ are trailing shrubs, destitute of stipules and constantly having toothed leaves, and have no aromatic or bitter properties, but abound in vegetable mucus. In this last property and their toothed leaves they differ from Anonaceæ, which approach them in the want of stipules and in their occasional sarmentose habit; Schizandreæ differ moreover from Anonaceæ, 1st, in the less constant number of the floral envelopes; 2nd, in their stamens usually combined; and 3rd, in their even, not ruminated, albumen. *(Fl. Jav.)*

It is highly probable that they do in fact form a peculiar order, allied most nearly to Anonaceæ, but also exhibiting a manifest tendency to the monadelphous unisexual structure of Myristicaceæ. Their supposed resemblance to Menispermaceæ, of which mention is made by authors, is of a very slight nature.

GENERA.

Kadsura, J.
Sarcocarpon, Bl.
Sphærostema, Bl.
Schizandra, Mx.

Order X. DILLENIACEÆ.

Dilleniaceæ, *DC. Syst.* 1. 395. (1818); *Prodr.* 1. 67. (1824); *A. St. H. Fl. Bras.* 1. 23. (1825.)

Essential Character.—*Sepals* 5, persistent, 2 exterior, 3 interior. *Petals* 5, deciduous, hypogynous in a single row. *Stamens* indefinite, hypogynous, arising from a torus, either distinct or polyadelphous, and either placed regularly around the pistil or on one side of it. *Filaments* dilated either at the base or apex. *Anthers* adnate, 2-celled, usually bursting longitudinally, always turned inwards. *Ovaries* definite, more or less distinct, with a terminal *style* and simple *stigma*; *ovules* ascending. *Fruit* consisting either of from 2 to 5 distinct unilocular carpels, or of a similar number cohering together; the carpels either baccate or 2-valved, pointed by the style. *Seeds* fixed in a double row to the inner edge of the carpels, either several or only 2, occasionally solitary by abortion; surrounded by a pulpy aril. *Testa* hard. *Embryo* minute, lying in the base of solid fleshy albumen.—*Trees, shrubs,* or *under-shrubs*, rarely *herbaceous* plants. *Leaves* usually alternate, almost always without stipules, very seldom opposite, most commonly coriaceous, and with strong veins running straight from the midrib to the margin, entire or toothed, often separating from the base of the petiole, which remains adhering to the stem. *Flowers* solitary, in terminal racemes or panicles, often yellow.

Anomalies. In several genera of the section Delimaceæ there is but one carpel; and in Dillenia and Colbertia the carpels partly cohere.

Affinities. These are nearly akin to Magnoliaceæ, from which they are distinguished by their want of stipules and the quinary arrangement of the parts of fructification; and to Ranunculaceæ, from which their persistent calyx, stamens, and whole habit in general, divide them. They are universally characterised by the presence of aril; a peculiarity which certainly exists in Hibbertia, notwithstanding De Candolle's definition of that genus. The most genuine form of the order is known by the veins of the leaves running straight from the midrib to the margin. Some of the genera are remarkable for having the stamens developed only half way round the pistil, so that the central part of the flower has a one-sided appearance. In this respect they tend towards Pittosporaceæ, where Cheiranthera has also declinate stamens. To Anonaceæ they also approach in a variety of ways, especially in the genus Acrotrema, whose albumen is irregularly indented upon the surface, as if it were approaching to a ruminated state.

Geography. According to De Candolle, 50 of this order are found in Australasia, 21 in India and its neighbourhood, 3 in equinoctial Africa, and 21 in equinoctial America; but since the publication of the *Systema* several have been added both to the Indian and South American species.

Properties. Dilleniaceæ are generally astringent. The Brazilians make use of a decoction of Davilla rugosa in swellings of the legs and testicles, very common maladies in hot and humid parts of South America. *Pl. Usuelles*, no. 22. Davilla elliptica is also astringent, and furnishes the vulnerary called *Cambaïbinha* in Brazil. *Ibid.* 23. In Curatella Cambaïba the same astringent principle recommends its decoction as an excellent wash for wounds. *Ibid.* 24. The young calyxes of Dillenia scabrella and speciosa have a pleasantly acid taste, and are used in curries by the inhabitants of Chittagong and Bengal. *Wallich.* Almost all Delimeæ have the leaves covered with asperities, which are sometimes so hard that the leaves are even used for polishing.

GENERA.

§ 1. DELIMEÆ, DC.
Tetracera, L.
Euryandra, Forst.
Wahlbomia, Thunb.
Tigarea, Aubl.
Rhinium, Schreb.
Pinzona, Mart.
Empedoclea, A. St. H.
Davilla, Vand.
Doliocarpus, Rol.
Calinea, Aubl.
Soramia, Aubl.
Delima, L.
Trachytella, DC.
Reifferschiedia, Presl.
Curatella, L.
Recchea, Sesse.

§ 2. DILLENIEÆ, DC.
Pachynema, R. Br.
Hemistemma, Juss.
Pleurandra, La Bill.
Candollea, La Bill.
Adrastæa, DC.
Hibbertia, Andr.
*Burtonia, Salisb.
Wormia, Rottb.
Lenidia, Poir.
Actinidia. (3.)
Colbertia, Salisb.
Dillenia, L.
Capellia, Blume.
Othlis, Schott.
Acrotrema, Jack.

Schumacheria, Vahl.
? Dasynema, Schott.

ALLIANCE III. *UMBELLALES.*

ESSENTIAL CHARACTER.—Flowers usually disposed in umbels. Calyx superior. Disk epigynous, very thick, in two or more pieces. Carpels always one-seeded. Stems usually hollow.

The only other albuminous alliance with a superior calyx is the Grossal, and that is readily known by its solid stems, and flowers never being arranged in regular umbels, while there is generally more seeds than one, usually many, in each carpel. The leaves too of this alliance are almost always dilated, and sheathing at the base, as in Ranunculaceæ. The motives which induced me to place Myristicaceæ in the same alliance as Anonaceæ have led me to group Umbelliferæ in the vicinity of Ranunculaceæ, contrary to the opinion and practice of the greatest of our living authorities. If we consider fairly the respective organization of Ranunculaceæ and Umbelliferæ, especially of such genera as Thalictrum in the one, and Pimpinella in the other, we shall find that *no positive mark* of discrimination between them can be pointed out except the superior carpels of the former, and the inferior ones of the latter; for the indefinite stamens of Ranunculaceæ are no longer capable of furnishing a distinctive character since the discovery of Casalea. As for Thalictrum fœniculaceum, any one would take it for an Umbelliferous plant, without attentive observation. Now it is impossible to acknowledge any system to be natural in which, under these circumstances of almost identity in structure and in sensible properties, two such orders are disjoined; and I consider the restoration of Umbelliferæ and Ranunculaceæ to their true relative positions, one of the strongest arguments in favour of the necessity for this albuminous group.

On the other hand, Umbelliferæ are but little different from Vitaceæ, except in their superior calyx and pendulous ovules; for Aralia racemosa has quite as much the appearance of a Cissus, and its structure also, except in those respects, as it has of a plant of the Umbellal alliance.

ORDER XI. UMBELLIFERÆ, or APIACEÆ. } THE UMBELLIFEROUS TRIBE.

UMBELLIFERÆ, *Juss. Gen.* 218. (1789); *Koch in N. Act. Bonn.* 12. 73. (1824); *Lindl. Synops.* 111. (1829); *DC. Memoire* (1829); *DC. Prodr.* 4. 55. (1830); *Tausch. in Bot. Zeit.* (1834); *Ann. sc. n. s.* 4. 41. (1835). UMBELLACEÆ, *Lindl. Key, no.* 11, (1835).

ESSENTIAL CHARACTER.—*Calyx* superior, either entire or 5-toothed. *Petals* 5, inserted on the outside of a fleshy epigynous disk; usually inflexed at the point; æstivation imbricate, rarely valvate. *Stamens* 5, alternate with the petals, incurved in æstivation. *Ovary* inferior, 2-celled, with solitary pendulous ovules; crowned by a double fleshy

disk; *styles* 2, distinct; *stigmas* simple. *Fruit* consisting of 2 carpels, separable from a common axis, to which they adhere by their face (*the commissure*); each carpel traversed by elevated *ridges*, of which 5 are primary, and 4, alternating with them, secondary; the ridges are separated by *channels*, below which are often placed, in the substance of the pericarp, certain linear receptacles of coloured oily matter called *vittæ*. *Seed* pendulous, usually adhering inseparably to the pericarp, rarely loose; *embryo* minute, at the base of abundant horny *albumen*; *radicle* pointing to the hilum.—*Herbaceous* plants, with fistular furrowed stems. *Leaves* usually divided, sometimes simple, sheathing at the base. *Flowers* in umbels, white, pink, yellow, or blue, generally surrounded by an involucre.

Anomalies. Sometimes there are three carpels. The leaves, or rather the dilated leafless petioles of some, as Eryngium, have the appearance of those of Endogens. Leaves opposite in Spananthe.

Affinities. I trust I have sufficiently proved already the near relation of this order to Ranunculaceæ; its affinity to Araliaceæ is such that the two orders hardly differ, except in the number of the parts of the flower. With Saxifragaceæ, Umbelliferæ agree in habit, if Hydrocotyle is compared with Chrysosplenium, and if the sheathing and divided leaves of the two orders are considered. To Geraniaceæ, De Candolle remarks that Umbelliferæ are allied, in consequence of the cohesion of the carpels around a woody axis, and of the umbellate flowers which grow opposite the leaves, and also because the affinity of Geraniaceæ to Vitaceæ, and of the latter to Araliaceæ, is not to be doubted. The resemblance of Umbelliferæ to Geraniaceæ is however very feeble compared with the likeness they bear to Vitaceæ. The arrangement of this order has only within a few years arrived at any very definite state; the characters upon which genera and tribes could be formed having been for a long while unsettled; it is, however, now generally admitted that the number and development of the ribs of the fruit, the presence or absence of reservoirs of oil called vittæ, and the form of the albumen, are the leading peculiarities which require to be attended to. Upon this subject see Koch's *Dissertation*, Lagasca in the *Otiosas Españolas*, and De Candolle's *Mémoire*, especially the last. The classification of De Candolle has, however, been recently attacked by Tausch, in the places above quoted, who asserts that the albumen is a fallacious guide. He says that some species of Bupleurum are campylospermous, and others orthospermous, and the same is true of many other genera. He adds, that in Hasselquistia the fruit of the ray is orthospermous, while that of the disk is cœlospermous. The arrangement which this author proposes to substitute has not yet been examined critically.

Geography. Natives chiefly of the northern parts of the northern hemisphere, inhabiting groves, thickets, plains, marshes, and waste places. They appear to be extremely rare in all tropical countries, except at considerable elevations; where they gradually increase in number as the other parts of the vegetation acquire an extra-tropical, or mountain character. Hence, although they are hardly known in the plains of India, they abound on the mountains of the Himalaya.

Properties. The properties of this order require to be considered under two points of view: firstly, those of the vegetation; and, secondly, those of the fructification. The character of the former is, generally speaking, suspicious, and often poisonous in a high degree; as in the case of Hemlock, Fool's Parsley, and others, which are deadly poisons. Nevertheless, the stems of the Celery, the leaves of Parsley and Samphire, the roots of the Skirret, the Carrot, the Parsnep, the Arracacha, and the tubers of Œnanthe pimpinelloides and Bunium bulbocastanum, are wholesome articles of food. The leaves of Prangos pabularis, afford a nourishing and abundant fodder for cattle; it is thought to have been the Silphium of the ancients. The fruit, vulgarly called the seed, is in no case dangerous, and is usually a warm-and agreeable aromatic, as Caraway, Coriander, Dill, Anise, &c. From the stem, when wounded,

sometimes flows a stimulant, tonic, aromatic, gum-resinous concretion, of much use in medicine; as Opoponax, which is procured from Pastinaca opoponax in the Levant; Assafœtida from the Ferula of that name in Persia, and Sagapenum from some other species of Ferula. Gum ammoniac is supposed to be obtained from Dorema ammoniacum. It is a gum resin of a pale yellow colour, having a faint but not unpleasant odour, with a bitter nauseous taste. Internally applied, it is a valuable deobstruent and expectorant. It is said by Paris to be, in combination with rhubarb, a useful medicine in mesenteric affections, by correcting viscid secretions. *Ainslie*, 1. 160. The substance called Galbanum is produced by some plant of this order, which Don calls Galbanum officinale. It is a stimulant of the intestinal canal and uterus, and is found to allay that nervous irritability which often accompanies hysteria. *Ainslie*, 1. 143. Cicuta virosa has its roots gorged with a gum-resinous juice, which is a violent poison for man and animals. Œnanthe crocata, and Phellandrium, and Œthusa Cynapium have leaves and stems with a similar character; the latter has been found by Ficinus, of Dresden, to contain a peculiar alkali, which he calls Cynopia. *Turner*, 654. The fruit of Ligusticum ajawain of Roxb. is prescribed in India in diseases of horses and cows. *Ainslie*, 1. 38. The roots of Eryngium campestre are slightly aromatic.

With regard to Conium maculatum, which is also a most dangerous poison, it is remarkable how its properties are affected by climate; in Russia and the Crimea it is inert and eatable; in the south of Europe it is extremely dangerous. Fée, who makes this statement, adds, that for medicinal purposes it should be collected in June, shortly after flowering, and asserts that if gathered later its energy is much impaired. The same author doubts whether our Conium was really the plant from which the death-drinks of the Greeks were prepared. See some excellent general remarks upon the properties of this order in *Fée's Cours d'Histoire Naturelle Pharmaceutique*, 2. 172.

GENERA.

Sub-Order. ORTHOSPERMÆ, DC.

Albumen flat on the inner face; neither involute nor convolute.

§ 1. Hydrocotyleæ, DC.
Hydrocotyle, Tourn.
Chondrocarpus, Nut.
Glyceria, Nutt.
? Crantzia, Nutt.
Dimetopia, DC.
Erigenia, Nutt.
Micropleura, Lag.
Didiscus, DC.
Lampra, Lindl.
Hugelia, Reichenb.
Trachymene, Rudg.
Fischera, Lag.
Catepha, Leschen.
Siebera, Reichenb.?
Xanthosia, Rudg.
Bowlesia, R. et P.
Azorella, Gaud.
Pectophytum, H. B. K.

§ 2. Mulineæ, DC.
Bolax, Comm.
Mulinum, Pers.
Laretia, Gill.
Homalocarpus, Hkr.
Drusa, DC.
Huanaca, Cav.
Diposis, DC.
Spananthe, Jacq.
Pozoa, Lag.
Asteriscium, Cham.
Cassidocarpus, Presl.

§ 3. Saniculeæ, DC.
Actinotus, La Bill.
Eriocalia, Smith.
Proustia, Lag.
Petagnia, Guss.
Heterosciadium, DC.
Sanicula, Tourn.
Hacquetia, Neck.
Dondia, Spreng.
Dondisia, Reichenb.
Astrantia, Tourn.
Alepidea, Laroch.
Horsfieldia, Blum.
Schubertia, Blum.
Eryngium, Tourn.
Strebanthus, Raf.
Lessonia, Bertero.
Actinanthus, Ehrenb.
Klotzschia, Cham.

§ 4. Ammineæ, DC.
Rumia, Hoffm.
Cicuta, L.
Cicutaria, Tourn.
Zizia, Koch.
Pentacrypta, Lehm.
Apium, Hoffm.
Petroselinum, Hoffm
Wydleria, DC.
Trinia, Hoffm.
Apinella, Neck.
Spielmannia, Cuss.
Helosciadium, Koch.
Discopleura, DC.
Leptocaulis, Nutt.
Ptychotis, Koch.
Falcaria, Riv.
Drepanophyllum, K.
Critamus, Bess.
Prionitis, Delarb.
Sison, Lag.
Schultzia, Spreng.
Ammi, Tourn.
Ptilimnion, Raf.
Ægopodium, L.
Podagraria, Riv.

Carum, Koch.
Chamæsciadium, Mey.
Bunium, Koch.
Bulbocastanum, Lag.
Cryptotænia, DC.
Oxypolis, Raf.
Sium, Koch.
Sisarum, Adans.
Bupleurum, Tourn.
Diaphyllum, Hoffm.
Isophyllum, Hoffm.
Odontites, Hoffm.
Tenoria, Spreng.
Trachypetalum, Rchb.
Heteromorpha, Cham. et Schlecht.
Orimaria, Raf.
§ 5. SESELINEÆ, DC.
Lichtensteinia, Cham.
Ottoa, H. B. K.
Œnanthe, Lam.
Phellandrium, L.
Anesorhiza, Cham. et Schlecht.
Sclerosciadium, Koch.
Dasyloma, DC.
Cynosciadium, DC.
Æthusa, L.
Wepferia, Heist.
Fœniculum, Adans.
Kundmannia, Scop.
Brignolia, Bertol.
Campderia, Lag.
Deverra, DC.
Soranthus, Ledeb.
Eriocycla, Lindl.
Seseli, L.
Libanotis, Crantz.
Cenolophium, Koch.
Cnidium, Cusson.
Hymenidium, Lindl.
Thaspium, Nutt.
Trochiscanthes, Koch.
Trachydium, Lindl.
Athamantha, Koch.
Libanotis, Scop.
Turbith, Tausch.
Petrocarvi, Tausch.
Malabaila, Tausch.
Ligusticum, Koch.
Spermolepis, Raf.
Silaus, Besser.
Wallrothia, Spreng.
Meum, Tourn.
Gaya, Gaud.
Arpitium, Neck.
Conioselinum, Fisch.
Crithmum, Tourn.
§ 6. ANGELICEÆ, DC.
Levisticum, Koch.
Selinum, Hoffm.
Mylinum, Gaud.
Thysselinum, Adans.
Ostericum, Hoffm.
Angelica, Hoffm.
Archangelica, Hoffm.
§ 7. PEUCADANEÆ, DC.
Opoponax, Koch.
Galbanum, Don.
Ferula, Tourn.
Ferulago, Koch.
Eriosynaphe, DC.
Palimbia, Bess.
Peucedanum, Koch.
Hammatocaulis, Taus.
Ormosôlenia, Tausch.
Imperatoria, L.
Anethum, Tourn.
Cortia, DC.
Capnophyllum, Gært.
Tiedemannia, DC.
Archemora, DC.
Symphyoloma, Meyr.
Pastinaca, Tourn.
Malabaila, Hoffm.
Leiotulus, Ehrenb.
Astydamia, DC.
Heracleum, L.
Wendia, Hoffm.
Spondylium, Tourn.
Zozimia, Hoffm.
Polytænia, DC.
Johrenia, DC.
Dorema, Don.
§ 8. TORDYLINEÆ, DC.
Hasselquistia, L.
Tordylium, Tourn.
Condylocarpus, Hoff.
? Tordyliopsis, DC.
§ 9. SILERINEÆ, DC.
Krubera, Hoffm.
Ulospermum, Link.
Pachypleurum, Led.
Stenocœlium, Led.
Agasyllis, Hoffm.
Siler, Scop.
Bradleia, Neck.
§ 10. CUMINEÆ, DC.
Cuminum, C. Bauh.
Trepocarpus, Nutt.
§ 11. THAPSIEÆ, DC.
Thapsia, Tourn.
Cymopterus, Rafin.
Laserpitium, Tourn.
Lophosciadium, DC.
Melanoselinum, Hoff.
§ 12. DAUCINEÆ, DC.
Artedia, L.
Orlaya, Hoffm.
Platyspermum, Koch.
Daucus, Tourn.

SUB-ORDER II. CAMPYLOSPERMÆ, DC.

Albumen rolled inwards at the edges, so as to form a longitudinal furrow.

§ 13. ELÆOSELINEÆ, DC.
Elæoselinum, Koch.
§ 14. CAUCALINEÆ, DC.
Caucalis, Hoffm.
Turgenia, Hoffm.
Torilis, Spreng.
§ 15. SCANDICINEÆ, DC.
Scandix, Gærtn.
Wylia, Hoffm.
Anthriscus, Hoffm.
Physocaulis, Tausch.
Rhyncostylis, Tausch.
Cerefolium, Hall.
Chærophyllum, Hoff.
Pycnocycla, Lindl.
Caldasia, Lag.
Sphalerocarpus, Bess.
Molopospermum, Kh.
Velæa, DC.
Myrrhis, Scop.
Osmorhiza, Rafin.
Uraspermum, Nutt.
Spermatura, Reich.
Grammosciadium, DC.
Ozodia, W. et A.
Tauschia, Schlecht.
§ 16. SMYRNEÆ, DC.
Lagœcia, L.
Cuminoides, Tourn.
Oliveria, Vent.
Anisosciadium, DC.
Echinophora, Tourn.
Exoacantha, Labill.
Arctopus, Linn.
Apradus, Adans.
Lophocachrys, DC.
Trachymarathrum, Tausch.
Cachrys, Tourn.
Hippomarathrum, L.
Prangos, Lindl.
Pteromarathum, Kh.
Colladonia, DC.
Perlebia, DC.
Lecokia, DC.
Magydaris, Koch.
Eriocachrys, DC.
Hermas, L.
Conium, L.
Aulacospermum, Led.
Vicatia, DC.
Arracacha, Bancr.
Pleurospermum, Hof.
Physospermum, Vela.
Enymonospermum, S.
Hymenolæna, DC.
Physospermum, Cuss.
Danaa, All.
Henselera, Lag.
Anosmia, Bernh.
Smyrnium, Lag.
Eulophus, Nutt.
Scaligeria, DC.

SUB-ORDER III. CŒLOSPERMÆ, D. C.

Albumen curved inwards from the base to the apex.

§ 17. CORIANDREÆ, DC.
Bifora, Hoffm.
Biforis, Spreng.
Corion, Hoffm.
Anidrum, Neck.
Astoma, DC.
Artema, DC.
Coriandrum, Hoffm.

Adorium, Raf.
Oreoxis, Raf.

Order XII. ARALIACEÆ. The Aralia Tribe.

Araliæ *Juss. Gen.* 217. (1789). — Araliaceæ, *A. Richard in Dictionnaire Classique d'Histoire Naturelle*, 1. 506. (1822); *DC. Prodr.* 4. 251. (1830); *Bartling Ord. Nat.* 237. (1830).

Essential Character—*Calyx* superior, entire or toothed. *Petals* definite, 5 to 10, deciduous, valvate in æstivation, occasionally absent. *Stamens* equal in number to the petals or twice as many, arising from within the border of the calyx, and from without an epigynous disk. *Ovary* inferior, with more cells than 2; *ovules* solitary, pendulous; *styles* equal in number to the cells, sometimes connate; *stigmas* simple. *Fruit* succulent or dry, consisting of several 1-seeded cells. *Seeds* solitary, pendulous, adhering to the pericarp; *albumen* fleshy, having a minute *embryo* at the base, with its radicle pointing to the hilum.—*Trees, shrubs,* or *herbaceous* plants, with, in all respects, the habit of Umbelliferæ.

Anomalies. Adoxa is apetalous, its petals being changed into an additional row of stamens.

Affinities. Distinguished from Umbelliferæ chiefly by their many-celled fruit and more shrubby habit; to which De Candolle adds their fleshy albumen with an embryo of nearly the same length. Very near Vitaceæ, from which their inferior fruit, pendulous seeds and stamens alternate with the petals chiefly distinguish the plants of this order. Araliaceæ are moreover connected with Caprifoliaceæ through Hedera.

Geography. China, India, North America, and the Tropics of the New World, are the chief abodes of the species of this small order.

Properties. The Ginseng, which is the root of Panax quinquefolium, is much valued by the Chinese for its beneficial influence upon the nerves, and for other supposed properties. It is, however, discarded from European practice. *Ainslie*, 1. 154. There appears to be no reasonable doubt that the Ginseng has really an invigorating and stimulant power when fresh. The virtues that are ascribed to it by the Chinese, although perhaps imaginary to a great extent, are nevertheless founded upon a knowledge of its good effects; which, after the statements made by Father Jartoux, cannot reasonably be called in question. An aromatic gum resin is exuded by the bark of Aralia umbellifera, and others. Aralia nudicaulis is used in North America as a substitute for Sarsaparilla. The Ivy exudes a gum resin or peculiar principle, called Hederine, and the leaves are irritating. *(Royle.)*

GENERA.

Adoxa, L.
Moschatellina, Tour.
Panax, L.
Cussonia, Thunb.
Maralia, Pet. Thou.
Gilibertia, R. et P.
Gastonia, Comm.
Polyscias, Forst.
Torricellia, DC.
Aralia, L.
Sciodaphyllum, P. Br.
Actinophyllum, R. et P.
Hedera, Swartz.
Gynapteina, Blum.
Paratropia, Bl.
Arthrophyllum, Blum.
Botryodendron, Endl.

Alliance IV. *GROSSALES.*

Essential Character.—*Flowers* never arranged in umbels. *Calyx* superior, *epigynous* disk, if present, not in several pieces. *Carpels* usually many seeded, with the seeds distinct from the pericarp. *Stems* solid.

The three orders of which it is proposed to constitute this alliance are scattered through various parts of the system of De Candolle, and are associated with other orders, their supposed relationship to which it is difficult to comprehend, as for example Grossulaceæ near Cactaceæ, Escalloniaceæ by Saxifragaceæ

and Bruniaceæ near Hamamelaceæ. The reader is referred to the observations under each order for such arguments as I have to advance for associating them, and stationing them here. It is to be expected that much more light will be thrown upon this subject by the future discovery of other genera.

Order. XIII. GROSSULACEÆ. The Currant Tribe.

Grossularieæ, *DC. Fl. Fr.* 4. 406. (1804); *Kunth Nov. G. et Sp.* 6. 58. (1823); *DC. Prodr.* 3. 477. (1828); *Spach in Ann. sc. ser.* 2. *tom.* 4. *p.* 16. (1835).—Ribesiæ, *Ach. Rich. Bot. Med.* 2. 487. (1823).—Grossulaceæ, *Mirb. Elem.* 2. 897. (1815); *Lindl. Synops.* 106. (1829).

Essential Character.—*Calyx* superior, 4- or 5-parted, regular, coloured. *Petals* 5, minute, inserted in the throat of the calyx. *Stamens* 5, inserted alternately with the petals, very short. *Ovary* 1-celled, with 2 opposite parietal placentæ; *ovules* numerous; *style* 2-3-4-cleft. *Berry* crowned with the remains of the flower, 1-celled; the cell filled with pulp. *Seeds* numerous, suspended among the pulp by long filiform cords; *testa* externally gelatinous, adhering firmly to the *albumen*, which is horny; *embryo* minute, excentrical, with the *radicle* next the hilum.—*Shrubs*, either unarmed or spiny. *Leaves* alternate, lobed, with a plaited vernation. *Flowers* in axillary racemes, with bracts at their base, rarely unisexual.

Affinities. Notwithstanding the great dissimilarity in the appearance of these plants and Cactaceæ, the two orders were formerly confounded, and are still accounted by most writers conterminous, chiefly on account of their both having inferior pulpy fruit and parietal placentæ, resemblances which are altogether those of analogy, and not of affinity. Von Martius, however, *(Conspectus*, no. 222,*)* abandons this view, and stations them somewhere between Saxifragaceæ and Onagraceæ, associating the former with Francoaceæ. I cannot but think, however, that considering the strongly marked habit of Grossulaceæ, and notwithstanding the similarity between the flowers of Ribes speciosum and Fuchsia, this order's true affinities are of another nature, and are best indicated by the excess of albumen in the seeds. Berberaceæ, for example, may be considered Grossulaceæ with superior fruit and peculiar anthers, and Pittosporaceæ with their succulent fruit, and aromatic leaves are again little more than Grossulaceæ with superior fruit having a central placenta and with undivided leaves; this latter character being diminished in importance by the fact of the lower leaves of Sollya heterophylla being serrated, which is the first tendency to separation into lobes, and by the decided although irregular lacerations of the leaves of at least one species of Pittosporum (rhombifolium). Bursaria, too, is spiny like Ribes.

Geography. Natives of the mountains, hills, woods, and thickets, of the temperate parts of Europe, Asia, and America, but unknown in Africa, the tropics of either hemisphere, or the South Sea Islands. In North America they are particularly abundant, and on the mountains of Northern India they contribute to give a European character to that remarkable region.

Properties. The properties of the Gooseberry and Currant are those of the generality of the order, except that in other species a mawkish or extremely acid taste is substituted for the refreshing and agreeable flavour of the former. Some are emetic; one is said to be intoxicating *(R. Inebrians)*. The black Currant, which is tonic and stimulant, has fragrant glands upon its leaves and flowers; these reservoirs are also found upon some other species. Malic acid exists in Currants and Gooseberries. *Turner*, 634.

GENERA.

Ribes, L. *Grossularia*, Tourn. *Botrycarpum*, Rich. Chrysobotrya, Spach. Calobotrya, Spach. Coreosma, Spach. Rebis, Spach.

Order XIV. ESCALLONIACEÆ.

Escallonieæ, *R. Brown in Franklin's Voyage*, 766. (1824.); *Aug. de St. H. Fl. Bras.* 3. 92. (1833).—Saxifragaceæ § 1. Escallonieæ, *DC. Prodr.* 4. 2. (1830).

Essential Character.—*Calyx* superior, 5-toothed. *Corolla* consisting of 5 petals, alternate with the segments of the calyx, from within which they arise, forming by their cohesion a tube, but finally separating from each other; æstivation imbricated. *Stamens* arising from the calyx, alternate with the petals; *anthers* bursting longitudinally. *Disk* conical, epigynous, plaited, surrounding the base of the style. *Ovary* inferior, usually 2-celled, with two large polyspermous placentæ in the axis; *style* simple; *stigma* 2-lobed. *Fruit* capsular, 2-celled, surmounted by the persistent style and calyx, splitting by the separation of the cells at their base. *Seeds* very numerous and minute; with a transparent membranous integument; *embryo* minute, in a mass of oily *albumen*, its *radicle* opposite the hilum.—*Shrubs* with alternate, toothed, resinously glandular, exstipulate *leaves*, and axillary conspicuous *flowers*.

Anomalies. In Escallonia canescens the embryo is nearly as long as the albumen (*Aug. De St. H.*).

Affinities. By De Candolle and others, these plants are either considered a section of Saxifragaceæ or are placed in the immediate vicinity of that order; an opinion which is founded upon their inferior polyspermous fruit, composed of two carpels, their polypetalous flowers with a small number of stamens, and some similarity in their habit as compared with Cunoniaceæ, which are also often referred to Saxifragaceæ. By other writers they are contrasted with Ericaceæ and Vaccinaceæ, and I think for equally weighty reasons they might be placed near Melastomaceæ, with which their inferior fruit, polypetalous flowers, and the remarkable cup-shaped epigynous disk of Escallonia in some degree assimilate them. Brown, however, long since demonstrated the necessity of considering them closely allied to Grossulaceæ, from which, indeed, they are hardly known, except by their oily albumen, dry fruit with central placentæ, and cohering petals. Of that order they must therefore of necessity follow the station. From Bruniaceæ they are known, firstly, by their broad leaves, lax inflorescence and larger flowers; and secondly, by their many-seeded fruit; but if we search for further points of difference, we shall hardly find them, for the epigynous disk of Escallonia does not appear to be universal in the order of that name, and the dicarpellary structure of the fruit, on account chiefly of which, and the final divergence of the styles, Escalloniaceæ are placed near or in Saxifragaceæ, affords an equally strong reason for placing Bruniaceæ in the same place. In short, Bruniaceæ appear to be a slightly developed form of Escalloniaceæ.

Geography. All found in the temperate parts of the world, especially South America. In countries near the equator belonging to the west side of America, Escallonias grow at the prodigious elevation of 6,600 to 14,760 feet, and there with Oaks and Drymis, they form a vegetable region *(Humboldt)*. They are even found as far southward as the Straits of Magellan. *(A. de St. H.)* A few species of the order occur in the Isle of Bourbon, and the southern parts of Australia.

Properties. Unknown. Handsome shrubs, with evergreen leaves, which have often a powerful odour.

GENERA.

Escallonia, Mutis.	Forgesia, Comm.	Itea, L.	Pickeringia, Nutt.
Stereoxylum, R.et P.	*Defforgia*, Lam.	*Diconangia*, Mitch.	
Quintinia, A. DC.	Anopterus, La. Bill.	*Cedrela*, Lour.	

Order XV. BRUNIACEÆ.

Bruniaceæ, *R. Brown in Abel's China*, (1818); *DC. Prodr.* 2. 43. (1825); *Ad. Brongniart in Ann. des Sc. Nat.* (1826).

Essential Character.—*Calyx* superior, 5-cleft, imbricated, occasionally nearly inferior. *Petals* alternate with the segments of the calyx, arising from its throat, imbricated. *Stamens* alternate with the petals, arising from the same point, or from a disk surrounding the ovary; *anthers* turned outwards, 2-celled, bursting longitudinally. *Ovary* half inferior, with from 1 to 3 cells, in each of which there is from 1 to 2 suspended collateral ovules; sometimes 1-celled from the abortion of carpels, or that of the dissepiments; *style* simple or bifid; *stigma* simple. *Fruit* dicoccous or indehiscent, 2- or 1-celled, crowned by the persistent calyx. *Seeds* solitary or in pairs, suspended, sometimes with a short aril; *albumen* fleshy; *embryo* minute at the base of the seed, with a conical radicle, and short fleshy cotyledons.—Branched, heath-like *shrubs*. *Leaves* small, imbricated, rigid, entire, with a callous point. *Flowers* small, capitate, or panicled, or even terminal, and solitary; either naked, or with large involucrating bracts.

Anomalies. Berzelia has a single carpel. Raspailia has the ovary superior.

Affinities. These appear to be most immediate with the last order, which see. Mœsslera (which is Tittmannia of Brong.) has an ovary which seems in a state of transition to Grossulaceæ. According to Brown, the order is nearly allied to Hamamelaceæ, which are known by their habit, stipules, and deciduous valves of the anthers, and also by their valvate sepals and petals. Brongniart indicates an affinity with Myrtaceæ through Imbricaria, which is very nearly constructed as true Bruniaceæ, but has the stamens opposite the petals, and dotted leaves. He also considers that Cornaceæ bear them much real affinity, and he even contrasts them with Umbelliferæ, to which they no doubt approximate very nearly. The genus Raspailia is remarkable for having the stamens arising from the top of a superior ovary! and Thamnea is perhaps a solitary instance of a 1-celled ovary with the ovules adhering to a central columnar axis.

Geography. All found at the Cape of Good Hope, with the exception of a single species inhabiting Madagascar.

Properties. Unknown.

GENERA.

Berzelia, Brongn.	*Levisanus*, Schreb.	Linconia, L.	Mœsslera, Rchb.
Brunia, L.	*Astrocoma*, Neck.	Audouinia, Brongn.	*Tittmannia*, Brongn.
Raspailia, Brongn.	Berardia, Brongn.	*Pavinda*, Thunb.	Thamnea, Soland.
Staavia, Thunb.	Gravenhorstia, N. ab E. (4.)		

Alliance V. *BERBERALES.*

Essential Character.—*Anthers* bursting by recurved valves.

This simple character is so remarkable that it seems in all cases, as far as we at present know, to form of itself an important mark of distinction. It may however prove, as many another has already proved, less valuable than is sup-

posed. In that case the alliance would possibly have to be combined with either Anonales or Ranunculaceæ. At present I know no more of its affinities than is stated under the order itself and Grossulaceæ.

Order XVI. BERBERACEÆ. The Berberry Tribe.

Berberideæ, *Vent. Tabl.* 3. 83. (1799); *DC. Syst.* 2. 1. (1821); *Prodr.* 1. 105. (1824); *Lindl. Synops.* 14. (1829.)

Essential Character.—*Sepals* 3-4-6, deciduous, in a double row, surrounded externally by petaloid scales. *Petals* hypogynous, either equal to the sepals in number, and opposite to them, or twice as many, sometimes with an appendage at the base in the inside. *Stamens* equal in number to the petals, and opposite to them; *anthers* generally with two separated cells, opening elastically with a valve from the bottom to the top. *Ovary* solitary, 1-celled; *style* rather lateral; *stigma* orbicular. *Fruit* berried or capsular. *Seeds* attached to the bottom of the cell on one side, 1, 2, or 3; *albumen* between fleshy and corneous; *embryo* minute, occasionally as long as the axis of the albumen.—*Shrubs* or *herbaceous perennial* plants, for the most part smooth. *Leaves* alternate, compound, usually without *stipules*.

Affinities. Botanists appear of one opinion in considering Menispermaceæ the nearest order to this, agreeing in having the stamens opposite the petals, the floral envelopes regularly imbricated, 3 or 4 in each row, never 5, the fruit usually baccate, and fleshy albumen. These, however, differ in their habit, the separation of the sexes in distinct flowers, and the presence of several distinct carpels, while in Berberaceæ there is never more than one, which is perfectly simple, as is demonstrated by the position of the placentæ, the single style, &c. I am, however, of opinion that under all circumstances Menispermaceæ must go to Incompletæ, and that consequently the supposed relationship of Menispermaceæ is more slight than is believed. (*See* that order hereafter.) The true affinity of Berberaceæ appears to be on the one hand with Grossulaceæ, with which the genus Berberis agrees even in habit, and on the other hand with Umbelliferæ, through the section Nandineæ. This latter differs exceedingly in habit from the section Berberideæ, and shows of how little real value external form is in determining affinities. In its pouched petals, and general appearance, the section Nandineæ may be compared to Fumarieæ. With Podophylleæ the order is connected through Leontice and Diphylleia, which have a near relation to Jeffersonia and Podophyllum itself. In the singular structure of their anthers there is a striking analogy with Lauraceæ, Atherospermaceæ, and Hamamelaceæ, orders not otherwise akin to Berberaceæ. Leontice thalictroides offers one of the few instances of seeds being absolutely naked, that is to say, not covered by any integument originating in the pericarp. In this plant the ovary is ruptured in an early state by the expansion of the ovule, which, having been impregnated, continues to grow, and ultimately arrives at maturity, although deprived of its pericarpial covering. The spines of the common Berberry are a curious state of leaf, in which the parenchyma is displaced, and the ribs have become indurated. They, as well as all the simple leaves of the other species, are articulated with the petiole, and are therefore compound leaves reduced to a single foliole; whence the supposed genus Mahonia does not differ essentially from Berberis in foliage any more than in fructification. Berberaceæ are related to Anonaceæ through the genus Bocagea; their ovary is described as being sometimes strikingly like that of Davilla in Dilleniaceæ. (*Fl. Bras.* 1. 47.) Aug. de St. Hilaire remarks, that the opposition of the stamens to the petals, and the erect ovules,

place them in alliance with Vitaceæ. *Fl. Bras.* 1. 47. Some of the pinnated species of Berberis have stipules.

Geography. Natives of mountainous places in the temperate parts of the northern hemisphere, and of South America as far as the Straits of Magellan; none in Africa, Australasia, or the South Sea islands. *DC.*

Properties. The berries of Berberis vulgaris and other species are acid and astringent, and form with sugar an agreeable refreshing preserve. Their acid is the oxalic. (Malic, *Royle.*) The stem and bark of the Berberry are excessively astringent, and are employed for that reason by dyers. *DC.* The root yields a yellow dye. *A. Rich.*

GENERA.

§ 1. Berberideæ.
Berberis, L.
Mahonia, Nutt.

§ 2. Nandineæ.
Epimedium, L.
Nandina, Thunb.
Leontice, L.
Achlys, DC.
Caulophyllum, Michx.
Diphylleja, Michx.
Aceranthus, Morren.
Vancouveria, Morren.
Bongardia, Meyer.

Alliance VI. *PITTOSPORALES.*

Essential Character.—*Carpels* all combined completely into a solid ovary, with a single style. *Placentæ* central. *Stamens* never epigynous.

This is undoubtedly the weakest part of the albuminous group, and will in all probability be entirely altered by the discovery of other plants. In the meanwhile, on the one hand, the affinity of Vitaceæ with Umbelliferæ is unquestioned and unquestionable; and I think that few persons can be found to doubt that Sarraceniaceæ are in close alliance with Papaveraceæ, or Francoaceæ with Ranunculaceæ, or Pittosporaceæ with Dilleniaceæ through Cheiranthera. With regard to the mutual relation of the natural orders grouped under this alliance, I must confess that, with the exception of Vitaceæ and Pittosporaceæ, about which I entertain no doubt, the others are too little known by me, and probably too little investigated by others, to enable any one to form a correct opinion about them. But I no more perceive the resemblance of Olacaceæ to Sapotaceæ, Aquilariaceæ, or Aurantiaceæ, and of Francoaceæ to Crassulaceæ, or Saxifragaceæ, than to those plants with which they are here associated; and certain it is that Francoaceæ are *at least* as near Ranunculaceæ as any of the orders to which they have been before compared.

Order XVII. VITACEÆ. The Vine Tribe.

Vites, *Juss. Gen.* 267. (1789).—Sarmentaceæ, *Vent. Tabl.* 3. 167. (1799).—Viniferæ, *Juss. Mem. Mus.* 3. 444. (1817).—Ampelideæ, *Kunth in Humboldt, N. G. et Sp.* 5. 223. (1821); *DC. Prodr.* 1. 627. (1824).—Leeaceæ, *Bartling Ord. Nat.* p. 354. (1830). *Martius Conspectus, No.* 148. (1835.)

Essential Character.—*Calyx* small, nearly entire at the edge. *Petals* 4 or 5, inserted on the outside of a disk surrounding the ovary; in æstivation turned inwards at the edge, in a valvate manner, and often inflected at the point. *Stamens* equal in number to the petals, and opposite them, inserted upon the disk, sometimes sterile by abortion; *filaments* distinct, or slightly cohering at the base; *anthers* ovate, versatile. *Ovary* superior, 2-celled; *style* 1, very short; *stigma* simple; *ovules* erect, definite. *Berry* round, often by abortion 1-celled, pulpy. *Seeds* 4 or 5, or fewer by abortion, bony, erect; *albumen*

hard; *embryo* erect, about one half the length of the albumen; *radicle* taper; *cotyledons* lanceolate, plano-convex.—Scrambling, climbing *shrubs*, with tumid separable joints. *Leaves* with stipules at the base, the lower opposite, the upper alternate, simple or compound. *Peduncles* racemose, sometimes by abortion changing to tendrils often opposite the leaves. *Flowers* small green.

Affinities. If Vitis is compared with Aralia racemosa, the close relationship of this order to Umbellales will be too obvious to be mistaken. Suppose that Aralia racemosa had an inferior calyx, erect ovules, with stamens opposite the petals, and it would be a Vitis. A remarkable character in Umbelliferæ is their petals turned inwards at the points; this occurs also in Ampelopsis quinquefolia; in foliation there is no material difference between them, and even a trace of similarity between the sensible properties of Vitaceæ and Umbelliferæ may be perceived in the acrid berries of some species of Cissus. The propriety of placing Leea along with Vitaceæ has been questioned, and that plant has either been referred absolutely to Meliaceæ, or erected into a distinct order, as by von Martius. Adrien de Jussieu has, however, in his Dissertation upon Meliaceæ, satisfactorily shewn (p. 33) that the genus ought not to be divided from Vitaceæ. The tumid joints, which separate from each other by an articulation, along with the many other points of agreement in their fructification, approximate the order to Geraniaceæ; the habit and inflorescence to Caprifoliaceæ, through Hedera. The tendrils of the order are the branches of inflorescence, the flowers of which are abortive. A singular variety of Vitis vinifera, with capsular fruit and loculicidal dehiscence, is described in the *Linnæa*, 5. 493.

Geography. Inhabitants of woods in the milder and hotter parts of both hemispheres, especially in the East Indies.

Properties. Acid leaves, and a fruit like that of the common grape, is the usual character of the order. The sap or tears of the vine are a popular remedy in France for chronic ophthalmia, but they are of little value. The leaves, on account of their astringency, are sometimes used in diarrhœa. But the dried fruit and wine are the really important products of the grape; products which are, however, yielded by no other of the order, if we except the Fox-grapes of North America, which scarcely deserve to be excepted. The acid of the grape is chiefly the tartaric; malic acid, however, exists in them. The sugar contained in grapes differs slightly from common sugar in composition, containing a smaller quantity of carbon. *Turner*, 682. The leaves of Cissus cordata and C. setosa are described as being acrid and useful in bringing indolent tumours to suppuration. The berries of the latter are also acrid, as indeed are those of some other species. *Royle, &c.*

GENERA.

Cissus, L.	Vitis, L.	Leea, L.	? Geruma, Forsk.
Sœlanthus, Forsk.	Pterisanthes, Bl.	*Aquilicia*, L.	
Ampelopsis, Mich.		*Ottilis*, Gærtn.	

Order XVIII. PITTOSPORACEÆ.

Pittosporeæ, *R.Brown in Flinder's Voyage*, 2. 542. (1814); *DC. Prodr.* 1. 345. (1824); *Ach. Rich. in Dict. Class* 13. 643. (1828).

Essential Character.—*Sepals* 5, deciduous, either distinct or partially cohering; *æstivation* imbricated. *Petals* 5, hypogynous, sometimes slightly cohering; *æstivation* imbricated. *Stamens* 5, hypogynous, distinct, alternate with the petals. *Ovary* single, distinct, with the cells or the placentæ 2 or 5 in number, and many-seeded; *style* 1; *stigmas*

equal in number to the placentæ. *Fruit* capsular or berried, with many-seeded cells, which are sometimes incomplete. *Seeds* often covered with a glutinous or resinous pulp; *embryo* minute, near the hilum, lying in fleshy *albumen*; *radicle* rather long; *cotyledons* very short.—*Trees* or *shrubs*. *Leaves* simple, alternate, without stipules, usually entire. *Flowers* terminal or axillary, sometimes polygamous.

Affinities. Brown, in establishing this as an order, remarks that it is widely different from Rhamnaceæ or Celastraceæ, but without pointing out its real affinity; De Candolle places it between Polygalaceæ and Frankeniaceæ; according to Achille Richard, the order is very near Rutaceæ, to which he thinks it allied by a crowd of characters. The great mass of albumen in the seeds, the minute embryo, the general accordance of the flowers with the structure of Vitaceæ, which is further established by the succulent fruit and climbing habit of Billardiera, seem to place Pittosporaceæ here. As to Dilleniaceæ, the declinate stamens and general habit of Cheiranthera form a transition from Pittosporaceæ to that order, at once of the most curious and the most satisfactory kind.

Geography. Chiefly New Holland plants. A few are found in Africa and the adjacent islands, and one in Nipal. Brown remarks that Pittosporum itself has been found not only in New Holland, but also in New Zealand, Norfolk Island, the Society and Sandwich Islands, the Moluccas, China, Japan, and even Madeira. *Flinders*, 542.

Properties. The wood of Senacia undulata is handsomely veined, whence it is called in the Mauritius *Bois de joli cœur*. *DC.* The berries of Billardiera are eatable; but they have a resinous odour, and a bitter subacrid taste. The bark of Pittosporum Tobira has a resinous smell.

GENERA.

Billardiera, Sm.	Sollya, Lindl.	Bursaria, Cav.	Senacia, Comm.
Pittosporum, Banks.	Cheiranthera, A. C.	*Itea*, Andr.	

Order XIX. OLACACEÆ.

Olacineæ, *Mirb. Bull. Philom. n.* 75. 377. (1813); *DC. Prodr.* 1. 531. (1824); *Bartl. Ord. Nat.* p. 423. (1830.)

Essential Character.—*Calyx* small, entire, or slightly toothed, finally becoming, in many cases, enlarged. *Petals* definite, hypogynous, valvate in æstivation, either altogether separate, or cohering in pairs by the intervention of stamens. *Stamens* definite, part fertile, part sterile; the former varying in number from 3 to 10, hypogynous, usually cohering with the petals, and alternate with them; the latter opposite the petals, to which they in part adhere, their upper end resembling an appendage; *filaments* compressed; *anthers* innate, oblong, 2-celled, bursting longitudinally. *Ovary* superior, 1-celled, with 3 ovules pendulous from the top of a central column or placenta. *R. Br.* *Style* filiform; *stigma* simple. *Fruit* somewhat drupaceous, indehiscent, frequently surrounded by the enlarged calyx, 1-celled, 1-seeded. *Seed* pendulous; *albumen* large, fleshy; *embryo* small, in the base of albumen, its *radicle* near the hilum.—*Trees* or *shrubs* often spiny. *Leaves* simple, alternate, entire, without stipules; occasionally altogether wanting (rarely compound). *Flowers* small, axillary, often fragrant.

Affinities. De Candolle places this order near Aurantiaceæ, with which it agrees in many respects, differing, however, in the structure of the ovary, the want of a disk, the unsymmetrical flowers, &c. Jussieu, on the contrary regards its affinity as the strongest with Sapotaceæ, considering the corolla as monopetalous. Brown considers the order nearly akin to Santalaceæ. In reality its affinities are extremely uncertain. The probability is in favour of its

being stationed near Aurantiaceæ; but then its seed with a minute embryo in the base of fleshy albumen, indicates a totally different relationship. It is, however, to be remarked that Brown ascribes to Olax a cylindrical embryo in the axis of the albumen, but Roxburgh, and Wight, and Arnott, deny this, ascribing, however, that structure to their Ximenia? olacioides.

Geography. A small order, consisting of tropical or nearly tropical shrubs, chiefly found in the East Indies, New Holland, and Africa. One only is known in the West Indies. None have been described from any part of South America, south of Dutch Guiana.

Properties. The wood of Heisteria coccinea is the Partridge wood of the cabinet-makers. The drupes of Ximenia americana have a sweet aromatic taste, but a little rough to the palate. They are eaten in Senegal. The flowers are very sweet. The pulp of the fruit of Balanites ægyptiaca when unripe is very purgative, acid, and extremely bitter; but it becomes pleasant and eatable when ripe. *Fl. Seneg.* 1. 104.

GENERA.

Olax, L.	Heisteria, L.	Pseudaleia, Pet. Thou.	Platea, Bl.
Roxburghia, Kön.	? Balanites, Del.	Pseudaleioides, Pet.Th.	Stemonurus, Bl.
Spermaxyrum, La B.	Ximenia, L.	? Opilia, Roxb.	Gomphandra, Wall. (5)
Fissilia, Commers.	*Heymassoli*, Aubl.	*Grcutia*, Guillem.	Icacina, Adr. J.

Order XX. FRANCOACEÆ.

Galacineæ, *Don in Edinb. New Phil. Journ. Oct.* 1828. *Ed. Pr. No.* 146 (1830).—Francoaceæ, *Ad. de Juss. Ann. Sc. Nat.* 25. 9. (1832); *Lindl. in Bot. Reg. fol.* 1645. (1834); *Key to Bot.* 47. (1835.)

Essential Character.—*Calyx* deeply four-cleft. *Petals* 4, inserted near the base of the calyx. *Stamens* subhypogynous, four times as numerous as the petals, alternately rudimentary. *Ovary* superior, with 4 cells opposite the petals; *ovules* numerous; *stigma* 4-lobed sessile. *Capsule* membranous, 4-valved, with a loculicidal, or septicidal dehiscence. *Seeds* numerous, minute, with a minute *embryo* in the base of fleshy albumen.—Stemless *Herbaceous* plants with lobed or pinnated leaves, without stipules. *Stems* scape-like with a racemose inflorescence. *Petals* persistent for a long time.

Affinities. Near Saxifragaceæ according to Don, Rosaceæ in the opinion of De Candolle, Crassulaceæ according to Adrien de Jussieu and Hooker. It is true, that looking to the separation of the carpels of Francoa when ripe, and the abortive stamens a case in favour of the approximation of the order to Crassulaceæ may seem to be made out; but then Tetilla does not separate its carpels, but divides them through the bark; and moreover, there is no resemblance either in habit or in proportionals of the flowers, or in the structure of the fruit, or in the organization of the seeds between that order and Francoaceæ. It will probably turn out that the real affinity of these plants is with Dionæa, which chiefly differs in its unilocular fruit, and the want of sterile stamens. Its seeds are absolutely the same in all essential respects, and I do not know that there would be any thing unnatural in actually associating that remarkable genus with this order. It is probable that Galax belongs in reality to Pyrolaceæ *(Ad. de J.)*, and consequently the order Galacineæ is abolished.

Geography. Found in the temperate parts of South America.

Properties. Unknown.

GENERA.

Francoa, Cav.
Tetilla, DC.
Dimorphopetalum, Bert.

Order XXI. SARRACENIACEÆ.

Sarraceniæ, *Turpin in Dict. des Sc.* c. ic. (?); *De la Pylaie in Ann. Linn. Par.* 6. 388. t. 13. (1827); *Hooker Fl. Boreal. Am.* p. 33. (1829).

Essential Character.—*Sepals* 5, persistent, often having a 3-leaved involucre on the outside; *æstivation* imbricate. *Petals* 5, hypogynous, unguiculate, concave. *Stamens* indefinite, hypogynous; *anthers* oblong, adnate, 2-celled, bursting internally and longitudinally. *Ovary* superior, 5-celled, with polyspermous placentæ in the axis; *style* single; *stigma* much dilated, peltate, with 5 angles. *Capsule* crowned by the persistent stigma, with 5 cells and 5 loculicidal valves. *Seeds* very numerous, minute, slightly warted, covering 5 large placentæ, which project from the axis into the cavity of the cells; *albumen* abundant; *embryo* cylindrical lying near the base of the seed, with the *radicle* turned to the *hilum*.—*Herbaceous* perennial plants, living in bogs. *Roots* fibrous. *Leaves* radical, with a hollow urn-shaped petiole, at the apex of which is articulated the lamina, which covers the petiole like a lid. *Scapes* each having one large flower, of a more or less herbaceous colour.

Affinities. These are not well made out. It is usual to refer Sarracenia to the vicinity of Papaveraceæ, on account of its remarkably dilated stigma, which is compared to that of Papaver, its indefinite stamens and small embryo lying at the base of copious albumen; and there can be no doubt that these points of resemblance are important. But I believe it is also akin to that order, whatever it may be, which shall finally comprehend Dionæa. With this genus no one has suspected the analogy of Sarracenia; a circumstance which has arisen, I presume, chiefly from attention having been turned to the fructification rather than the vegetation of those genera. If we compare the foliage of Dionæa with that of Saracenia, we shall find that the pitcher of the latter is represented by the dilated footstalk of the former, which only requires its margins to cohere to be identical with it, and that the lid of the pitcher of the latter is analogous to the irritable lamina of the former. In both genera the stamens are hypogynous; both have a single stigma, which in Sarracenia is petaloid, in Dionæa is merely fringed; both have an embryo lying at the base of copious albumen, and both have polyspermous placentæ. In the internal arrangement of the fruit the two genera are dissimilar; but the differences depend upon peculiar modifications of structure, which cannot be considered to affect affinities otherwise so strongly indicated. In the remarkable structure of the leaves this order agrees with Nepenthaceæ and Cephalotaceæ.

Geography. The species are exclusively confined to the bogs of North America.

Properties. Unknown.

GENUS.

Sarracenia, L.

Group II. Epigynosæ.

Essential Character.—*Ovary* inferior, usually having an epigynous disk. *Seeds* not having a disproportionate quantity of albumen.

That all the orders comprehended in this group are really connected by some common character, can hardly be doubted by any one. The third and fourth, and especially the fifth and sixth alliances, are imperfect, and will, no doubt, be more correctly limited when more forms that shall be referable to them have been discovered; but in the mean while Cornales joins Myrtales by Rhizophoraceæ and Loranthaceæ, or Alangiaceæ and Hamamelaceæ; Cucurbi-

tales Onagrales, and Myrtales by Loasaceæ, and Ficoidales by Cactaceæ, while, as will be shown in the proper place, they also touch very closely upon Begoniales by Cucurbitaceæ. With regard to the external relations of this group, it seems to be connected with the Syncarpous group by way of Melastoma and Lythraceæ; with the Albuminous group, through Myrtales, on the one hand, which touch Euphorbiaceæ, and Cactaceæ on the other which approximate to Grossulaceæ. A more distant, but at the same time a striking affinity is to be traced between Epigynosæ and Monopetalous Dicotyledons, if we compare certain Melastomaceæ with Gentianaceæ.

The principal exceptions to the character of this group occur, firstly, in Legnotideæ, of which very little is at present known, and, secondly, in Melastomaceæ and Myrtaceæ, some of which have their ovary nearly superior. The syncarpous fruit with no tendency to separate into carpels, appears a certain mark by which the group may be known from such orders as Rosaceæ or Saxifragaceæ, in which the ovary is sometimes partly inferior.

Alliance I. *ONAGRALES.*

Essential Character.—*Æstivation* not valvate. *Placentæ* central. Every part of the flower some regular multiple of *two*. In most cases *herbaceous* plants.

As this alliance contains but one order, observations upon it will be in a great measure confined to that order. It might perhaps be combined with the next alliance, but its general tendency to form its flowers upon a perfectly dimerous plan, seems to point it out as something more different from Myrtales than the orders of Myrtales are from each other. It is to be remarked that when the number four (or twice two) appears in Myrtales, it is not uniformly preserved through all the parts of the flower, but is departed from in the stamens, or the pistil, or in some organ or other.

Order XXII. ONAGRACEÆ, The Evening Primrose Tribe.

Onagræ, *Juss. Gen.* 317. (1789).—Epilobiaceæ, *Vent. Tabl.* 3. 307. (1799); *Martius Conspectus, No.* 230. (1835).—Onagrariæ, *Juss. Ann. Mus.* 3. 315. (1804) *in part.*; *DC. Prodr.* 3. 35. (1828); *Lindl. Synops.* 107. (1829); *Bartl. Ord. Nat.* 318. (1830).

Essential Character.—*Calyx* superior, tubular, with the limb 4-lobed; the lobes cohering in various degrees, with a valvate æstivation. *Petals* generally equal in number to the lobes of the calyx, into the throat of which they are inserted, regular, with a twisted æstivation. *Stamens* four or eight inserted into the calyx; *filaments* distinct; *pollen* triangular, usually cohering by threads. *Ovary* of several cells, generally crowned by a disk; *style* filiform; *stigma* either capitate or 4-lobed. *Fruit* baccate or capsular, many-seeded, with 4 cells. *Seeds* numerous, without *albumen*; *embryo* straight; *radicle* long and taper; *cotyledons* very short.—*Herbaceous* plants or *shrubs*. *Leaves* alternate or opposite, simple, entire or toothed. *Flowers* red, purple, white, blue, or yellow, axillary, or terminal.

Anomalies.—Lopezia has but one stamen, and is altogether an irregular genus.

Affinities. The above character applies only to the genuine forms of Onagraceæ, which are certainly known from the plants that are otherwise near them, by the regular prevalence of the number 4 in the whole of the parts of fructification. From Lythraceæ they are separated by their inferior fruit, and from Myrtaceæ, to which they approach through Fuchsia, by the absence of pellucid

dots and their definite stamens. Philadelphaceæ are distinguished by their polyandrous flowers, &c. The obscure character of the radicle of the embryo of Onagraceæ being unusually long, has been relied on by some as a characteristic mark of the order. I formerly considered Hydrocaryes, Circæeæ, and Halorageæ, as so many distinct orders; but upon a careful review of all the bearings of the question, I incline to believe that these little assemblages of genera, are mere forms or degenerations of Onagraceæ.

Geography. Chiefly natives of the temperate parts of the world, and especially of America: a good many are found in India, and a large number in Europe. In Africa they are scarcer, being mostly confined to the Cape, and to a few Jussiæas inhabiting other parts of that continent.

Properties. Few, or unknown. Œnothera biennis is cultivated for the sake of its eatable roots; and the leaves of Jussiæa peruviana form an emollient poultice. *DC.*

GENERA.

§ 1. Montinieæ, DC.
Montinia, L.
Hauya, Moç. et Sess.
§ 2. Fuchsieæ, DC.
Fuchsia, Pl.
Quelusia, Vandell.
Dorvalia, Comm.
Nahusia, Schneev.
Skinnera, Forst.
§ 3. Onagreæ, DC.
Œnothera, L.
Heterostemon, Nutt.
Gayophytum, A. de J.
Clarkia, Ph.
Gaura, L.
Epilobium, L.
Chamænerion, Tourn.
Zauschneria, Presl.
§ 4. Jussieæ, DC.
Jussiæa, L.
Prieurea, DC.
Vanhallia, Schult.
Ceramium, Bl.
Ludwigia, L.
Isnardia, L.
Dantia, Thouars.
Lopezia, Cav.
Pisaura, Bonat.

Onosuris, Raf.
Camisonia, Lk.
Pleurostemon, Raf.
Pleurandra, Raf.

The following sub-orders are probably degenerations of Onagraceæ.

Sub-Order. CIRCÆEÆ.

Circæaceæ, *Lindl. Synops.* p. 109. (1829); *Martius Conspectus, No.* 229. (1835).

Essential Character.—*Calyx* superior, deciduous, tubular, with a two-parted limb. *Petals* 2, alternate with the lobes of the calyx. *Stamens* 2, alternate with the petals, inserted into the calyx. *Disk* large, cup-shaped, filling up the whole of the tube of the calyx, and projecting beyond it. *Ovary* 2-celled, with an erect ovule in each cell; *style* simple, arising out of the disk; *stigma* emarginate. *Fruit* 2-celled, 2 valved, 2 seeded. *Seeds* solitary, erect: *albumen* none; *embryo* erect; *radicle* short, inferior. — *Herbaceous* plants. *Leaves* opposite, toothed, stalked. *Flowers* in terminal and lateral racemes, covered with uncinate hairs.

Affinities. These plants differ from true Onagraceæ in their large fleshy disk, which fills up the tube of the calyx, in the solitary erect ovules, and in the binary division of the flower. They may be considered as Onagraceæ deprived of half their parts; their relation to Lopezia is very close.

Geography. Natives of the northern parts of the world, inhabiting groves and thickets.

Properties. Unknown.

GENUS.

Circæa, L.

Sub-Order. HYDROCARYES.

Hydrocaryes, *Link Enum. Hort. Ber.* 1. 141. (1821); *Martius Conspectus, No.* 231. (1835). —Onagrariæ, § Hydrocaryes, *DC. Prodr.* 3. 63. (1828).

Essential Character.—*Calyx* superior, 4-parted. *Petals* 4, arising from the throat of the calyx. *Stamens* 4, alternate with the last. *Ovary* 2-celled; *ovules* solitary, pendu-

ous; *style* filiform, thickened at the base; *stigma* capitate. *Fruit* hard, indehiscent, 1-celled, 1-seeded, crowned by the indurated segments of the calyx. *Seed* solitary, large, pendulous; *albumen* none; *cotyledons* 2, very unequal.—*Floating* plants. Lower *leaves* opposite, upper alternate; those under water cut into capillary segments; *petioles* tumid in the middle. *Flowers* small, axillary.

Affinities. From true Onagraceæ these plants are distinguished by their solitary pendulous ovules; from Halorageæ, by their very large seeds with unequal cotyledons, developed calyx, and want of albumen; agreeing with them, especially with Myriophyllum, in habit.

Geography. Found in the south of Europe, the East Indies, and China.

Properties. The great seeds of Trapa are sweet and eatable. Those of T. bispinosa form an extensive article of cultivation in Cashmere and other parts of the East, where they are a common food, under the name of Singhara nuts.

GENUS.

Trapa, L.
Tribuloides, Tourn.

Sub-Order. HALORAGEÆ.

Halorageæ, *R. Brown in Flinders*, 17. (1814); *DC. Prodr.* 3. 65. (1828); *Lindl. Synops.* 110. (1829); *Bartl. Ord. Nat.* 314. (1830); *Martius Conspectus, No.* 228 (1835).—Hygrobieæ, *Rich. Anal. Fr.* (1808).—Hippurideæ, *Link Enum.* 1. 5. (1821) *handb.* 1. 288. (1829).—Cercodianæ, *Juss. Dict. Sc. Nat.* (1817).

Essential Character.—*Calyx* superior, with a minute limb. *Petals* minute, inserted into the summit of the calyx, or wanting. *Stamens* inserted in the same place, equal in number to the petals, or occasionally fewer. *Ovary* adhering inseparably to the calyx, with 1 or more cells; *style* none; *stigmas* equal in number to the cells, papulose, or pencil-formed; *ovules* pendulous. *Fruit* dry, indehiscent, membranous, or bony, with 1 or more cells. *Seeds* solitary, pendulous; *albumen* fleshy; *embryo* straight, in the axis; *radicle* superior, long and taper; *cotyledons* minute.—*Herbaceous* plants or *under-shrubs*, often growing in wet places. *Leaves* either alternate, opposite, or whorled. *Flowers* axillary, sessile, occasionally monœcious or dicœcious.

Affinities. Placed by Link among Monocotyledons, but inseparable from Dicotyledons, and apparently a degeneration or imperfect form of Onagraceæ, from which the minute calyx and albuminous solitary pendulous seeds chiefly distinguish them. The presence or absence of albumen when it is only deposited in small quantities, is a character of much less importance than was once supposed; and the pendulous ovules will hardly be allowed much value by themselves. Among other evidences of these being merely an imperfect form of Onagraceæ, may be adduced the general reduction in size of all the parts, and the occasional want of petals. Callitrichaceæ, although placed among Halorageæ, seems to be referred by the achlamydeous flowers to Imperfectæ. See order 142.

Geography. Damp places, ditches, and slow streams, in Europe, North America, southern Africa, Japan, China, New Holland, and the South Sea Islands, are the resort of this order.

Properties. Of no importance.

GENERA.

Myriophyllum, L.
Ptilophyllum, Nutt.
Purshia, Rafin.
Proserpinaca, L.
Trixis, Mitch.
Mejonectes, R. Br.
Cercodia, Murr.
Haloragis, Forst.
Goniocarpus, Thunb.
Gonatocarpus, W.
Serpicula, L.
Laurembergia, Berg.? Spondylantha, Presl.
Hippuris, L.
Limnopeuce, Vaill.
Riesenbachia, Presl.
Gongylocarpus, Schlec.

Alliance II. *MYRTALES.*

Essential Character.—*Æstivation* not valvate. *Placentæ* occupying the centre of the fruit. Parts of the flower not a regular multiple of any number throughout. In most cases shrubby plants or trees.

This alliance is connected with the last through Myrtales, some of which approach the genus Fuchsia, and with Cucurbitales by way of Cactaceæ, which are in some respects succulent Myrtaceæ. The relation of Myrtales to Cornales is less obvious; but at the same time it does not appear that the orders comprehended under the latter alliance are nearer to any other polypetalous plants. The transition probably occurs between Alangiaceæ and Hamamelaceæ.

Order XXIII. COMBRETACEÆ. The Myrobalan Tribe.

Combretaceæ, *R. Brown Prodr.* 351. (1810), *incidentally without a character; in Flinders*, 2. 548. (1814); *A. Rich. Dict. Class.* 4. 353. (1823); *DC. Prod.* 3. 9. (1828); *Memoire* (1828); *Bartl. Ord. Nat. p.* 322. (1830); *Martius Conspectus, No.* 177. (1835).—Myrobolaneæ, *Juss. Dict. Sc. Nat.* 31. 458. (1824.)

Essential Character.—*Calyx* superior, with a 4- or 5-lobed deciduous limb. *Petals* arising from the orifice of the calyx, alternate with the lobes; sometimes wanting. *Stamens* arising from the same part, twice as many as the segments of the calyx, very rarely equal to them in number, or 3 times as many; *filaments* distinct, subulate; *anthers* 2-celled, bursting longitudinally. *Ovary* 1-celled, with from 2 to 4 ovules, hanging from the apex of the cavity; *style* 1; *stigma* simple. *Fruit* drupaceous, baccate, or nut-like, 1-celled, by abortion 1-seeded, indehiscent, often winged. *Seed* pendulous, without albumen; *embryo* with the radicle turned towards the hilum; *plumule* inconspicuous; *cotyledons* leafy, usually convolute, occasionally plaited.—*Trees* or *shrubs*. *Leaves* alternate or opposite, without stipules, entire. *Spikes* axillary or terminal.

Anomalies. Often apetalous.

Affinities. "These may be placed indifferently in the vicinity of Santalaceæ and Elæagnaceæ, or of Onagraceæ and Myrtaceæ, approaching the former by the apetalous genera, and the latter by those which have petals." *DC.* To Myrtaceæ and Melastomaceæ they are related through Memecylaceæ, and especially to the former, by Punica, with which they agree in the structure of their embryo. In the latter respect they also accord with Rhizophoraceæ and Vochyaceæ; and with Alangiaceæ and Onagraceæ in the general structure of the flower. With Santalaceæ and Elæagnaceæ the apetalous genera agree in many important particulars. On account of their convolute cotyledons and inferior fruit they have been supposed to approach Lauraceæ through Gyrocarpus. The solitary carpel of which the fruit consists is peculiar to these and Alangiaceæ, and neatly distinguishes those two orders from all others of the Myrtal alliance.

Geography. All natives of the tropics of Asia, Africa, and America. No species is extra-tropical.

Properties. Mostly astringents. Bucida Buceras yields a bark used for tanning. The bark of Conocarpus racemosa, one of the plants called Mangroves in Brazil, is used greatly at Rio Janeiro for tanning. *Pr. Max. Trav.* 206. The fruit of the Terminalia bellerica, or the Belleric Myrobalan, is an astringent, tonic, and attenuant. *Ainslie*, 1. 236. The bark of Terminalia alata is astringent and antifebrile. *Ibid.* 2. 193. The fruit of Terminalia Chebula, as well as the galls of the same plant, are very astringent, and highly valued by dyers: with alum they give a durable yellow, and with a ferruginous mud an excellent

black. *Ibid.* 2. 128. The root of T. latifolia is given in Jamaica in diarrhœa. *Ibid.* Species of Terminalia and Pentaptera yield excellent timber. The kernels of T. Catappa, &c. are eaten as almonds, and are very palatable. A gum exudes from T. Bellerica and Combretum alternifolium. A milky juice is described as flowing from T. Benzoin, which being fragrant on drying, and resembling Benzoin, is used in churches in the Mauritius as a kind of incense. *Royle*, p. 210.

GENERA.

§ 1. Terminalieæ, DC.
Bucida, L.
Buceras, P. Browne.
Hudsonia, Robins.
Agathisanthes, Blume.
Terminalia, L.
Bahara, Hamilt.
Catappa, Gærtn.
Myrobalanus, Gærtn.
Badamia, Gærtn.
Pamea, Aubl.
Tanibouca, Aubl.
Fatræa, Juss.
Pentaptera, Roxb.
Getonia, Roxb.
Calycopteris, Lam.
Chuncoa, Pav.
Gimbernatia, R. et P.
Ramatuella, H. B. K.
Conocarpus, L.
Rudbeckia, Adans.
Andersonia, Roxb.
Laguncularia, Gærtn.
Sphenocarpus, Rich.
Schousbœa, Spreng.
Guiera, Juss.
Poivrea, Commers.
Cristaria, Sonn.
Gonocarpus, Hamilt.
§ 2. Combreteæ, DC.
Combretum, Lœfl.
Ætia, Adans.
Chrysostachys, Pohl.
Cacoucia, Aubl.
Schousbœa, Willd.
Hambergera, Scop.
Hambergia, Neck.
Lumnitzera, Willd.
Quisqualis, L.
Ceratostachys, Bl.
Bobua, DC.
Pyrrhanthus, Jack.
Sphalanthus, Jack.

Order XXIV. ALANGIACEÆ.

Alangieæ, *DC. Prodr.* 3. 203. (1828); *Bartl. Ord. Nat.* p. 424. (1830); *Martius Conspectus, No.* 219. (1835).

Essential Character.—*Calyx* superior, campanulate, 5-10-toothed. *Petals* 5-10, linear, reflexed. *Stamens* long, exserted, 2 or 4 times as numerous as the petals; *filaments* distinct, villous at the base; *anthers* adnate, linear, 2-celled, turned inwards, often empty. *Disk* fleshy at the base of the limb of the calyx. *Drupe* oval, somewhat crowned by the calyx, fleshy, slightly ribbed, and downy; *nucleus* 1-celled, bony, with a foramen at the apex. *Seed* 1, or according to Rheede 3, inverted, ovate; *albumen* fleshy, brittle; *embryo* straight; *radicle* long, ascending; *cotyledons* flat, foliaceous, cordate-ovate.—Large *Trees*. *Branches* often spiny. *Leaves* alternate, without stipules, entire, without dots. *Flowers* fascicled, axillary. *Fruit* eatable.

Affinities. "Differ from Myrtaceæ in their more numerous petals, adnate anthers, 1-celled fruit, and pendulous albuminous seeds. Agree with Combretaceæ in the contracted tube of the calyx, 1-celled fruit, and pendulous seeds; but differ in the number of the petals, adnate anthers, albuminous seeds, and flat cotyledons. The order disagrees entirely with Melastomaceæ and Onagraceæ, in the form of the anthers, and 1-celled fruit. It in some measure approaches Halorageæ in the structure of the seed, but recedes from them in habit, 1-celled fruit, and single style." *DC. Prodr.* 3. 203. Its most immediate relationship, next to Combretaceæ, is with Cornaceæ, to which Marlea approximates, and with Hamamelaceæ, whose long narrow petals are strikingly similar to those of Alangiaceæ.

Geography. Common in the southern parts of India, whence they extend along the Malayan Peninsula to Cochinchina, northward along the forest-clad base of the Himalaya. *Royle.*

Properties. Alangium decapetalum and hexapetalum are said by the Malays to have a purgative hydragogic property. Their roots are aromatic. They are said to afford good wood and edible fruit. *Royle.*

GENERA.

Alangium, Lam.
Angolam, Adans.
Marlea, Roxb.
Stylidium, Lour.

Order XXV. RHIZOPHORACEÆ. The Mangrove Tribe.

Rhizophoreæ, *R. Brown Gen. Rem. in Flinders*, p. 17. (1814); *in Congo*, p. 18. (1818); *DC. Prodr.* 3. 31. (1828); *Bartl. Ord. Nat.* 320. (1830).—Paletuviers, *Savigny in Lam. Dict*, 4. 696. (1796.)

Essential Character.—*Calyx* superior, very rarely nearly inferior, with the lobes varying in number from 4 to 13, occasionally all cohering in a calyptra. *Petals* arising from the calyx, alternate with the lobes, and equal to them in number. *Stamens* arising from the same point as the petals, and twice or thrice their number; *filaments* distinct; *anthers* erect, innate. *Ovary* 2-celled, each cell containing 2 or more pendulous ovules. *Fruit* indehiscent, crowned by the calyx, 1-celled, 1-seeded. *Seed* pendulous, without albumen; *radicle* long; *cotyledons* 2, flat.—Coast *trees* or *shrubs*. *Leaves* simple, opposite, entire or toothed, with stipules between the petioles. *Peduncles* axillary.

Anomalies. The leaves of Baraldeia have pellucid dots.

Affinities. An order exceedingly remarkable for the seeds germinating while yet attached to the branch. From a consideration of the structure of Carallia and Legnotis, Brown has been led to conclude that we have a series of structures connecting Rhizophora, on the one hand, with certain genera of Lythraceæ, particularly with Antherylium, though that genus wants the intermediate stipules; and, on the other, with Cunoniaceæ, especially with the simple-leaved species of Ceratopetalum. *Congo*, 437. This order agrees with Cunoniaceæ in its opposite leaves and intermediate stipules, and with great part of them in the æstivation of its calyx, and in the structure and cohesion of ovary. *R. Brown, Flinders*, 549. De Candolle points out its relation to Vochyaceæ and Combretaceæ, and even to Memecylaceæ through the genus Olisbea. The genera were comprehended in Loranthaceæ by Jussieu. Legnotideæ are probably a distinct order, of which little is yet known.

Geography. Natives of the shores of the tropics, where they root in the mud, and form a dense thicket down to the verge of the ocean.

Properties. The bark is usually astringent; that of Rhizophora gymnorhiza is used in India for dyeing black. *DC.* The wood of several is described as being hard and durable. *Royle.*

GENERA.

§ 1. Rhizophoreæ Veræ, DC.	*Paletuviera*, Thouar.	? Codia, Forst.	*Tita*, Scop.
Rhizophora, L.	Carallia, Roxb.	Olisbea, DC.	*Legnotis*, Sw.
Bruguiera, Lam.	*Barraldeia*, Thouars.	§ 2. Legnotideæ, Btg.	Richæia, Thouars.
	Baraultia, Steud.	Cassipourea, Aubl.	*Weihea*, Spreng.

Order XXVI. MEMECYLACEÆ.

Memecyleæ, *DC. Prodr.* 3. 5. (1828); *Bartl. Ord. Nat.* p. 327. (1830).

Essential Character.—*Calyx* superior, 4- or 5-lobed, or 4-5-toothed. *Petals* 4-5, inserted into the calyx, and alternate with its lobes. *Stamens* 8-10; *filaments* distinct; *anthers* incurved, 2 celled. *Ovary* 2-4 celled, rarely 8-celled; *ovules* solitary, pendulous. *Style* filiform; *stigma* simple. *Fruit* either berried or drupaceous, crowned by the limb of the calyx, indehiscent; occasionally (by abortion) only one-celled. *Seeds* pendulous, without *albumen*; *cotyledons* foliaceous, convolute; *radicle* straight.—*Shrubs*. *Leaves* opposite, simple, entire, without stipules or dots, almost always without more than one central rib. *Flowers* axillary, pedicellate.

Affinities. A small order very near Myrtaceæ and Melastomaceæ, and in some respects almost intermediate between them. It agrees with the former in the single rib of the leaves, and with the latter in the want of dots

and in the peculiar form of the anthers; the cotyledons are those of Combretaceæ, to which the order approaches in many respects. The genus Mouriria has leaves with elevated dots, but on account of its conformity with this order in the structure of the anthers is admitted here. Brown considers it intermediate between Myrtaceæ and Melastomaceæ.*

Geography. All natives of the hottest parts of the East Indies and of the Mauritanian Islands, with the exception of the Mouririas, which are West Indian.

Properties. The leaves of Memecylon edule form an ingredient in the dyes of Coromandel. The ripe berries, though somewhat astringent, are eaten by the natives. *Royle.*

GENERA.

Memecylon, L. *Valikaha*, Adans. | Mouriria, Juss. *Mouriri*, Aubl. | *Petaloma*, Sw. Scutula, Lour. | Guildingia, Hooker. Fenzlia, Endl.

Order XXVII. MELASTOMACEÆ.

Melastomæ, *Juss. Gen.* p. 328. (1789); *Dict. Sc. Nat.* 29. 507. (1823).—Melastomaceæ, *Don in Mem. Wern. Soc.* 4. 281. (1823); *DC. Prodr.* 3. 99. (1828); *Memoire* (1828); *Bartl. Ad. Nat.* p. 328. (1830); *Blume in Botanisch. Zeit.* (1833).

Essential Character.—*Calyx* divided into 4, 5, or 6 lobes, cohering more or less with the angles of the ovary, but distinct from the surface between the angles, and thus forming a number of cavities, within which the young anthers are curved downwards. *Petals* equal to the segments of the calyx; arising from their base, or from the edge of a disk that lines the calyx; twisted in æstivation. *Stamens* usually twice as many as the petals, sometimes equal to them in number; in the former case, those which are opposite the segments of the calyx are alone fertile; *filaments* curved downwards in æstivation; *anthers* long, 2-celled, usually bursting by two pores at the apex, and elongated in various ways beyond the insertion of the filament; sometimes bursting longitudinally; before flowering, contained within the cases between the ovary and sides of the calyx. *Ovary* more or less coherent with the calyx, with several cells, and indefinite ovules; *style* 1; *stigma* simple, either capitate or minute; a cup often present upon the apex of the ovary, surrounding the style. *Pericarp* either dry and distinct from the calyx, or succulent and combined with the calyx, with several cells; if dehiscent, bursting through the valves, which therefore bear the septa in the middle; *placentæ* attached to a central column. *Seeds* innumerable, minute, with a brittle *testa* and no *albumen*; usually with appendages of some kind; *embryo* straight, or curved, with equal or unequal *cotyledons.*—*Trees, shrubs,* or *herbaceous* plants. *Leaves* opposite, undivided, usually entire, without dots, with several ribs. *Flowers* terminal, usually thyrsoid.

Anomalies. Traces of pellucid dots in Diplogenea. Ovary more or less superior in several. Leaves sometimes not ribbed in Sonerila. Spathandra has an ovary with only one cell, in which there are from 7 to 8 ovules adhering to a central placenta.

Affinities. "The family of Melastomaceæ," remarks De Candolle, in an excellent memoir upon the subject, "although composed entirely of exotic plants, and established at a period when but few species were known, is so well characterised, that no one has ever thought of putting any part of it in any other group, or even introducing into it genera that do not rightly belong to it." These distinct characters are, the opposite leaves, with several great veins or ribs running from the base to the apex, something as in Monocotyledonous plants, and the long beaked anthers; to which peculiarities combined there is nothing to be compared in other families. Permanent, however, as these characters undoubtedly are, yet the cause of no uncertainty having been yet found in fixing the limits of the order, is rather to be attributed to

* The order is reduced to Melastomaceæ in *Linnæa*, 10. 217.

the small number of species that have been examined, than to the want of connecting links: thus Diplogenea has traces of the dots of Myrtaceæ, which were not known to exist in Melastomaceæ until that genus was described; several genera are now described with a superior ovary, a structure which was at one time supposed not to exist in the order; and, finally, in the remarkable genus Sonerila, the leaves are sometimes not ribbed.

The greatest affinity of Melastomaceæ is on the one hand with Lythraceæ, on the other with Myrtaceæ and their allies; from the former they differ in the æstivation of their calyx not being valvate, from the latter in having the petals twisted before expansion and no dots on the leaves, and from both, and all others to which they can be compared, in their long anthers bent down parallel to the filaments in the flower, and lying in niches between the calyx and ovary; with the exception of Memecylaceæ, in which, however, the union between the calyx and ovary is complete, and which have leaves destitute of the lateral ribs that so strongly point out Melastomaceæ. The structure of the seeds of Memecylaceæ is also different.

Geography. Found neither in Europe nor in Africa north of the desert of Zahara, nor south of Brazil in South America, nor in extra-tropical Africa to the south. Beyond the tropics, 8 are found in the United States, a few in China and the northern provinces of India, and 3 in New Holland. Of the remainder, it appears that 78 are described from India or the Indian Archipelago, 12 from Africa and the adjacent islands, and 620 from America, according to De Candolle; but this computation now requires some correction.

Properties. A slight degree of astringency is the prevailing character of the order, which, although one of the most extensive known, is entirely destitute of any unwholesome species. The succulent fruit of many is eatable; that of some dyes the mouth black, whence the name of Melastoma. Blakea triplinervia produces a yellow fruit, which is pleasant and eatable, in the woods of Guiana. *Hamilt. Prodr.* 42.

Tribe I. MELASTOMEÆ, DC.

GENERA.

§ 1. Lavoisiereæ, DC.
Meriania, Sw.
Axinæa, R. et P.
Chastenæa, DC.
Lavoisiera, DC.
Davya, DC.
Graffenrieda, DC.
Jucunda, Cham.
Centronia, Don.
Truncaria, DC.
Rhynchanthera, DC.
Macairea, DC.
Bucquetia, DC.
Cambessedesia, DC.
Chætostoma, DC.
Salpinga, Mart.
Bertolania, Raddi.
Triblemma, R. Br.
Meisneria, R. Br.
§ 2. Rhexieæ, DC.
Appendicularia, DC.
Comolia, DC.
Spennera, Mart.
Microlicia, Don.
Fritzschia, Cham.
Ernestia, DC.
Siphanthera, Pohl.
Dicrananthera, Presl.
Rhexia, L.
Heteronoma, DC.
Pachyloma, DC.
Oxyspora, DC.
Tricentrum, DC.
Marcetia, DC.
Trembleya, DC.
Adelobotrys, DC.
§ 3. Osbeckieæ, DC.
Lasiandra, DC.
Chætogastra, DC.
Svitramia, Cham.
Arthrostemma, Pav.
Pternandra, Jack.
Osbeckia, L.
Pyramia, Cham.
Tibouchina, Aubl.
Savastenia, Neck.
Tristemma, Juss.
Melastoma, Burm.
Otanthera, Bl.
Pleroma, Don.
Lachnopodium, Bl.
Diplostegium, Don.
Aciotis, Don.
§ 4. Miconieæ, DC.
Rousseauxia, DC.
Leandra, Raddi.
Tschudya, DC.
Clidemia, Don.
Myriaspora, DC.
Tococa, Aubl.
Majeta, Aubl.
Calophysa, DC.
Medinilla, Gaudich.
Pogonanthera, Bl.
Allomorphia, Bl.
Pachycentria, Bl.
Triplectrum, Don.
Huberia, DC.
Behuria, Cham.
Ochthocharis, Bl.
Calycogonium, DC.
Ossæa, DC.
Sagræa, DC.
Tetrazygia, Rich.
Dissochæta, Bl.
Aplectrum, Bl.
Heterotrichum, DC.
Conostegia, Don.
Diplogenea, Lindl.
Diplochita, DC.
Chitonia, Don.
Fothergilla, Aubl.
Phyllopus, DC.
Henriettea, DC.
Marumia, Bl.
Creochiton, Bl.
Phyllagathis, Bl.
Loreya, DC.
Miconia, R. et P.
Oxymeris, DC.
Cremanium, Don.
Blakea, L.
Topobea, Aubl.
Valdesia, R. et P.
? *Bellucia*, Neck.
? *Drepanandrum*, N.
§ 5. Sonerileæ.
Sonerila, Roxb.
Sarcopyramis, Wall.
Cyathanthera, Pohl.
Noterophila, Mart.

Tribe II. CHARIANTHEÆ, *Ser.*

Kibessia, DC. Ewyckia, Bl. Charianthus, Don. Chænopleura, Rich. Astronia, Blume. Spathandra, Guillem.

Order XXVIII. MYRTACEÆ. The Myrtle Tribe.

Myrti, *Juss. Gen.* 323. (1789).—Myrteæ, *Juss. Dict. Sc. Nat.* 34. 94. (1825).—Myrtoideæ, *Vent. Tab.* (1799).—Myrtineæ, *DC. Théorie, Elem.* (1819).—Myrtaceæ, *R. Brown in Flinders*, p. 14. (1814); *DC. Dict. Class.* v. 11. (1826); *Prodr.* 3. 207. (1829).—Granateæ, *Don. in Ed. Phil. Journ.* p. 134. (1826); *DC. Prodr.* 3. 3. (1829); *Von Martius H. Reg. Monac.* (1829); *Conspectus, No.* 317. (1835).

Essential Character.—*Calyx* superior, 4-or 5-cleft, sometimes falling off like a cap, in consequence of the cohesion of the apex. *Petals* equal in number to the segments of the calyx, with a quincuncial æstivation; rarely none. *Stamens* either twice as many as the petals, or indefinite, rarely equal to them in number; *filaments* either all distinct, or connected in several parcels, curved inwards before flowering; *anthers* ovate, 2-celled, small, bursting lengthwise. *Ovary* inferior, 1- 2- 4- 5- or 6-celled; *style* simple; *stigma* simple. *Fruit* either dry or fleshy, dehiscent or indehiscent. *Seeds* usually indefinite, variable in form; *embryo* without *albumen*, straight or curved, with its *cotyledons* and *radicle* distinguishable or conferruminated into a solid mass.—*Trees* or *shrubs*. *Leaves* opposite or alternate, entire, with transparent dots, and usually with a vein running parallel with their margin, *Inflorescence* variable, usually axillary. *Flowers* red, white, occasionally yellow, never blue.

Anomalies. Chamælauciceæ have a 1-celled fruit, with erect ovules. A species of Sonneratia is apetalous. Some dotted leaves are alternate.

Affinities. One of the most natural among the tribes of plants, and the most easily recognised. Its opposite exstipulate dotted entire leaves with a marginal vein, are a certain indication of it, with the exception of a few species, some of which probably do not belong to the order, although at present placed in it. It is closely allied to Rosaceæ, Lythraceæ, Onagraceæ, Combretaceæ, and Melastomaceæ, but cannot well be confounded either with them or any other order. It offers a curious instance of the facility with which the calyx and corolla can take upon themselves the same functions and transformations. In Eucalyptus, as is well known, the sepals are consolidated into a cup-like lid, called the operculum, In Eudesmia, a nearly-related genus, the calyx remains in its normal state, while the petals are consolidated into an operculum. Punica is usually referred to this order; but the descriptions that have been published of it have been founded upon so imperfect a view of its structure, that I may be permitted to dwell upon it at some length, especially as I hope to shew that it not only does not differ from the order essentially, but that it does not require to be distinguished from true Myrtaceæ even as a section. A consideration of the real structure of this plant comes the more properly within the scope of the present publication, because the genus has been considered the type of a particular order (Granateæ) by Don, in which he is supported by the high authority of De Candolle and Von Martius. The fruit of the Pomegranate is described by Gærtner and De Candolle as being divided into two unequal divisions by a horizontal diaphragm, the upper half of which consists of from 5 to 9 cells, and the lower of three; the cells of both being separated by membranous dissepiments; the placentæ of the upper half proceeding from the back to the centre, and of the lower irregularly from their bottom; and by Don as a fleshy receptacle formed by the tube of the calyx into a unilocular berry, filled with a spongy placenta, which is hollowed out into a number

of irregular cells. In fact, if a Pomegranate is examined, it will be found to agree more or less perfectly with both these descriptions. But it is clear that a fruit as thus described is at variance with all the known laws upon which compound fruits are formed. Nothing, however, is more common than that the primitive construction of fruits is obscured by the additions, or suppressions, or alterations, which its parts undergo during their progress to maturity. Hence it is always desirable to obtain a clear idea of the structure of the ovary of all fruits which do not obviously agree with the ordinary laws of carpological composition. Now, a section of the ovary of the Pomegranate in various directions, if made about the time of the expansion of the flowers before impregnation takes place, shews that it is in fact composed of two rows of carpels, of which three or four surround the axis, and are placed in the bottom of the tube of the calyx, and a number, varying from five to ten, surround these, and adhere to the upper part of the tube of the calyx. The placentæ of these carpels contract an irregular kind of adhesion with the back and front of their cells, and thus give the position ultimately acquired by the seeds that anomalous appearance which it assumes in the ripe fruit. If this view of the structure of the Pomegranate be correct, its peculiarity consists in this, that, in an order the carpels of which occupy but a single row around the axis, it possesses carpels in two rows, the one placed above the other, in consequence of the contraction of the tube of the calyx, from which they arise. Now, there are many instances of a similar anomaly among genera of the same order, and they exist even among species of the same genus. Examples of the latter are, Nicotiana multivalvis and Nolana paradoxa, and of the former Malope among Malvaceæ; polycarpous Ranunculaceæ as compared with Nigella, and polycarpous Rosaceæ as compared with Spiræa. In Prunus I have seen a monstrous flower producing a number of carpels around the central one, and also, in consequence of the situation, upon the calyx above it; and finally, in the *Revue Encyclopèdique* (43. 762.), a permanent variety of the Apple is described, which is exactly to Pomeæ what Punica is to Myrtaceæ. This plant has regularly 14 styles and 14 cells, arranged in two horizontal parallel planes, namely, 5 in the middle, and 9 on the outside, smaller and nearer the top; a circumstance which is evidently to be explained by the presence of an outer series of carpels, and not upon the extravagant hypothesis of Tillette de Clermont, who fancies that it is due to the cohesion of 3 flowers. The anomaly of the structure of the fruit of Punica being thus explained, nothing remains to distinguish it from Myrtaceæ but its leaves without a marginal vein, its convolute cotyledons, and pulpy seeds. There are, however, distinct traces of dots in the leaves, and the union of the venæ arcuatæ, which gives the appearance of a marginal vein to Myrtaceæ, takes place, although less regularly, in Punica; the convolute cotyledons of Punica are only in Myrtaceæ what those of Chamæmeles are in Pomeæ, a curious but unimportant exception to the general structure; and the solitary character of the pulpy coat of the seeds will hardly be deemed by itself sufficient to characterise Granateæ. The place of Punica in the order will be probably near Sonneratia. There is no instance of a blue flower in the order. The fruit varies from succulent to dry in different genera, and in some cases is nearly superior. Chamælaucieæ, which are remarkable for the structure of their ovary, are possibly a distinct order. They are, however, very near Leptospermeæ. According to Auguste de St. Hilaire, a passage is formed from Myrtaceæ to Onagraceæ through the genus Felicianea.

Geography. Natives of hot countries both within and without the tropics; great numbers are found in South America and the East Indies, not many in Africa, and a considerable proportion of the order in New Holland and the South Sea Islands; but the genera of those countries are mostly peculiar to them. Myrtus communis, the most northern species of the order, is native of the south of Europe.

Properties. The pellucid dotting of the leaves and other parts indicates the presence of a fragrant aromatic or pungent volatile oil, which gives the principal quality to the produce of the order. To this are due the grateful perfume of the Guava fruit, the powerful aroma of the flower-buds of Caryophyllus aromaticus, called by the English Cloves, and the balsamic odour of those eastern fruits, the Jamrosade and the Rose Apple. Along with this is frequently mixed an astringent principle, which sometimes predominates, to the suppression of any other property. The following are some of the less known instances of the existence of these and other qualities. The fruit of various Eugenias are found by travellers in the forests of Brazil to bear very agreeable fruit. *Pr. Max. Trav.* 75. A fruit of Brazil, called *Jaboticabeiras*, brought from the forests to the town of St. Paul and Tejuco, belongs to this order; it is said to be delicious. *Pl. Usuelles*, 29. The young flower-buds of Calyptranthus aromatica have the flavour and quality of Cloves, for which they might be advantageously substituted, according to Auguste de St. Hilaire, *Ibid*, no. 14. The volatile oil of Cajeputi is distilled from the leaves of Melaleuca leucadendron and Cajeputi, and is well known as a powerful sudorific, and useful external application in chronic rheumatism. *Ainslie*, 1. 260. It is considered carminative, cephalic, and emmenagogue, and is, no doubt, a highly diffusible stimulant, antispasmodic, and diaphoretic. It has also the power of dissolving caoutchouc. *Ibid.* A kind of gum *Kino* is yielded by Eucalyptus resinifera, which is occasionally sold in the medicine bazars of India. *Ibid.* 1. 185. Other species of Eucalyptus yield a large quantity of tannin, which has been even extracted from the trees in New Holland, and sent to the English market. The efficacy of the bark of the root of the Pomegranate as a remedy for tape-worm is well established in India. *Ibid.* 2. 175. The leaves of Glaphyria nitida, called by the Malays *The Tree of Long Life, (Kayo Umur Panjang)*, "probably from its maintaining itself at elevations where the other denizens of the forest have ceased to exist," afford at Bencoolen a substitute for tea; and it is known to the natives by the name of the Tea Plant. *Linn. Trans.* 14. 129.

GENERA.

§ 1. Chamælaucieæ, DC.*
Verticordia, DC.
Calythrix, La Bill.
Lhotskya, Schauer (6)
Darwinia, Rudge.
Homoranthus, A. Cunn. (7)
Pileanthus, La Bill.
Chamælaucium, Desf.
Genetyllis, DC.
Actinodium, Schr. (8)
§ 2. Leptospermeæ, DC.
Astartea, DC.
Lophostemon, Schott.
Tristania, R. Br.
Beaufortia, R. Br.
Calothamnus, La Bill.
Billottia, Coll.
Baudinia, Lesch.
Lamarkia, Gaudich.
Melaleuca, L.
Cajaputi, Adans.
Eudesmia, R. Br.
Eucalyptus, L'Her.
Angophora, Cav.
Callistemon, R. Br.
Metrosideros, Gærtn.
Nani, Adans.
Leptospermum, Forst.
Fabricia, Gærtn.
Bæckea, L.
Jungia, Gærtn.
Imbricaria, Sm.
Mollia, Gmel.
Bartlingia, Brongn.
§ 3. Myrteæ, DC.
Sonneratia, L.
Aubletia, Gærtn.
Nelitris, Gærtn.
Decaspermum, Forst.
Campomanesia, R. et P.
Psidium, L.
Guajava, Tourn.
Burchardia, Neck.
Jossinia, Commers.
Myrtus, L.
Myrcia, DC.
Calyptranthes, Sw.
Chytraculia, P. Br.
Chytralia, Adans.
Syzygium, Gærtn.
Opa, Lour.
Caryophyllus, L.
Acmena, DC.
Eugenia, L.
Plinia, L.
Greggia, Gærtn.
Olynthia, Lindl.
Guapurium, Juss.
Jambosa, Rumph.
Rhodamnia, Jack.
Marlieria, A. St. H.
Felicianea, A. St. H.
Tetrastemon, H. et A.
§ 4. Granateæ, DC.
Punica, L.

Glaphyria, Jack.
? Crossostylis, Forst.
? Grias, L.
? Petalotoma, DC.
Diatoma, Lour.
Myrrhinium, Schott.

The following, comprehended as a section in Myrtaceæ by some, and separated as a distinct order by others, requires further examination.

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* For the list of the genera of Chamælaucieæ, I am indebted to the kindness of Mr. Schauer of Breslau, who is occupied upon a monograph of those remarkable plants.

Sub-Order? BARRINGTONIEÆ.

Myrtaceæ § Barringtonieæ, *DC. Prodr.* 3. 288. (1828); *Bart. Ord. Nat.* 322. (1830). Barringtonieæ, *DC. Dict. Class.* v. *XI. not.* (1826); *Martius Conspectus, No.* 319. (1835).

Affinities. No characters have yet been assigned these plants, by which they may be known from Myrtaceæ, except their alternate leaves, without semitransparent dots, and the presence of stipules. The latter peculiarity, which has been assigned to them by Von Martius, does not exist in any one of the species I have examined; so that the substantial distinction is reduced to that first mentioned. There is, however, something so peculiar in the appearance of these plants, that one can hardly doubt that some good characteristic mark will be one day added to those they already possess.

Geography. The tropics of the old and new world are the exclusive habitation of this order.

Properties. The root of Stravadium racemosum has a slightly bitter but not unpleasant taste. It is considered by the Hindoo Doctors valuable on account of its aperient, deobstruent, and cooling properties; the bark is supposed to possess properties similar to those of Cinchona. *Ainslie*, 2. 65. The wood of Gustavia urceolata is called Bois puant, because its wood becomes, after exposure to the air, exceedingly fœtid. *Poiteau, Mem. Mus.* v. 13.

GENERA.

Barringtonia, Forst.	*Mitraria*, Gmel.	Gustavia, L.	Coupoui, Aubl.
Butonica, Lam.	Stravadium, Juss.	*Pirigara*, Aubl.	Careya, Roxb.
Huttum, Adans.	*Meteorus*, Lour.	*Spallanzania*, Neck.	Fœtidia, Commers.
Commersona, Lour.	*Menichea*, Lour.	Catinga, Aubl.	

Order XXIX. LECYDITHACEÆ.

Lecythideæ, *Richard, MSS. Poiteau Mem. Mus.* 13. 141. (1825); *DC. Prodr.* 3. 290. (1828); *a sect. of* Myrtaceæ. *Ach. Richard in Ann. des Sc.* 1. 321. (1824); *Bartl. Ord. Nat.* 332. (1830).—Lecythideæ, *Martius Conspec. No.* 320. (1835).

Essential Character.—*Calyx* superior, 2- to 6-leaved, or urceolate, with a divided limb; æstivation valvate or imbricated. *Corolla* consisting of 6 petals, sometimes cohering at the base, with an imbricated æstivation. *Stamens* indefinite, epigynous, either connected into a single petaloid cucullate unilateral body, or monadelphous at the base. *Ovary* inferior, 2- to 6-celled; *ovules* definite or indefinite attached to the axis; *stigma* simple. *Fruit* a woody capsule, either opening with a lid or remaining closed. *Seeds* several, covered by a thick integument; *embryo* without *albumen*, either undivided, or with two large plaited leafy or fleshy *cotyledons*, sometimes folded upon the *radicle*, which is next the *hilum*.—Large *trees*, with alternate entire or toothed *leaves*, with minute deciduous stipules, and without pellucid dots. *Flowers* large, showy, terminal, solitary, or racemose.

Affinities. Combined by De Candolle and others with Myrtaceæ, from which they differ most essentially in their alternate, often serrated, leaves, without pellucid dots. For an account of the germination of Lecythis, see *Du Petit Thouars, Ess.* 3. 32. They agree with Barringtonieæ in many respects, but they have stipules, and their singular hooded stamens are most remarkable. It is probable that we have in this place a tendency towards the form of Ternstromiaceæ.

Geography. Natives of the hottest parts of South America, especially of Guiana.

Properties. The fruit of Couroupita guianensis, called *Abricot sauvage* in Cayenne, is vinous and pleasant. The most gigantic tree in the ancient forests of Brazil is that called the *Sapucaya*. It is the Lecythis ollaria, the seeds of which are large and eatable. *Pr. Max. Trav.* 83. The fleshy seeds of all the species of Lecythis are eatable, but they leave a bitter unpleasant after-taste in the mouth. The bark of L. ollaria is easily separable, by beating the liber, into a number of fine distinct layers, which divide so neatly from each other, that, when separated, they have the appearance of thin satiny paper. Poiteau says he has counted as many as 110 of these coatings. The Indians cut them in pieces, as wrappers for their cigars. The well-known Brazil nuts of the shops of London are the seeds of Bertholletia excelsa. The lacerated parts of the flowers of Couroupita guianensis become blue upon exposure to the air. *Poiteau*, l. c.

GENERA.

Lecythis, Lœfl. Couroupita, Aubl. Couratari, Aubl. ? Touroulia, Aubl. (9)
Eschweilera, Mart. *Pontoppidana*, Scop. *Lecythopsis*, Schrank. *Robinsonia*, Schreb.
Bertholletia, H. et B. *Curupita*, Gmel.

Order XXX. PHILADELPHACEÆ. The Syringa Tribe.

Philadelpheæ, *Don in Jameson's Journal*, 133. (*April* 1826); *DC. Prodr.* 3. 205. (1828.)

Essential Character.—*Calyx* superior, with a persistent limb, having from 4 to 10 divisions. *Petals* alternate with the segments of the calyx, and equal to them in number, with a convolute-imbricate æstivation. *Stamens* indefinite, arising in 1 or 2 rows from the orifice of the calyx. *Styles* either distinct, or consolidated into one; *stigmas* several. *Capsule* half inferior, with from 4 to 10 cells, many-seeded. *Seeds* scobiform, subulate, smooth, heaped in the angles of the cells upon an angular placenta; *aril?* loose, membranous. *Albumen* fleshy; *embryo* inverted, about as long as the albumen; *cotyledons* oval, obtuse, flattish; *radicle* longer than the cotyledons, superior, straight, obtuse.—*Shrubs*. *Leaves* deciduous, opposite, toothed, without dots or stipules. *Peduncles* axillary or terminal, in trichotomous cymes. *Flowers* always white. *Fruit* sometimes a little scurfy.

Affinities. The genera of this order were formerly referred to Myrtaceæ; and I think there is a dissertation by the late President of the Linnean Society, in which he endeavoured to shew the difficulty of distinguishing Leptospermum even *generically* from Philadelphus,—so little did his school at that time know of the method of pursuing botanical inquiries. Afterwards Don stated that their affinity was not so much with Myrtaceæ as with Saxifragaceæ, in which I formerly concurred. A more careful consideration of the matter has induced me to adhere to the old views of affinity, and to consider Philadelphaceæ an order very nearly allied to Myrtaceæ, De Candolle points out an approach to Hydrangea. In many respects Philadelphaceæ are like Columelliaceæ, but in that order the corolla seems truly monopetalous, and the stamens are quite of another kind.

Geography. Deciduous shrubs, inhabiting thickets in Europe, North America, the north of India, and Japan.

Properties. Flowers often fragrant.

GENERA.

Philadelphus, L. Decumaria, L.
Forsythia, Walt. Deutzia, Thunb.

Somewhere here will probably have to be stationed Aristotelia, of which Von Martius has lately formed his

MAQUINÆ.

MAQUINÆ, *Martius Conspectus, No.* 256 (1835).

The genus Aristotelia, commonly referred to Homaliaceæ, or by Don to Elæocarpaceæ, is placed by Von Martius near Pittosporaceæ, Celastraceæ, and Nitrariaceæ. To me it seems more akin to Philadelphaceæ; its definite seeds distinguish it from that order, as its imbricated petals do from Cornaceæ. Possibly it stands in some such relation to Philadelphus as Eugenia to Leptospermum.

GENUS.

Aristotelia, L.

ALLIANCE III. *CORNALES.*

ESSENTIAL CHARACTER.—*Æstivation* of corolla valvate.

It does not seem to me possible to question the strict affinity of the three orders comprehended under this alliance, so close is their resemblance in all essential points. Independent of their mutual affinity they are related most nearly on the one hand with Alangiaceæ through Hamamelaceæ, and on the other with Cornaceæ through Loranthaceæ.

ORDER XXXI. HAMAMELACEÆ. THE WITCH-HAZEL TRIBE.

HAMAMELIDEÆ, *R. Br. in Abel's Voyage to China,* (1818); *A. Richard Nouv. Elém.* 532. (1828); *DC. Prodr.* 4. 267. (1830.)

ESSENTIAL CHARACTER.—*Calyx* superior, in 4 pieces. *Petals* 4, linear, with a valvular æstivation. *Stamens* 8, of which 4 are alternate with the petals; their *anthers* turned inwards, 2-celled, and 4 are sterile, and placed at the base of the petals; the dehiscence of the anthers variable. *Ovary* 2-celled, inferior; *ovules* solitary, pendulous or suspended; *styles* 2. *Fruit* half inferior, capsular, usually opening with two septiferous valves. *Seeds* pendulous; *embryo* in the midst of fleshy (horny) albumen; *radicle* superior.—*Shrubs. Leaves* alternate, deciduous, toothed, with veins running from the midrib straight to the margin. *Stipules* deciduous. *Flowers* small, axillary, sometimes unisexual.

AFFINITIES. Distinguished from Saxifragaceæ by the deciduous valves of the anthers, definite seeds, and shrubby stem bearing alternate leaves and deciduous stipules. In the latter respect related to Cupulaceæ, from which the petals and calyx divide them. According to Brown, their affinity is on the one hand with Bruniaceæ, from which they are distinguished by the insertion and dehiscence of the anthers, the monospermous cells of the ovary, the dehiscence of the capsule, the quadrifid calyx and habit; and on the other with Cornus, Marlea, and the neighbouring genera; in some respects also with Araliaceæ, but differing in their capsular fruit, the structure of the anthers, and other marks. See *Abel's Voyage, Appendix.* Du Petit Thouars looks upon them as allied to Rhamnaceæ, and Jussieu to Halorageæ. Others consider them akin to Amentaceæ and Euphorbiaceæ through Fothergilla. The fact seems to be, that, from the variety of opinion, none of these speculations are well founded. For my own part I do not see where they are to range if not

in the Epigynous group near Alangiaceæ, with which as will be seen by examining their characters, they have so many points in common.

GEOGRAPHY. Natives of North America and Japan, or the north of China.

PROPERTIES. Unknown.

GENERA.

§ 1. HAMAMELEÆ, DC. Hamamelis, L. *Trilopus*, Mitch. Dicoryphe, Pet. Th. Trichocladus, Pers. *Dahlia*, Thunb. Parrotia, Meyer. Bucklandia, R. Br. § 2. FOTHERGILLEÆ, DC. Fothergilla, L.

ORDER XXXII. CORNACEÆ. THE DOGWOOD TRIBE.

CAPRIFOLIACEÆ § Corneæ, *Kunth. Nov. G. Amer.* 3. 430.—CORNEÆ, *DC. Prod.* 4. 271. (1830); *Martius Conspectus, No.* 217. (1835).

ESSENTIAL CHARACTER.—*Sepals* 4, superior. *Petals* 4, oblong, broad at the base, inserted into the top of the calyx, regular, valvate in æstivation. *Stamens* 4, inserted along with the petals and alternate with them; *anthers* ovate-oblong, 2-celled. *Style* filiform; *stigma* simple. *Drupe* berried, crowned by the remains of a calyx, with a 2-celled nucleus. *Seeds* pendulous, solitary. *Albumen* fleshy; *radicle* superior, shorter than the 2 oblong cotyledons.—*Trees* or *shrubs*, seldom *herbs*. *Leaves* (except in one species) opposite, entire or toothed, with pinnate veins. *Flowers* capitate, umbellate, or corymbose, naked or with an involucre, occasionally by abortion dicœcious. *Flesh* of the *fruit* eatable. *DC. Prod.* 4. 271.

AFFINITIES. These plants were formerly confounded with Caprifoliaceæ; they are however beyond all doubt the representatives of an entirely distinct order, as their habit and general characters ought long since to have foretold. From Caprifoliaceæ their polypetalous structure at once removes them. To Hamamelaceæ they approach very nearly, but they differ in the valvate æstivation of their corolla, &c. &c. In many respects Cornaceæ resemble Loranthaceæ from which they differ among other things in the stamens being alternate with the petals and not opposite to them.

GEOGRAPHY. Found all over the temperate parts of Europe, Asia, and America.

PROPERTIES. Cornus mascula, and Benthamia yield a fruit which is eatable, but not worth eating. The bark of C. florida and sericea is said to rank among the best tonics of North America, nothing having been found in the United States that so effectually answers the purposes of Peruvian bark in intermittent fevers. *Barton*, 1. 51. It is a remarkable fact that the young branches of Cornus florida stripped of their bark and rubbed with their ends against the teeth, render them extremely white. *Ibid.* From the bark of the fibrous roots the Indians extract a good scarlet colour. *Ibid.* 1. 120.

GENERA.

Cornus, Tourn. Benthamia, Lindl. Aucuba, Kæmpf. *Eubasis*, Salisb. Votomita, Aubl. *Glossoma*, Schreb. *Guillemina*, Neck. Mastixia, Blum. Polyosma, Blum.

ORDER XXXIII. LORANTHACEÆ.

LORANTHEÆ, *Juss. et Rich. Ann. Mus.* 12. 292. (1808); *DC. Prodr.* 4. 277. (1830); *Mémoire* (1830); *Blume. Fl. Jav.* VISCOIDEÆ, *Rich. Anal. du Fr.* 33. (1818.)

ESSENTIAL CHARACTER.—*Calyx* superior, with 2 bracts at the base. *Corolla* with 3- 4- or 8 petals, more or less united at the base, with a valvate æstivation. *Stamens* equal

in number to the petals, and opposite to them. *Ovary* 1-celled; *ovule* pendulous; *style* 1 or none; *stigma* simple. *Fruit* succulent, 1-celled. *Seed* solitary, pendulous; *testa* membranous; *embryo* cylindrical, longer than the fleshy *albumen*, sometimes with no division of cotyledons; *radicle* naked, clavate, superior.—*Parasitical* half-shrubby plants. *Leaves* opposite, sometimes alternate, veinless, fleshy, without stipules. *Flowers* often monœcious, axillary or terminal, solitary, corymbose, or spiked.

Affinities. In some respects near Caprifoliaceæ, from which they are readily known not only by their universally parasitical habit, but also by their stamens being opposite the lobes of the corolla, and not alternate with them. Viscum seems to bear about the same relation to Loranthus that Cornus does to Caprifoliaceæ. Don has expressed an opinion that a connexion is established between this order and Araliaceæ, by means of Aucuba *(Jameson's Journal, Jan.* 1830, p. 168), which belongs to Cornaceæ; but this does not seem clearly made out. Brown *(Flinders,* 549) suggests their relation to Proteaceæ. The anther of Viscum is remarkable for having its substance broken up into a number of hollow cavities containing pollen, and not divided regularly into 2 lobes, each of which has a cavity containing pollen, and a longitudinal line of dehiscence. A good figure of this will be found in the *Ann. du Muséum*, vol. 12. t. 27. fig. E. The germination of Viscum is exceedingly remarkable. It has afforded a subject for some curious experiments upon the nature of the vital energies of vegetables. See *Dutrochet sur la Motilité*, 114. Upon the whole, the structure of Loranthaceæ seems rather that of a polypetalous than of a monopetalous order. Many details and excellent observations will be found in Blume's Flora Javæ. All the species are, without exception, parasitical, except Nuytsia, which, like other plants, grows attached to the soil. The adhesion of the petals into a monopetalous corolla is a remarkable exception to the general character of Polypetalæ.

Geography. Judging from the collections of systematic botanists, it would appear that the tropics of America contain a greater number of species than all the rest of the world; but we now know, from the extensive researches of Wallich and Blume, that the Flora of India contains at least as large a proportion: the order would, therefore, seem to be equally dispersed through the equinoctial regions of both Asia and America; but on the continent of Africa to be much more rare, only 2 having been yet described from equinoctial Africa, and 5 or 6 from the Cape of Good Hope. Two are named from the South Seas, and 1 from New Holland; but this number requires, no doubt, to be largely increased.

Properties. The bark is usually astringent, as in the Mistletoe of the Oak. The berries contain a viscid matter like birdlime, which is insoluble in water and alcohol. The most remarkable quality that Loranthaceæ possess, however, is the power of rooting in the wood of other plants, at whose expense they live. The habits of the common Mistletoe give an idea of those of all, except that in the genus Loranthus the corolla is tubular and usually richly coloured with scarlet.

GENERA.

Viscum, Tourn.	Loranthus, L.	Loxanthera, Bl.	Tupeia, Blume.
Arceuthobium, Bieb.	Lepostegeris, Bl.	Gaiadendron, G. Don.	——
Razoumowskia, Hoff.	Elytranthe, Bl.	Nuytsia, R. Br.	Schœpfia, Schreb.
Misodendrum, Banks.	Notanthera, G. Don.	Spirostylis, Presl.	*Codonium*, Vahl.
			Hænkea, R. et P.

Alliance IV. *CUCURBITALES.*

Essential Character.—*Placentæ* parietal. *Flowers* neither with a valvate æstivation of the corolla nor with any other character which appertains to the preceding alliances.

Order XXXIV. CUCURBITACEÆ. The Gourd Tribe.

Cucurbitaceæ, *Juss. Gen.* 393. (1789); *Aug. St. Hil. in Mem. Mus.* 9. 190–221. (1823); *DC. Prodr.* 3. 297. (1828); *Lindl. Synops.* 319. (1829).—Nandhirobeæ, *Aug. de St. Hil.* 1. c. (1823); *Turpin Dict. des Sc. Atlas.* (?)

Essential Character.—*Flowers* usually unisexual, sometimes hermaphrodite. *Calyx* 5-toothed, sometimes obsolete. *Corolla* 5-parted, scarcely distinguishable from the calyx, very cellular, with strongly marked reticulated veins, sometimes fringed. *Stamens* 5, either distinct, or cohering in 3 parcels; *anthers* 2-celled, very long and sinuous. *Ovary* inferior, 1-celled, with 3 parietal placentæ; *style* short; *stigmas* very thick, velvety or fringed. *Fruit* fleshy, more or less succulent, crowned by the scar of the calyx, 1-celled, with 3 parietal placentæ. *Seeds* flat, ovate, enveloped in an aril, which is either juicy, or dry and membranous; *testa* coriaceous, often thick at the margin; *embryo* flat, with no *albumen*; *cotyledons* foliaceous, veined; *radicle* next the hilum.—*Roots* annual or perennial, fibrous or tuberous. *Stem* succulent, climbing by means of tendrils formed by abortive leaves (stipules, *St. Hil.*). *Leaves* palmated, or with palmate ribs, very succulent, covered with numerous asperities. *Flowers* white, red or yellow.

Anomalies. The ripe fruit is divided into 3 or 4 cells in some Momordicas, and is occasionally dry, opening by valves at the apex.

Affinities. Placed by Auguste de St. Hilaire and De Candolle between Myrtaceæ, to which they appear to have little affinity, and Passifloraceæ, to which they are so closely allied, that they scarcely differ, except in their sinuous stamens, unisexual flowers, and exalbuminous seeds, the habit of both being exactly the same. By the former of these two writers a very particular account of the structure of the order has been given in the *Mémoires du Muséum.* He adopts the opinion of Jussieu, that the apparent corolla of these plants is really a calyx, considering the apparent calyx to be merely certain external appendages. In discussing the affinities of the order, which he does much at length, he remarks, that Carica (now the type of the order Papayaceæ) should be excluded; that the tendrils of Cucurbitaceæ are transformed stipules, but scarcely analogous to the stipules of Passifloraceæ; that there is an affinity between the order and Campanulaceæ, manifested in the perigynous insertion of the stamens, the inferior ovary, the single style with several stigmas, the quinary division of the flower connected with the ternary division of the fruit, and, finally, some analogy in the nature of the floral envelopes. He, however, chiefly insists upon their affinity with Onagraceæ, with which, including Combretaceæ, they agree in their definite perigynous stamens, single style, exalbuminous seeds, fleshy fruit, and occasionally in the unisexual flowers and climbing stem, being connected in the latter point of view with Onagraceæ through Gronovia, a climbing genus then referred to that order. He also points out the further connexion that exists between Cucurbitaceæ and Onagraceæ through Loasaceæ, which, with an undoubted affinity to the latter, have the habit of the former, especially in the genus Gronovia which has just been named. With regard to the supposed affinity of Cucurbitaceæ to Myrtaceæ, this is founded upon the characters of a small group, called Nandhirobeæ, consisting of plants having the habit of Cucurbitaceæ, but some resemblance in the form of the fruit to that of Lecythidaceæ, which border closely upon Myrtaceæ: but beyond this resemblance in the fruit, which appears to be altogether a structure of analogy rather than of affinity, I find little to confirm the approachment.

Geography. Natives of hot countries in both hemispheres, chiefly within the tropics; a few are found to the north in Europe and North America, and several are natives of the Cape of Good Hope. India appears to be their favourite station.

Properties. One of the most useful orders in the vegetable kingdom,

comprehending the Melon, the Cucumber, the Choco, and the various species of Gourd, all useful as the food of man. A bitter laxative quality perhaps pervades all these, which, in the Colocynth gourd, is so concentrated as to become an active purgative principle. The Colocynth of the shops is prepared from the pulp of Cucumis Colocynthis: it is of so drastic and irritating a nature as to be be classed by Orfila among his poisons; but, according to Thunberg, this gourd is rendered perfectly mild at the Cape of Good Hope, by being properly pickled. *Ainslie*, 1. 85. The bitter resinous matter in which the active principles of Colocynth are supposed to exist, is called by chemists Colocynthin. A waxy substance is secreted by the surface of the fruit of Benincasa cerifera. It is produced in the most abundance at the time of its ripening. *Delile Descript.* The leaf of Feuillea cordifolia is asserted by Drapiez to be a powerful antidote against vegetable poisons. *Ed. P. J.* 4. 221. The fruit of Trichosanthes palmata, pounded small and intimately blended with warm cocoa-nut oil, is considered a valuable application in India for cleaning and healing the offensive sores which sometimes form inside of the ears. It is also supposed to be a useful remedy, poured up the nostrils, in cases of ozæna. *Ainslie*, 2. 85. The root of Bryonia possesses powerful purgative properties, but is said to be capable of becoming wholesome food if properly cooked. The perennial roots of all the order appear to contain similar bitter drastic virtues, especially that of the Momordica Elaterium, or Spirting Cucumber. An extremely active poisonous principle, called Elatine, has also been found in the placenta of this plant. It exists in such extremely small quantity, that Dr. Clutterbuck only obtained 6 grains from 40 fruit. *Ed. P. J.* 3. 307. An ingenious explanation of the cause of the singular ejection of the seeds of this plant will be found in Dutrochet's *Nouvelles Recherches sur l'Exosmose.* The root of Bryonia rostrata is prescribed in India internally, in electuary, in cases of piles. It is also used as a demulcent, in the form of powder. That of Bryonia cordifolia is considered cooling, and to possess virtues in complaints requiring expectorants. *Ainslie*, 2. 21. The root of Bryonia epigæa was once supposed to be the famous Calombo root, to which it approaches very nearly(?) in quality. The tender shoots and leaves of Bryonia scabra are aperient, having been previously roasted. *Ibid.* 2. 212. The seeds of all the species are sweet and oily, and capable of forming very readily an emulsion; those of Joliffia africana, an African plant, are as large as chestnuts, and said to be as excellent as almonds, having a very agreeable flavour; when pressed they yield an abundance of oil, equal to that of the finest Olives. De Candolle remarks, that the seeds of this family never participate in the property of the pulp that surrounds them. That this is occasionally extremely dangerous is proved by a case of a sailor who brought home with him a bottle gourd, into which he poured a quantity of beer, of which those who drunk died. Excellent remarks upon the order are to be found in *Royle's Illustrations*, p. 218.

GENERA.

Lagenaria, Ser.
Cucumis, L.
Rigocarpus, Neck.
Luffa, Cav.
Zehneria, Endl.
Benincasa, Savi.
Erythropalum, Bl.
Turia, Forsk.
Bryonia, L.
Solena, Lour.
Cucumeroides, Gært.
Sicyos, L.
Sicydium, Schlecht.
Elaterium, L.
Momordica, L.
Amordica, Neck.
Poppya, Neck.
Ecbalium, Rich.
Neurosperma, Rafin.
Sechium, P. Br.
Melothria, L.
Colocynthis Schrad.
Trichosanthes, L.
Ceratosanthes, Juss.
Joliffia, Bojer.
Telfairia, Hook.
Coccinia, W. et A.
Cucurbita, L.
Citrullus, Neck.
Involucraria, Ser.
Muricia, Lour.
Anguria, L.
Psiguria, Neck.
Feuillea, L.
Nhandiroba, Plum.
Zanonia, L.
Alsomitra, Blume.
Kolbea, Pal. Beauv.
Zucca, Commers.
Allasia, Lour.
Thladiantha, Bge.
Hepetospermum, Wall.
Schizocarpum, Schrad.
Cyclanthera, Schrad.

Order XXXV. LOASACEÆ.

Loaseæ, *Juss. Ann. Mus.* 5. 18. (1804); *Dict. Sc. Nat.* 27. 93. (1823); *Kunth. in Nov. Gen. et Sp.* 6. 115. (1823); *DC. Prodr.* 3. 339. (1828.)

Essential Character.—*Calyx* superior or inferior, 5-parted, persistent, spreading in æstivation. *Petals* 5 or 10, arising from within the recesses of the calyx, cucullate, with an inflexed valvate æstivation; the interior often, when present, much smaller than the outer, and truncate at the apex. *Stamens* indefinite, in several rows, arising from within the petals, either distinct or adhering in bundles before each petal, within the cavity of which they lie in æstivation; *filaments* subulate, unequal, the outer ones frequently destitute of anthers. *Ovary* inferior, or nearly superior, 1-celled, with several parietal placentæ, or with 1 free central lobed one; *style* single; *stigma* 1, or several. *Fruit* capsular or succulent, inferior or superior, 1-celled, with parietal placentæ originating at the sutures. *Seeds* numerous, without aril; *embryo* lying in the axis of fleshy albumen, with the radicle pointing to the hilum, and flat small cotyledons.—*Herbaceous* plants, hispid, with pungent hairs secreting an acrid juice. *Leaves* opposite or alternate, without stipules, usually more or less divided. *Peduncles* axillary, 1-flowered.

Anomalies. Ovary sometimes almost superior. Seeds definite in Mentzelia and Klaprothia.

Affinities. Distinguished from Onagraceæ by their unilocular ovaries and indefinite stamens, part of which are sterile; and perhaps by the latter character, and the additional 5 petals, connected with Passifloraceæ, with which they also sometimes accord in habit. Their rigid stinging hairs, climbing habit, and lobed leaves, resemble those of some Urticaceæ, with which, however, they have nothing more of importance in common. On the same account they may be compared with Cucurbitaceæ, with which they further agree in their inferior unilocular fruit, with parietal placentæ, and in the very generally yellow colour of their flowers. This, indeed, is the order with which, upon the whole, Loasaceæ must be considered to have the closest affinity.

Geography. All American, and chiefly from the more temperate regions, or the tropics, of either hemisphere.

Properties. Except the stinging property which resides in the hairs of some species, nothing is known of the qualities of these plants.

GENERA.

Klaprothia, H. B. K.	Acrolasia, Presl.	Caiophora, Presl.	Gronovia, L.
Mentzelia, L.	Loasa, Adans.	Blumenbachia, Schrad.	Grammatocarpus, Prsl.
Petalanthera, Nutt.	*Ortiga*, Feuill.	Bartonia, Sims.	Scyphanthus, Sweet.

Order XXXVI. CACTACEÆ. The Indian-Fig Tribe.

Cacti, *Juss. Gen.* 310. (1789) *in part.*—Cactoideæ, *Vent. Tabl.* 3. 289. (1799).—Opuntiaceæ, *Juss. Dict. Sc.* 144. (1825) *in part.*; *Kunth. Nov. G. et Sp.* 6. 65. (1823).—Nopaleæ, *DC. Théorie Elém.* 216. (1819).—Cacteæ, *DC. Prodr.* 3. 457. (1828); *Revue des Cactées* (1829). *Mem. Mus.* (1829). *Link and Otto in Verhand. des ver. Gart. Preuss. vol. iii. p.* 412 (1827). *Martius in act. Acad. Nat. Cur. XVI.* (1832).—Spætalumeæ, *Nuttall Act. Philadelph.* 7. 23.

Essential Character.—*Sepals* numerous, usually indefinite, and confounded with the petals, either crowning the ovary, or covering its whole surface. *Petals* numerous, usually indefinite, arising from the orifice of the calyx, sometimes irregular. *Stamens* indefinite, more or less cohering with the petals and sepals; *filaments* long, filiform; *anthers* ovate, versatile. *Ovary* fleshy, inferior, 1-celled, with numerous ovules arranged upon parietal placentæ, equal in number to the lobes of the stigma; *style* filiform; *stigmas* numerous, collected in a cluster. *Fruit* succulent, 1-celled, many-seeded, either smooth, or covered with scales, scars, or tubercles. *Seeds* parietal, or, having lost their adhesion, nestling in pulp, ovate or obovate, without albumen; *embryo* either straight, curved, or spiral, with a short thick radicle; *cotyledons* flat, thick, foliaceous, sometimes almost obsolete) in

the leafless species).—Succulent *shrubs*, very variable in form. *Stems* usually angular, or two-edged, or foliaceous. *Leaves* almost always wanting; when present, fleshy, smooth, and entire; or spine-like. *Flowers* either showy or minute, usually lasting only one day or night, always sessile.

Anomalies.—The calyx and corolla are distinguishable in Rhipsalis, which is also said to have its seeds attached to a central placenta.

Affinities. That remarkable distension or increase of the cellular tissue of vegetables, from which the name of succulent is derived, is no indication of natural affinity, but is rather to be considered a modification of structure which may be common to all tribes. Hence the immediate relationship of Cactaceæ is neither with Euphorbiaceæ, nor Cassythaceæ, nor Asclepiaceæ, nor Portulaceæ, nor Asphodelaceæ, all of which contain a greater or less number of succulent genera. Through Rhipsalis, which is said to have a central placenta, Cactaceæ are connected with Portulaceæ, to which also the curved embryo of the section of Opuntiaceæ probably indicates an approach. De Candolle further traces an affinity between these plants and Mesembryaceæ. For an elaborate account of this order, see his memoir above quoted. Grossulaceæ, with which they were formerly combined, are manifestly different in a large number of points. Nuttall separates from these what he calls Spætalumeæ, which contain nothing but a certain plant named Lewisia. That species, however, seems to be only a Cactus with nearly superior fruit. Nuttall, indeed, says that it has not the habit of Cactaceæ; but it is not easy to say what the habit is of an order which comprehends such plants as the leafy Pereskias, the cord-like Rhipsalis, and the lumpish Melocacti. Lewisia, of which alone Spætalumeæ consist, is a sort of leafy Mammillaria.

Geography. America is the station of the order; no species appearing to be natives of any other part of the world; in that country they are abundant in the tropics, extending a short distance beyond them, both to the north and the south. De Candolle states that 32° or 33° north latitude is the northern limit of the order; but it is certain that a species is either wild or naturalised in Long Island, in latitude 42° north, and that there is another somewhere about 49°, in the Rocky mountains. The species which are said to be wild or naturalised in Europe, Mauritius, and Arabia, have been introduced from America, and having found themselves in situations suitable to their habits, have taken possession of the soil like actual natives: in Europe this does not extend beyond the town of Final, in 44° north latitude. There is no reason for supposing that the modern Opuntia is described in Theophrastus, as Sprengel asserts; the description of the former writer applying, as far as it applies to any thing now known, rather to some tree like Ficus religiosa. Hot, dry, exposed places are the favourite stations of Cactaceæ, for which they are peculiarly adapted, in consequence of the imperfect evaporating pores which they possess, as compared with other plants; a circumstance which, as De Candolle has satisfactorily shewn, will account for the excessively succulent state of their tissue. For geographical observations see *Martius in Ann. Sc.* 2. *ser.* 2. 110.

Properties. The fruit is very similar in its properties to that of Grossulaceæ, in some being refreshing and agreeable to the taste, in others mucilaginous and insipid; they are all, however, destitute of the excessive acidity of some gooseberries and currants. The fruit of Opuntia vulgaris has the property of staining red the urine of those who eat it. The juice of Mammillaria is remarkable for being slightly milky, and at the same time sweet and insipid.

GENERA.

Mammillaria, Haw.	Echinocactus, Salm.	Opuntia, Tourn.	Rhipsalis, Gærtn.
Lewisia, Pursh.	Cereus, DC.	Pereskia, Plum.	*Hariota*, Adans.
Melocactus, C. Bauh.	*Phyllanthus*, Neck.		

Order XXXVII. HOMALIACEÆ.

Homalineæ, *R. Brown in Congo*, (1818); *DC. Prodr.* 2. 53. (1825.)

Essential Character.—*Calyx* funnel-shaped, superior, with from 5 to 15 divisions. *Petals* alternate with the segments of the calyx, and equal to them in number. *Glands* present in front of the segments of the calyx. *Stamens* arising from the base of the petals, either singly or in threes or sixes; *anthers* 2-celled, opening longitudinally. *Ovary* half-inferior, 1-celled, with numerous ovules; *styles* from 3 to 5, simple, filiform, or subulate; *ovules* attached to as many parietal placentæ as there are styles. *Fruit* berried or capsular. *Seeds* small, ovate, or angular, with an embryo in the middle of fleshy albumen.—*Trees* or *shrubs*. *Leaves* alternate, with deciduous stipules, toothed or entire. *Flowers* in spikes, racemes, or panicles.

Anomalies. It is said there are no glands in Napimoga. Astranthus is said to have a superior ovary; but this requires confirmation.

Affinities. According to Brown, related to Passifloraceæ, especially to Smeathmannia, from which, however, their inferior ovary distinguishes them, to say nothing of their general want of stipules and glands on the leaves, of the presence of glands at the base of the floral envelopes, and of their erect and very different habit. With Malesherbiaceæ they agree and disagree much as with Passifloraceæ. From Rosaceæ, Bixaceæ, and Flacourtiaceæ, to all which they have a greater or less degree of affinity, they differ in many obvious particulars. De Candolle places them between Samydaceæ and Chailletiaceæ, describing them as apetalous, but classing them with his Dichlamydeæ; Brown also understands them as without petals; but I confess I cannot comprehend what petals are, if the inner series of the floral envelopes of these plants be not so; an opinion which their supposed affinity with Passifloraceæ would confirm, if analogy could be admitted as evidence in cases which can be decided without it. I may remark, that the statement of De Candolle, that the stamens are opposite the sepals (*Prodr.* 3. 53.) is inaccurate; they are, as Brown describes them (*Congo*), opposite the petals.

Geography. All tropical, and chiefly African or Indian. Four or five species are described from the West Indies and South America.

Properties. Unknown.

GENERA.

Homalium, Jacq.
Acoma, Adans.
Racoubea, Aubl.
Napimoga, Aubl.
Blackwellia, Comm.
Vermontea, Comm.
Astranthus, Lour.
Pineda, R. et P.
Nisa, Pet. Thou.
Myriantheia, Pet. Thou.
Eriudaphus, N. ab Es. (10).
Adenobasium, Presl.

Alliance V. *FICOIDALES.*

Essential Character.—*Petals* extremely narrow and numerous; placentation not parietal.

Notwithstanding the resemblances of the only order that belongs to this alliance and the foregoing, the central placentation completely separates them. By most botanists a number of apetalous genera are admitted here; but they seem in reality to have far more affinity with Chenopodiaceæ.

Order XXXVIII. FICOIDEÆ or MESEMBRYACEÆ.

Ficoideæ, *Juss. Gen.* 315. (1789); *Dict. Sc. Nat.* 16. 528. (1820); *DC. Prodr.* 3. 415. (1828); *Salm Dyck Monogr. Mesemb.* (1834).

Essential Character. *Sepals* definite, usually 5, but varying from 4 to 8, more or less combined at the base, either cohering with the ovary, or nearly distinct from it, equal or unequal, with a quincuncial or valvate æstivation. *Petals* indefinite, coloured, in many rows, opening beneath bright sunshine. *Stamens* arising from the calyx, indefinite, distinct; *anthers* oblong, incumbent. *Ovary* inferior, or nearly superior, many-celled; *stigmas* numerous, distinct. *Capsule* surrounded by the fleshy calyx, many-celled, opening in a stellate manner at the apex. *Seeds* definite, or more commonly indefinite, attached to the inner angle of the cells; *embryo* lying on the outside of mealy *albumen*, curved or spiral. —*Shrubby* or *herbaceous* plants. *Leaves* succulent, opposite, simple. *Flowers* usually terminal.

Affinities. The embryo curved round mealy albumen, along with the superior calyx, and distinctly perigynous stamens, characterises these among their neighbours, independently of their succulent habit. With Crassulaceæ, Chenopodiaceæ, and Silenaceæ, they are more or less closely related. Reaumuriaceæ and Nitrariaceæ, combined with Mesembryaceæ by De Candolle, are families different in affinity. The order has been made to contain several genera which are essentially distinct, and which approach closely to Chenopodiaceæ.

Geography. The hottest sandy plains of the Cape of Good Hope nourish the largest part of this order. A few are found in the south of Europe, north of Africa, Chile, China, Peru, and the South Seas.

Properties. The succulent leaves of a few are eaten, as of Mesembryanthemum edule; others yield an abundance of soda. Mesembryanthemum nodiflorum is used in the manufacture of Maroquin leather.

GENERA.

Mesembryanthemum, L.	Glinus, L.	Orygia, Forsk.
Hymenogyne, Haw.	*Rolofa*, Adans.	Kolleria, Presl.
	Plenckia, Rafin.	

Alliance VI. *BEGONIALES.*

Essential Character.—*Flowers* unisexual. *Placentæ* central.

Order XXXIX. BEGONIACEÆ.

Begoniaceæ, *R. Brown in Congo*, 464. (1818); *Link Handb.* 1. 309. (1829); *Martius H. Reg. Mon.* (1829); *Conspectus, No.* 168. (1835).

Essential Character —*Flowers* unisexual. *Sepals* superior, coloured; in the males 4, 2 within the others and smaller; in the females 5, imbricated, two smaller than the rest. *Stamens* indefinite, distinct or combined into a solid column; *anthers* collected in a head, 2-celled, continuous with the filaments, clavate, the connective very thick, the cells minute, bursting longitudinally. *Ovary* inferior, winged, 3-celled, with 3 double polyspermous placentæ in the axis; *stigmas* 3, 2-lobed, sessile, somewhat spiral. *Fruit* membranous, capsular, winged, 3-celled, with an indefinite number of minute seeds; bursting by slits at the base on each side of the wings. *Seeds* with a transparent thin *testa* marked by reticu-

lations, which are oblong at the sides and contracted at either extremity; *embryo* very cellular, without *albumen*, with a blunt round *radicle* next the hilum.—*Herbaceous* plants or *under-shrubs*, with an acid juice. *Leaves* alternate, toothed, oblique at the base. *Stipules* scarious. *Flowers* pink, in cymes.

Affinities. These have always been considered extremely puzzling. I formerly supposed the order related to Hydrangeæ from some resemblances in its seeds, &c.; others have approximated it to Polygonaceæ on account of the stipules, 3-cornered fruit, and coloured calyx. Link places the order near Umbelliferæ; Von Martius next Scævolaceæ; but the real affinities seem to be with Cucurbitaceæ and the epigynous group in general. With Cucurbitaceæ the order accords in the unisexual flowers, in the sinuous stamens, and peculiar stigmas, and even in the ternary number of the carpels; all points of considerable importance, inasmuch as they do not often occur elsewhere. That the tendency of Begoniaceæ is to form petals is indicated, firstly, by the coloured and highly developed state of the floral envelope of ordinary Begonias; and, secondly, by those of Eupetalum, in which there is a distinct separation of petals and sepals, and by their number an approach to the proportions of Onagraceæ, with which Begoniaceæ have probably a considerable affinity.

Geography. Common in the West Indies, South America, and the East Indies. Brown remarks, that no species has been found on the continent of Africa, though several have occurred in Madagascar and the Isles of France and Bourbon, and 1 in the island of Johanna. *Congo*, 464.

Properties. The roots are astringent and slightly bitter. Those of 2 species are employed in Peru with success in cases of a flux of blood, or in other visceral diseases in which astringents are employed. They are also said to be useful in cases of scurvy, and in certain fevers.

GENERA.

Begonia, L. Eupetalum, (11).

Group III. Parietosæ.

Essential Character.—*Placentæ* parietal, or, which is the same thing, arising from the base of carpels combined into a one-celled ovary.

These plants possess common characters that are never overlooked in any plan of arrangement that is not artificial. The early part of the group consists of portions of De Candolle's thalamiflorous plants better brought together, and the remainder is composed of orders that are separated by their perigynous stamens, although combined by every other peculiarity. The only orders upon the correctness of whose position doubt can be thrown are Moringaceæ, Samydaceæ, and Passifloraceæ. Of Moringaceæ so little is known that they cannot affect the arrangement either one way or the other; Samydaceæ are extremely like Smeathmannia among Passifloraceæ, and certain Bixaceæ and Flacourtiaceæ, which are equally apetalous, and have no better position. With regard to Passifloraceæ, it is true that they are very near Cucurbitaceæ; but so they are Violaceæ, and upon the whole they may be best considered in this order as formations analogous with that of Cucurbitales in the bordering group of Epigynosæ. A great many genera of this group are apetalous.

Alliance I. *CRUCIALES.*

Essential Character.—*Embryo* curved. *Albumen* absent.

This character completely cuts off the Crucial from all other Parietous alliances. It has no very positive external relation, but may be accounted as near Violales as anything else.

Order XL. CRUCIFERÆ. or BRASSICACEÆ. } The Cruciferous Tribe.

Cruciferæ, *Juss. Gen.* 237. (1789); *DC. Mémoire sur les Crucifères (no date)*; *Syst.* 2. 139. (1821); *Prod.* 1. 131. (1824); *Lindl. Synops.* 20. (1829); *Bartl. Ord. Nat.* 261. (1830).

Essential Character.—*Sepals*, 4 deciduous, cruciate. *Petals* 4, cruciate, alternate with the sepals. *Stamens* 6, of which two are shorter, solitary, and opposite the lateral sepals; occasionally toothed; and four longer, in pairs, opposite the anterior and posterior sepals, generally distinct, sometimes connate, or furnished with a tooth on the inside. *Disk* with various green glands between the petals and the stamens and ovary. *Ovary* superior, unilocular, with parietal placentæ usually meeting in the middle, and forming a spurious dissepiment. *Stigmas* two, opposite the placentæ. *Fruit* a silique or silicule, 1-celled, or spuriously 2-celled; 1- or many-seeded; dehiscing by two valves separating from the replum; or indehiscent. *Seeds* attached in a single row by a funiculus to each side of the placentæ, generally pendulous. *Albumen* none. *Embryo* with the radicle folded upon the cotyledons.—*Herbaceous* plants, annual, biennial, or perennial, very seldom suffruticose. *Leaves* alternate. *Flowers* usually yellow or white, seldom purple.

Anomalies. Schizopetalum has 4 cotyledons; sometimes the petals are abortive.

Affinities. This order is among the most natural that are known, and its character of having what Linnæan botanists call tetradynamous stamens is scarcely subject to exception. It has a near relation to Capparidaceæ, with which it agrees in the number of the stamens of some species of that order, in the fruit having two placentæ and a similar mode of dehiscence, and in the quaternary number of the divisions of the flower. To Papaveraceæ it is thought to approach in the number of the petals, an unusual number to prevail in dicotyledonous plants, and again in the structure of the fruit of some genera of that order, such as Glaucium and Chelidonium; with the siliquose-fruited Fumarieæ it has also some analogy, and even with the whole of that order in the number of its petals, supposing the common opinion of the nature of the floral envelopes of Fumarieæ to be correct, or in the binary division of its flower, from which the quaternary is only a slight deviation, upon the hypothesis I have suggested in speaking of that order. But the totally different structure of the seed forbids Cruciferæ to be associated in the same group with the latter.

Cruciferæ may be said to be characterised essentially by their deviation from the ordinary symmetry observable in the relative arrangement of the parts of fructification of other plants,—deviations which are of a very interesting nature. Their stamens are arranged thus: two stand opposite each of the anterior and posterior sepals, and one opposite each of the lateral sepals; there being 6 stamens to 4 sepals, instead of either 4 or 8, as would be normal. Now in what way does this arise? is the whorl of stamens to be considered double, one of the series belonging to the sepals, and one to the petals, and, of these, one imperfect? I am not aware of any such explanation having been offered, nor do I know of any better one. It appears to me that the outer series is incomplete, by the constant abortion of the stamens belonging to the

anterior and posterior sepals. But it is in their fruit that their great peculiarity consists.

As the placentæ are opposite the lobes of the stigma in this order, it is difficult to reconcile their fruit with any general theory of structure. Either it is in reality composed of four carpels, two of which are abortive, as is suggested in the *Botanical Register*, fol. 1168, or each of the two lobes of the stigma is composed of two half lobes belonging to different carpels. In any view, the dissepiment which cuts off the interior of the fruit into 2 cells must be considered spurious, and a mere expansion of the placentæ.

Almost all Cruciferæ are destitute of bracts, and have the calyx imbricated in æstivation; but Brown has noticed (*Denham*, p. 7) that in Savignya and Ricotia it is valvate.

Linnæus divided this order, which is the same as his Tetradynamia, by the form of the fruit, under two heads, bearing the names of Siliquosa and Siliculosa. More recently, divisions have been founded upon the nature of the plicature of the cotyledons, and the position of the radicle with respect to them. It is difficult to say what degree of importance really deserves to be attached to these characters, which are however in general use, and which will probably continue to be employed for the purpose of distinction.

Geography. An order eminently European; 166 species are found in northern and middle Europe, and 178 on the northern shore or islands of the Mediterranean; 45 are peculiar to the coast of Africa, between Mogador and Alexandria; 184 to Syria, Asia Minor, Tauria, and Persia; 99 to Siberia; 35 to China, Japan, or India; 16 to New Holland and the South Sea Islands; 6 to the Isle of France and the neighbouring islands; 70 to the Cape of Good Hope; 9 to the Canaries or Madeira; 2 to St. Helena; 2 to the West Indies; 41 to South America; 48 to North America; 5 to the islands between North America and Kamtchatka; and 35 are common to various parts of the world. This being their general geographical distribution, it appears that, exclusive of species that are uncertain, or common to several different countries, about 100 are found in the southern hemisphere, and about 800 in the northern, or 91 in the new, and the rest in the old world. Finally, if we consider them with regard to temperature, we shall find that there are,—

In the frigid zone of the northern hemisphere		205
In all the tropics (and chiefly in mountainous regions)		30
In the temperate zone	of the northern hemisphere 548	634
	of the southern ditto . . . 86	

Such were the calculations of De Candolle in 1821 (*Syst.* 2. 142). Although requiring considerable modification, especially in the Asiatic and North American numbers, which are much too low, they serve to give a general idea of the manner in which this order is dispersed over the globe.

Properties. The universal character of Cruciferæ is to possess antiscorbutic and stimulant qualities, combined with an acrid flavour. These are so uniform, that I shall only offer some general remarks upon them; for which I am chiefly indebted to De Candolle's *Essai sur les Propriétés Médicales des Plantes*, to which I refer those who wish for more information. Cruciferæ contain a great deal of nitrogen, to which it is supposed is due their animal odour when rotting. Mustard, Cress, Horseradish, and many others, are extremely stimulating and acrid. The seeds of Sinapis chinensis are considered by Hindoo and Mahometan practitioners as stimulant, stomachic, and laxative. *Ainslie*, 1. 230. The seeds of one species of Arabis (chinensis *Rottler*) are prescribed by the Indian doctors as stomachic and gently stimulant; but they apprehend its bringing on abortion if imprudently given. *Ibid.* 2. 12. When the acrid flavour is dispersed among an abundance of mucilage, various parts of these plants become a wholesome food; such as the root of the Radish and the Turnip, the herbage of the Water-cress, the Cabbage, the Sea-kale, and

the stems of the various plants of the cabbage tribe. Prince Maximilian, of Wied Neuwied, relates that the Brazilian Indians use a kind of cress, which in taste resembles that of Europe, as a good remedy for asthma. *Travels*, 1. 35. Their seeds universally abound in a fixed oil, which is expressed from some species, as the Rape, for various economical purposes.

GENERA.

§ 1. ARABIDEÆ, DC.
Mathiola, R. Br.
Cheiranthus, R. Br.
Psilostylis, Andrz.
Nasturtium, R. Br.
Brachylobos, Desv.
Roupa, Scop.
Leptocarpæa, DC.
Notoceras, R. Br.
Diceratium, Lga.
Barbarea, R. Br.
Streptanthus, Nutt.
Stevenia, Adans.
Braya, Sternb.
Oreas, Cham.
Orobium, Rchb.
Eutrema, R. Br.
Platypetalum, R. Br.
Platyspermum, Hook.
Smelowskia, Meyer.
Taphrospermum, Mey.
Turritis, Dillen.
Arabis, L.
Abasicarpon, Andrz.
Macropodium, R. Br.
Parrya, R. Br.
Cardamine, DC.
Pteroneuron, DC.
Dentaria, Tourn.
Neuroloma, Andrz.

§ 2. ALYSSINEÆ, DC.
Lunaria, L.
Savignya, DC.
Ricotia, L.
Farsetia, Turr.
Fibigia, Med.
Berteroa, DC.
Aubrietia, Adans.
Vesicaria, Lam.
Schivereckia, Andrz.
Alyssum, DC.
Adyseton, Scop.
Odontarrhena, Meyer.
Glyce, Lindl.
Koniga, R. Br.
Meniocus, Desv.
Psilonema, Meyer.
Selenia, Nutt.
Discovium, Raf.
Clypeola, Gærtn.
Orium, Desv.
Bergentia, Desv.
Peltaria, L.
Bohatschia, Crz.
Peerocallis, R. Br.
Draba, DC.
Mathewsia, Hooker.
Ptilotrichum, Meyer.
Erophila, DC.
Cochlearia, Tourn.
Tetrapoma, Turcz.
Kernera, Medik.

§ 3. THLASPIDEÆ, DC.
Thlaspi, Dill.
Pterolobium, Andrz.
Hutchinsia, R. Br.
Noccæa, Mœnch.
Teesdalia, R. Br.
Guepinia, Bat.
Iberis, L.
Biscutella, L.
Megacarpæa, DC.
Cremolobus, DC.

§ 4. EUCLIDIEÆ, DC.
Euclidium, R. Br.
Ochthodium, DC.
Pugionium, Gærtn.

§ 5. ANASTATICEÆ, DC.
Anastatica, Gærtn.
Morettia, DC.

§ 6. CAKILINEÆ, DC.
Cakile, Tourn.
Cordylocarpus, Desf.
Chorispora, DC.

§ 7. SISYMBREÆ, DC.
Malcomia, R. Br.
Triceras, Andrz.
Oudneya, R. Br.
Hesperis, L.
Deilosma, Andrz.
Andreoskia, DC.
Hesperidopsis, DC.
Dontostemon, Andrz.
Sisymbrium, All.
Redowskia, Cham.
Hugueninia, Rchb.
Alliaria, Adans.
Erysimum, Gærtn.
Coringia, Heist.
Syrenia, Andrz.
Cheirinia, Lk.
Gorinkia, Presl.
Leptaleum, DC.
Stanleya, Nutt.*
Warea, Nutt.

§ 8. CAMELINEÆ, DC.
Stenopetalum, R. Br.
Camelina, Crz.
Mönchia, Roth.
Eudema, H. Bk.
Hymenophysa, Meyer.
Neslia, Desv.
Rapistrum, Gærtn.
Vogelia, Fl. Wett.

§ 9. LEPIDINEÆ, DC.
Senebiera, Poir.
Coronopus, Hall.
Lepidium, R. Br.
Lepia, Desv.
Lasioptera, Andrz.
Dileptium, Raf.
Cardaria, Desv.
Cardiolepis, Wall.
Menonvillæa, DC.
Hexaptera, Hooker.
Subularia, L.
Capsella, Vent.
Rodschiedia, Fl. Wett.
Bivonæa, DC.
Eunomia, DC.
Æthionema, R. Br.

§ 10. ISATIDEÆ, DC.
Aphragmus, Andr.
Tauscheria, Fisch.
Isatis, C. Bauh.
Sameraria, Desv.
Myagrum, Tourn.
Sobolewskia, M. B.
Tetrapterygium, F. et M.
Dipterygium, Decais.
Thysanocarpus, Hook.

§ 11. ANCHONIEÆ, DC.
Goldbachia, DC.
Anchonium, DC.
Sterigma, DC.
Sterigmostemon, M. B.
Arthrolobus, Stev.

§ 12. BRASSICEÆ, DC.
Brassica, L.
Gunthera, Andrz.
Sinapis, Tourn.
Hirschfeldia, Mönch.
Bonannia, Presl.
? Disaccium, DC.
Moricandia, DC.
Orychophragmus, Bge.
Diplotaxis, DC.
Eruca, Tourn.
Euzomum, Link.
Erucastrum, Rchb.
Ramphospermum, Andrz.

§ 13. VELLEÆ, DC.
Vella, L.
Boleum, Desv.
Carrichtera, DC.
Succowia, Med.

§ 14. PSYCHINEÆ, DC.
Schouwia, DC.
Psychine, Desf.

§ 15. ZILLEÆ, DC.
Zilla, Forsk.
Muricaria, Desv.
Calepina, Adans.

§ 16. RAPHANEÆ, DC.
Crambe, Tourn.
Didesmus, Desv.
Rapistrum, Boerh.
Enarthrocarpus, Lab.
Raphanus, L.

§ 17. BUNIADEÆ, DC.
Bunias, R. Br.
Lælia, Pers.

§ 18. ERUCARIEÆ, DC.
Erucaria, Gærtn.
Cordylocarpus, W.

§ 19. SCHIZOPETALEÆ,
Schizopetalum, Sims.

§ 20. HELIOPHILEÆ, DC.
Chamira, Thunb.
Heliophila, L.
Trentepohlia, Roth.
Carponema, DC. Eckl.
Leptormus, DC. Eckl.
Ormiscus, DC. Eckl.
Selenocarpæa, DC. Eckl.
Pachystylum, DC. Eckl.
Carpopodium, DC. Eckl.

§ 21. BRACHYCARPÆÆ, DC.
Brachycarpæa, DC.

For another mode of arranging the genera, see *Bartling Ord. Nat.* p. 261.

* In the opinion of Nuttall, Warea and Stanleya constitute a very distinct natural order, intermediate between Cruciferæ and Capparidaceæ. He calls it STANLEÆ, *Act. Acad. Phil.* 7. 85.

Order. XLI. CAPPARIDACEÆ. The Caper Tribe.

Capparideæ, *Juss. Gen.* 242. (1789); *Ann. Mus.* 18. 474. (1811); *DC. Prodr.* 1. 237. (1824).

Essential Character.—*Sepals*, 4, either nearly distinct, equal, or unequal, or cohering in a tube, the limb of which is variable in form. *Petals* 4, cruciate, usually unguiculate and unequal. *Stamens* almost perigynous, very seldom tetradynamous, most frequently arranged in some high multiple of a quaternary number, definite or indefinite. *Disk* hemispherical, or elongated, after bearing glands. *Ovary* stalked; *style* none, or filiform. *Fruit* either podshaped and dehiscent, or baccate, 1-celled, very rarely 1-seeded, most frequently with 2 polyspermous placentæ. *Seeds* generally reniform, without albumen, but with the lining of the testa tumid, attached to the margin of the valves; *embryo* incurved; *cotyledons* foliaceous, flattish.—*Herbaceous plants*, *shrubs*, or even *trees*, without true stipules, but sometimes with spines in their place. *Leaves* alternate, stalked, undivided, or palmate. *Flowers* in no particular arrangement.

Anomalies. Some species of Niebuhria, Mærua, Boscia, Cadaba, and Thylacium, have no petals. The stamens are occasionally tetradynamous, according to De Candolle.

Affinities. Distinguished from Cruciferæ by their stamens being often indefinite, if definite never tetradynamous, or scarcely ever, and by their reniform seeds. They are related to Passifloraceæ in their stipitate ovary, and fleshy indehiscent fruit with parietal polyspermous placentæ; and to Flacourtiaceæ in the structure of their fruit, parietal placentæ, and indefinite stamens; from these last they are known by their narrow placentæ, exalbuminous seeds and peculiar habit; and from the former by a number of obvious characters. Brown remarks (*Denham*, 15,) that some species of Capparis, of which C. spinosa is an example, have as many as 8 placentæ. Aug. de St. Hilaire and Moquin Tandon state that Capparidaceæ are referable to a tetrandrous type, which is very possible. But the explanation they give, or the proofs they offer of this are less clear than could be desired. (See *Ann. des, Sc.* 20. 321).

Geography. They are chiefly found in the tropics and in the countries bordering upon them, where they abound in almost every direction. Of the capsular species, a single one, Cleome violacea, is found in Portugal; another, Polanisia graveolens, occurs as far to the north as Canada; and one or two others are met with in the southern provinces of the United States. Of the fleshy-fruited kinds, the common Caper, Capparis spinosa, a native of the most southern parts of Europe, is that which approaches the nearest to the north; Africa abounds in them.

Properties. De Candolle compares Capparidaceæ with Cruciferæ in regard to their sensible qualities; and they no doubt resemble each other in many respects; for instance, the flower-buds of the Caper are stimulant, antiscorbutic, and aperient, and form a well known pickle; the bark of the root of the Caper passes for a diuretic; and some species of Cleome and Polanisia have a pungent taste, like that of mustard. The root of Cleome dodecandra is used as a vermifuge in the United States. Cleome icosandra acts as a vesicatory, and is used in Cochin China as a sinapism. Dancer states that the bark of the root of Cratæva gynandra blisters like Cantharides. *Ainslie*, 2. 88. There is a plant called *Fruta de Burro*, found in the neighbourhood of Carthagena, the fruit of which is extremely poisonous. It is supposed to be a species of Capparis, nearly allied to the Capp. pulcherrima of Jacquin; and must not be confounded with the Fruta del Burro of Humboldt, found in Guiana, which is a valuable medicinal plant, belonging to Anonaceæ.

GENERA.

§ 1. Cleomeæ, DC.
Dactylæna, Schrad.
Cleomella, DC.
Peritoma, DC.
Gynandropsis, DC.
Podogyne, Hffg.
Cleome, L.
Siliquaria, Forsk.
Polanisia, Rafin.
Cristatella, Nutt.
Jacksonia, Rafin.
Physostemon, Mart.
Rorida, Forsk.
§ 2. Capparеæ, DC.
Corynandra, Schrad.
Tovaria, Fl. Peruv.
Cratæva, L.
Othrys, Pet. Thou.
Niebuhria, DC.
Boscia, Lam.
Podoria, Pers.
Cadaba, Forsk.
Strœmia, Vahl.
Schepperia, Neck.
Macromerum, Burch.
Atamisquea, Miers.
Capparis, L.
Sodada, Forsk.
Stephania, Willd.
Steriphoma, Spr.
Morisonia, Plum.
Busbeckea, Endl.
Thylacium, Lour.
Mærua, Forsk.
Hermupoa, Lœffl.
Roydsia, Wall.
? Singana, Aubl.
Sterbeckia, Schreb.

Order XLII. RESEDACEÆ. The Mignonette Tribe.

Resedaceæ, *DC. Théor. ed.* 1. 214. (1813); *Lindl. Synops.* 219. (1829); *Aug. de St. Hil. Ann. Soc. Roy. Orl. vol.* 13.

Essential Character.—*Calyx* many parted. *Petals* lacerated, unequal. *Disk* hypogynous, one-sided, glandular. *Stamens* perigynous, definite; *filaments* erect; *anthers* 2-celled, opening longitudinally. *Ovary* sessile, 3-lobed, 1-celled, many-seeded, with 3 parietal placentæ. *Stigmas* 3, glandular, sessile. *Fruit* dry and membranous, or succulent, opening at the apex. *Seeds* several, reniform, attached to 3 parietal placentæ; *embryo* taper, arcuate, without albumen; *radicle* superior.—*Herbaceous* plants with alternate *leaves*, the surface of which is minutely papillose; and minute, gland-like *stipules*.

Affinities. In the former edition of this work and elsewhere I described the structure of Resedaceæ very differently, considering the apparent calyx as an involucre, the petals as abortive male flowers, and the disk as the calyx of a central bisexual flower. I am, however, now convinced, by the arguments of Henslow, that this view was erroneous, and I accordingly revert to the old view of its organization and affinities. These latter are chiefly with Capparidaceæ, to which the seeds, and the great disk out of which the stamens arise, along with the parietal placentæ, agree. In habit it is extremely like Datiscaceæ.

Geography. Weeds inhabiting Europe, the adjoining parts of Asia, the basin of the Mediterranean, and the adjacent islands.

Properties. Nothing further is known of them than that Reseda luteola yields a yellow dye, and that the Mignionette (R. odorata) is among the most fragrant of plants.

GENERA.

Reseda, L.
Sesamella, Reichenb.
Ochradenus, DC.
Astrocarpus, Neck.

Alliance II. *VIOLALES.*

Essential Character.—*Stamens* few, with no collection of abortive petals or stamens into an external ring. *Embryo* never curved.

With the exception of Moringaceæ, the orders combined under this alliance are most naturally connected. Sauvagesiæ point towards Hypericaceæ, while Samydaceæ, notwithstanding their apetalous flowers, so completely agree with Violaceæ in their fruit, that the accuracy of their position can hardly be doubted. The coloured internal face of the calyx of the former order gives that part the same sort of claim to be considered corolline as the analogous organ in Ranunculaceæ.

Order XLIII. VIOLACEÆ. The Violet Tribe.

Violarieæ, *DC. Fl. Fr.* 4. 801. (1805); *Juss. Ann. Mus.* 18. 476. (1811); *DC. Prodr.* 1. 287. (1824); *Bartl. Ord. Nat.* 283. (1830).—Violaceæ, *Lindl. Synops.* 35. (1829).

Essential Character.—*Sepals* 5, persistent, with an imbricate æstivation, usually elongated at the base. *Petals* 5, hypogynous, equal or unequal, usually withering, and with an obliquely convolute æstivation. *Stamens* 5, alternate with the petals, occasionally opposite them, inserted on a hypogynous disk, often unequal; *anthers* bilocular, bursting inwards, either separate or cohering, and lying close upon the ovary; *filaments* dilated, elongated beyond the anthers; two, in the irregular flowers, generally furnished with an appendage or gland at their base. *Ovary* 1-celled, many-seeded, or rarely 1-seeded, with 3 parietal placentæ opposite the 3 outer sepals; *style* single, usually declinate, with an oblique hooded *stigma*. *Capsule* of 3 valves, bearing the placentæ in their axis. *Seeds* often with a tumour at their base; *embryo* straight, erect, in the axis of fleshy *albumen*.—*Herbaceous* plants or *shrubs*. *Leaves* simple, usually alternate, sometimes opposite, stipulate entire, with an involute *vernation*. *Inflorescence* various.

Anomalies.—The berry of Pentaloba is 5-lobed.

Affinities. Brown, in speaking of Violaceæ, mentions, in his Appendix to the Congo Voyage, a genus, at that time unpublished, called Hymenanthera, having 5 scales alternating with the petals, with a bilocular berry, in each cell of which is a single pendulous seed. It appears very paradoxical to associate such a plant with an order otherwise well defined; and Brown himself seems to think it should be placed between Violaceæ and Polygalaceæ. The structure of this genus seems to point out the relation of those two orders, to the latter of which, however, it rather appears to me to be referable. These orders differ from each other, in the latter having a 2-celled not 1-celled ovary, leaves without stipules, and 1-celled anthers. Droseraceæ are known from Violaceæ by their numerous styles, minute embryo, circinate leaves, and want of stipules. Passifloraceæ, to which the baccate genera of Violaceæ, and especially Corynostylis (Calyptrion, *DC.*), which has a twining stem, undoubtedly approach, are distinguished by a multitude of characters. The irregular flowers, dilated filaments and sepals, and stipulate leaves, of Violaceæ, usually indicate them at once; but the regular-flowered fruticose genera, which constitute the tribe of Alsodineæ, are not to be recognised by a combination of such characters.

Geography. Of the tribes, Violeæ chiefly consist of European, Siberian, and American plants; a few only being found within the tropics of Asia. They are abundant in South America, the forms of which are, however, materially different from those of the more temperate parts of the world, most of them being shrubs, while the northern Violets are uniformly herbaceous, or nearly so. Alsodineæ are exclusively South American and African, with the exception of Pentaloba, which belongs to the Malayan Flora.

Properties. The roots of all Violaceæ appear to be more or less emetic, a property which is strongly possessed by the South American species, and in a less degree only by those of Europe. Hence they form part of the herbs known under the name of Ipecacuanha. Ionidium parviflorum is used by the Spanish Americans, and I. Poaya by the Brazilians, as a substitute for Ipecacuanha. *Pl. Us.* 9. and 20. The root of another species, called Poaya, Poaya da praia, and Poaya branca, the Ionidium Itubu of Kunth, is commonly sold as true Ipecacuanha, to which it approaches very nearly in its properties. At Pernambuco it is esteemed the very best remedy that can be employed in dysentery; and the inhabitants of Rio-Grande-do-Norte consider it a specific against gout. *Ibid.* no. 11. The foliage of the Conohoria Lobolobo is used in Brazil for the same purposes as Spinach with us. Boiled, it becomes mucilaginous. *Ibid.* 10. Viola canina is reputed a powerful agent for the

removal of cutaneous affections; and Anchietea salutaris is accounted by the Brazilians not only a purgative, but also a remedy against similar maladies. A. de St. Hilaire remarks, that this notion deserves attention, as connected with the depurative properties ascribed in Europe to Viola canina, to which, although Anchietea is botanically related, there is nothing in its appearance which would have led the Portuguese settlers to attribute the virtues of the one to the other. *Ibid.* no. 19.

GENERA.

§ 1. Violeæ, DC.
Corynostylis, Mart.
Calyptrion, Gingins.
Anchietea, A. St. H.
Noisettia, H. B. K.
Glossarrhen, Mart.
Viola, L.
Solea, Spreng.
Pombalia, Vand.
Pigea, DC.
Ionidium, Vent.
Hybanthus, Jacq.
Amphirhox, Spr.

§ 2. Alsodineæ, DC.
Alsodeia, Pet. Thou.
Conoria, H. B. K.
Passoura, Aubl.
Riana, Aubl.
Rinorea, Aubl.
Ceranthera, Beauv.
Passalia, Soland.
Physiphora, Soland.
Lavradia, Vellozo.
Spathularia, A. St. H.
Pentaloba, Lour.

Tachibota, Aubl.
Salmasia, Schreb.

Apparently distinct from Violaceæ, but not yet sufficiently defined, is the

Sub-Order SAUVAGESIÆ.

Violaceæ § Sauvageæ, *DC. Prod.* 1. 315. (1824).—Sauvagesieæ, *Bartl. Ord. Nat.* 289. (1830).—Sauvagesiaceæ, *von Martius Conspectus, No.* 238. (1835).

Affinities. Distinguished from Violaceæ principally by the stamens being opposite the petals, by the anthers not having a membranous termination, by the presence of 5 hypogynous scales, and by their fruit having a septicidal dehiscence, so that the seeds adhere to the edges and not the centre of the valves, and by the strongly ribbed and imbricated calyx. The latter character brings them near Hypericaceæ, with which they accord in habit, but they differ in their stipules and decidedly parietal placentation. They are also said to approach Droseraceæ; but this is by no means clear. Aug. de St. Hilaire places them in Frankeniaceæ, from which their calyx divides them.

Geography. Natives of the tropics of South America and Africa.

Properties. Sauvagesia erecta is very mucilaginous, on which account it has been used in Brazil for complaints of the eyes, in Peru for disorders of the bowels, and in the West Indies as a diuretic, or rather in cases of a slight inflammation of the bladder.

GENERA.

Sauvagesia, Jacq.
Sauvagea, Neck.
Luxemburgia, A. St. H.
Plectranthera, Mart.

Order XLIV. SAMYDACEÆ.

Samydeæ, *Vent. Mem. Inst.* 2. 142. (1807); *Gærtn. fil. Carp.* 3. 238. 242. (1805); *Kunth. Nov. Gen.* 5. 360. (1821); *DC. Prodr.* 2. 47. (1825).

Essential Character.—*Sepals* 3, 5, or 7, more or less cohering at the base, usually coloured inside; æstivation somewhat imbricated, very seldom completely valvate. *Petals* 0. *Stamens* arising from the tube of the calyx, 2, 3, or 4 times as many as the sepals; *filaments* monadelphous, either all bearing anthers, or alternately shorter, villous or ciliated, and alternately bearing ovate 2-celled erect *anthers*. *Ovary* superior, 1-celled; *style* 1, filiform; *stigma* capitate, or slightly lobed; *ovules* indefinite, attached to parietal placentæ. *Capsule* coriaceous, with 1 cell and from 3 to 5 valves, many-seeded, the valves dehiscing

imperfectly, often somewhat pulpy inside, and coloured. *Seeds* fixed to the valves, without order, on the papillose or pulpy part, with a fleshy aril and excavated hilum; *albumen* fleshy; *cotyledons* ovate, foliaceous; *radicle* pointing to the extremity remote from the hilum.—*Trees* or *shrubs*. *Leaves* alternate, often somewhat distichous, simple, entire or toothed, evergreen, with stipules, usually with pellucid markings, which are most frequently oblong. *Peduncles* axillary, solitary, or numerous.

Affinities. Placed in Polypetalous Exogens by De Candolle, who, however, describes the order as apetalous, "unless the petaloid layer covering the inner surface of the sepals be considered a corolla;" although this cannot be admitted as true, yet it may be taken as evidence of a tendency to assume a corolline state. This order appears to be of very uncertain affinity. Its apetalous flowers and fruit approximate it to Bixaceæ, its dotted leaves to Amyridaceæ, near which De Candolle stations it, and its perigynous stamens to Rosaceæ, with which its alternate stipulate leaves also ally it. Its fruit, as in Casearia parviflora, is sometimes remarkably like that of Violaceæ. In habit the order approaches Smeathmannia among Passifloraceæ. Brown observes, that Samydaceæ are especially distinguished by their leaves having a mixture of *round* and *linear* pellucid dots, which distinguish them from all the other families with which they are likely to be confounded. *Congo*, 444.

Geography. Tropical shrubs.

Properties. The bark and leaves are said to be astringent in a slight degree. *DC.* In Brazil the leaves of Casearia ulmifolia are applied to wounds, and their juice is drank by the sick. It is said they are a most certain remedy against the bite of the most noxious serpents; it is called *Marmaleiro do Mato. Aug. St. H. Fl. Bras. merid.* 2. 233. A decoction of the leaves of Casearia lingua is also used internally in inflammatory disorders and malignant fevers. It is called by the Brazilians *Cha de frade* and *Lingua de Fin. Ibid.*

GENERA.

Samyda, L. *Bigelovia*, Spr.
Casearia, Jacq. *Anavinga*, Lam. *Iroucana*, Aubl.
Pitumba, Aubl. *Melistaurum*, Forst. *Athenæa*, Schreb.
Vareca, Gærtn. Chætocrater, R. et P. *Crateria*, Pers.

Order XLV. MORINGACEÆ.

Moringeæ, *R. Brown in Denham*, p. 33. (1826); *Bartl. Ord. Nat.* 425. (1830); *Decaisne in Ann. Sc. n. s.* 4. 203. (1835).

Essential Character.—*Calyx* consisting of 5 nearly equal divisions (deciduous, *DC.*) the tube lined with a fleshy disk; *æstivation* slightly imbricated. *Corolla* of 5 nearly equal petals, the uppermost of which is ascending. *Stamens* 10, arising from the top of the tube of the calyx; 5 opposite the sepals, sometimes sterile; *filaments* slightly petaloid, callous and hairy at the base; *anthers* simple, 1-celled, with a thick convex connective. *Ovary* stipitate, superior, 1-celled, with 3 parietal placentæ; *style* filiform, terminal, not obliquely inserted; *stigma* simple. *Fruit* a long pod-like capsule, with 3 valves, and only 1 cell; the valves bearing the seeds along their middle. *Seeds* numerous, half buried in the fungous substance of the valves, sometimes winged; *embryo* without albumen; *radicle* straight, very small; *cotyledons* fleshy, plano-convex.—*Trees*. *Leaves* pinnate, with an odd one. *Flowers* in panicles.

Affinities. Confounded with Leguminosæ, until separated by the authority of Brown, who does not, however, point out the real affinities of the order. De Candolle, who did not overlook its anomalous structure as a Leguminous plant, accounted for the compound nature of its fruit upon the supposition, that although unity of carpels is the normal structure of Leguminosæ, yet the presence of more ovaries than one, in a few instances in that order,

explained the constantly trilocular state of that Moringa. To this, however, there are numerous and grave objections, which cannot fail to strike every botanist. What its proper station should be remains to be determined. I confess I place it here, because I know of no better station, and because it accords with the verbal character of this group. Decaisne seems to think it has more affinity with Leguminosæ than with any other order.

Geography. Natives of the East Indies and Arabia.

Properties. The root of the Moringa pterygosperma has a pungent odour, with a warm, biting, and somewhat aromatic taste; it is used as a stimulant in paralytic affections and intermittent fever; it is also employed as a rubefacient. *Ainslie*, 1. 175. The nuts (seeds) of this plant, called by the French *pois quéniques* and *chicot*, have been used in venereal affections. *Ibid.* They are the Ben-nuts of old writers, from which the oil of Ben was extracted, formerly more famed than at present. The flowers, leaves, and tender seed-vessels, are eaten by the natives of India in their curries. *Royle.*

GENERA.

Moringa, Burm.
Hyperanthera, W.
Alandina, Neck.

Order XLVI. DROSERACEÆ. The Sundew Tribe.

Droseraceæ, *DC. Théorie*, 214. (1819); *Prodr.* 1. 317. (1824); *Lindl. Synops.* 38. (1829).

Essential Character.—*Sepals* 5, persistent, equal, with an imbricate æstivation. *Petals* 5, hypogynous. *Stamens* distinct, withering, either equal in number to the petals and alternate with them, or 2, 3, or 4 times as many. *Ovary* single; *styles* 3-5, either wholly distinct, or slightly connected at the base, bifid or branched. *Capsule* of 3 or 5 valves, which bear the placentæ either in the middle or at their base, and sometimes turn in their edges so as to form almost perfect dissepiments. *Seeds* either naked or furnished with aril. *Embryo* straight, erect in the axis of a fleshy or cartilaginous *albumen*. *Cotyledons* rather thick.—Delicate *herbaceous* plants, often covered with glands. *Leaves* alternate, with *stipulary* fringes and a circinate vernation. *Peduncles*, when young, circinate.

Anomalies. The anthers of Byblis and Roridula open by pores.

Affinities. Nearly allied to Violaceæ, from which their circinate vernation, several styles, and extipulate leaves, distinguish them. They are also no doubt related to Saxifragaceæ, and these two orders are chiefly distinguished by their vernation and placentation; but in the latter respect Parnassia among Saxifragaceæ accords with Droseraceæ. Droseraceæ are also allied to Sarraceniaceæ: see that order.

Geography. At the Cape of Good Hope, in South America, North America, New Holland, China, Europe, Madagascar, the East Indies, wherever there are marshes or morasses, these plants are found. Drosophyllum lusitanicum is remarkable for growing on the barren sands of Portugal.

Properties. The common Droseras are rather acid, slightly acrid, and, according to some, poisonous to cattle. The Drosera communis of Brazil is said by A. de St. Hilaire to be poisonous to sheep. *Pl. Usuelles*, no. 15. Drosera muscipula has viscous leaves with glandular fringes, which close upon flies and other insects that happen to alight upon them. It is probable it would yield a valuable dye. *Royle.*

GENERA.

Byblis, Salisb.	Drosera, L.	Drosophyllum, Link.
Aldrovanda, Monti.	Roridula, L.	Bohadschia, Presl.

Order XLVII. FRANKENIACEÆ.

Frankeniaceæ, *Aug. de St. Hilaire Mém. Plac. Centr.* 39. (1815); *DC. Prodr.* 1. 349. (1824); *Lindl. Synops.* 38. (1829).

Essential Character.—*Sepals* 4-5, united in a furrowed tube, persistent, equal. *Petal* alternate with the sepals, hypogynous, unguiculate, with appendages at the base of the limb. *Stamens* hypogynous, either equal in number to the petals, and alternate with them, or having a tendency to double the number; *anthers* roundish, versatile. *Ovary* superior; *style* filiform, 2-fid or 3-fid. *Capsule* 1-celled, enclosed in the calyx, 2- 3- or 4-valved, many-seeded. *Seeds* attached to the margins of the valves, very minute; *embryo* straight, erect, in the midst of albumen (divided into two plates, *Gærtn. fil.*)—*Herbaceous* plants or *under-shrubs*. *Stems* very much branched. *Leaves* opposite, exstipulate, with a membranous sheathing base; often revolute at the edge. *Flowers* sessile in the divisions of the branches, and terminal, embosomed in leaves, usually pink.

Anomalies. Wormskioldia has a siliquose fruit, alternate deeply lobed leaves, and a different habit.

Affinities. Allied on the one hand to Silenaceæ, from which they are distinguished by their different placentation, and by the form of their embryo; to Linaceæ, from which they are known by their unilocular fruit; and on the other to Violaceæ, which differ in having a loculicidal, not septicidal, dehiscence. Their habit is that of Amarantaceæ and Illecebraceæ, from which their petals and compound fruit divide them. Wormskioldia is a very anomalous plant. It seems more nearly allied to this than any other order, and certainly does not belong to Droseraceæ, in which it is placed by Achille Richard provisionally.

Geography. This order is chiefly found in the north of Africa and south of Europe. Two species are natives of the Cape of Good Hope, 1 of South America, 4 of New Holland, and 3 of temperate Asia. None have been found in tropical India or North America.

Properties. Unknown.

GENERA.

Frankenia, L.
Nothria, Berg.
Beatsonia, Roxb.
Wormskioldia, Thonn.

Alliance III. *PASSIONALES.*

Essential Character.—*Flowers* with a ring or crown of sterile stamens. *Petioles* generally glandular. *Embryo* never curved so that the radicle lies on the cotyledons.

The foregoing characters collect a set of orders, the mutual relationship of which is of the strongest kind. But in the order Turneraceæ, the crown of sterile stamens is wanting, and so far the character of the alliance is weakened. Nevertheless it seems unadvisable to separate Turneraceæ far from Malesherbiaceæ.

Order XLVIII. PASSIFLORACEÆ.

The Passion-Flower Tribe.

Passifloreæ, *Juss. Ann. Mus.* 6. 102. (1805); *Id. Dict. des Sciences Nat.* 38. 48. (1825); *DC. Prodr.* 3. 321. (1828); *Achille Richard Dict. Class.* 13. 95. (1828).

Essential Character.—*Sepals* 5, sometimes irregular, combined in a tube of variable length, the sides and throat of which are lined by filamentous or annular processes, appa-

rently metamorphosed petals. *Petals* 5, arising from the throat of the calyx, on the outside of the filamentous processes, occasionally wanting, sometimes irregular, imbricated in æstivation. *Stamens* 5, monadelphous, rarely indefinite, surrounding the stalk of the ovary; *anthers* turned outwards, linear, 2-celled, bursting longitudinally. *Ovary* seated on a long stalk, superior, 1-celled; *styles* 3, arising from the same point, clavate; *stigmas* dilated. *Fruit* surrounded by the calyx, stalked, 1-celled, with 3 parietal polyspermous placentæ, sometimes 3-valved. *Seeds* attached in several rows to the placenta, with a brittle sculptured testa surrounded by a pulpy aril; *embryo* straight, in the midst of fleshy thin albumen; *radicle* turned towards the hilum; *cotyledons* flat, leafy.—*Herbaceous* plants or *shrubs*, usually climbing, very seldom erect. *Leaves* alternate, with foliaceous stipules, often glandular. *Flowers* axillary or terminal, often with a 3-leaved involucre.

Anomalies. Some apetalous.

Affinities. The real nature of the floral envelopes of this remarkable order is a question upon which botanists entertain different opinions, and their ideas of its affinities are consequently at variance. According to Jussieu (*Dict. des Sciences*, 38. 49.), the "parts taken for petals are nothing but inner divisions of the calyx, usually in a coloured state, and wanting in several species;" and, therefore, in the judgment of this venerable botanist, the order is apetalous. De Candolle adopts the same view of the nature of the floral envelopes as Jussieu; but he nevertheless considers the order polypetalous; a conclusion which I confess myself unable to understand, upon the supposition of the inner series of floral envelopes being calyx. Other botanists, and I think with justice, consider the outer series of the floral envelopes as the calyx, and the inner as the corolla, for two principal reasons. In the first place, they have the ordinary position and appearance of calyx and corolla, the outer being green, and the inner coloured; and, in the second place, there is no essential difference between the calyx and corolla, except the one being the outer, and the other the inner of the floral envelopes. And if the real nature of these parts is to be determined by analogy, an opinion in which I do not, however, concur, the great affinity, as I think, of the order with Violaceæ would confirm the idea of its being polypetalous rather than apetalous. The nature of the filamentous appendages, or rays as they are called, which proceed from the orifice of the tube, and of the membranous or fleshy, entire or lobed, flat or plaited, annular processes which lie between the petals and the stamens, is ambiguous. I am disposed to refer them to a peculiar form of petals, rather than to the stamens, for the reasons which I have assigned in the *Hort. Trans.* vol. 6. p 309, for understanding the normal metamorphosis of the parts of fructification to be centripetal. There can, at least, be no doubt of their being of an intermediate nature between petals and stamens. With regard to the affinity of Passifloraceæ, Jussieu, swayed by the opinion he entertains of their being apetalous, and De Candolle, who partly agrees and partly disagrees with Jussieu in his view of their structure, both assign the order a place near Cucurbitaceæ, and there can be no doubt that Cucurbitaceæ are really little more than Passifloraceæ with inferior fruit; but when we consider the stipitate fruit, occasionally valvular, the parietal placentæ, the sometimes irregular flowers, the stipulate leaves, and the climbing habit of these plants, it is difficult not to admit their affinity with Capparidaceæ and Violaceæ, the dilated disk of the former of which is probably analogous to the innermost of the annular processes of Passiflora. That the fleshy covering of the seeds in this order is a real aril, is clear from the seeds of a capsular species nearly related to Pass. capsularis, but apparently unpublished, a drawing of which, by Ferdinand Bauer, exists in the Library of the Horticultural Society. In this plant the apex of the sculptured testa is uncovered by the aril. Smeathmannia forms a connecting link between Passifloraceæ and Samydaceæ.

Geography. Passionflowers are the pride of South America and the West Indies, where the woods are filled with their species, which climb about from

tree to tree, bearing at one time flowers of the most striking beauty, and of so singular an appearance, that the zealous Catholics who discovered them, adapted Christian traditions to those inhabitants of the South American wilderness; and at other times fruit, tempting to the eye and refreshing to the palate. One or two extend northwards into North America. Several are found in Africa and the neighbouring islands; and a few in the East Indies, of which the greater part belong to the genus Modecca.

Properties. Nothing is known of the properties of this order further than that the succulent aril and pulp that surround the seeds are fragrant, juicy, cooling, and pleasant, in several species.

GENERA.

Smeathmannia, DC.
Paropsia, Noron.
Astrophea, DC.
Passiflora, L.
Cicca, Med.
Astephananthes, Bor.
Monactineirma, Bor.
Anthactinia, Bory.
Disemma, La Bill.
Murucuja, Tourn.
Tacsonia, Juss.
Distephana, Juss.
Paschanthus, Burch.
Ceratosicyos, N. ab E. (12)
Modecca, Lam.
Deidamia, Pet. Thou.
Thompsonia, R. Br.

Order XLIX. PAPAYACEÆ. The Papaw Tribe.

Papayæ, *Agardh Classes.* (1824).—Caricæ, *Turpin in Atl. du Dict. des. Sc. Nat.* (?)—Papayaceæ, *Von Martius Conspectus, No.* 169. (1835).

Essential Character.—*Flowers* unisexual. *Calyx* inferior, minute, 5-toothed. *Corolla* gamopetalous; in the *male* tubular, with 5 lobes and 10 stamens, all arising from the same line, and of which those that are opposite the lobes are sessile, the others on short filaments; *anthers* adnate, 2-celled, bursting longitudinally; in the *female* divided nearly to the base into 5 segments. *Ovary* superior, 1-celled, with 5 parietal polyspermous placentæ; *stigma* sessile, 5-lobed, lacerated. *Fruit* succulent, indehiscent, 1-celled, with 5 polyspermous parietal placentæ. *Seeds* enveloped in a loose mucous coat with a brittle pitted testa; *embryo* in the axis of fleshy *albumen*, with flat cotyledons and a taper radicle turned towards the hilum.—*Trees* without branches, yielding an acrid milky juice. *Leaves* alternate, lobed, on long taper petioles. *Flowers* in axillary racemes.

Affinities. It was the opinion of Jussieu that the genus upon which this order is founded held a sort of middle station between Urticaceæ and Cucurbitaceæ. Auguste de St. Hilaire has, however, well remarked upon this subject, that the only relation that it has with Urticaceæ consists in the separation of sexes, milky juice, habit, which is like that of some species of Ficus, foliage, which is not very different from that of Cecropia, and the position of its stigmas; and to these he very wisely attaches very little importance. Its fruit brings it near Cucurbitaceæ; but its true place is probably in the vicinity of Passifloraceæ, with which it altogether agrees in the appearance of its testa, in its unilocular fruit with parietal polyspermous placentæ, and in its dichlamydeous flowers; differing, however, widely in its habit and united petals.

Geography. Natives of South America; unknown, except as objects of cultivation, beyond that continent.

Properties. The fruit of the Papaw is eaten, when cooked, and is esteemed by some persons; but it appears to have little to recommend it. Its great peculiarities are, that the juice of the unripe fruit is a most powerful and efficient vermifuge, the powder of the seed even answers the same purpose, and that a principal constituent of this juice is fibrine, a principle otherwise supposed peculiar to the animal kingdom and to fungi. The tree has, moreover, the singular property of rendering the toughest animal substances tender, by causing a separation of the muscular fibre; its very vapour even does this; newly-killed meat suspended among the leaves, and even old hogs

and old poultry, when fed on the leaves and fruit, become tender in a few hours. See an excellent account of the Papaw by Hooker in the *Bot. Mag.* 2898.

GENUS.

Carica, L.

Order L. FLACOURTIACEÆ.

Flacourtianeæ, *Richard in Mém. Mus.* 1. 366. (1815); *DC. Prodr.* 1. 255. (1824).

Essential Character.—*Sepals* definite, from 4-7, cohering slightly at the base. *Petals* equal to the latter in number and alternate with them, seldom wanting. *Stamens* hypogynous, of the same number as the petals, or twice as many, or some multiple of them, occasionally changed into nectariferous scales. *Ovary* roundish, distinct, sessile or slightly stalked; *style* either none or filiform; *stigmas* several, more or less distinct. *Fruit* 1-celled, either fleshy and indehiscent, or capsular, with 4 or 5 valves, the centre filled with a thin pulp. *Seeds* few, thick, usually enveloped in a pellicle formed by the withered pulp, attached to the surface of the valves in a branched manner, not in a line as in Violaceæ and Passifloraceæ; *albumen* fleshy, somewhat oily; *embryo* straight in the axis with the radicle turned to the hilum, and therefore usually superior; *cotyledons* flat, foliaceous.—*Shrubs*, or small *trees*. *Leaves* alternate, simple, on short stalks, without stipules, usually entire, and coriaceous. *Peduncles* axillary, many-flowered. *Flowers* sometimes unisexual.

Anomalies. Ryanæa, Patrisia, Flacourtia, Roumea, and Stigmarota, that is to say, more than half the order, have no petals.

Affinities. The unilocular fruit, over the whole of the inside of which the placentæ spread, is, according to De Candolle, sufficient to distinguish these from all other Dicotyledons. They resemble the Capparidaceæ with fleshy fruit in a number of particulars; and De Candolle indicates an approach to Passifloraceæ: this chiefly depends upon both orders having parietal placentæ, and the presence of a series of barren stamina, analogous to the corona of Passifloraceæ. They have also some relation to Samydaceæ.

Geography. Almost all natives of the hottest parts of the East and West Indies, and Africa, Two or three species are found at the Cape of Good Hope, and one or perhaps two in New Zealand.

Properties. Nothing is known of their sensible qualities. The fruit of some of the Flacourtias is eatable and wholesome, That of Hydnocarpus venenata is used in Ceylon for poisoning fish, which afterwards becomes so unwholesome as to be unfit for food. But according to Blume, this genus belongs to a distinct and natural order. See *Pangiaceæ* below.

GENERA.

§ 1. Patrisieæ, DC.	§ 2. Flacourtieæ, DC.	Stigmarota, Lour.	§ 4. Erythrospermeæ, DC.
Ryanæa, DC.	Flacourtia, L'Herit.	§ 3. Kiggelarieæ, DC.	Erythrospermum, Lm.
Ryania, Vahl.	Roumea, Poit.*	Kiggelaria, L.	Chaulmoogra, Roxb.
Patrisia, Rich.	*Kœlera*, Willd.	Melicytus, Forst.	
Patrisia, H.B.K.	*Bessera*, Spreng.		Phoberos, Lour.
	Limacia, Dietr.		

PANGIACEÆ,

Blume in Ann. Sc. Nov. Ser. 2. 88. (1834).

Pangium, Rumf.	Hydnocarpus, Gærtn.
Vareca, Gærtn.*	*Chilmoria*, Hamlt.
	Gynocardia, Roxb.

are mentioned by name in the work above quoted, but no character is assigned to them.

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* See Samydaceæ.

Order LII. MALESHERBIACEÆ.

Malesherbiaceæ, *Don in Jameson's Journal*, 321. (1826); *Martius Conspectus*, *No.* 240. (1835).—Passifloreæ, § Malesherbicæ, *DC. Prodr.* 3. 337. (1828).

Essential Character.—*Calyx* tubular, membranous, inflated, 5-lobed, the lobes with an imbricated æstivation. *Petals* 5, alternate with the segments of the calyx, persistent, with a convolute æstivation, arising from without a short membranous rim or corona. *Stamens* 5 or 10, perigynous; *filaments* filiform, distinct, or connected with the stalk of the ovary; *anthers* versatile. *Ovary* superior, stipitate, 1-celled, sometimes with the placentæ at the base, from which the ovules arise by the intervention of umbilical cords; *styles* 3, filiform, very long, arising from distinct points of the apex of the ovary; *stigmas* clavate. *Fruit* capsular, 1-celled, 3-valved, membranous more or less, many-seeded. *Seeds* attached by umbilical cords to placentæ arising either from the axis of the valves, or from their base; *testa* crustaceous, brittle, with a fleshy crest, and no aril; *embryo* taper, in the midst of fleshy *albumen*, with the radicle next the hilum.—*Herbaceous* or *half-shrubby* plants. *Leaves* alternate, lobed, without stipules. *Flowers* axillary or terminal, solitary, yellow or blue.

Affinities. According to Don, by whom these plants were first considered the rudiments of an order, "they agree on the one hand with Passifloraceæ, and on the other with Turneraceæ;" and I am persuaded that this is their true position. From the former they differ in the insertion of their styles, in their versatile anthers, taper embryo, want of aril and stipules, and altogether in their habit: from Turneraceæ, to which their habit quite allies them, they differ in the presence of a perigynous membrane, in the remarkable insertion of the styles, and in the want of all trace of an aril; agreeing with that order in the æstivation of the corolla, and in the principal other points of their structure. In their thin-sided fruit they approach Smeathmannia in Passifloraceæ. *At least* two genera of the order are known.

Geography. Natives of Chili.

Properties. Unknown, except as objects of great beauty.

GENERA.

Malesherbia, R. et P.
Gynopleura, Cav.

Order LIII. TURNERACEÆ.

Loaseæ, § Turneraceæ, *Kunth. N. G. et Sp.* 6. 123. (1823).—Turneraceæ, *DC. Prodr.* 3. 345. (1828).

Essential Character.—*Calyx* inferior, often coloured, with 5 equal lobes, imbricated in æstivation. *Petals* 5, inserted into the tube of the calyx, equal, with a twisted æstivation. *Stamens* 5, inserted into the tube of the calyx below the petals, with which they are alternate; *filaments* distinct; *anthers* oblong, erect, 2-celled. *Ovary* superior, 1-celled, with 3 parietal placentæ; *ovules* indefinite; *styles* 3 or 6, cohering more or less, and simple branched or multifid at the apex. *Capsule* 3-valved, 1-celled, opening from the point about as far as the middle, the valves bearing the placentæ in the middle. *Seeds* with a thin membranous aril on one side, crustaceous, reticulated; *embryo* slightly curved, in the middle of fleshy albumen; *radicle* turned towards the hilum; *cotyledons* somewhat plano-convex.—*Herbaceous* plants, having sometimes a tendency to become shrubby, with a simple pubescence, which does not sting. *Leaves* alternate, simple, without stipules, with occasionally 2 glands at the apex of the petiole. *Flowers* axillary, their pedicel either distinct or cohering with the petiole; with 2 bractlets. *Petals* yellowish, rarely blue.

Affinities. Placed by De Candolle between Loasaseæ and Fouquieraceæ, chiefly, it should seem, on account of its manifest relation to the former,

and its perigynous stamens. Others station it in the vicinity of Cistaceæ, from which it differs more in the calyx, in the insertion of the stamens, and in the approximation of the radicle to the hilum, than in any other character, agreeing with them very much in habit. With Malvaceæ the order agrees in the twisted æstivation of the corolla, and in habit. But with Loasaseæ and Passifloraceæ they have most in common: the presence of glands upon the ends of the petioles of Turneraceæ is a confirmation of their affinity to the latter. They are distinguished from Loasaseæ by their fruit being superior and 1-celled, with parietal placentæ, and by their definite stamens; the former character is, however, weakened by the nearly superior fruit of some Loasaseæ.

Geography. Natives exclusively of the West Indies and South America. There seems no good reason for supposing Turnera trioniflora to be a native of Japan.

Properties. Unknown,

GENERA.

Turnera, L.
Piriqueta, Aubl.
Burcardia, Schreb.
Burghartia, Neck.

Alliance IV. *BIXALES.*

Essential Character.—Polyandrous, without any crown of sterile stamens. *Leaves* usually dotted.

This character divides the present alliance from the last, to which it is otherwise most nearly related. Oncoba in Bixaceæ is, in fact almost equally referable to Flacourtiaceæ; for if it agrees with this alliance in the absence of sterile stamens, and in the large number of the fertile ones, so does it also agree with Flacourtiaceæ in its placentæ spread all over the inside of the fruit.

Order LIV. BIXACEÆ. The Arnotto Tribe.

Bixineæ, *Kunth Diss. Malv.* p. 17. (1822); *DC. Prodr.* 1. 259. (1824).

Essential Character.—*Sepals* 4-7, either distinct or cohering at the base, with an imbricated æstivation. *Petals* 5, like the sepals, or wanting. *Stamens* indefinite, distinct, inserted upon a receptacle at the base of the calyx; *anthers* 2-celled. *Ovary* superior, sessile, 1-celled; *ovules* proceeding from 4 to 7 parietal placentæ; *style* single, or in 2 or 4 divisions. *Fruit* capsular, or berried, 1-celled, many-seeded. *Seeds* attached to parietal placentæ, and enveloped in pulp; *albumen* either fleshy or very thin; *embryo* included, either straightish or curved, with leafy *cotyledons*; *radicle* pointing to the hilum.—*Trees* or *shrubs*. *Leaves* alternate, simple, entire, usually with pellucid dots; *stipules* deciduous, one only in Azara, often wanting; *peduncles* axillary, 1-many-flowered, with bracts.

Anomalies. Corolla often wanting.

Affinities. The carpological characters of this order are very much those of Cistaceæ and Homaliaceæ; from the former, Bixaceæ differ in the position of their radicle, and in many other particulars; from the latter they are distinguished by their hypogynous stamens, and consequently superior fruit, by the distinct nature of the sepals and petals, when the latter are present, &c. Their dotted leaves are remarkable among all the neighbouring orders, and would alone suffice to characterise them, if they were constant, but they are occasionally not dotted. Some of the genera were formerly referred to Rosaceæ; but the affinity of that order is very weak; the plants formerly placed in

it were imperfectly known. Oncoba connects the order with Flacourtiaceæ, and seems equally allied to both; it also joins both that and this present order to Passifloraceæ by the genus Smeathmannia, with which it accords in habit.

GEOGRAPHY. All natives of the hotter parts of America, or of the islands of the Mauritius.

PROPERTIES. Bixa yields the substance known to the English by the name of Arnotto, and to the French by that of Rocou. It is the pulp that envelopes the seeds, and which is slightly purgative and stomachic. Farmers use it to stain their cheeses, and dyers for a reddish colour. The bark of Ludia is said to be emetic: but it is uncertain whether that genus does not belong to Homaliaceæ.

GENERA.

Echinocarpus, Blume.
Bixa, L.
Abatia, R. et P.
Banara, Aubl.
Laetia, L.
Thamnia, R. Br.
Oncoba, Forsk.
Lundia, Thonn.
Prockia, L.
Lightfootia, Sw.
Kuhlia, H. B. K.
Ludia, Lam.
Ascra, Schott.
Trichospermum, Blum.
Azara, R. et P.
Lindackeria, Presl.
Dasyanthera, Presl.
Christannia, Presl.
Mayna, Aubl.
Piparea, Aubl.

GROUP IV. Calycoseæ.

ESSENTIAL CHARACTER.—*Calyx* incompletely whorled, two of the sepals being exterior. *Placentæ* not parietal in the ovary. *Fruit* never inferior. *Albumen* if present, of nearly the same capacity as the embryo.

The natural orders collected under this head, seem to have some common bond of union, which separates them from the remainder of the series; whether that bond depends upon some peculiarity in the calyx or in any other organ. It must be confessed that the structure of the calyx, upon which I rely for my distinction, is sometimes, especially when the fruit is nearly full grown, but little appreciable, and yet I think it is capable of practical application in all cases, if it be remembered that plants with parietal placentæ in the ovary, or inferior fruit, are excluded from this group. For example, Sauvagesieæ have a complete calycose structure, but their ovary has parietal placentation, and therefore the sub-order belongs to the parietal group. In the Cistal alliance are comprehended the lowest forms of the calycose group, and it is here that we pass on the one hand into the Ranal alliance of the albuminous group through Cistus and Dendromecon; and on the other into the Malval alliance of the Syncarpous group through Linaceæ, Hugoniaceæ, and Malvaceæ. Polygalaceæ seem to form one of the connections of this group with the last through Violaceæ, and with the Apocarpous group through Leguminosæ.

ALLIANCE I. *GUTTALES.*

ESSENTIAL CHARACTER.—*Stamens* indefinite in number. *Albumen* absent in the seeds. *Petals* equal in number to the sepals.

This may be considered the highest form of the calycose group. The leaves in almost all the genera are opposite, and of a firm texture with a smooth surface, and the flowers are large and showy. This alliance differs from the Theal in the general tendency to a uniformity in number between the sepals and

petals; besides which the plants of the Theal alliance have in all cases alternate leaves, which are very often serrated. The Cistal alliance is scarcely distinguishable by any single character beyond the presence of albumen, and yet the orders it comprehends are in reality very peculiar.

Order LV. GUTTIFERÆ, or CLUSIACEÆ. } The Mangosteen Tribe.

Guttiferæ, *Juss. Gen.* 243. (1789); *DC. Prodr.* 1. 557. (1824); *Cambessédes Mémoire* (1828).

Essential Character.—*Flowers* hermaphrodite, or unisexual. *Sepals* from 2 to 6, usually persistent, round, membranous, and imbricated, frequently unequal and coloured. *Petals* hypogynous, from 4 to 10, passing insensibly into sepals. *Stamens* numerous, either distinct, or combined in one or more parcels, hypogynous, rarely definite; *filaments* of various lengths; *anthers* adnate, bursting inwards, sometimes very small, occasionally bursting outwards, sometimes 1-celled, and sometimes opening by a pore. *Disk* fleshy, occasionally 5-lobed. *Ovary* solitary, superior, 1- or many-celled; *ovules* solitary, erect, or ascending, or numerous and attached to central placentæ; *style* none, or very short; *stigma* peltate, or radiate. *Fruit* either dry or succulent, 1- or many-celled, 1- or many-seeded, dehiscent or indehiscent. *Seeds* frequently nestling in pulp; their coat thin and membranous; always apterous, very frequently with an aril; *albumen* none; *embryo* straight; *cotyledons* thick, inseparable; *radicle* either turned to or from the hilum.—*Trees* or *shrubs*, occasionally parasitical, yielding resinous juice. *Leaves* without stipules, opposite, very rarely alternate, coriaceous, entire, with a strong midrib, and often with the lateral veins running through to the margin. *Flowers* usually numerous, axillary, or terminal, white, pink, or red, articulated with their peduncle.

Anomalies. Havetia has the anthers *immersed* in a fleshy receptacle. The ovary of Calophylleæ is 1-celled, and the petals opposite the sepals.

Affinities. In treating of Ternströmiaceæ use has been made of the excellent memoir of Cambessédes for the purpose of explaining the affinities of that order with this; and the following comparisons are drawn from the same source. European botanists are much in want of good observations upon living plants of Guttiferæ, and there is no order that is more in need of elucidation from some skilful Indian botanist than this. Cambessédes remarks, that Guttiferæ differ from Hypericaceæ in their branches, their leaves, and their articulated peduncles; in the normal number of the parts of their flowers, which appears to be two and its multiples, instead of five, which obtains in Hypericaceæ; in their anthers united the whole length with the filament, and not articulated at its summit; in their seeds, which often have an aril, and are solitary in each cell of the ovary, a character found in no Hypericaceæ (the monospermous cells of the fruit of some Vismias is due to abortion); finally, in the structure of the embryo, which is different in the two orders. Hypericaceæ, moreover, have the carpels often nearly distinct. Marcgraaviaceæ are distinguished by their alternate leaves, the singular form of their lower bracts, their petals frequently united, their unsymmetrical flowers, and by their seeds being very small, and exceedingly numerous. Royle remarks that Guttiferæ are in some respects allied to Ebenaceæ, as may be seen by comparing species of Garcinia with some species of Diospyrus. *Illustr.* p. 132.

Geography. All natives of the tropics, the greater part of South America; a few are from Madagascar, none from the continent of Africa. They generally require situations combining excessive heat and humidity.

Properties. The species all abound in a viscid, yellow, acrid, and purgative gum-resinous juice resembling Gamboge. This gum-resin is obtained by removing the bark or by breaking the leaves and young shoots. Two kinds of Gamboge are known in Indian bazaars; one the best, is the produce

of Siam; this is in rolls, having the appearance of being rolled or cast in moulds when in its soft state; it is solid and compact in texture, and forms the best pigment. This is what is supposed to be procured from Stalagmitis Cambogioides, which, according to Wight and Arnott, is a species of Garcinia, and probably identical with G. cochinchinensis. The other kind in smaller pieces, granular, brittle, less valued as a colour, and less effective as a purgative, is the produce of Ceylon. This, there can be little doubt is what is furnished by Xanthochymus pictorius. Many more species afford a similar substance although of inferior quality. Garcinia pictoria yields Gamboge which in its crude and unprepared state is superior to every other kind; but it is not so permanent. *Royle's Illustr.* p. 132. Many would, no doubt, yield useful timber, as Calophyllum angustifolium furnishes the straight spars called *Peon*, at Penang, and in the islands to the Eastward of the Bay of Bengal. The blossoms of Mæsua ferrea are to be found in every bazaar in a dried state, under the name of *nagkesur*, being used in medicine as well as esteemed for their fragrance. The seeds of Calophyllum inophyllum yield an oil, and a resin exudes from the roots which is supposed by some authors to be the same as the *Tacamahaca* of the Isle of Bourbon. *Ibid.* The true East India Tacamahaca is produced by Calophyllum Calaba. The powerful gastric cathartic properties of Gamboge are well known. If dissolved in water, and examined beneath a very powerful microscope, this substance will be found to consist entirely of active molecules. In the West Indies the juice of Mammea is employed to destroy the chiggers, little insects which attack the naked feet, introducing themselves into the flesh below the toe-nails. The bark of many kinds is astringent and slightly vermifugal. The berry of Garcinia Mangostana is believed to be the most grateful to the palate of all the fruits that are known. Other species, especially G. cornea and paniculata, also bear a grateful fruit. The Butter and Tallow-tree of Sierra Leone, which owes its name (Pentadesma butyracea) to the yellow greasy juice its fruit yields when cut, belongs to this order. The flowers of Clusia insignis weep a considerable quantity of resin from the disk and stamens; so much that Von Martius says he obtained an ounce from two flowers. See *Nov. G. and Sp.* 3. 165.

GENERA.

§ 1. Clusieæ, DC.
Tovomita, Aubl.
Marialva, Vand.
Beauharnoisia, R. et P.
Ochrocarpus, Pt. Th.
Verticillaria, R. et P.
Chloromyron, Pers.
Clusia, L.
Xanthe, W.
Arrudea, Camb.
Havetia, Kth.
Quapoya, Aubl.
Schweiggera, Mart.
Micranthera, Chois.
Bertolonia, Spr.

§ 2. Moronobeæ.
Moronobea, Aubl.
Symphonia, Juss.
Chrysopia, Pet. Th.
Aneuriscus, Presl.

§ 3. Garcinieæ, DC.
Mammea, L.
Pentadesma, R. Br.
Rheedia, L.
Garcinia, L.
Cambogia, L.
Mangostana, Gærtn.
Stalagmitis, Murr.
Xanthochymus, Rox.
Brindonia, Pet. Th.
Oxycarpus, Lour.

§ 4. Calophylleæ.
Mesua, L.
Calophyllum, L.
Kayea, Wall.
——
Apoterium, Bl.
Gynotroches, Bl.
Macoubea, Aubl.
Macanea, Juss.
Macahanea, Aubl.

Sub-Order? CANELLEÆ.

Canellaceæ, *Von Martius, Nov. Gen. et Sp.* 3. 163. (1829); *Conspectus, No.* 300. (1835).

Von Martius states in the place above quoted, "that Platonia and Canella form a peculiar order, especially distinguished from Guttiferæ by the presence of albumen." He suggests that Moronobea may also belong to the same assemblage. The ovules of Canella are remarkably different from those of Guttiferæ; they hang in a single pair side by side, and by short funicles, from near the apex of the solitary carpel of which the fruit consists.

PROPERTIES. For Winters bark is sometimes substituted that of Canella alba, which it resembles in its aromatic pungent qualities. *Fée.*

GENERA.

Canella, P. Br. Platonia, Mart.
Winterana, L.

ORDER LVI. RHIZOBOLACEÆ.

RHIZOBOLEÆ, *DC. Prodr.* 1. 599. (1824); *Cambessédes in Aug. St. Hil. Fl. Bras. Merid.* 1. 322. (1827).

ESSENTIAL CHARACTER.—*Sepals* 5, more or less combined, imbricated in æstivation. *Petals* 5, thickish, unequal, arising along with the stamens from a hypogynous disk. *Stamens* extremely numerous, slightly monadelphous, arising in a double row from a disk, the innermost being shorter and often abortive; *anthers* roundish. *Ovary* superior, 4-6-celled, 4-6-seeded; *styles* 4-6; *stigma* simple; *ovules* peltate. *Fruit* formed of 4-6-combined nuts, part of which are sometimes abortive; each nut indehiscent, 1-seeded, 1-celled, with a thick double putamen. *Seed* reniform, without albumen, with a funicle which is dilated into a spongy excrescence; *radicle* very large, constituting nearly the whole of the almond-like substance of the nut, with a long 2-edged caulicle, having two small cotyledons at the top, and lying in a furrow of the radicle.—*Trees.* *Leaves* opposite, stalked, compound, without stipules. *Flowers* racemose.

AFFINITIES. A very distinct order, allied to Sapindaceæ, in its hypogynous flowers and its fruit; in some measure also related to Æsculaceæ on account of its opposite compound palmate leaves; but in Æsculaceæ the radicle is small, and the cotyledons very large, while in Rhizobolaceæ the radicle is enlarged, and the cotyledons small. In both orders the albumen seèms to be absorbed by the various parts of the embryo. *De Candolle, Prodr.* 1. 599. It is, however, with Guttiferæ that Rhizobolaceæ best agree. "In these two orders we find the leaves opposite and articulated at their base, hypogynous petals with an æstivation of the same nature; numerous hypogynous stamens, and exalbuminous seeds. The large flowers of Caryocar call to mind those of most Guttiferæ, its inflorescence is nearly that of Moronobea; its fruit has a relation to that of Mammea, and presents, in that genus as in several others of the same order, a single seed in each cell." *Camb. in Aug. St. H. Fl. Bras.* 1. 323.

GEOGRAPHY. Six large trees found in the forests of the hottest parts of South America constitute the whole of the order.

PROPERTIES. Some of them are known for producing the *Souari* (vulgò Suwarrow) Nuts, of the shops, the kernel of which is one of the most delicious fruits of the nut kind that is known. An oil is extracted from them not inferior to that of the Olive.

GENUS.

Caryocar, L.
Rhizobolus, Gærtn.
Saouari, Aubl.
Pekea, Aubl.

ORDER LVII. MARCGRAAVIACEÆ.

MARCGRAAVIACEÆ, *Juss. Ann. Mus.* 14. 397. (1809); *DC. Prod.* 1. 565. (1824).

ESSENTIAL CHARACTER.—*Sepals* from 2 to 7, usually coriaceous and imbricated. *Corolla* hypogynous; sometimes gamopetalous, calyptriform, entire, or torn at the point,

sometimes consisting of five petals. *Stamens* indefinite, inserted either on the receptacle or on a hypogynous membrane; *filaments* dilated at the base; *anthers* long, innate, bursting inwards. *Ovary* single, superior, usually furrowed, many-celled, many-seeded; *style* single; *stigma* simple or capitate; *ovules* numerous, attached to a central placenta. *Capsule* coriaceous, consisting of several valves which separate slightly; *dissepiments* proceeding from the middle of the valves, but not meeting in the centre, so that the fruit is 1-celled. *Seeds* very minute and numerous, nestling in pulp.—*Shrubs*, having sometimes a scrambling habit. *Leaves* alternate. *Flowers* in umbels or spikes. *Peduncles* naked, or furnished with either simple or cucullate hollow *bracts*.

Affinities. The station of this order is uncertain; it approaches Ebenaceæ in its gamopetalous corolla cut round at the base, in the anthers attached by their base, and the alternate leaves: Ericaceæ in the anthers and disk of the genus Antholoma: Hypericaceæ and Guttiferæ in the hypogynous stamens, the polypetalous corolla of some genera, placentation and numerous seeds; wherefore Jussieu stationed the order near Clusia. *DC. Prodr.* 1. 565. (1824). Turpin has somewhere remarked, that the bracts of this order offer a clear explanation of the conversion of a degenerated leaf into an ovule.

Geography. All found in equinoctial America, except Antholoma, which is a native of New Caledonia.

Properties. Handsome and curious plants, remarkable for their singular cucullate bracts. Nothing is known of their qualities.

GENERA.

§ 1. Marcgraavieæ, DC.	§ 2. Norantеæ, DC.	Ruyschia, Jacq.
Antholoma, La Bill.	Norantea, Aubl.	*Souroubea*, Aubl.
Marcgraavia, L.	*Ascium*, Vahl.	

Order LVIII. HYPERICACEÆ. The Tutsan Tribe.

Hyperica, *Juss. Gen.* 254. (1789).—Hypericineæ, *Chois. Prodr. Hyp.* 32. (1821); *DC. Prodr.* 1. 541. (1824); *Lindl. Synops.* p. 41. (1829).

Essential Character.—*Sepals* 4-5, either more or less cohering, or wholly distinct, persistent, unequal, with glandular dots. *Petals* 4-5, hypogynous, with a twisted æstivation and oblique vernation, often having black dots. *Stamens* indefinite, hypogynous, in three or more parcels; *anthers* versatile. *Ovary* single, superior; *placenta* at this time central; *styles* several, rarely connate; *stigmas* simple, occasionally capitate. *Fruit* a capsule or berry, of many valves and many cells; the edges of the former being curved inwards, *Seeds* minute, indefinite, usually tapering, attached to a placenta in the axis or on the inner edge of the dissepiments; *embryo* straight, with an inferior *radicle* and no *albumen*.—*Herbaceous* plants, *shrubs*, or *trees*, with a resinous juice. *Leaves* opposite, entire, sometimes dotted, occasionally alternate and crenelled. *Flowers* generally yellow. *Inflorescence* variable.

Anomalies. Lancretia has 10 monadelphous stamens. Some species of Vismia have solitary seeds, according to Cambessédes.

Affinities. Nearly allied to Guttiferæ, from which they chiefly differ in their small round and versatile anthers, numerous styles, and polyspermous capsules. To Cistaceæ they approximate in many points, differing principally in their fruit, polyadelphous stamens, and dotted leaves. With Saxifragaceæ they appear to me to have some relation, through the medium of Parnassia, the fringed glands of which are analogous to the polyandrous fascicles of Hypericum. The leaves of Hypericaceæ are very commonly marked with dots, which are either transparent, or black and opaque.

Geography. Very generally spread over the surface of the earth, inhabiting mountains and valleys, marshes and dry plains, meadows and heaths.

The following is the distribution of the species according to Choisy:—Europe 19; North America, 41; South America, 21; West Indies, 1; Asia, 24; New Holland, 5; Africa and the neighbouring islands, 7; Azores and Canaries, 5; common to Europe and Asia, 4; common to Europe, Asia, and Africa, 1. (*Choisy Prodr.* 1821.) Many, have however, to be added for Asia and South America.

Properties. The juice of many species is slightly purgative and febrifugal. In the European species this yellow juice being in small proportion to the essential oil, and the rest of the vegetable matter, they have been used as tonics and astringents; especially H. perforatum and H. Androsæmum. Some of the American species of the order are possessed of a more copious yellow juice, and more energetic properties; that obtained from Vismia guianensis, a Mexican and Surinam tree, is known in commerce and called American Gummi Gutta. *Royle's Illustr.* 131. Hypericum hircinum is fœtid. A gargle for sore throats is prepared in Brazil from the Hypericum connatum, commonly called *Orelha de Gato. Pl. Us.* 61. A decoction of the leaves of another species, Hypericum laxiusculum, or *Allecrim brabo,* is reputed in the same country to be a specific against the bites of serpents. *Ib.* 62.

GENERA.

§ 1. Hypericeæ, DC.
Ascyrum, L.
Hypericoides, Adans.
Lancretia, DC.
Cratoxylon, Blume.
Hypericum, L.
Brathys, Mut.
Sarothra, L.
Triadenium, Rafin.
Elodea, Pursh.
Martia, Spreng.
Androsæmum, All.

§ 2. Vismiæ, DC.
Vismia, Vand.
Haronga, Pet. Thou.
Harongana, Lam.
Arongana, Pers.
Hæmocarpus, Noron.
Monoporina, I.S.Prsl.
Scyphæa, C.B. Presl.

§ 3. Carpodonteæ, Bartl.
Carpodontos, La Bill.
Eucryphia, Cav.
Godoya, R. et P.

Sub-Order? OCHRANTHACEÆ.

In the *Botanical Register,* t. 1819 (Dec. 1835), I have described a plant called Ochranthe, which agrees with Hypericaceæ in having imbricated sepals, hypogynous petals and stamens, partly disjoined carpels, and in some degree in habit, but which differs in having definite stamens (5), stipules, and serrated leaves. Its fruit is unknown. To what order it really ought to be referred is uncertain; but it appears to me so very remarkable a plant as to indicate very strong traces of a peculiar assemblage.

GENUS.

Ochranthe, Lindl.

Alliance II. *THEALES.*

Essential Character.—*Stamens* indefinite in number. *Albumen* absent in the seeds. The petals and sepals not equal to each other in number, but gradually passing the one into the other.

Here we have a kind of transition from Guttales to Acerales. Saurauja approaches Sapindaceæ in the panicled inflorescence and general character.

Order LIX. TERNSTRÖMIACEÆ.

Ternströmieæ, *Mirbl. Bull. Philom.* 381. (1813).—Ternströmiaceæ, *DC. Mém. Soc. H. N. Genev.* vol. 1. (1823); *Prodr.* 1. 523. (1824); *Cambessédes Mémoire* (1828). —Theaceæ, *Mirb. Bull. Phil.* (1813).—Camellieæ, *DC. Théor. Elem. ed.* 1. (1813); *Prodr.* 1. 529. (1824).

Essential Character.—*Flowers* very rarely polygamous. *Sepals* 5 or 7, imbricated in æstivation, concave, coriaceous, deciduous, the innermost often the largest. *Petals* 5, 6, or 9, not equal in number to the sepals, often combined at the base. *Stamens* very numerous; *filaments* filiform, monadelphous or polyadelphous; *anthers* versatile, or adnate. *Ovary* superior, with several cells; *styles* from 3 to 7, filiform, more or less combined; *ovules* pendulous, or erect, or peltate. *Capsule* 2-7-celled and capsular, with the dehiscence taking place in various ways; sometimes coriaceous and indehiscent; usually with a central column. *Seeds* large, attached to the axis, very few; *albumen* none, or in very small quantity; *embryo* straight, bowed or folded back, the radicle turned to the hilum; *cotyledons* very large, often filled with oil, occasionally plaited lengthwise; an aril sometimes present.—*Trees* or *shrubs*. *Leaves* alternate, coriaceous, without *stipules*, usually undivided, now and then with pellucid dots. *Peduncles* axillary or terminal, articulated at the base. *Flowers* generally white, seldom pink or red, very rarely (in Cochlospermum) yellow.

Anomalies. Cochlospermum has the ovary 1-celled, with imperfect septa, to the margins of which the ovules are attached. Leaves very rarely opposite. *Cambessédes.*

Affinities. This order originated in 1813, with Mirbel, who separated some of its genera from Aurantiaceæ, where they had been placed by Jussieu, and at the same time founded another closely allied order, under the name of Theaceæ. These opinions were substantially adopted by Kunth and De Candolle, the latter of whom, moreover, formed several sections among his Ternströmiaceæ. It is, however, certain, that no solid difference exists between this last order and Theaceæ or Camellieæ, as they were called by De Candolle; and Cambessédes, after a careful revision of the whole, has come to the conclusion, that even the sections proposed by De Candolle among Ternströmiaceæ are untenable. I shall profit by Cambessédes' observations in all I have to say upon the order. Ternströmiaceæ may be compared, in the first place, with Guttiferæ, with which they accord more closely than with any thing else, and in the affinities of which they entirely participate. They differ thus: in Ternströmiaceæ the leaves are alternate, to which there are scarcely any exceptions; they are always opposite in Guttiferæ. In the former the normal number of the parts of the flower appears to be 5 and its multiples; in Guttiferæ it is evidently two. In the former the calyx is always perfectly distinct from the corolla; these two organs are usually confounded in the latter. Ternströmiaceæ have the petals generally united at the base, and a twisted æstivation; in Guttiferæ they are distinct, with a convolute æstivation. The seeds of the former are almost always either destitute of albumen, or furnished with a membranous wing; the latter have neither the one nor the other. The first have the radicle always near the hilum; the second have it either near the hilum or turned in an opposite direction. Finally, in Guttiferæ the cotyledons are very thick, and firmly glued together; and this character, which is not observed in Ternströmiaceæ, is the more important, as it is not liable to any exception. Ternströmiaceæ are allied to Hypericaceæ through the medium of Carpodontos, a genus which, with the foliage of the latter order, has the fruit of the former; and also of certain plants of Hypericaceæ, which, according to Cambessédes, have a definite number of seeds. With Marcgraaviaceæ they agree through Norantea, which has the stamens slightly adherent to the base of the petals, and fixed anthers; but that order is entirely different in habit, and is well marked by its singular cucullate bracts, its fruit, and its wingless

exalbuminous seeds. Many genera of Ternströmiaceæ, such as Kielmeyera and others, have the habit of Tiliaceæ, while the fruit of Laplacea is strikingly like that of Luhea; but the æstivation of the calyx and many other characters distinguish them.

Geography. Although the plants of this order which are known in European gardens are chiefly from China or North America, these form but an inconsiderable part of the whole: 7 or 8 are all that are contained in the first of these countries, and 4 in the latter; while between 60 and 70, all beautiful trees or shrubs, are natives of the woods of South America: about a score are known in the East Indies, and one in Africa.

Properties. These are ill understood, but little being known of the greater part of the species. The tea which is so extensively consumed by Europeans is produced by different species of Thea and Camellia: its slightly stimulating properties become narcotic in very hot latitudes, as at Penang. For a most valuable account of this plant see *Royle's Illustr.* p. 107. An excellent table oil is expressed from the seeds of Camellia oleifera. The different species and varieties of Camellia japonica are the glory of gardeners. The fruit of a species of Saurauja is said to be acidulous, and to resemble Tomatoes in flavour. *DC.* The leaves of Kielmeyera speciosa are employed in Brazil for fomentations, for which they are well adapted, on account of the mucilage in which they abound. *Pl. Us.* 58. It is believed in Brazil, that a decoction of the roots of a plant called *Butua do curvo* (Wittelsbachia insignis, *Mart.*, Maximilianea regia, *Ibid.*, Cochlospermum insigne, *Aug. St. H.*) has the power of healing internal abscesses. The Brazilians take it for all kinds of internal bruises. *Pl. Us.* 57. Cochlospermum tinctorium is used in cases of amenorrhæa, and also as a yellow dye. *Fl. Seneg.* 1. 100. The seeds of Cochlospermum Gossypium are surrounded with cotton of a soft silky nature, and the tree yields the gum called *Kuteera*, which in the North-Western Provinces of India is substituted for Tragacanth. *Royle.*

GENERA.

Cochlospermum, Kth.
Maximilianea, Mart.
Wittelsbachia, Mart.
Ternströmia, Mut.
Tonabea, Juss.
Adinandra, Jack.
Cleyera, Thunb.
Freziera, Swz.
Lettsomia, R. et P.
Eurya, Thunb.
Saurauja, W.
Apatelia, DC.
Palava, R. et P.
Stewartia, Cav.
Malachodendron, Cav.
Laplacea, Kth.
Hæmocharis, Salisb.
Gordonia, Ellis.
Camellia, L.
Ventenatia, P. de B.
Bonnetia, Mart.
Kieseria, Nees.
Architæa, Mart.
Mahurea, Aubl.
Bonnetia, Schreb.
Marila, Pers.
Anisosticte, Bartl.
Kielmeyera, Mart.
Thea, L.
Sasanqua, Nees.

? Anneslea, Wall.
Wikströmia, Schrad.
Lindleya, Nees.
Schima, Reinw.
Geeria, Bl.
Pyrenaria, Bl.
Reinwardtia, Bl.
Blumia, Spr.

Alliance III. *ACERALES.*

Essential Character. *Stamens* definite in number. *Flowers* usually unsymmetrical in their parts, or if symmetrical more or less irregular; in the majority small and disposed in a compound inflorescence.

Most nearly connected are all the orders of this alliance. Aceraceæ are hardly different from Sapindaceæ, except in their opposite leaves. Æsculaceæ used to be referred to Sapindaceæ. Polygalaceæ are principally distinguished by their papilionaceous calyx, and Vochyaceæ are scarcely more than calcarate Polygalaceæ.

Order LX. ACERACEÆ. The Sycamore Tribe.

Acera, *Juss. Gen.* 50. (1789); *Ann. Mus.* 18. 477. (1811).—Acerineæ, *DC. Théorie*, ed. 2. 244. (1819); *Prodr.* 1. 593. (1824); *Lindl. Synops.* 55. (1829).

Essential Character.—*Calyx* divided into 5, or occasionally from 4 to 9 parts, with an imbricated æstivation. *Petals* equal in number to the lobes of the calyx, inserted round an hypogynous disk. *Stamens* inserted upon an hypogynous disk, generally 8, not often any other number, always definite. *Ovary* 2-lobed; *style* 1; *stigmas* 2. *Fruit* formed of two parts, which are indehiscent and samaroid; each 1-celled, with 1 or 2 seeds. *Seeds* erect, with a thickened lining to the testa; *albumen* none; *embryo* curved, with foliaceous wrinkled *cotyledons*, and an inferior *radicle*.—*Trees*. *Leaves* opposite, simple, rarely pinnate, without stipules. *Flowers* often polygamous, sometimes apetalous, in axillary corymbs or racemes.

Affinities. They chiefly differ from Sapindaceæ in their fruit having but 2 carpels, the petals never being furnished with scales, and their opposite leaves. Geissois, referred to Cunoniaceæ by Don, agrees with this order in habit, hypogynous stamens, dicarpellary fruit, and unsymmetrical flowers; but is apetalous and polyspermous, and has stipules. The internal structure of its seeds is unknown.

Geography. Europe, the temperate parts of Asia, the north of India, and North America, are the stations of this order, which is unknown in Africa and the southern hemisphere.

Properties. The species are only known for the sugary sap of Acer saccharinum and others, from which sugar is extracted in abundance, and for their light useful timber.

GENERA.

Acer, L.
Negundium, Raf.

Dobinæa, Hamilt.

? Geissois, Lab.

Order LXI. SAPINDACEÆ. The Soap-Tree Tribe.

Sapindi, *Juss. Gen.* 246. (1789).—Sapindaceæ, *Juss. Ann. Mus.* 18. 476. (1811); *DC. Prodr.* 1. 601. (1824); *Cambessédes in Mém. Mus.* 18. 1. (1829).

Essential Character.—*Flowers* polygamous. Males. *Calyx* more or less deeply 4-5-parted, or 4-5-leaved; with an imbricated æstivation. *Petals* 4-5, or occasionally absent, alternate with the sepals, hypogynous, sometimes naked, sometimes with a doubled appendage in the inside; æstivation imbricated. *Disk* fleshy; sometimes occupying the base of the calyx, regular, nearly entire, expanded between the petals and stamens; sometimes glandular, incomplete, the glands stationed between the petals and stamens. *Stamens* 8-10, rarely 5-6-7, very seldom 20, sometimes inserted into the disk, sometimes into the receptacle between the glands and the pistil; *filaments* free or combined just at the base; *anthers* turned inwards, bursting longitudinally. *Rudiment* of a pistil very small or none. Hermaphrodite Flowers. *Calyx*, *petals*, *disk*, *stamens*, as in the males. *Ovary* 3-celled, rarely, 2-4-celled, the cells containing 1, 2, 3, very seldom more, *ovules*. *Style* undivided, or more or less deeply 2- or 3-cleft. *Ovules* when solitary erect or ascending, rarely (as in Hypelate) suspended; when double the upper ascending, the lower suspended. *Fruit* sometimes capsular, 2-3-valved, sometimes samaroid, sometimes fleshy and indehiscent. *Seeds* usually with an aril; their outer integument crustaceous or membranous, their interior pellucid. *Albumen* 0. *Embryo* seldom straight, usually curved, or spirally twisted. *Radicle* next the hilum. *Cotyledons* incumbent, sometimes combined into a thick mass. *Plumule* 2-leaved.—*Trees*, or *shrubs* which often climb and have tendrils,

seldom climbing *herbs*. *Leaves* alternate, compound, very rarely simple, with or without stipules, often marked with lines or pellucid dots. *Flowers* in racemes, or racemose panicles, small, white or pink, seldom yellow. *Cambessédes.*

Affinities. From Aceraceæ these scarcely differ, except in their alternate leaves and petals, which have almost always an appendage on their face. In some respects near Meliaceæ, which agree in habit and in their pinnated leaves, but which are known by their monadelphous stamens and symmetrical flowers. To Polygalaceæ they are no doubt akin in the singular combination of 8 stamens with 5 unequal sepals, and an uncertain number of petals; and also in their aril, which may be compared to the caruncula of Polygalaceæ, although somewhat different in its origin. The dried leaves resemble, as De Candolle remarks, those of Connaraceæ. Their climbing habit and tendency to produce tendrils indicate a relation to Vitaceæ, which, however, is not very near. Brown remarks, that although in the far greater part of this family the ovule is erect and the radicle of the embryo inferior, yet it includes more than one genus in which both the seeds and embryo are inverted. *Congo*, 427. (1818.)

Geography. Natives of most parts of the tropics, but especially of South America and India. Africa knows many of them, but they are wanting in the cold regions of the north. None are found in Europe or the United States of America. Dodonæa represents the order in New Holland.

Properties. It is singular that while the leaves and branches of many of these plants are unquestionably poisonous, the fruit of others is valuable as an article of the dessert. Thus the *Longan*, the *Litchi*, and the *Rambutan*, fruits among the most delicious of the Indian archipelago, are the produce of different species of Nephelium. Pierardia sativa and dulcis, to which belong the *Rambeh* and *Choopa* of Malacca, and Hedycarpus malayanus producing the *Tampui*, are other fruit-trees of the order. The fruit of Schmidelia edulis is known at desserts in Brazil under the name of *Fruta de paraô;* it is said to have a sweet and pleasant taste. *Pl. Us.* 67. That of Sapindus esculentus is very fleshy, and much esteemed by the inhabitants of Certaô, by whom it is called *Pittomba. Ibid.* 68. Some species of Paullinia are, however, stated, upon various authorities, to be poisonous, especially the P. australis, to which principally Auguste de St. Hilaire attributes the poisonous quality of the Lecheguana honey, *Ed. P. J.* 14. 269; and P. cupania, which is used for making an intoxicating liquor. The aril of Paullinia subrotunda and of Blighia sapida is eatable. The leaves of Magonia pubescens and glabrata, called *Tinguy* in Brazil, are used for stupifying fishes; their bark is employed for healing sores in horses caused by the stings of insects. *A. St. Hil. Hist. des Pl.* 238. Serjania triternata is also employed as a fish poison. *Royle.* The fruit of Sapindus saponaria, and of several Indian species of the same genus, is used for the purposes of soap, owing to the presence of the vegetable principle called *Saponine. Royle.* The root of Cardiospermum halicacabum is aperient. *Ainslie*, 2. 204.

GENERA.

§ 1. Sapindeæ, Camb.
Cardiospermum, L.
Bridgesia, Camb.
Urvillea, Kth.
Serjania, Pl.
Toulicia, Aubl.
Ponæa, Schreb.
Paullinia, L.
Cardiopteris, Wall.
Sioja, Hamilt.
Schmidelia, L.
Ailophyllus, L.
Aporetica, Forst.
Toxicodendron, Gært.
Ornitrophe, Juss.
Gemella, Lour.
Irina, Bl.
Euceræa, Mart.
Xanthoceras, Bge.
Pappea, Eckl.
Ptæroxylon, Eckl.
Prostea, Camb.
Lepisanthes, Bl.
Sapindus, L.
Erioglossum, Bl.
Moulinsia, Camb.
Valenzuelia, Camb.
Cupania, Plum.
Vouarana, Aubl.
Trigonis, Jacq.
Molinæa, Juss.
Gelonium, Gærtn.
Guion, Cav.
Stadmannia, Lam.
Blighia, König.
Akeesia, Tuss.
Bonnannia, Raf.
Tina, R. et S.
Ratonia, DC.
Diplopetalum, Spr.
Dimereza, Lab.
Mischocarpus, Bl.
Talisia, Aubl.
Harpullia, Roxb.
Pierardia, Roxb.
Hedycarpus, Jack.
Nephelium, L.
Pometia, Forst.

Euphoria, Juss.
Scytalia, Gærtn.
Dimocarpus, Lour.
Thouinia, Poit.
Thyana, Hamilt.
Hypelate, P. Browne.
Melicocca, L.
Schleichera, W.

§ 2. Dodonæaceæ, Camb.
Kölreuteria, L.
Cossignia, Commers.
Llagunoa, R. et P.
Amirola, Pers.
Dodonæa, L.

Magonia, A. St. H.
Phæocarpus, Mart.

Enourea, Aubl.
Matayba, Aubl.
Ephielis, Schreb.
Ernstingia, Neck.
Aphania, Blume.

Alectryon, Gærtn.
Loxostylis, Spr.
Harrisonia, R. Br.
Eustathes, Lour.
Valentinia, Siv.
Pedicellia, Lour.
Racaria, Aubl.

Sub-Order? MILLINGTONIEÆ.

Jack in Malay. Misc. 2. 32; *Hooker Journal*, 377.—Millingtoniaceæ, *Wight and Arnott in Ed. Ph. Journ.* 15. 177. (1833); *Prodr. Penins.* 115. (1834); *Royle Illustr.* p. 139. (1835).

Essential Character.—*Sepals* 5, persistent, unequal, somewhat in a double series: æstivation imbricative. *Petals* 5, inserted on the margin of the receptacle, deciduous, alternating with the sepals, of two kinds; three outer ones orbicular, entire, with an imbricative æstivation; two interior smaller, acutely bifid, resembling scales. *Stamens* 5, opposite to the petals, and slightly united to them at the very base: three exterior sterile, opposite to the larger petals; two interior fertile, opposite to the bifid petals; *filaments* of the fertile stamens flat: anther-cells globose, dehiscing transversely, placed side by side on the inner side of the saucer-shaped connective. *Disk* flat, thin, hypogynous, free except at its point of attachment with the ovary and receptacle. *Ovary* ovate, 2-celled; *ovules* 2 in each cell, superposed; *style* simple, short, and thick; *stigma* slightly 2-lobed. *Fruit* a 1-celled, 1-seeded drupe; the dissepiment evanescent above, hardened and persistent at the base. *Seed* with a small cavity on one side, near the base. *Albumen* none, or extremely thin. *Embryo* curved: cotyledons thin, foliaceous, folded (chrysaloid): *radicle* curved, pointing to the hilum.—*Trees*. *Leaves* alternate, without *stipules*, entire or rarely pinnated. *Inflorescence* in panicles, terminal, or axillary near the extremity of the branches. *Flowers* small, inconspicuous, nearly sessile on very short peduncles that are arranged along the horizontal branches of the panicles. *Wight and Arnott, l. c.*

Affinities. The plants belonging to this assemblage are looked upon by Wight and Arnott as forming a family distinct from, but closely related to, Sapindaceæ. The principal differences pointed out by those authors are, that in the latter the stamens are usually twice as numerous as the petals, which have scales or tufts of hair at their base; and the hypogynous disk is fleshy. Other points are, indeed, adverted to, but they are either unimportant, or not clearly explained. These authors do not take the same view of the structure of the genus as Roxburgh, but agree with Jack in considering the number of petals 5, of which three only are petaloid, and the other two bifid and adnate to the base of the two fertile stamens. It appears to me, however, that in reality, in M. simplicifolia at least, there is very great irregularity in the proportion of the parts of the flower; in the calyx I find six pieces, two very minute and external, two larger, but unequal, next the first, and two more, also unequal, in the inside; petals I see only three, on the face of the largest of which is a distinct trace of a rudimentary scale; the stamens are five, three of them being deformed, lobed, and opposite the 3 petals, the other two fertile, alternating with two of the petals, with a membranous tooth on each side at the base (not the apex, as Roxburgh has it), and a remarkable saucer-like connective, on the upper face of which grow two anther-cells, the valves of which are extremely unequal. I do not, therefore, perceive how the genus differs from Sapindaceæ, except in the pistil being composed of two carpels instead of three. But although the number three is what usually prevails in Sapindaceæ, yet there are instances of two in Schmidelia, Irina, &c. and of four in Talisia and Dodonæa.

In habit the genus Millingtonia resembles Semecarpus and Buchanania among Anacardiaceæ.

GEOGRAPHY. Timber-trees found in India from 10° to 31½°, N. Lat. *Royle.*

PROPERTIES. Unknown.

GENUS.

Millingtonia, Roxb.

ORDER LXII. ÆSCULACEÆ. THE HORSE-CHESTNUT TRIBE.

HIPPOCASTANEÆ, *DC. Théorie, ed.* 2. 244. (1819); *Prodr.* 1. 597. (1824).—CASTANEACEÆ, *Link Enum.* 1. 354. (1821).

ESSENTIAL CHARACTER.—*Calyx* campanulate, 5-lobed. *Petals* 5, or 4 by the abortion of one of them, unequal, hypogynous. *Stamens* 7-8 distinct, unequal, inserted upon a hypogynous disk; *anthers* somewhat incumbent. *Ovary* roundish, 3-cornered, 3-celled; *style* 1, filiform, conical, acute; *ovules* 2 in each cell. *Fruit* coriaceous, 1- 2- or 3-valved, 1- 2- or 3-celled, 1- 2- or 3-seeded. *Seeds* large, roundish, with a smooth shining coat, and a broad pale hilum; *albumen* none; *embryo* curved, inverted, with fleshy, very thick, gibbous, cohering cotyledons, germinating under ground; *plumule* unusually large, 2-leaved; *radicle* conical, curved, turned towards the hilum.—*Trees* or *shrubs*. *Leaves* opposite, without *stipules*, compound, quinate or septenate. *Racemes* terminal, somewhat panicled; the pedicels with an articulation.

AFFINITIES. The want of symmetry in the parts of the flower, and their compound leaves, approximate Æsculaceæ to Sapindaceæ; the same character brings them near Aceraceæ, from both which they are distinguished by the structure of their fruit and seeds. They also approach Rhizobolaceæ, as is stated in speaking of that order.

GEOGRAPHY. The north of India and North America contain the few species that belong to this order.

PROPERTIES. Handsome trees or small bushes, chiefly remarkable for their large seeds, with an extensive hilum. These seeds contain a great quantity of starch, which renders them nutritive for man and many other animals, They also contain a sufficient proportion of potash to be useful as cosmetics, or as a substitute for soap; they are bitter, and have been employed as a sternutatory. The bark of the common Horse Chestnut is bitter, astringent, and febrifugal.

GENERA.

Æsculus, L.	Macrothyrsus, Spach.
Pavia, Boerh.	Calothyrsus, Spach.

ORDER LXIII. POLYGALACEÆ. THE MILKWORT TRIBE.

POLYGALEÆ, *Juss. Ann. Mus.* 14. 386. (1809); *R. Brown in Flinders* (1814); *Juss. Mem. Mus.* 1. 385. (1815); *DC. Prodr.* 1. 321. (1824); *Lindl. Synops.* 39. (1829); *Aug. de St. Hilaire and Moquin-Tandon Mém. Mus.* 17. 313. (1829).

ESSENTIAL CHARACTER.—*Sepals* 5, very irregular, distinct, often glumaceous; 3 exterior, of which 1 is superior and 2 anterior; 2 interior (*the wings*) usually petaloid, and alternate with the upper and lower ones. *Petals* hypogynous, usually 3, of which 1 is anterior and larger than the rest (*the keel*), and 2 alternate with the upper outer, and lateral inner sepals, and often connate with the keel; sometimes 5, and then the 2 additional ones minute and between the wings and the lower sepals. *Keel* sometimes entire, and then

either naked or crested; sometimes 3-lobed, and then destitute of a crest. *Stamens* hypogynous, 8, usually combined in a tube, unequal, and ascending; sometimes 4, and distinct; the tube split opposite the upper sepal; *anthers* clavate, innate, mostly 1-celled and opening at their apex, sometimes 2-celled; very rarely the dehiscence is longitudinal. *Disk* either absent or present, regular or irregular. *Ovary* superior, compressed, with 2 or 3 cells, which are anterior and posterior, the upper one occasionally suppressed; *ovules* solitary, very rarely twin, pendulous; *style* simple, curved, sometimes very oblique and cucullate at the apex, which is also entire or lobed; *stigma* simple. *Fruit* usually opening through the valves; occasionally indehiscent, membranous, fleshy, coriaceous, or drupaceous, winged or apterous. *Seeds* pendulous, with a caruncula next the hilum, naked or enveloped with hairs; the outer integument crustaceous, the inner membranous; *albumen* abundant, fleshy, rarely reduced to a thin gelatinous plate, very seldom wanting; *embryo* straight, or slightly curved, with the radicle next the hilum.—*Shrubs* or *herbaceous* plants. *Leaves* generally alternate, sometimes opposite, mostly simple, and always destitute of *stipules*. *Flowers* usually racemose, very often small and inconspicuous, but showy in many Polygalas. *Pedicels* with 3 bracts.

Anomalies. Flowers generally gamopetalous. Ovary sometimes 1-celled by abortion. Fruit indehiscent in Mundia, Monnina, Securidaca, and Krameria. The latter has also no albumen.

Affinities. The structure of this order has been explained by Aug. de St. Hilaire and Moquin-Tandon, from whose memoir above quoted, the foregoing character and almost all that is said here is extracted, and to which I refer those readers who wish to study the subject more intimately. Before adverting to the affinities of this order, it will be useful to consider what is the nature of the irregularity of the flowers; an irregularity which is such as to obscure, in a great measure, the relative position of the sepals and petals. The calyx apparently consists of but three pieces, which are usually green, and like sepals in their common state; but their real number is 5, the two coloured lateral petal-like bodies, sometimes lying within the apparent sepals, being in reality part of the series of the calyx. The corolla is mostly monopetalous, and, if carefully examined, formed of 3 pieces; namely, the keel and two petals, all soldered together. We have, therefore, an abortion of two petals, according to the laws of alternation: but this is not all; there is not only an abortion of two petals, but of those two which would, if present, be found right and left of the keel. The monopetalous corolla is, therefore, formed by the cohesion of the two posterior and the one anterior petal of a pentapetalous corolla, of which the two lateral petals are suppressed. The keel has an appendage of an anomalous character, called technically a crest, and often consisting of one or even two rows of fringes or divisions, originating not from the margin but from within it, and sometimes cohering in a common membrane at their base. Aug. de St. Hilaire has shewn that this crest is nothing more than the deeply-lobed middle segment of a keel, with these lobes in such a state of cohesion that the central lobe is pushed outwards, while the lateral ones cohere by their own margins and with its back. The stamens are only 8, two therefore are suppressed; or in Krameria 4, one being suppressed. I may remark, in addition, that the relative position of the fifth sepal and petal respectively, was first indicated by Brown. *Denham* 31.

Polygalaceæ are stationed by De Candolle between Droseraceæ and Tremandraceæ, and in the immediate vicinity of Violaceæ. With the latter they are related on account of their hypogynous stamens, irregular flowers, and cucullate stigma; and with Tremandraceæ on account of the caruncula of their seed. To Fumarieæ they approach in the general aspect of their flowers; but if my theory of the structure of that order be admitted, their resemblance would not be so great as it appears to be. Leguminosæ are, notwithstanding their perigynous stamens, an order with which Polygalaceæ have great affinity: the irregularity of corolla is of a similar nature in both; there is in Leguminosæ a tendency to suppress the upper lateral petals in Erythrina, as in Po-

lygala; the ascending direction of the style and a cohesion of stamens are characters common to both orders. Many additional observations are made by St. Hilaire and Moquin-Tandon to the same effect. These authors, moreover, compare this order with Rutaceæ; but they appear to have finally decided upon the vicinity of Sapindaceæ being its true position; remarking that "the calyx of Sapindaceæ is unequal, the corolla very irregular, and the ovary of Schmidelia is usually 2-celled and 2-seeded like that of Polygala. Moreover, the greater part of the genera of that order have, with a calyx of five divisions, a corolla with four petals, and the place of the fifth is manifestly vacant. This suppression is not exactly the same as what is observed in the corolla of Polygala, where there is only 3 petals with 5 sepals; but the suppression has more analogy with what concerns the stamens, since with a quinary number in the calyx each order has eight antheriferous filaments."

Geography. Most of the genera are limited to one or two of the five parts of the globe; thus Salomonia is only found in Asia, Soulamea in the Moluccas, Muraltia at the Cape of Good Hope, and Monnina and Badiera in South America. Comesperma is found both in Brazil and New Holland, and, what is very remarkable, there is in the former country a species of the Cape genus Mundia. Polygala itself is found in four of the five parts; under the torrid zone and in temperate climates, at Cayenne, and on the mountains of Switzerland; it is, however, very unequally distributed. This genus inhabits almost every description of station,—dry plains, deep morasses, woods, mountains, cultivated and barren soils. Comesperma is only known in Brazilian woods, and Monnina and Krameria in open places.

Properties. Bitterness in the leaves and milk in the root are their usual characteristics; but the order has not been well investigated with respect to its qualities. Soulamea amara esteemed in the Moluccas and in Java as a medicine was called by Rumf "Rex amaroris." *Royle.* Polygala senega root is stimulant, diuretic, sialagogue, expectorant, purgative, emetic, and sudorific, and also emmenagogue. It has been used with great success in croup. *Barton*, 2. 116. It and P. crotalarioides have been employed, the former in America, the latter in the Himalayas, as a cure against the bite of venomous reptiles. *Royle.* P. sanguinea, according to Barton, possesses similar qualities. A peculiar vegetable principle, called Senegin, has been discovered by Gehlen in the root of Polygala senega, and Reschier is also said to have procured a principle called Polygaline from the same plant; but it is not known whether these two substances are the same. *Stephens and Church.* no. 103. The bark of Monnina polystachya, called *Yallhoy* in Peru, is stated to be extremely useful in cases of dysentery. It also possesses detersive properties in a great degree. The ladies of Peru ascribe the beauty of their hair to the use of its infusion, and the silversmiths of Huanaco employ it for cleansing and polishing their wrought silver. *Lambert's Illust. Cinch.* 132, &c. Krameria, a genus of an extremely anomalous structure, is remarkable for its tonic and excessively astringent qualities. Its root is sold in Europe under the name of Ratanhia, and is one of the substances which in conjunction with gum kino, is used for adulterating port wine in England. According to Cadet, this root contains gallic acid, but neither tannin nor resin. Xanthophyllum furnishes timber of considerable size. Polygala poaya is an active emetic. It is used successfully in Brazil in bilious fevers. *Mart. Mat. Med. Bras.* 12.

GENERA.

Polygala, L.
Psychanthus, Rafin.
Nylandtia, Dumort.
Brachytropis, DC.
Salomonia, Lour.
Comesperma, La Bill.
Badiera, DC.
Xanthophyllum, Rox.
Jackia, Bl.
Soulamea, Lam.
Muraltia, Neck.
Heisteria, Berg.
Mundia, Kunth.
Monnina, R. et P.
Hebeandra, Bonpl.
Securidaca, L.
Bredemeyera, W.
Krameria, Löfl.
Cardiocarpus, Rnwdt.
Hymenanthera, R. Br.

From these plants Von Martius distinguishes (*Conspectus*, no. 207, 1835), as the type of an order to be called

KRAMERIACEÆ,

The genus Krameria to which reference has been already made. Of this remarkable plant, usually placed in Polygalaceæ, Auguste de St. Hilaire and Moquin-Tandon give the following character:—

KRAMERIA.—*Sepals* 3-4, irregular, much spreading, coloured, deciduous, arranged in 2 or 3 rows, one of them, if it is present, superior, solitary, very small. *Petals* 5 (sometimes 4, *Kunth*), hypogynous, smaller than the calyx, irregular; the three lower alternating with one exterior sepal, two intermediate, and a minute superior one, long, unguiculate; the claws united at the base, occasionally with a small abortive lamina; the two upper alternating with one external sepal and two intermediate ones, much smaller than the lower petals, remote from them, converging obliquely, sessile, rather thick. *Stamens* 4 (sometimes 1 or 3, *Kunth*), hypogynous, unequal; two larger, ascending, alternating with the upper and lower petals, 2 smaller erect, close together, alternating with the lower intermediate petal; *filaments* free, thick; *anthers* continuous, immoveable, 2-celled, opening at the end by a double pore. *Disk* 0. *Ovary* superior, 2-celled (incompletely 2-celled, *Kunth*), two seeded; *ovules* 2, suspended from a little below the top of the cavity, turned away from the lower petals. *Style* single, terminal, ascending, awl-shaped. *Stigma* terminal, simple. *Fruit* between woody and leathery, globose, glochidate, by abortion 1-seeded, indehiscent. *Testa* membranous. *Albumen* 0. *Embryo* straight; *cotyledons* plano-convex, with two auricles below the base surrounding the radicle, which is superior.—Spreading many-stemmed *under-shrubs*. *Leaves* alternate, simple, entire (3-leaved in *K. cytisoides*), without stipules, sometimes having in their axil bundles of little spines. *Racemes* simple, spike-shaped. *Bracts* of the stalks two. *Hairs* simple.

Ten American species are known.

ORDER LXIV. VOCHYACEÆ.

VOCHYSIACEÆ, *Mart. Nov. Gen.* 1. 123. (1824).—VOCHYSIEÆ, *A. St. Hil. Mém. Mus.* 6. 265. (1820); *DC. Prodr.* 3. 25. (1828).

ESSENTIAL CHARACTER.—*Sepals* 4-5, combined at the base, imbricated in æstivation, the upper one calcarate. *Petals* 1, 2, 3 or 5, alternate with the segments of the calyx, and inserted into their base, unequal. *Stamens* 1-5, usually opposite the petals, rarely alternate with them, arising from the bottom of the calyx, for the most part sterile, 1 of them having an ovate fertile 4-celled anther. *Ovary* superior, or partially inferior, 3-celled; *ovules* in each cell solitary or twin, attached to the base of the axis; *style* and *stigma* 1. *Capsule* 3-cornered, 3-celled, 3-valved, the valves bursting along their middle. *Seed* without albumen, erect; *embryo* straight, inverted; *cotyledons* large, foliaceous, convolute, plaited; *radicle* short, superior.—*Trees*. *Branches* opposite, when young 4-cornered. *Leaves* opposite, sometimes towards the extremities of the branches alternate, entire, with 2 stipules at the base. *Flowers* usually in terminal panicles or racemes.

ANOMALIES. Ovary either superior or inferior. The leaves of Salvertia have no stipules.

AFFINITIES. "An order at present but ill understood, in habit and flower somewhat allied to Guttiferæ or Marcgraaviaceæ, but distinct from both in the stamens being inserted into the calyx; perhaps more directly connected with Combretaceæ, on account of the convolute cotyledons and inverted seeds; and even perhaps allied to some Onagraceæ, on account of the abortive solitary stamen." *DC. Prodr.* 3. 25. Is not the order nearer Violaceæ? an affinity strongly pointed out by the irregular flowers, 3-locular ovarium, and stipules, but impeded by the perigynous insertion of the stamens; or yet nearer Polygalaceæ, from which the calcarate flowers and ascending ovules principally distinguish it.

Geography. Natives of equinoctial America, where they inhabit ancient forests, by the banks of streams, sometimes rising up mountains to a considerable elevation. They are often trees with large spreading heads.

Properties. Unknown.

GENERA.

Callisthene, Mart.	Vochya, Vand.	Salvertia, St. Hil.
Amphilochia, Mart.	*Vochy*, Aubl.	Qualea, Aubl.
Lozania, Mutis.	*Vochysia*, Juss.	Erisma, Rudg.
Agardhia, Spr.	*Salmonia*, Neck.	*Debræa*, Rœm. et Schult.
	Cucullaria, Schreb.	*Ditmaria*, Spreng.

Alliance IV. *CISTALES.*

Essential Character.—*Flowers* regular. *Albumen* present in the seeds.

These can be confounded only with the Guttal alliance, from which the hairy, thin, deeply-veined, and usually alternate leaves, together with a habit, which, although sometimes woody and even arborescent, is most commonly herbaceous, assist in distinguishing them. The orders vary from Chlenaceæ, which are the highest form, to Elatinaceæ which is the lowest, through all gradations of developement. Elatinaceæ are to Cistaceæ what Fumaria is to Nelumbium, Hippuris to Œnothera, Viscum to Loranthus, and so on. Hugoniaceæ form a transition to Malvaceæ in the next alliance.

Order LXV. ELATINACEÆ. The Water-Pepper Tribe.

Elatineæ, *Cambessédes in Mém. Mus.* 18. 225. (1829); *Aug. de St. H. Fl. Bras.* 2. 159. (1830); *Fl. Seneg.* 1. 42. (1832); *Fischer and Meyer in Linnæa*, x. 69. (1835).

Essential Character.—*Sepals* 3-5, distinct, or slightly connate at the base. *Petals* hypogynous, alternate with the sepals. *Stamens* hypogynous, usually twice as numerous as the petals. *Ovary* with from 3 to 5 cells, an equal number of styles, and capitate stigmas. *Fruit* capsular, 3-5-celled, with the valves alternate with the septa which usually adhere to a central axis, but in Merimea to the valves separating from the axis. *Seeds* numerous, with a straight *embryo*, whose *radicle* is turned to the hilum, and little *albumen*. —*Annuals*, found in marshy places. *Stems* fistulous, rooting. *Leaves* opposite, with stipules.

Affinities. This little order has been established by Cambessédes, who distinguishes it from Alsinaceæ, with which a part had been confounded, by the capitate stigmas, by the dehiscence of the fruit, by the little albumen, and by the straight not curved embryo. The species agree with Hypericaceæ in many respects, even in the presence of receptacles of resinous secretions; but differ in having a persistent central axis in the fruit, definite stamens, and so forth.

Geography. Found in marshes in the four quarters of the globe. The Elatines are natives of Europe and Asia, Bergias of the Cape of Good Hope and the East Indies, and Merimea of South America.

Properties. Unknown.

GENERA.

Elatine, L.	Bergia, L.	? Tetradiclis, M. B.
Crypta, Nutt.	Merimea, Camb.	Anisadenia, Wall.

Order LXVI. LINACEÆ. The Flax Tribe.

Lineæ, *DC. Théorie*, ed. 1. 217. (1819); *Prodr.* 1. 423. (1824); *Lindl. Synops.* 53. (1829).

Essential Character.—*Sepals* 3-4-5, with an imbricated æstivation, continuous with the peduncle, persistent. *Petals* equal in number to the sepals, hypogynous, unguiculate, with a twisted æstivation. *Stamens* equal in number to the petals, and alternate with them, united at the base in a hypogynous ring, from which proceed little teeth opposite to the petals, and indicating abortive stamens; *anthers* ovate, innate. *Ovary* with about as many cells as sepals, seldom fewer; *styles* equal in number to the cells; *stigmas* capitate. *Capsule* generally pointed with the indurated base of the styles, many-celled; each cell partially divided in two by an imperfect spurious dissepiment, and dehiscing with two valves at the apex. *Seeds* in each cell single, compressed, inverted; *albumen* usually present; *embryo* straight, fleshy, with the radicle pointing towards the hilum; *cotyledons* flat.—*Herbaceous* plants, or small *shrubs*. *Leaves* entire, without stipules, usually alternate. *Petals* fugitive.

Affinities. It is remarked by De Candolle, that this order is intermediate, as it were, between Silenaceæ, Malvaceæ, and Geraniaceæ, from all which, however, it is obviously distinguished. Aug. de St. Hilaire considers it a mere section of Geraniaceæ. But the want of a gynobasic structure, the strongly imbricated calyx, and the regular flowers, together with the constant presence of a small quantity of albumen in the seeds, rather point out its affinity with the Cistal alliance, and especially with Elatinaceæ, of which it is a sort of decandrous exstipulate form.

Geography. Europe and the north of Africa are the principal stations of this order, which is, however, scattered more or less over most parts of the globe. Several are natives of North and South America, 2 only are found in India, 1 in New Zealand, and none in New Holland; for the L. angustifolium mentioned by De Candolle as having been sent him from that country, had probably, as he suggests, been introduced from Europe. It is stated by Richardson, that the most northern limit of this order in North America is 54° N. *Ed. P. J.* 12. 209.

Properties. The tenacity of their fibre, and the mucilage of their diuretic seeds, are striking characters of Linaceæ, which are also usually remarkable for the beauty of their flowers. The leaves of L. catharticum are purgative. Linum selaginoides is considered in Peru bitter and aperient. *DC.*

GENERA.

Linum, L.
Reinwardtia, Dumort.
Radiola, Gmel.

Order LXVII. HUGONIACEÆ.

Hugoniaceæ, *Arnott Prodr. Fl. Ind. Penins.* 1. 71. (1834).

Essential Character.—*Calyx* without an involucre, persistent, 5-sepaled; *sepals* distinct, acute, unequal; the two exterior lanceolate, densely pubescent on the back; another dimidiate-ovate, the straight side pubescent, the rounded side testaceous and shining; the two inner ones roundish ovate and suddenly pointed, testaceous, and shining except the short pubescent point: æstivation imbricated, quincuncial. *Petals* hypogynous, 5, alternate with the sepals, shortly unguiculate: æstivation twisted. *Stamens* hypogynous, 10, all fertile; *filaments* united at the base into an urceolus, free and filiform above; *anthers* cordate-ovate, erect, 2-celled, opening by two longitudinal clefts. *Torus* slightly elevated, supporting the staminal urceolus and the ovary. *Ovary* roundish, coriaceous, glabrous,

5 celled; *ovules* 2 in each cell, pendulous, collateral; *styles* 5, distinct; *stigmas* slightly dilated and lobed. *Fruit* (a *nuculanium*) with a fleshy epicarp, enclosing 5 distinct, bony, 1-seeded carpels; *seeds* pendulous. *Embryo* in the axis of fleshy albumen; *cotyledons* flat, foliaceous: *radicle* short, superior, pointing to the hilum.—*Shrubs*. *Leaves* alternate, or sometimes crowded and opposite near the flowers. *Stipules* 2, subulate. *Peduncles* axillary 1-flowered, often by abortion transformed into circinnate spines. ARNOTT, l. c.

AFFINITIES. The only genus referable here has been placed by De Candolle with doubt in Chlenaceæ, to which we cannot agree; that order having the calyx and gynœceum in a ternary, while the corolla and andrœceum follow the quinary arrangement. Kunth hesitatingly places it in Buttneriaceæ and the tribe Dombeyaceæ, and there is no doubt that the affinity is very great; it is now separated on account of the imbricate (not valvate) calyx, the ovules pendulous (not erect or ascending), and the radicle superior (not inferior) rather than invalidate the character of the order by its insertion. In many points it agrees with the character (but not with the habit) of Oxalidaceæ, forming another link between the group of Malvaceous orders, and Geraniaceæ. *Arnott, l. c.*

GENUS.

Hugonia, L.

ORDER LXVIII. CHLENACEÆ.

CHLENACEÆ, *Thouars Hist. Veg. Afr. Austr.* 46. (1806); *DC. Prodr.* 1. 521. (1824).

ESSENTIAL CHARACTER.—*Involucre* 1-2-flowered, persistent, of variable form and texture. *Sepals* 3, small; æstivation imbricated? *Petals* 5 or 6, hypogynous, broader at the base, sometimes cohering there. *Stamens* either very numerous, or sometimes only 10; *filaments* either cohering at the base into a tube, or adhering to the tube of petals; *anthers* roundish, adnate, or loose, 2-celled, *Ovary* single, 3-celled; *style* 1, filiform; *stigma* triple. *Capsule* 3-celled, or 1-celled by abortion. *Seeds* solitary or numerous, attached to the centre, suspended; *embryo* green, central; *albumen* fleshy according to Jussieu, or horny according to Du Petit Thouars; *cotyledons* foliaceous, wavy.—*Trees* or *shrubs*. *Leaves* alternate, with stipules, entire. *Stipules* deciduous. *Flowers* in panicles or racemes. *DC.*

ANOMALIES. Leptolæna has definite stamens.

AFFINITIES. The monadelphous stamens and involucrated flowers indicate an affinity with Malvaceæ. But Jussieu refers the order rather to the vicinity of Ebenaceæ, considering it monopetalous, and the seeds albuminous. Very little is, in fact, known of these plants. To me it appears that their imbricated calyx, regular flowers and albumen place them in the Cistal alliance of Calycose Polypetalous Dicotyledons, and in the vicinity of Cistaceæ.

GEOGRAPHY. There are only eight certain species, which are all natives of Madagascar.

PROPERTIES. Handsome shrubs, with fine flowers, often red; but nothing is known of their qualities.

GENERA.

Sarcolæna, Pet. Thou.
Leptolæna, Pet. Thou.
Schizolæna, Pet. Thou.
Rhodolæna, Pet. Thou.

Order LXIX. CISTACEÆ. The Rock-Rose Tribe.

Cisti, *Juss. Gen.* 294. (1789).—Cistoideæ, *Vent. Tabl.* 3. 219. (1799).—Cistineæ, *DC. Prodr.* 1. 263. (1824); *Lindl. Synops.* 36. (1829).

Essential Character.—*Sepals* 5, continuous with the pedicel, persistent, unequal, the three inner with a twisted æstivation. *Petals* 5, hypogynous, very fugitive, crumpled in æstivation, and twisted in a direction contrary to that of the sepals. *Stamens* indefinite, hypogynous, distinct; *anthers* innate. *Ovary* distinct, 1- or many-celled; *ovules* with the foramen at their apex; *style* single; *stigma* simple. *Fruit* capsular, usually 3- or 5-valved, occasionally 10-valved, either 1-celled with parietal placentæ in the axis of the valves, or imperfectly 5- or 10-celled with dissepiments proceeding from the middle of the valves, and touching each other in the centre. *Seeds* indefinite in number. *Embryo* inverted, either spiral or curved in the midst of mealy albumen. *Radicle* remote from the hilum.—*Shrubs* or *herbaceous* plants. *Branches* often viscid. *Leaves* usually entire, opposite or alternate, stipulate or exstipulate. *Racemes* usually unilateral. *Flowers* white, yellow, or red, very fugacious.

Affinities. Distinguished from Violaceæ, with which they were formerly confounded, by their indefinite stamens and inverted embryo; from Bixaceæ by this last character, by their mealy albumen, habit, and not having the leaves ever dotted; from Hypericaceæ by the latter character, and the structure of the fruit; they are akin to Papaveraceæ by the genus Dendromecon. But their true station seems to be in the vicinity of Linaceæ, Hugoniaceæ, and Chlenaceæ, to the first of which they approach by the genus Lechea.

Geography. S. Europe and the north of Africa are the countries that Cistaceæ chiefly inhabit. They are rare in North America, extremely uncommon in South America, and scarcely known in Asia.

Properties. None, except that the resinous balsamic substance, called Labdanum, is obtained from Cistus creticus, and neighbouring species.

GENERA.

Cistus, Tourn.	Lechea, L.
Helianthemum, Tourn.	Hudsonia, L.

Order LXX. REAUMURIACEÆ.

Reaumurieæ, *Ehrenberg in Ann. des. Sc.* 12. 78. (1827).

Essential Character.—*Calyx* 5-parted, surrounded externally by imbricated bracts. *Petals* 5, hypogynous. *Stamens* definite or indefinite, hypogynous, with or without an hypogynous disk; *anthers* peltate. *Ovary* superior; *styles* several, filiform, or subulate. *Fruit* capsular, with 2 to 5 valves, and as many cells, and a loculicidal dehiscence. *Seeds* definite, villous, erect; *embryo* straight, surrounded by a small quantity of mealy *albumen;* radicle next the hilum.—*Shrubs*. *Leaves* fleshy, scale-like, or small, alternate, without stipules. *Flowers* solitary.

Affinities. Ehrenberg suggests (*Ann. des Sc.* 12. 78.) that Reaumuria and Hololachna, both of which have, according to him, hypogynous stamens, may constitute a little group, to be called Reaumuriaceæ. To me the order appears more nearly related to Hypericaceæ than to either Mesembryaceæ or Tamaricaceæ. From the former it chiefly differs in its succulent habit, and definite villous seeds, agreeing, in Reaumuria at least, even in the obliquity of the veins of the petals, and in the leaves being dotted. From Mesembryaceæ its hypogynous stamens and seeds distinguish it; from Tamaricaceæ its plurilocular ovary and distinct styles; from Nitrariaceæ its erect villous seeds, distinct styles, and hypogynous stamens.

Geography. Natives of the Mediterranean and the milder parts of northern Asia.

Properties. Saline matter is present in great abundance. Reaumuria vermiculata is used at Alexandria as a cure for the itch, being applied bruised externally, and taken internally in the form of a decoction. *Forsk. Fl. æg. arab.* 101.

GENERA.

Reaumuria, L. Hololachna, Ehr.

Group V. Syncarpoſae.

Essential Character.—The carpels compactly united into a solid pistil. *Calyx* not having the sepals in a broken whorl. *Placentæ* not parietal. *Ovary* not inferior. *Carpels* not placed obliquely upon a central gynobase; or if they are, then either in more rows than one or of a larger number than 5.

The characters of this group are negative rather than positive, but the orders collected under it seem generally to have a common and obvious bond of union. The highest alliances in regard to structure are the Malval and Melial, the lowest the Silenal, in which, among Alsinaceæ, the force of developement seems as it were worn out. The only mistake that is likely to occur is the confounding some gynobasic genera with this group; but such an error will be avoided if it is remembered that the truly gynobasic orders have never more than 5 carpels; hence Malva itself, which in some respects may be looked upon as gynobasic, is divided from the Gynobaseous group by its numerous carpels. Aurantiaceæ connect this Syncarpous group with the Gynobaseous by Luvunga, which is almost a Xanthoxylum, and Lythraceæ join it with the Epigynous through the medium of Melastomaceæ. There is no polypetalous group in which the tendency to be apetalous is so common as here.

Alliance I. *MALVALES.*

Essential Character.—Æstivation of the calyx valvate. *Carpels* 4, or a larger number. *Stamens* generally monadelphous; the calyx long and tubular when that is not the case. *Hairs* mostly starry.

The valvate æstivation of the calyx clearly divides this from all the other alliances except the Rhamnal, and from that the numerous carpels, and far more highly developed corolla often distinguish it neatly.

Order LXXI. STERCULIACEÆ.

Sterculiaceæ, *Vent. Malm.* 2. 91. (1799); *Endl. Meletem.* p. 30. (1832).—Hermanniaceæ, *Juss.*—Byttneriaceæ, *Brown in Flinders*, 2. 540. (1814); *Kunth. Diss.* p. 6. (1822); *DC. Prodr.* 1. 481. (1824); *Aug. St. Hil. Fl. Bras. mer.* 1. 139. (1827); *a section of* Malvaceæ.—Bombaceæ, *Kunth. Diss. Malv.* p. 5. (1822); *DC. Prodr.* 1. 475. (1824); *A. St. Hilaire Fl. Br. merid.* 1. 257. (1827), *a section of* Malvaceæ; *Ed. pr. No.* 26. (1830).

Essential Character.—*Calyx* either naked or surrounded with an involucre, consisting of 5 sepals, more or less united at the base, with a valvular, or nearly valvular æstiva-

tion, except where the calyx is irregularly ruptured. *Petals* 5, or none, hypogynous, convolute in æstivation, often saccate at the base, and variously lengthened at the apex. *Stamens* definite or indefinite, monadelphous in various ways, some among them being often sterile; *anthers* 2-celled, turned outwards, sometimes anfractuose. *Pistil* consisting of 5, or rarely 3, carpels, either distinct or cohering into a single ovary, often seated upon a columnar gynophore. *Styles* equal in number to the carpels distinct or united; *ovules* erect if definite; sometimes indefinite. *Fruit* capsular, with 3 or 5 cells. *Seeds* with a strophiolate apex, often winged, sometimes woolly; *albumen* oily or fleshy, rarely wanting; *embryo* straight, with an inferior radicle; *cotyledons* either foliaceous, flat, and plaited, or rolled round the plumule, or else very thick, but this only in the seeds without albumen. —*Trees* or *shrubs*. *Pubescence* often stellate. *Leaves* alternate, simple, often toothed, with stipules. *Inflorescence* variable.

Anomalies. The carpella of Sterculia and Erythropsis are distinct, and their flowers have no petals. True Buttneriaceæ have five abortive stamens. Waltheria has but one carpel, four being abortive. Cheirostema is apetalous.

Affinities. It appears that we have two different assemblages of plants in the old Malvaceæ of authors, whereof a part have 2-celled anthers, and the remainder 1-celled ones. The former circumstance limits the order Sterculiaceæ, which comprehends several remarkable sets that might, if there were any difference in their sensible properties, be separated into so many distinct orders. Of these Helictereæ have an irregular calyx and corolla; Sterculieæ no petals, and definite stamens placed at the end of a long column; Bombaceæ a calyx with a ruptile dehiscence, usually woolly seeds, and the cells of the anthers anfractuose; Dombeyæ, a part of the stamens sterile, and flat well formed petals; Byttnerieæ, a part of the stamens sterile, and small petals bagged at the base; Lasiopetaleæ, a petaloid calyx, and rudimentary petals or 0; and Hermannieæ, spirally twisted petals with only 5 stamens, and those opposite the petals. The monadelphous stamens of Sterculiaceæ distinguish that order from Tiliaceæ and Dipteraceæ. Their valvate calyx is the great mark of combination which unites them with these last-mentioned orders. The fruit of Sterculia often exhibits beautiful illustrations of the real nature of that form of fruit which botanists call the follicle, and helps to demonstrate that it, and hence all simple carpels, are formed of leaves, the sides of which are inflexed, and the margins dilated into placentæ, bearing ovules. In Firmiana platanifolia, in particular, the follicles burst and acquire the form of coriaceous leaves, bearing the seeds upon their margin. But, notwithstanding this peculiarity of the distinct carpels, on account of which Sterculia would, as the type of an order, be referable to another group, it is impossible to doubt that Reevesia, a remarkable Chinese plant, having the habit and peculiar confirmation of anthers found in Sterculia, along with the petals and fruit of Pterospermum, completely identifies the genus with the polypetalous syncarpous group.

Geography. India, New Holland, the Cape of Good Hope, and South America, with the West Indies, are the chief countries inhabited by this order, taken collectively; but its various sections are each characterised by peculiarities of geographical distribution. Thus:—

Sterculieæ are principally found in India and equinoctial Africa; 5 or 6 only have been discovered in Mexico and South America.

Dombeyæ are all African, East Indian, or South American.

Of *Hermannieæ* two-thirds are found exclusively at the Cape of Good Hope; the remainder are chiefly West Indian and South American; about one-tenth are natives of the East Indies, and two or three are found in the South Seas.

The *Byttnerieæ* are principally natives of South America and the West Indies; about one-seventh is found in the East Indies, a similar number in New Holland, and a single species, Glossostemon Bruguieri, in Persia.

Lasiopetaleæ are exclusively from New Holland.

Properties. These, like the orders most nearly related to them, are chiefly remarkable for the abundance of mucilage they contain. The seeds of Sterculia acuminata afford the Kola spoken of by African travellers, which, when chewed or sucked, renders the flavour of water, even if half putrid, agreeable. The seeds of the Chichà, Sterculia Chicha, are eaten as nuts by the Brazilians. *Pl. Usuelles*, 46. The Gum Tragacanth of Sierra Leone is produced by a species of Sterculia (*St. Tragacantha* Mihi). Sterculia urens of Coromandel yields a gum which is exceeding like Tragacanth, and has been imported as such into England. *Royle*. The pod of Sterculia fœtida is, according to Horsfield, employed in gonorrhœa in Java. The leaves are considered repellant and aperient. A decoction of the fruit is mucilaginous and astringent. *Ainslie*, 2.119. The bark of a species of Sterculia is employed in the Moluccas as an emmenagogue; and the seeds of all that genus are filled with an oil, which may be expressed and used for lamps. There is a slight acridity in the seeds of Sterculia. The Waltheria Douradinha is used in Brazil as a remedy for venereal disorders, for which its very mucilaginous nature renders it proper. *Pl. Usuelles*, 36. The fruit of Guazuma ulmifolia is filled with a sweet and agreeable mucilage, which the Brazilians suck with much pleasure. In Martinique the young bark is used to clarify sugar, for which the copious mucilage it yields when macerated qualifies it. In the same island the infusion of the old bark is esteemed as a sudorific, and useful in cutaneous diseases. *Ibid.* 47. The bark of Kydia calycina is applied in India to the same purpose. *Royle*. The buttery, slightly bitter substance, called *Cocoa*, is obtained from the seeds of Theobroma Cacao, and from this Chocolate is prepared. The fibrous tissue of the bark of many species is so tough as to be well adapted for manufacturing into cordage; this is more especially the case with Sterculia guttata, Microlæna spectabilis, and Abroma augustum. *Royle*. Bombax pentandrum, the Cotton Tree of India, yields a gum, which is given in conjunction with spices in certain stages of bowel complaints. *Ainslie*, 2. 97. The largest tree in the world is the Adansonia, or Baobab Tree, the trunk of which has been found with a diameter of 30 feet; but its height is not in proportion. "It is emollient and mucilaginous in all its parts. The leaves dried and reduced to powder constitute *Lalo*, a favourite article with the Africans, which they mix daily with their food, for the purpose of diminishing the excessive perspiration to which they are subject in those climates; and even Europeans find it serviceable in cases of diarrhœa, fevers, and other maladies. The fruit is, perhaps, the most useful part of the tree. Its pulp is slightly acid and agreeable, and frequently eaten; while the juice is expressed from it, mixed with sugar, and constitutes a drink, which is valued as a specific in putrid and pestilential fevers." *Hooker Bot. Mag.* 2792. The dried pulp is mixed with water, and administered, in Egypt, in dysentery. It is chiefly composed of gum, like Gum Senegal, a sugary matter, starch, and an acid which appears to be the malic. *Delile, Cent.* 12. The fruit of the Durian is considered one of the most delicious productions of nature; it is remarkably fœtid, and therefore disagreeable to those who are unaccustomed to it, but it universally becomes in the end a favourite article of the dessert, It is found in the islands of the Indian Archipelago, where it is cultivated extensively; see *Hort. Trans.* 5. 106. The seeds of many of the species are enveloped in long hairs, like those of the true Cotton: it is found, however, that they cannot be manufactured, in consequence of no adhesion existing between the hairs. The woolly coat of the seeds of the *Arvore de Paina* (Chorisia speciosa), and several species of Eriodendron and Bombax, is employed in different countries for stuffing cushions, aud for similar domestic purposes. *Pl. Us.* 63. Helicteres *Sacarolha*, called by the latter name only in Brazil, is used against vene-

real disorders: a decoction of the root is administered. It is supposed that its effects depend upon its mucilaginous properties. *Ibid.* 64.

GENERA.

§ 1. Helicteræ, Endl.
Quararibea, Aubl.
Myrodia, Sw.
Matisia, Humb.
Methorium, Endl.
Helicteres, L.
Isora, Endl.
Alicteres, Neck.
Orthothecium, Endl.
Ungeria, Endl.
Reevesia, Lindl.
§ 2. Sterculieæ, Endl.
Pterygota, Endl.
Heritiera, Ait.
Balanopteris, Gærtn.
Triphaca, Lour.
Sterculia, L.
Chichæa, Presl.
Biasolettia, Presl.
Southwellia, Salisb.
Pœcilodermis, Endl.
Cola, Endl.
Cavallium, Endl.
Hildegardia, Endl.
Scaphium, Endl.
Firmiana, Marsigl.
Erythropsis, Lindl.
Trichosiphum, Endl.
Brachychiton, Endl.
§ 3. Bombaceæ, Endl.
Cheirostemon, Humb.
Ochroma, Swz.
Durio, L.
Erione, Endl.
Chorisia, Kth.
Campylanthera, Endl.
Eriodendron, DC.
Gossampinus, Hamilt.
Salmalia, Endl.
Eriotheca, Endl.
Bombax, L.
Bombycospermum, Presl.
Carolinea, L.
Adansonia, L.
Ophelus, Lour.
Montezuma, Moc. et S.
Pourretia, W.
§ 4. Dombeyæ, DC.
Wallichieæ, DC.
Ruizia, Cav.
Pentapetes, L.
Assonia, Cav.
Dombeya, Cav.
Brotera, Cav.
Melhania, Forsk.
Trochetia, DC.
Pterospermum, Schrb.
Velaya, Adans.
Astrapæa, Lindl.
Kydia, Roxb.
? Vantanea, Aubl.
Lemniscia, Schreb.
Eriolæna, DC.
Microchlæna, Wall.
Wallichia, DC.
Jackia, Spr.
Gœthea, Nees.
§ 5. Byttnerieæ, DC.
Theobroma, L.
Cacao, Tourn.
Abroma, L.
Guazuma, Plum.
Bubroma, Schreb.
Glossostemon, Desf.
Commersonia, Forst.
Büttneria, Lœfl.
Rulingia, R. Br.
Ayenia, L.
Kleinhovia, L.
Actinophora, Wall.
Pentaglottis, Wall.
Prosthesia, Bl.
Visenia, Bl.
Maranthes, Bl.
§ 6. Lasiopetaleæ, Gay. Mém. Mus. 7. 431 (1821).
Seringia, Gay.
Gaya, Spreng.
Lasiopetalum, Sm.
Guichenotia, Gay.
Thomasia, Gay.
Keraudrenia, Gay.
§ 7. Hermannieæ, Jus.
Melochia, L.
Riedlea, Vent.
Visena, Houtt.
Mougeotia, Kth.
Glossospermum, Wall.
Physodium, Presl.
Waltheria, L.
Altheria, Thouars.
Hermannia, L.
Lophanthus, Forst.
Mahernia, L.
Jurgensia, Spr.
Medusa, Lour.

Order LXXII. MALVACEÆ. The Mallow Tribe.

Malvaceæ, *Juss. Gen.* 271. (1789) *in part.*; *Brown in Voy. to Congo.* p. 8. (1818); *Kunth. Diss.* p. 1. (1822); *DC. Prodr.* 1. 429. (1824); *Lindl. Synops.* p. 40. (1829).—Malvaceæ, § Malveæ, *Aug. St. Hil. Fl. Bras. mer.* 1. 173. (1827).

Essential Character.—*Sepals* 5, very seldom 3 or 4, more or less united at the base, with a valvate æstivation, often bearing external bracts forming an involucre. *Petals* of the same number as the sepals, hypogynous, with a twisted æstivation, either distinct or adhering to the tube of the stamens. *Stamens* usually indefinite, sometimes of the same number as the petals, hypogynous; *filaments* monadelphous; *anthers* 1-celled, reniform, bursting transversely. *Ovary* formed by the union of several carpels round a common axis, either distinct or coherent; *styles* the same number as the carpels, either united or distinct; *stigmas* variable. *Fruit* either capsular or baccate, its carpels being either monospermous or polyspermous, sometimes united in one, sometimes separate or separable; dehiscence either loculicidal or septicidal. *Seeds* sometimes hairy; *albumen* none, or in small quantity; *embryo* curved, with twisted and doubled *cotyledons*.—*Herbaceous* plants, *trees*, or *shrubs*. *Leaves* alternate, more or less divided, stipulate. *Hairs* stellate. *Peduncles* usually axillary.

Anomalies. In Malope the carpels are numerous, and distinct, not arranged in a single row, as in the rest of the order.

Affinities. The relation of Malvaceæ with Sterculiaceæ, Tiliaceæ, and Elæocarpaceæ, is clearly indicated by their general accordance in structure, and especially by the valvate æstivation of their calyx. With other orders they also agree in numerous points; as, with Ranunculaceæ in the indefinite stamens

and distinct aggregate carpels of Malope; with Ternströmiaceæ in their monadelphous stamens; with Chlenaceæ in the presence of an involucre below the flower, and monadelphous stamens; with Linaceæ in their mucilaginous properties, definite seeds, many-celled fruit, and unguiculate petals; and through the medium of this last order with Silenaceæ.

Geography. These plants are found in great abundance in the tropics, plentifully in the hotter parts of temperate regions, but gradually diminishing to the north. Thus in Sicily they form $\frac{1}{86}$ of the flowering plants(*Presl.*), in France $\frac{1}{145}$ (*Humboldt*), in Sweden $\frac{1}{253}$ (*Wahl.*), in Lapland unknown, in the temperate parts of North America $\frac{1}{125}$, in the equinoctial parts of the same continent $\frac{1}{47}$; or, taking into account only the vegetation of the valleys, they, according toHumboldt, form $\frac{1}{50}$ of the flowering plants in the tropics, $\frac{1}{200}$ in the temperate zone, and are not found in the frigid zone. But these calculations no doubt include Sterculiaceæ.

Properties. The uniform character is to abound in mucilage, and to be totally destitute of all unwholesome qualities. The use to which Mallows and Marsh-mallows are applied in Europe is well known. Similar properties are possessed by extra-European species. Sida cordifolia mixed with rice is used to alleviate the bloody flux. Emollient fomentations are prepared from Sida mauritiana by the Hindoo doctors. *Ainslie,* 1. 205. The flowers of *Benção de Deos,* Abutilon esculentum, are used in Brazil as a boiled vegetable. *Pl. Usuelles,* 51. A decoction of Sphæralcea Cisplatina is administered in the same country in inflammations of the bowels, and is generally employed for the same purposes as the Marsh-mallow in Europe. *Ib.* 52. Pavonia diuretica is prescribed in Brazil as a diuretic; it is supposed to act rather as an emollient. *Ibid.* 53. The wood is always very light, and of little value. Rocket-sticks are obtained from the light straight stems of Sida micrantha. *Ibid.* 49. The chewed leaves of another species, S. carpinifolia, are applied in Brazil to the punctures of wasps. *Ib.* 50. The bark is often so tenacious as to be manufactured into cordage. Malva crispa was found by Cavanilles to be fit for this purpose; and several species of Hibiscus are employed in like manner in tropical countries. From the fibres of the bark of Hibiscus arboreus the whips are manufactured with which the negro slaves are lashed in the West India Islands. The plant is called *Mohoe* or *Mohaut. Hamilt. Prodr.* 49. Sida abutila is said to be cultivated in China, as we know Hibiscus cannabinus, or *Sun,* is in India, as a substitute for hemp. Various other species are named as furnishing serviceable fibres. *Royle,* p. 84. The petals of some are astringent; this property exists in Malva Alcea (*DC.*) and in Hibiscus Rosa sinensis, of which the Chinese make use to blacken their eyebrows and the leather of their shoes. *Ib.* The leaves of Althæa rosea are said to yield a blue colouring matter not inferior to indigo. *Ed. P. J.* 14. 376. A decoction of the root and stem of Urena lobata is employed in Brazil as a remedy in windy colic; the flowers are used as an expectorant in dry and inveterate coughs. The bark furnishes good cordage. *Pl. Us.* 56. A few species, such as Hibiscus Sabdariffa and suratensis, &c., are slightly acid. The unripe fruit of the *Ochro, Gombo, Gobbo,* or Hibiscus esculentus, is a favourite ingredient in soups, which are thickened by the mucilagincus quality of this plant. Hibiscus longifolius or *Ramturai,* is applied in the same way in India. *Royle.* The musky seeds of Abelmoschus moschatus are considered cordial and stomachic, and by the Arabians are mixed with coffee. *Ainslie,* 2. 73. The root of Sida lanceolata is intensely bitter, and is considered a valuable stomachic. *Ainslie,* 2. 179. It has been supposed that the root of Althæa officinalis contains a peculiar alkaline principle called *Althein;* but it has since been stated by Plisson that it does not exist; what was taken for it having been Asparagin. *Brewster,* 8. 369. The *Cotton* of commerce is the hairy covering of the seeds

of several species of Gossypium. For an excellent account of this plant, see *Royle's Illustr.* p. 84.

GENERA.

Malope, L.
Palavia, Cav.
Kitaibelia, W.
Malva, L.
Sphæralcea, A. S. H.
Modiola, Mnch.
Althæa, L.
Alcea, L.
Lavatera, L.
Stegia, Lam.
Olbia, Med.
Anthema, Med.
Malachra, L.
Urena, L.
Wissadula, Medik.
Sida, L.
Malvinda, Med.
Napæa, L.
Gaya, Kth.
Bastardia, Kth.
Abutilon, Mnch.
Nuttallia, Dick.
Callirhoe, Nutt.
Lagunea, Cav.
Solandra, Murr.
Triguera, Cav.
Lagunaria, Endl.
Cristaria, Cav.
Anoda, Cav.
Pavonia, Cav.
Malache, Trow.
Periptera, DC.
Achania, Sw.
Malvaviscus, DC.
Lebretonia, Schrank.
Lopimia, Mart.
Hibiscus, L.
Trionum, Med.
Kosteletskya, Presl.
Abelmoschus, Med.
Bamia, R. Br.
Decaschistia, W. et A.
Paritium, A. St. H.
Thespesia, Corr.
Malvaviscus, Gærtn.
Gossypium, L.
Redoutea, Venten.
Cienfuegosia, Cav.
Fugosia, Juss.
Cienfuegia, Willd.
Senra, Cav.
Senræa, Willd.
Serræa, Spreng.

Ingenhousia, Moc. et Sesse.
? Lexarza Llave.

Order LXXIII. ELÆOCARPACEÆ.

Elæocarpeæ, *Juss. Ann. Mus.* 11. 223. (1808); *DC. Prodr.* 1. 519. (1824); *Arnott, Prodr. Penins. Ind.* 1. 81. (1834).

Essential Character.—*Sepals* 4 or 5, with a valvular æstivation, and no involucre. *Petals* 4 or 5, hypogynous, lobed or fringed at the point, very rarely perigynous, or 0. *Disk* glandular, somewhat projecting. *Stamens* hypogynous or rarely perigynous, some multiple of the sepals (8-80); *filaments* short, distinct; *anthers* long, filiform, 4-cornered, 2-celled, the cells opening by an oblong pore at the apex. *Ovary* two or many-celled; *style* 1, very rarely 4. *Fruit* variable, either indehiscent, dry, or drupaceous, or dehiscent; sometimes by abortion 1-celled. *Seeds* 1, 2, or more in each cell; *albumen* fleshy; *embryo* erect, with flat, leafy *cotyledons* (inverted; *radicle* superior, *Arnott*). *Trees* or *shrubs*. *Leaves* alternate, entire or serrated, simple, with deciduous *stipules*. *Flowers* racemose.

Anomalies. Crinodendron is apetalous.

Affinities. This order differs from Tiliaceæ only in the fringed petals, and anthers opening by two pores at the apex. *DC.* Kunth combines the two. *Diss. Malv.* p. 16.

Geography. Of the described species, 10 are found in the East Indies, 4 in South America, 2 in New Holland, and 2 in New Zealand; several more, however, exist in India.

Properties. Handsome trees or shrubs, with showy flowers. The furrowed, sculptured, bony fruit of the Elæocarpi, being freed from its pulp, forms handsome necklaces, which are not uncommonly set in gold, and sold in the shops. The name *julpai* or olive is applied to the fruit of some species of Elæocarpus, which is eaten; while that of others is dried and used in the curries of the natives of India, and is also pickled. *Royle*, p. 104. Roxburgh did not succeed in extracting any oil from the fruit. *Id.*

GENERA.

Elæocarpus, L.
Aceratium, DC.
Adenodus, Lour.
Ganitrus, Gærtn.
Dicera, Forst.
Friesia, DC.
Vallea, Mutis.
Tricuspidaria, R. et P.
Tricuspis, Pers.
Acronodia, Bl.
Acrozus, Spreng.
Monocera, Jack.
Crinodendron, Mol.

Order LXXIV. DIPTERACEÆ. The Camphor-Tree Tribe.

Dipterocarpeæ, *Blume Bijdr.* p. 222. (1825); *Fl. Javæ* (1829); *Wight and Arnott, Prodr. Fl. Ind. Penins.* 1. 83. (1834).

Essential Character.—*Calyx* tubular, 5-lobed, unequal, persistent, and afterwards enlarged, naked at the base; æstivation imbricated. *Petals* hypogynous, sessile, often combined at the base; æstivation contorted. *Stamens* indefinite, hypogynous, distinct, or slightly and irregularly polyadelphous; *anthers* innate, subulate, opening longitudinally towards the apex; *filaments* dilated at the base. *Ovary* superior, without a disk, few-celled; *ovules* in pairs, pendulous; *style* single; *stigma* simple. *Fruit* coriaceous, 1-celled by abortion, 3-valved or indehiscent, surrounded by the calyx, having tough leafy enlarged permanent divisions which crown the fruit. *Seed* single, without albumen; *cotyledons*, twisted and crumpled, or unequal and obliquely incumbent; *radicle* superior.—Elegant *trees*, abounding in resinous juice. *Leaves* alternate, involute in vernation, with veins running out from the midrib to the margin; *stipules* deciduous, oblong, convolute, terminating the branches with a taper point. *Peduncles* terminal, or almost so, in racemes or panicles; *flowers* usually large.

Affinities. Very near Elæocarpaceæ, but also allied to Malvaceæ in the contorted æstivation of the corolla, and the crumpled cotyledons: the order differs from the latter in having the stamens either distinct or partially combined, long narrow 2-celled anthers, and pendulous ovules; and from the former in the petals not being fringed, and in want of albumen. The resinous juice, compound superior ovary, drupaceous fruit, numerous long anthers, irregular coloured calyx, and single exalbuminous seed, ally it, as Blume remarks, to Guttiferæ, from which the stipules and the æstivation of the corolla abundantly distinguish it. The enlarged foliaceous unequal segments of the calyx, while investing the fruit, point out this family at once.

Geography. Only found in India, and especially in the eastern islands of the Indian Archipelago, where, according to Blume, they form the largest trees of the forest. Shorea robusta limits the northern distribution of the order, being found all along the foot of the Himalaya.

Properties. Here belongs the famous Camphor tree of Sumatra, Dryobalanops Camphora, which is no doubt a species of Dipterocarpus. The camphor is found in a concrete state in the cavities and fissures in the heart of the tree. It is less volatile than the common camphor of commerce. *Ed. P. J.* 6. 400. See remarks upon this tree in Blume's *Flora Javæ*. It also yields the camphor-oil of Borneo and Sumatra; the latter is supposed to be camphor in a partially formed state. Shorea robusta yields a balsamic resin used in the temples of India under the name of *ral* or *dhoona: Sal*, the best and most extensively used timber in India, is produced by this tree. *Royle.* Vateria indica produces the resin called in India *copal* (in England known by the name of *Gum animi*), as very nearly approaching the true resin of that name. In its recent and fluid state it is used as a varnish (called Piney varnish) in the south of India (*Buchanan's Mysore*, II. 476), and dissolved by heat, in closed vessels, is employed for the same purpose in other parts of India. *As. res.* XII. 539. *Royle*, 107. It is extremely tenacious and solid, but melts at a temperature of 97½ Fahr. *Brewster*, 4. 186. Other kinds of resin are furnished by other species; as, by Shorea robusta and Tumbugaia, the *dhoona* or *dammer* pitch, generally used in India for marine purposes, and as incense; by various species of Dipterocarpus, the balsam called by the natives of India *gurjun*, by the Cinghalese *dhoonatil*, and by the English *wood-oil*. *As. res. l. c.*

GENERA.

Lophira, Afz.
Hopea, Wall.
Shorea, Wall.
Dipterocarpus, Gærtn.
Caryolobis, Gærtn.
Dryobalanops, Gærtn.
Pterigium, Gærtn.
Vateria, L.

Order LXXV. TILIACEÆ. The Linden Tribe.

Tiliaceæ, *Juss. Gen.* 290. (1789) *in part.*; *Kunth. Malv. Diss.* p. 14. (1822); *DC. Prodr.* 1. 503. (1824); *Lindl. Coll.* p. 54. (1829).

Essential Character.—*Sepals* 4 or 5, with a valvular æstivation, usually with no involucre. *Petals* 4 or 5, entire, usually with a little pit at their base; very seldom wanting; most commonly the size of the sepals. *Stamens* generally indefinite, hypogynous, distinct; *anthers* 2-celled, dehiscing longitudinally; in Sparmannia the outer stamens are barren. *Disk* formed of glands, equal in number to the petals, at the base of which they are placed, adhering to the stalk of the ovary. *Ovary* single, composed of from 4 to 10 carpels; *style* one; *stigmas* as many as the carpels. *Fruit* dry, of several cells. *Seeds* numerous; *embryo* erect in the axis of fleshy *albumen*, with flat foliaceous *cotyledons*.—*Trees* or *shrubs*, very seldom *herbaceous* plants. *Leaves* simple, stipulate, toothed, alternate. *Flowers* axillary.

Anomalies. Petals sometimes absent. Diplophractum is remarkable for having an extremely anomalous fruit, with several spurious cells, and with the placentæ apparently in the circumference instead of the axis. Apeiba has sometimes as many as 24 cells in the fruit. Brown notices the existence of an African genus of this order (Christiania, DC.), remarkable in having a calyx of 3 lobes, while its corolla consists of 5 petals; the fruit composed of 5 single-seeded capsules, connected only at the base. *Cong.* 428.

Affinities. These resemble Sterculiaceæ, Malvaceæ, and the orders allied to them, in most respects, and especially in the valvate æstivation of their calyx. They are known by their glandular disk and distinct stamens, with 2-celled anthers.

Geography. The principal part of the order is found within the tropics all over the world, forming mean weed-like plants, or shrubs, or trees, with handsome, usually white or pink, flowers. A small number is peculiar to the northern parts of either hemisphere, where they form timber-trees.

Properties. They have all a mucilaginous, wholesome juice. The leaves of Corchorus olitorius are used in Egypt as a pot-herb. The berries of some of them are succulent and eatable. The species are more remarkable for the toughness of the fibres of their inner bark, which are used for various economical purposes. Fishing lines and nets, rice bags or *gunny*, and a coarse kind of linen called *tat*, are made in India of Corchorus capsularis; and the Russian mats of commerce are manufactured from the Tilia. The bark of Luhea paniculata is used in Brazil for tanning leather. The wood of Luhea divaricata, which is white and light, but very close grained, makes good musket-stocks, and wooden soles for shoes. The Brazilians call all such *Açoita cavallos*, because the sticks they use for driving their cattle are obtained from them. *Pl. Us.* 66. The flowers of Tilia, separated from the bracts, are used in infusion, according to Host (*Fl. Austr.* 2. 63), with much success in vertigo and spasms; they promote perspiration and alleviate coughs. But if the bracts and fruits are mixed with the flowers, the infusion then becomes astringent, and confines the bowels. Some species of Grewia, as G. sapida, asiatica, &c. yield pleasant acid berries much used in the manufacture of sherbet. The wood of Grewia elastica, called *dhamnoo*, affords timber highly valued for its strength and elasticity, and, therefore, much used for bows, the shafts of carriages, &c. *Royle.* The excellent light timber called *Trincomalee wood*, employed in the construction of the excellent Massoola boats of Madras, is furnished by Berrya Ammonilla. *Id.*

GENERA.

Sparmannia, Th.
Heliocarpus, L.
Montia, Houst.
Entelea, R. Br.
Antichorus, L.
Carrichtera, Scop.
Corchorus, L.
Honckenya, W.
Triumfetta, L.
Bartramia, Gærtn.
Porpa, Blume.
Grewia, L.
Microcos, L.
Mallococca, Forst.
Chadara, Forsk.

Columbia, Pers.	Apeiba, Aubl.	Luhea, Willd.	Hasseltia, H. B. K.
Colona, Cav.	*Aubletia*, Schreb.	Berrya, Roxb.	Vatica, L.
Tilia, L.	*Oxytandrum*, Neck.	Brownlowia, Roxb.	Xeropetalum, Del.
Diplophractum, Desf.	Muntingia, L.	Vincentia, Hook.	Espera, Willd.
Sloanea, L.	Christiania, DC.	———	Trilix, L.
Neesia, Bl.	Alegria, Moç. et Sess.	Ablanæa, Aubl.	Mollia, Mart.
Esenbeckia, Bl.		*Trichocarpus*, Schrb.	*Schlechtendahlia*, Spr.

Order LXXVI. LYTHRACEÆ. The Loosestrife Tribe.

Salicariæ, *Juss. Gen.* 330. (1789); *Lindl. Synops.* 71. (1829); *Aug. de St. H. Ann. Sc. Nat.* 2. *ser.* 1. p. 1. and 333. (1834).—Calycanthemæ, *Vent. Tabl.* 3. 298. (1799).—Salicarinæ, *Link Enum.* 1. 142. (1821).—Lythrariæ, *Juss. Dict. Sc. Nat.* 27. 453. (1823); *DC. Prodr.* 3. 75. (1828).

Essential Character.—*Calyx* monosepalous, the lobes with a valvate or separate æstivation, their sinuses sometimes lengthened into other lobes. *Petals* inserted between the lobes of the calyx, very deciduous, sometimes wanting. *Stamens* inserted into the tube of the calyx below the petals, to which they are sometimes equal in number; sometimes they are twice, or even thrice, and occasionally four times as numerous; *anthers* adnate, 2-celled, opening longitudinally. *Ovary* superior, 2- or 4-celled; *style* filiform; *stigma* usually capitate. *Capsule* membranous, covered by the calyx, usually 1-celled, dehiscing either longitudinally or in an irregular manner. *Seeds* numerous, small, without albumen, adhering to a central placenta; *embryo* straight; *radicle* turned towards the hilum; *cotyledons* flat and leafy.—*Herbs*, rarely *shrubs*. *Branches* frequently 4-cornered. *Leaves* opposite, seldom alternate, entire, without either stipules or glands. *Flowers* axillary, or in terminal spikes or racemes, in consequence of the depauperation of the upper leaves.

Anomales. Occasionally apetalous.

Affinities. In many respects this order resembles Onagraceæ, from which the superior ovary and many-ribbed calyx distinguish it; also Melastomaceæ, from which the superior ovary, the veining of the leaves, and the æstivation of the stamens divide it. With Labiatæ it has often a resemblance in habit, but this goes no further. Malvaceæ, however, appear to be the plants to which Lythraceæ the most nearly approach, as is indicated by Lagerströmia and Hibiscus, as well as by Lythrum itself, and Napæa. Their strictly perigynous stamens place them in a widely different affinity according to the French school. Their resemblance to Celastraceæ is completely established by the genus Adenaria.

Geography. The Lagerströmias are all Indian or South American. The true Lythraceæ are European, North American, and natives of the tropics of both hemispheres. Lythrum Salicaria, a common European plant, is singular for being found in New Holland, and for also being the only species of that order yet described from that country.

Properties. Astringency is a property of the Lythrum Salicaria, which is reputed to have been found useful in inveterate diarrhœas: another species of the same genus is accounted in Mexico astringent and vulnerary. The flowers of Grislea tomentosa, (Lythrum? Hunteri,) are employed in India, mixed with Morinda, for dyeing, under the name of *Dhaee*. *Hunter, As. Res.* 4. 42. Nesæa salicifolia, a plant remarkable, in an order with red or purple flowers, for its yellow corolla, is said to excite violently perspiration and the urinary secretion. The Mexicans consider it a potent remedy for venereal diseases, and call it *Hanchinol*. *DC.* Lawsonia inermis is the plant from which the *Henné* of Egypt is obtained. Women in that country stain their fingers and feet of an orange colour with it. It is also used for dyeing skins and maroquins reddish yellow, and for many other purposes. It contains no

tannin. *Ed. P. J.* 12. 416. The leaves of Ammannia vesicatoria have a strong muriatic smell; they are extremely acrid, and are used by the native practitioners of India to raise blisters, in rheumatism, &c.: bruised and applied to the part intended to be blistered, they perform their office in half an hour, and most effectually. *Ainslie*, 2. 93.

GENERA.

§ 1. SALICARIEÆ, DC.
Rotala, L.
Symmetria, Bl.
Cryptotheca, Blume.
Suffrenia, Bell.
Ameletia, DC.
Peplis, L.
Chabræa, Adans.
Ammannia, L.
Cornelia, Ard.
Lythrum, L.
Salicaria, Tourn.
Pythagorea, Rafin.
Anisotes (13).
Pleurophora, Don.
Cuphea, Jacq.
Melanium, P. Br.
Parsonia, P.
Balsamona, Vand.
Acisanthera, P. Br.
Fatioa, DC.
Pemphis, Forst.
Diplusodon, Pohl.
Friedlandia, Cham.
Nesæa, Commers.
Heimia, Link.
Decodon, Gmel.
Crenea, Aubl.
Lawsonia, L.
Antherylium, Rohr.
Dodecas, L.
Ginoria, Jacq.
Adenaria, H. B. K.
Grislea, Lœfl.
Woodfordia, Salisb.
§ 2. LAGERSTRŒMIEÆ, DC.
Lagerstrœmia, L.
Münchhausia, L.
Adambea, Lam.
Duabanga, Hamilt.
Lafœensia, Vand.
Calyplectus, R. et P.
Physocalymna, Pohl.

ALLIANCE II. *MELIALES.*

ESSENTIAL CHARACTER.—*Æstivation* of calyx imbricated. *Carpels* four or a larger number. *Stamens* very generally monadelphous in a kind of cup. Seldom or never hairy.

While the last alliance contains plants universally mucilaginous, with the exception of the astringent Lythraceæ; this comprehends genera which are mostly more or less aromatic or bitter. The number of carpels being usually at least four, and often seven distinguishes the alliance with almost certainty from Euphorbiales.

ORDER LXXVII. MELIACEÆ. THE BEAD-TREE TRIBE.

MELIÆ, *Juss. Gen.* 263. (1789); *Mém. Mus.* 3. 436. (1817); *DC. Prod.* 1. 619. (1824); *Adr. de Juss. Mémoire* (1830).

ESSENTIAL CHARACTER.—*Sepals* 3, 4, or 5, more or less united. *Petals* the same number, hypogynous, conniving at the base, or even cohering, usually having a valvate æstivation. *Stamens* twice as many as the petals; *filaments* cohering in a long tube; *anthers* sessile within the orifice of the tube. *Disk* frequently highly developed, surrounding the ovary like a cup. *Ovary* single, with the same number of cells as petals, or fewer (3-2) very seldom many more (10-12) cells; *style* 1; *stigmas* distinct or combined; *ovules* 1 or 2 in each cell, very rarely 4. *Fruit* berried, drupaceous or capsular, often, in consequence of abortion, 1-celled, the valves, if present, having the dissepiments in their middle. *Seeds* without albumen, not winged, with or without an aril; *albumen* fleshy, *(Melieæ)* usually absent *(Trichilieæ).—Trees* or *shrubs*. *Leaves* alternate, without *stipules*, simple or compound.

AFFINITIES. This order was ill understood until it was investigated by Adrien de Jussieu, from whose memoir I borrow the principal part of what follows. It is, no doubt, related to Aurantiaceæ, notwithstanding that Canella, which was considered a case of transition, is removed from it. The inflorescence of Aurantiaceæ terminates in dichotomies with a central and præcocious flower, the union that sometimes occurs between the filaments of that order, the number of stamens often double that of the petals and their relative length, the embryo with a short radicle drawn back between the thick

cotyledons, are all points in which there is an accordance between the two orders. The occasionally monadelphous stamens of Rutaceæ designate an analogy with that order, which is confirmed by the general tendency in both cases to produce two ovules in each cell of the ovary. The number and the relative position of the parts of the flower, shew an affinity with Sapindaceæ, and the structure of the seeds of that order is often absolutely the same as that of Meliaceæ; their accordance in habit is incontestable, and in fact the species of the two orders are often mixed together in herbaria. Burseraceæ and Spondiaceæ have also their degree of affinity. Cedrelaceæ are chiefly distinguished by their winged seeds and the stamens being in a less degree monadelphous.

Geography. Found all over the world; in about equal quantities in America and Asia, and four times fewer in Africa; but these proportions are possibly due to the difference in the degree that those parts of the world have been examined. They do not extend further to the north than 40°; Melia Azedarach is naturalised as it were in Provence; and an Hartighsea exists in New Zealand. The extra-tropical species are, however, extremely rare.

Properties. Bitter, astringent, and tonic qualities belong to the species of this order, but often developed in so considerable a degree as to render their employment dangerous without much precaution. A Brazilian plant called *Jito* is a powerful purgative, but Piso in mentioning it, warns us against the danger of employing it, and says that it is more often a poison than a medicine; it is supposed to be a species of Guarea. Trichilia cathartica is reputed to have similar properties. The juice of the bark of Guarea Aubletia is a purgative and a violent emetic; the bark of Guarea trichilioides has similar qualities. The same power is assigned to the Arabian Elcaija (Trichilia emetica). Jacquin says that the negresses employ the root of T. trifoliolata to procure abortion. The root of Melia Azedarach is bitter and nauseous, and is used in North America as anthelmintic; the pulp that surrounds the seeds is said to be deleterious; but this is denied by Turpin, who asserts that dogs which he has seen eat it experienced no inconvenience; and children in Carolina eat the seeds with impunity. *Ach. R.* It is supposed that the Melia Azedarachta, or Neemtree of India, possesses febrifuge properties. See *Trans. of M. and Ph. Soc. of Calcutta*, 3. 430. A kind of Toddy, which the Hindoo doctors consider a stomachic, is obtained by tapping this, which is also called the Margosa-tree. *Ainslie*, 1. 453. From the fruit of the same plant an oil is obtained, which is fit for burning and for other domestic purposes, and, as Ach. Richard well observes (*Bot. Méd.* 708.), is another instance, after the Olive, of the pericarp yielding that substance which is usually obtained from the seed. This oil is said to possess antispasmodic qualities. *DC.* Blume attributes to the root of Sandoricum indicum properties similar to those of Melia; but the latter has a repulsive odour, while the other is aromatic. It is employed against leucorhæa, combined with the bark of the root of Carapa obovata, which is bitter and astringent. Rumf mentions the extreme bitterness of Xylocarpus granatum. An alliaceous odour found in two species of Cedrela also occurs in a very prominent degree in some species of Dysoxylum and Hartighsea; the Javanese mountaineers use the fruit of these trees as garlic. Blume suspects that some species of Epicharis have similar properties. A warm pleasant-smelling oil is prepared from the fruit of Trichilia speciosa, which the Indian doctors consider a valuable external remedy in chronic rheumatism and paralytic affections. *Ainslie*, 2. 71. Some delicious fruits of the Indian archipelago, called Langsat, or Lanséh, and Ayer Ayer, are species of the genus Lansium; they have a watery pulp, with a cooling pleasant taste. Milnea edulis is another plant of the order, with eatable fruit. See further *Royle's Illustrations*, p. 141.

GENERA.

§ 1. Meliæ, A. de J.
Quivisia, J.
Gilibertia, Gmel.
Calodryum, Desv.
Turræa, L.
Melia, L.
Azedarach, Tourn.
Azadirachta, Ad. J.
Mallea, Ad. J.
Cipadessa, Bl.

§ 2. Trichilieæ, A. de J.
Amoora, Roxb.
Aphanamixis, Bl.
Nemedra, Ad. J.
Andersonia, Roxb.
Sphærosacme, Wall.
Milnea, Roxb.
Walsura, Roxb.
Dysoxylum, Bl.
Chisocheton, Bl.
Schizochiton, Spreng.
Synoum, Ad. J.
Hartighsea, Ad. J.
Epicharis, Bl.
Cabralea, Ad. J.
Didymocheton, Bl.
Goniocheton, Bl.
Sandoricum, Cav.
Lansium, Jack.
Ekebergia, Sparm.
Heynea, Roxb.
Schoutensia, Endl.
Trichilia, L.
Portesia, J.
Elcaja, Forsk.
Moschoxylum, Ad. J.
Guarea, L.
Guidonia, Pl.
Carapa, Aubl.
Persoonia, W.
Xylocarpus, Kon.
Calpandria, Bl.
Aglaia, Lour.
Camunium, Rumf.
Cambaria, Commer.

Naregamia, W. et A.
Stemmatosiphon, Poh.
Aitonia, L.

Order LXXVIII. CEDRELACEÆ.

Cedreleæ, *Brown in Flinders*, 64. (1814).—Meliaceæ, § Cedreleæ, *DC. Prodr.* 1. 624. (1824).—Cedrelaceæ, *A. de J. Mémoire* (1830).

Essential Character.—*Calyx* 4-5-cleft. *Petals* 4-5, longer. *Stamens* 8-10; the filaments either united into a tube *(Swieteniæ)*, or distinct *(Cedreleæ)*, and inserted into an hypogynous disk. *Style* and *stigmas* simple. Cells of the *ovary* equal in number to the petals or fewer (3), with the ovules 4, or often more, imbricated in two rows. *Fruit* capsular, with the valves separable from the dissepiments with which they alternate. *Seeds* flat, winged; *albumen* thin or none.—*Trees* with timber which is usually compact, scented, and beautifully veined. *Leaves* alternate, pinnated, without stipules. *Flowers* in terminal panicles. *Ad. de J.*

Affinities. Nearly related to Meliaceæ, in whose affinities they participate. Chiefly distinguished by their winged and indefinite seeds. Flindersia, a genus established by Brown in the Appendix to Captain Flinders' Voyage, differs from Cedrelaceæ both in the insertion of its seeds, which are erect, in the dehiscence of its capsules, and also in having moveable dissepiments: these last, however, Brown considers as segments of a common placenta, having a peculiar form. Flindersia, and Chloroxylon are distinct from the rest of the order, in having the leaves dotted with pellucid glands, in which respect they serve to connect Cedrelaceæ with Aurantiaceæ, and, notwithstanding the absence of albumen, even with Rutaceæ. See the *Appendix and Atlas to Flinders' Voyage*.

Geography. These are common to the tropics of America and India, but have not yet been found on the continent of Africa, nor in any of the adjoining islands. *Brown Congo*, 465.

Properties. The wood of the order is in general fragrant, in consequence of the presence of an aromatic principle. The bark of Cedrela is fragrant and resinous; that of C. Toona, and of Swietenia Mahagoni, is also accounted febrifugal. The *mahogany wood* used by cabinet makers is the produce of the last-mentioned plant. The bark of Soymida febrifuga, the Rohuna of Hindostan, called on the Coromandel coast the *Red Wood Tree*, is a useful tonic in India in intermittent fevers; but Ainslie found that if given beyond the extent of 4 or 5 drachms in 24 hours, it deranged the nervous system, occasioning vertigo and subsequent stupor. That of Khaya, the *Kassou-Khaye* of Senegal, is a common febrifuge in the swampy districts on the banks of the Gambia. Cedrela febrifuga bark is said by Blume to be employed successfully against the intermittent fevers of Java; he observes that it is tonic and useful in cases of diarrhœa, &c., but that it should never be used where there is a tendency to

inflammation. An essential oil is found in Flindersia and Chloroxylon, as is indicated by their dotted leaves. The young shoots of Cedrela angustifolia have a powerful smell of garlic, according to Ruiz and Pavon. *Ad. de Juss. Mém. Méliac*, p. 51. *Satin Wood* is the produce of Chloroxylon Swietenia, which is one of the plants that yield the *wood oil* of India. *Royle*. Oxleya xanthoxyla, a large tree, is the *Yellow-wood* of New South Wales.

GENERA.

§ 1. Swieteniæ, Ad. J.
Swietenia, L.
Roia, Scop.
Plagiotaxis, Wall.
Khaya, Ad. J.
Soymida, Ad. J.
Chikrassia, Ad. J.
§ 2. Cedreleæ, A. de J.
Chloroxylon, DC.
Flindersia, R. Br.
Cedrela, L.
Cedrus, Miller.
Johnsonia, Adans.
Odontandra, Kth.
Oxleya, Hooker.
? Ixionanthes, Jack.

Order LXXIX. HUMIRIACEÆ.

Humiriaceæ, *Adrien de Jussieu in Aug. de St. Hil. Flora Bras. Merid.* 2. 87. (1829). *Martius Nov. Gen.* 2. 147. (1826); *Conspect. No.* 303. (1835).

Essential Character.—*Calyx* in 5 divisions. *Petals* alternate with the lobes of the calyx, and equal to them. *Stamens* hypogynous, 4 or many times as numerous as the petals, monadelphous; *anthers* 2-celled, with a fleshy connective, extended beyond the 2 lobes. *Ovary* superior, usually surrounded by an annular or toothed disk, 5-celled, with from 1 to 2 suspended ovules in each cell; *style* simple; *stigma* lobed. *Fruit* drupaceous, with 5 or fewer cells. *Seed* with a membranous integument; *embryo* straight, oblong, lying in fleshy albumen; *radicle* superior.—*Trees* or *shrubs*. *Leaves* alternate, simple, coriaceous, without stipules. *Flowers* somewhat cymose.

Affinities. These are not well made out; they differ from Meliaceæ very much in habit, and in many respects in fructification, especially in having the æstivation of the corolla quincuncial, not valvate, and the stamens sometimes indefinite; the anthers of Humiriaceæ, as Von Martius observes (*Nov. Gen. &c.* 2. 147.), are very different from those of Meliaceæ in the great dilation of their connective; their albuminous seeds and slender embryo are also at variance with Meliaceæ. In the latter respect, and in their balsamic wood, they agree better with Styraceæ, as also in the variable direction of the embryo. Besides these points of affinity, Von Martius compares Humiriaceæ with Chlenaceæ, on account of both orders containing definite and indefinite monadelphous stamens, several stigmas, partially abortive cells, inverted albuminous seeds, and a singular complicated vernation, by which two longitudinal lines are impressed upon each leaf. To me it appears, that the real affinity is with Aurantiaceæ; an affinity indicated by their inflorescence, the texture of their stamens, their disk, their winged petioles, and their balsamic juices.

Geography. All Brazilian trees.

Properties. Humirium floribundum, when the trunk is wounded, yields a fragrant liquid yellow balsam, called *Balsam of Umiri*, resembling the properties of Copaiva and Balsam of Peru. *Martius*.

GENERA.

Humirium, Mart.
Sacoglottis, Mart.
Hellcria, Mart.

Order LXXX. AURANTIACEÆ. The Orange Tribe.

Aurantiaceæ, *Corr. Ann. Mus.* 6. 376. (1805); *Mirb. Bull. Philom.* 379. (1813); *DC. Prodr.* 1. 536. (1824).

Essential Character.—*Calyx* urceolate or campanulate, somewhat adhering to the disk, short, 3- or 5-toothed, withering. *Petals* 3 to 5, broad at the base, sometimes distinct, sometimes slightly combined, inserted upon the outside of a hypogynous disk, slightly imbricated at the edges. *Stamens* equal in number to the petals, or twice as many, or some multiple of their number, inserted upon a hypogynous disk; *filaments* flattened at the base, sometimes distinct, sometimes combined in one or several parcels; *anthers* terminal, innate. *Ovary* many-celled; *style* 1, taper; *stigma* slightly divided, thickish. *Fruit* pulpy, many-celled, with a leathery rind replete with receptacles of volatile oil, and sometimes separable from the cells; *cells* often filled with pulp. *Seeds* attached to the axis, sometimes numerous, sometimes solitary, usually pendulous, occasionally containing more embryos than one; *raphe* and *chalaza* usually very distinctly marked; *embryo* straight; *cotyledons* thick, fleshy; *plumule* conspicuous.—*Trees* or *shrubs*, almost always smooth, and filled every where with little transparent receptacles of volatile oil. *Leaves* alternate, often compound, always articulated with the petiole, which is frequently winged. *Spines*, if present, axillary.

Affinities. Readily known by the abundance of oily receptacles which are dispersed over all parts of them, by their deciduous petals, and compound leaves with a winged petiole. They are nearly related to Amyridaceæ and Connaraceæ on the one hand, and to various genera of Diosmeæ on the other, but are distinguished from them all by a variety of obvious characters. It is more difficult to distinguish Aurantiaceæ from Xanthoxylaceæ unless attention is paid to the gynobasic structure of the latter; and this is made out with difficulty in the ovary; their ripe fruit is, however, very different. Luvunga is remarkable for having the climbing habit of Xanthoxylaceæ, and the fruit of the Orange tribe. The raphe and chalaza are usually distinctly marked upon the testa, and sometimes beautifully. De Candolle considers the rind of the Orange to be of a different origin and nature from the pericarp of other fruit, and more analogous to the torus or disk of Nelumbiaceæ; but if the ovary and ripe fruit are compared, it will be readily seen that this hypothesis is untenable, and that there is no difference between the rind of an orange and an ordinary pericarp.

Geography. Almost exclusively found in the East Indies, whence they have in some cases spread over the rest of the tropics. Two or three species are natives of Madagascar; one is described as found wild in the woods of Essequebo; and Prince Maximilian of Wied Neuwied speaks of a wild Orange of Brazil, called *Caranja da terra*, which has by no means the delicious refreshing qualities of the cultivated kind, but a mawkish sweet taste. *Travels*, 76. Limonia laureola is remarkable as the only plant of this family found on the tops of cold and lofty mountains, where it is for some months of the year buried under the snow. The Hill people of India call it *Kidar-patri* and *Kutharchara*, and fancy that it is by feeding on its leaves that the musk acquires its peculiar flavour. *Royle.*

Properties. The wood is universally hard and compact; they abound in a volatile, fragrant, bitter, exciting oil; the pulp of the fruit is always more or less acid. *DC.* The Orange, the Lemon, the Lime, and the Citron, fruits which, although natives of India, have now become so common in other countries as to give a tropical character to a European dessert, are the most remarkable products of this order. If to this be added the excellence of their wood, and the fragrance and beauty of their flowers, I know not if an order more interesting to man can be pointed out. The fruits just mentioned are not, however, its only produce. The *Wampee*, a fruit highly esteemed in China and the Indian archipelago, is the produce of Cookia punctata. The berries

of Glycosmis citrifolia are delicious; those of Triphasia are extremely agreeable. The productiveness of the common Orange is enormous. A single tree at St. Michael's has been known to produce 20,000 oranges fit for packing, exclusively of the damaged fruit and the waste, which may be calculated at one-third more. The juice of the Lime and the Lemon contains a large quantity of citric acid. *Turner*, 632. Oranges contain malic acid. *Ib.* 634. A decoction of the root and bark of Ægle Marmelos is supposed, on the Malabar coast, to be a sovereign remedy in hypochondriasis, melancholia, and palpitation of the heart; the leaves in decoction are used in asthmatic complaints, and the fruit a little unripe is given in diarrhœa and dysentry. Roxburgh adds, that the Dutch in Ceylon prepare a perfume from the rind; the fruit is most delicious to the taste, and exquisitely fragrant and nutritious, but laxative; the mucus of the seed is a good cement for some purposes. *Ainslie*, 2. 87. The leaves of Bergera Königii are considered by the Hindoos stomachic and tonic; an infusion of them toasted stops vomiting. The green leaves are used raw in dysentery; the bark and root internally as stimuli. *Ibid.* 2. 139. The young leaves of Feronia elephantum have, when bruised, a most delightful smell, very much resembling anise. The native practitioners of India consider them stomachic and carminative. Its gum is very like gum arabic. *Ib.* 2, 83. See further *Royle's Illustrations*, p. 129.

GENERA.

Atalantia, Corr.
Triphasia, Lour.
Limonia, L.
Cookia, Sonner.
Quinaria, Lour.
Aulacia, Lour.
Murraya, Kœn.
Marsana, Sonner.
Chalcas, Lour.
Bergera, Kœn.
Clausena, Burm.
Glycosmis, Corr.
Feronia, Corr.
Ægle, Corr.
Belou, Adans.
Citrus, L.
Luvunga, Hamilt.
Sclerostylis, Bl.
Micromelum, Bl.
Chionotria, Jack.

Order LXXXI. SPONDIACEÆ. The Hogplum Tribe.

Spondiaceæ, *Kunth in Ann. Sc. Nat.* 2. 362. (1824); *Martius Conspectus, No.* 268. (1835). Terebintaceæ, trib. 3. *DC. Prodr.* 2. 74. (1825).

Essential Character.—*Flowers* sometimes unisexual. *Calyx* 5-cleft, regular, persistent or deciduous. *Petals* 5, inserted below a disk surrounding the ovary, somewhat valvate or imbricate in æstivation. *Stamens* 10, perigynous, arising from the same part as the petals. *Disk* annular, in the males orbicular, with 10 indentations. *Ovary* superior, sessile, from 2- to 5-celled; *styles* 5, very short; *stigmas* obtuse; *ovule* 1 in each cell, pendulous. *Fruit* drupaceous, 2-5-celled. *Seeds* without *albumen*; *cotyledons* plano-convex; *radicle* superior, pointing to the hilum (inferior in Spondias, according to *Gærtner*). *Trees* without spines. *Leaves* alternate, unequally pinnate, without pellucid dots, a few simple leaves occasionally intermixed. *Stipules* 0. *Inflorescence* axillary and terminal in panicles or racemes.

Affinities. According to the French school, related to Anacardiaceæ in the structure of the fruit, which is almost that of Mangifera. Spondiaceæ are, however, essentially distinguished by their syncarpous fruit, and the absence of a resinous juice; and appear to differ from Aurantiaceæ in little beyond their perigynous stamens, large disk (which is remarkably dilated), and undotted leaves. The transition to Aurantiaceæ is through Bergera and its allies in the latter order.

Geography. Natives of the West Indies, the Society Islands, and the Isle of Bourbon.

PROPERTIES. The fruit of several species of Spondias is eatable in the West Indies, where they are called Hog Plums.

GENERA.

Spondias, L.
Poupartia, Comm.
Lannea, G. et P.

ALLIANCE III. *RHAMNALES.*

ESSENTIAL CHARACTER.—*Æstivation* of the calyx valvate. *Carpels* fewer than four, sometimes slightly adhering to the calyx. *Hairs* if present never starry. All *shrubs*.

About the strict relationship of Rhamnaceæ, Chailletiaceæ, and Nitrariaceæ, there will probably be little difference of opinion. These three orders, especially the first, are only to be distinguished from certain Euphorbiaceæ with some difficulty; Rhamnales were formerly considered a part of the same order as Celastraceæ. Tremandraceæ are usually reckoned next akin to Polygalaceæ, but it seems to me better to remove them from the immediate vicinity of that order, on account of their calyx not having the strongly imbricated structure of that order. Burseraceæ are allied to Spondiaceæ in this, and to Amyridaceæ in the apocarpous alliance, and is one of the cases that connect the two.

ORDER LXXXII. RHAMNACEÆ. THE BUCKTHORN TRIBE.

RHAMNI, *Juss. Gen.* 376. (1789).—RHAMNEÆ, *DC. Prodr.* 2. 19. (1825); *Brongniart Mémoire sur les Rhamnées*, (1826); *Lindl. Synops.* 72. (1829).

ESSENTIAL CHARACTER.—*Calyx* monophyllous, 4-5-cleft, with a valvate æstivation. *Petals* distinct, cucullate, or convolute, inserted into the orifice of the calyx, occasionally wanting. *Stamens* definite, opposite the petals. *Disk* fleshy. *Ovary* superior, or half superior, 2- 3- or 4-celled; *ovules* solitary, erect. *Fruit* fleshy and indehiscent, or dry and separating in 3 divisions. *Seeds* erect; *albumen* fleshy, seldom wanting; *embryo* almost as long as the seed, with large flat *cotyledons*, and a short inferior *radicle*.—*Trees* or *shrubs*, often spiny. *Leaves* simple, alternate, very seldom opposite, with minute *stipules*. *Flowers* axillary or terminal.

ANOMALIES. Sometimes the ovary is inferior. Leaves opposite in Colletia and Retanilla. Stipules and petals often wanting.

AFFINITIES. Under this name have been for a long time confounded four orders, very different in characters, and even in natural affinities, the peculiarities of three of which have been pointed out by Ad. Brongniart in his memoir upon the subject, and a fourth has been distinguished by myself. These orders are Rhamnaceæ properly so called, Celastraceæ, Aquifoliaceæ, and Staphyleaceæ, the respective affinities of which will be found under each. Brongniart indicates the relation that Rhamnaceæ bear, thus: if we take the insertion of stamens as the most important distinction of plants, it will be found that among polypetalous orders with perigynous stamens, Pomeæ are those to which Rhamnaceæ have the closest relation, agreeing with them in the ovary, the cells of which are determinate in number, in the ascending ovules, and in their alternate leaves usually having two stipules at their base; the number and position of their stamens, and the structure of their seeds, separate them widely. But if the insertion of the stamens is left out of consideration, they

will be found to have many characters in common with Büttnerieæ (*Brown in Flinders*, 22.); such as, the æstivation of the calyx, the form of the petals, the position of the stamens in the front of those petals, the structure of the ovary and seeds in many important points; the principal difference between them are, in fact, the stamens being turned outwards in Büttnerieæ, which are also destitute of a disk, have hypogynous stamens, and always 2 or more ovules. Euphorbiaceæ are allied to Rhamnaceæ; but the constant separation of sexes in the former family, their hypogynous stamens and suspended ovules, are obvious marks of distinction. Nitrariaceæ may be compared with Rhamnaceæ in several points.

Geography. Found over nearly all the world, except in the arctic zone; the maximum of species is said to be dispersed through the hottest parts of the United States, the south of Europe, the north of Africa, Persia, and India in the northern hemisphere, and the Cape of Good Hope and New Holland in the southern. Some of the genera appear to be confined to particular countries, as all the true Ceanothuses to North America, Phylicas to the Cape, Cryptandra and Pomaderris to New Holland.

Properties. The berries of various species of Rhamnus are violent purgatives, and have been highly spoken of in dropsy. They also yield a dye, varying in tint from yellow to green; the ripe berries of R. catharticus, mixed with gum arabic and lime-water form the green colour known under the name of *Bladder-green*. The *French berries* of the shops *(Graines d'Avignon*, Fr.*)* are the fruit of Rh. infectorius and saxatilis, and amygdalinus. The fruit of Zizyphus is destitute of these purgative qualities, and, on the contrary, is often wholesome and pleasant to eat, as in the case of the *Jujube* and the *Lote*, the latter of which is known to have given their name to the classical Lotophagi. The peduncles of Hovenia dulcis become extremely enlarged and succulent, and are in China a fruit in much esteem, resembling in flavour, as it is said, a ripe Pear. Some species are astringent. Sageretia theezans is used for tea by the poorer classes in China; an infusion of the twigs of Ceanothus americanus has been named as useful, on account of its astringency, to stop gonorrhœal discharges; antisyphilitic virtues are ascribed to the root of the same, and also of Berchemia volubilis; and it is said, by Rumphius, that in the Moluccas the bark of Zizyphus Jujuba is employed as a remedy for diarrhœa. *Brongn.* See *Royle's Illustrations*, p. 169.

GENERA.

Paliurus, Tourn.
Aspidocarpus, Neck.
Aubletia, Lour.
Zizyphus, Tourn.
Condalia, Cavan.
Berchemia, Neck.
Œnoplia, Hedw.
Ventilago, Gærtn.
Sageretia, Brongn.
Karwinskia, Zucc.
Rhamnus, L.
Marcorella, Neck.
Cervispina, Dill.
Frangula, Tourn.
Scutia, Commers.
Retanilla, Brongn.
Colletia, Kunth.
Discaria, Hooker.
Trevoa, Hooker.
Hovenia, Thunb.
Colubrina, Rich.
Ceanothus, L.
Forrestia, Rafin.
Willemetia, Brong.
Pomaderris, La B.
Pomatoderris, Schult.
Cryptandra, Sm.
Trichocephalus, Bron.
Tittmannia, Brongn.
Moesslera, Rchb.
Phylica, L.
Soulangia, Brongn.
Gouania, L.
Retinaria, Gærtn.
Crumenaria, Mart.
Lepionurus, Bl.
Crypteronia, Bl.
Pennantia, Forst.
Goupia, Aubl.
Glossopetalum, Sch.
Carpodetus, Forst.
? Phaleria, Jack. (14)

Order LXXXIII. CHAILLETIACEÆ.

Chailletiæ, *R. Brown Cong.* p. 23. (1818).—Chailletiaceæ, *DC. Prodr.* 2. 57. (1825).

Essential Character.—*Sepals* 5, with an incurved valvate æstivation. *Petals* 5, alternate with the sepals, and arising from the base of the calyx, usually 2-lobed. *Stamens*

5, alternate with the petals, and combined with them at the base; *anthers* ovate, versatile. *Glands* usually 5, hypogynous, opposite the petals. *Ovary* superior, 2- or 3-celled; *ovules* twin, pendulous; *style* simple; *stigma* obsoletely 3-lobed. *Fruit* drupaceous, rather dry, 1- 2- or 3-celled. *Seeds* solitary, pendulous, without albumen; *embryo* thick, with a thick superior *radicle* and fleshy *cotyledons*.—*Trees* or *shrubs*. *Leaves* alternate, with two stipules entire. *Flowers* small, axillary, their peduncle often connate with the petiole.

Affinities. Whether what are here called petals are not rather abortive stamens is doubted by botanists, and hence the station of the order is by one referred to Polypetalæ, and by another to Apetalæ, and is compared, on the one hand, with Anacardiaceæ or Rosaceæ, and, on the other, with Samydaceæ and Cupuliferæ. To me it seems that what appear to be petals are so; a fact which it is difficult to doubt, when it is remembered that both organs are mere transformations of one common type, and that it is in appearance and position only that they differ. De Candolle stations the order between Homalinaceæ and Aquilariaceæ; it agrees with the former in the presence of glands round the ovary, but differs in its superior ovary with the placentæ in the axis, and many other characters. Rhamnaceæ, with which it agrees so much in habit, seem upon the whole to claim the closest kindred with it.

Geography. Of the few known species belonging to this order, 2 are found in Sierra Leone, 2 in Madagascar, 2 in equinoctial America, and 1 in Timor.

Properties. The fruit of Chailletia toxicaria is said to be poisonous. That of Moutabea is said by Aublet to be harmless.

GENERA.

Chailletia, DC.
Patrisia, Rohr.
Mestotes, Sol.
Dichapetalum, Thou.
Leucosia, Thouars.

Tapura, Aubl.
Rohria, Schreb.

Moutabea, Anol.
Cryptostomum, Schr.

Moacurra, Roxb.
Wahlenbergia, R.Br.

Order LXXXIV. TREMANDRACEÆ.

Tremandraceæ, *R. Brown in Flinders*, p. 12. (1814); *DC. Prodr.* 1. 343. (1824).

Essential Character.—*Sepals* 4 or 5, equal, with a valvular æstivation, slightly cohering at the base, and deciduous. *Petals* equal in number to the sepals, with an involute æstivation, enwrapping the stamens, much larger than the calyx, and deciduous. *Stamens* hypogynous, distinct, 2 before each petal, and therefore either 8 or 10; *anthers* 2- or 4-celled, opening by a pore at the apex. *Ovary* 2-celled; *ovules* from 1 to 3 in each cell, pendulous; *style* 1; *stigmas* 1 or 2. *Fruit* capsular, 2-celled, 2-valved; *dehiscence* loculicidal. *Seeds* pendulous, ovate, with a thickened appendage at the apex, but with no appendage about the hilum; *embryo* cylindrical, straight, in the axis of fleshy albumen; the *radicle* next the hilum.—Slender heath-like *shrubs*, with their hairs usually glandular. *Leaves* alternate or whorled, without stipules, entire or toothed. *Pedicels* solitary, axillary 1-flowered. *Flowers* often large and showy.

Affinities. Not very certain; many genera probably still remain to be discovered. According to De Candolle, they are related to Polygalaceæ; from which they differ in a number of points, especially in their distinct stamens and regular flowers; agreeing with them in having a remarkable tumour, called a caruncula, at one end of the seeds, which are also definite and pendulous in both orders, and in the porous dehiscence of the anthers. With the exception of the stamens being hypogynous, instead of perigynous, they may be rather considered as approaching Rhamnaceæ, to which the position and definite

number of their stamens, the definite seeds, syncarpous fruit, and albuminous seeds ally them.

GEOGRAPHY. All natives of New Holland.

PROPERTIES. Unknown.

GENERA.

Tetratheca, Sm.
Tremandra, R. Br.

ORDER LXXXV. NITRARIACEÆ.

NITRARIACEÆ, *Ed. Pr. No.* 149. (1830); *Martius Conspectus, No.* 255. (1835).

ESSENTIAL CHARACTER.—*Calyx* inferior, 5-toothed, fleshy. *Corolla* of 5 petals, which arise from the calyx, with an inflexed valvular æstivation. *Stamens* 3 times the number of the petals, perigynous; *anthers* innate, with 2 oblique longitudinal lines of dehiscence. *Ovary* superior, 3- or more celled, with a continuous fleshy style, at the apex of which are as many stigmatic lines as there are cells; *ovules* pendulous, by means of a long funiculus. *Fruit* drupaceous, opening by 3 or 6 valves. *Seeds* solitary, with no *albumen*, and a straight *embryo*, with the *radicle* next the *hilum*.—*Shrubs* with deciduous succulent alternate *leaves*, which are sometimes fascicled. *Flowers* in cymes, or solitary.

AFFINITIES. I take Nitraria to be the type of an order related on the one hand to Chenopodiaceæ, and on the other to Rhamnaceæ, agreeing with both in a multitude of characters, and with the latter in habit. De Candolle includes Nitraria and Reaumuria among his Ficoideæ spuriæ, at the same time expressing a doubt whether they belong either to that or even to the same order. To me it appears that the affinities of Reaumuria are greater with Hypericum or Cistus, and I accordingly adopt Ehrenberg's proposed separation of that genus along with Hololachna, the Tamarix songarica of Pallas, into a little order to be called Reaumuriaceæ. The affinity of Nitraria with those Tetragoniaceæ in which the ovary is inferior and compound (a part of Ficoideæ of authors) is undoubtedly great, especially with Tetragonia; but its very different embryo, and the peculiar æstivation of the petals, which is much more like that of Rhamnaceæ, remove it from the former order.

GEOGRAPHY. Natives of western Asia and the north of Africa. One species is described from New Holland.

PROPERTIES. Slightly saline. Otherwise unknown.

GENUS.

Nitraria, L.

ORDER LXXXVI. BURSERACEÆ.

TEREBINTACEÆ, *Juss. Gen.* 368. (1789) *in part.*—BURSERACEÆ, *Kunth in Ann. Sc. Nat.* 2. 333. (1824).—TEREBINTACEÆ, trib. 4. *DC. Prodr.* 2. 75. (1825).

ESSENTIAL CHARACTER—*Flowers* hermaphrodite, occasionally unisexual. *Calyx* persistent, somewhat regular, with from 2 to 5 divisions. *Petals* 3-5, inserted below a disk arising from the calyx; *æstivation* usually valvate. *Stamens* 2 or 4 times as many as the petals, perigynous, all fertile. *Disk* orbicular or annular. *Ovary* 2-5-celled, superior, sessile; *style* 1 or 0; *stigmas* equal in number to the cells; *ovules* in pairs, attached to the axis, collateral. *Fruit* drupaceous, 2-5-celled, with its outer part often splitting into valves.

Seeds without albumen; *cotyledons* either wrinkled and plaited, or fleshy; *radicle* superior, straight, turned towards the hilum.—*Trees* or *shrubs*, abounding in balsam, resin, or gum. *Leaves* alternate, unequally pinnate, occasionally with *stipules*, usually without pellucid dots. *Flowers* axillary or terminal, in racemes or panicles.

Affinities. This order may be considered analogous in the syncarpous alliance to Amyridaceæ and Anacardiaceæ in the apocarpous, and hence although in a linear arrangement it is widely separated from these orders, yet it may be considered a case of transition from one alliance to the other. Its valvate petals and few carpels place it near Rhamnaceæ, and divide it independently of other circumstances from Anacardiaceæ.

Geography. Exclusively natives of tropical India, Africa, and America.

Properties. They have all an abundance of fragrant resinous juice, which is, however, destitute of the acridity and staining property of Anacardiaceæ. The resin of Boswellia is used in India as frankincense, and also as pitch. It is hard and brittle, and, according to Roxburgh, is boiled with some low-priced oil to render it soft and fit for use. The native doctors prescribe it, mixed with ghee (clarified butter), in cases of gonorrhœa, and also in what they call *Ritta Kaddapoo*, which signifies flux accompanied with blood. The wood is heavy, hard, and durable. *Ainslie*, 1. 137. The Boswellia serrata, called Libanus thurifera by Colebrooke, produces the gum-resin *Olibanum*, a substance chiefly used as a grateful incense, but which also possesses stimulant, astringent, and diaphoretic properties. *Ibid.* 1.267. A kind of coarse resin is obtained from Boswellia glabra, and is used boiled with oil for pitching the bottom of ships. *Ibid.* The Bursera paniculata, called *Bois de Colophane* in the Isle of France, gives out, from the slightest wound in the bark, a copious flow of limpid oil of a pungent turpentine odour, which soon congeals to the consistence of butter, assuming the appearance of camphor. *Brewster*, 2. 182. The gum of Canarium commune has the same properties as those of the Balsam of Copaiva; the three-cornered nuts are eaten in Java both raw and dressed, and an oil is expressed from them, which is used at table when fresh, and for burning when stale. The raw nuts are, however, apt to bring on diarrhœa. *Ainslie*, 2. 60. *Balsam of Acouchi* is produced by Icica acuchini, *Gum elemi* by Icica heptaphylla, *Balm of Gilead* by Balsamodendron Gileadense, *Myrrh* by Balsamodendron Myrrha, *Opobalsamum* or *Balsam of Mecca* by B. Opobalsamum, a substance like Gum elemi by Icica Icicariba, and Carana, and a yellow concrete essential oil by Bursera acuminata. See further *Royle's Illustrations*, p. 175.

GENERA.

Boswellia, Roxb.
Libanus, Colebr.
Bursera, Jacq.
Protium, Burm.
Canarium, L.
Pimela, Lour.
Icica, Aubl.
Balsamodendron, Kth.
Balsamea, Gled.
Elaphrium, Jacq.
Marignia, Comm.
Dammara, Gærtn.
Colophonia, Comm.
Hedwigia, Swz.
Sorindeia, Thouars.
Garuga, Roxb.
Hemprichia, Ehr.

Alliance IV. *EUPHORBIALES.*

Essential Character.—Æstivation of calyx imbricated. *Carpels* fewer than four; very often three. *Hairs* frequently starry if present.

The reasons for considering Euphorbiaceæ a polypetalous order are given under the proper head. The imbricated calyx completely separates this alli-

ance from Malvales to which it materially approaches in habit, and in the monadelphous and even indefinite stamens, in the stellate hairs, &c., and also from Rhamnales with which Celastraceæ very much agree. We find here the same tendency to combine the petals into a tube, in Stackhousiaceæ and Fouquieraceæ, as occurs so remarkably among Diosmeæ in the next group. In both these cases, however, the petals readily separate at their base, as the fruit increases in size.

Order LXXXVII. EUPHORBIACEÆ.

The Euphorbium Tribe.

Euphorbiæ, *Juss. Gen.* 385. (1789).—Euphorbiaceæ, *Ad. de Juss. Monogr.* (1824); *Lindl. Synops.* 220. (1829).

Essential Character.—*Flowers* monœcious or diœcious. *Calyx* lobed, inferior, with various glandular or scaly internal appendages; (sometimes wanting). *Corolla* either consisting of petals or scales equal in number to the sepals, or absent; sometimes more numerous than the sepals, sometimes united at the base. *Males: Stamens* definite or indefinite, distinct or monadelphous; *anthers* 2-celled. *Females: Ovary* superior, sessile, or stalked, 2- 3- or more celled; *ovules* solitary or twin, suspended from the inner angle of the cell; *styles* equal in number to the cells, sometimes distinct, sometimes combined, sometimes none; *stigma* compound, or single with several lobes. *Fruit* generally consisting of 3, dehiscent cells, separating with elasticity from their common axis. *Seeds* solitary or twin, suspended, with an aril; *embryo* enclosed in fleshy albumen; *cotyledons* flat; *radicle* superior.—*Trees, shrubs,* or *herbaceous plants,* often abounding in acrid milk. *Leaves* opposite or alternate, simple, rarely compound, usually with stipules. *Flowers* axillary or terminal, usually with bracts, sometimes enclosed within an involucre.

Anomalies. Carpels occasionally 2, or more than 3. Ricinus does not milk, except in the middle of the summer.

Affinities. It is usual to consider Euphorbiaceæ an apetalous order, because of the want of a corolla in the genera with which European Botanists are most familiar. And accordingly we find these plants sometimes stationed near Urticaceæ, with which they have scarcely a point in common, except the absence of petals, or close by Myristicaceæ, with which they have even less kindred. But if instead of considering the imperfectly developed genera of Europe as typical of the true structure of the order, we look to those of tropical countries we shall find that the apetalous character by no means holds good with them. In Aleurites, for example, the petals are as much developed as in a Malvaceous plant; the same thing occurs in Jatropha, Elæococca, and others; and, in fact, upon looking through the genera described by Adrien de Jussieu in his Monograph, it appears that out of 61 genera no fewer than 32 have petals. The tendency of the order is, therefore, at least as great to form petals as to want them. Now, if the sum of the affinity of Euphorbiaceæ and other orders be calculated, it will be found that it is with Malvaceæ and Rhamnaceæ that they most agree, and especially with the former. Their habit, and general appearance, are so much alike that one might easily mistake some Crotons, Aleurites, &c., for Malvaceæ; the starry structure of the hairs, the monadelphous stamens, the definite number of ovules in a definite number of united carpels, are all further and important points of resemblance. The relationship of Euphorbiaceæ to Rhamnaceæ was long ago perceived by Jussieu, and has been since adverted to by Adolphe Brongniart (*Monogr. des Rham.* p. 35.). Brown, too, in omitting Euphorbiaceæ from the apetalous orders, in his Prodromus, may be conjectured to have entertained a similar opinion; and Auguste de St. Hilaire enquires (*Plantes Usuelles,* no. 18,) whether they are not intermediate between Malvaceæ and Menispermaceæ.

Geography. This extensive order, which probably does not contain fewer than 1500 species, either described or undescribed, exists in the greatest abundance in equinoctial America, where about 3-8ths of the whole number have been found; sometimes in the form of large trees, frequently of bushes, still more usually of diminutive weeds, and occasionally of deformed, leafless, succulent plants, resembling Cactaceæ in their port, but differing from them in every other particular. In the Western world they gradually diminish as they recede from the equator, so that not above 50 species are known in North America, of which a very small number reaches as far as Canada. In the Old World the known tropical proportion is much smaller, arising probably from the species of India and equinoctial Africa not having been described with the same care as those of America; not above an eighth having been found in tropical Africa, including the islands, and a sixth being perhaps about the proportion in India. A good many species inhabit the Cape, where they generally assume a succulent habit; and there are almost 120 species from Europe, including the basin of the Mediterranean: of these, 16 only are found in Great Britain, and 7 in Sweden.

Properties. The excellent monograph of Adrien de Jussieu contains the best information that exists upon this subject; and I accordingly avail myself of it, making a few additions to his facts. The general property is that of excitement, which varies greatly in degree, and consequently in effect. This principle resides chiefly in the milky secretion of the order, and is most powerful in proportion as that secretion is abundant. The smell and taste of a few are aromatic; but in the greater part the former is strong and nauseous, the latter acrid and pungent. The hairs of some species are stinging. The bark of varies species of Croton is aromatic, as *Cascarilla;* and the flowers of some, such as Caturus spiciflorus, give a tone to the stomach. Many of them act upon the kidneys, as several species of Phyllanthus, the leaves of Mercurialis annua, and the root of Ricinus communis. Several are asserted by authors to be useful in cases of dropsy; some Phyllanthuses are emmenagogue. The bark of several Crotons, the wood of Croton Tiglium and common Box, the leaves of the latter, of Cicca disticha, and of several Euphorbias, are sudorific, and used against syphilis: the root of various Euphorbias, the juice of Commia, Anda, Mercurialis perennis, and others, are emetic; and the leaves of Box and Mercurialis, the juice of Euphorbia, Commia, and Hura, the seeds of Ricinus, Croton Tiglium, &c. &c., are purgative. Many of them are also dangerous, even in small doses, and so fatal in some cases, that no practitioner would dare to prescribe them; as, for example, Manchineel. In fact, there is a gradual and insensible transition, in this order, from mere stimulants to the most dangerous poisons. The latter have usually an acrid character, but some of them are also narcotic, as those Phyllanthuses the leaves of which are thrown into water to intoxicate fish. Whatever the stimulating principle of Euphorbiaceæ may be, it seems to be of a very volatile nature, because application of heat is sufficient to dissipate it. Thus the root of the Jatropha Manihot or Cassava, which when raw is one of the most violent of poisons, becomes a wholesome nutritious article of food when roasted. In the seeds the albumen is harmless and eatable, but the embryo itself is acrid and dangerous. Independently of this volatile principle, there are two others belonging to the order, which require to be noticed; the first of these is Caoutchouc, that most innocuous of all substances, produced by the most poisonous of all families, which may be almost said to have given a new arm to surgery, and which has become an indispensable necessary of life; it exists in Artocarpeæ and elsewhere, but is chiefly the produce of species of Euphorbiaceæ. The other is the preparation called Turnsol, which, although chiefly obtained from

Crozophora (Croton) tinctoria, is to be produced equally abundantly from many other plants of the order.

The properties of Euphorbiaceæ are so important, that I do not think I should fulfil the object of this work, if I did not, in addition to the foregoing general view of the order, add a detailed list of the qualities of the most important species named by writers.

In some parts of Persia where Box-trees abound the Camel cannot be employed, because it is found impracticable to prevent that animal from browzing upon the Box-leaves, which invariably prove poisonous to it. Acalypha Cupameni, an Indian herb, has a root which, bruised in hot water, is cathartic; a decoction of its leaves is also laxative. *Rheede,* 10. 161. The nut of Aleurites ambinux is eatable and aphrodisiac, but rather indigestible. *Commers. according to Ad. de J.* The nuts of another species are eaten in Java and the Moluccas; but they are intoxicating unless they are roasted. *Rumph.* The Anda of Brazil is famous for the purgative qualities of its seeds, which are fully as powerful as those of the Palma Christi. The Brazilians make use of them in cases of indigestion, in liver complaints, the jaundice and dropsy. The rind, roasted on the fire, passes as a certain remedy for diarrhœa brought on by cold. According to Marcgraaf, the fresh rind steeped in water communicates to it a narcotic property which is sufficient to stupify fish. *Martius Amœn. Monac.* p. 3. The seeds are either eaten raw, or are prepared as an electuary; they yield an oil, which is said, M. Auguste de St. Hilaire, to be drying and excellent for painting; in short, much better than nut oil. *Pl. Usuelles,* 54. The bark of Briedelia spinosa, an Indian shrub, is, according to Roxburgh, a powerful astringent; the leaves are greedily eaten by cattle, which by their means free themselves of intestinal worms. The leaves of common Box are sudorific and purgative: according to Hanway, camels eat them in Persia, but they die in consequence. *Ad. de J.* The flowers of Caturus spiciflorus are spoken of as a specific in diarrhœa, either taken in decoction or in conserve. *Burm. Ind.* 303. The succulent fruit of Cicca disticha and racemosa is sub-acid, cooling, and wholesome. Its leaves are sudorific, and its seeds cathartic. The capsules of Cluytia collina are poisonous, according to Roxburgh. The root and bark of Codiæum variegatum are acrid, and excite a burning sensation in the mouth if chewed: but the leaves are sweet and cooling. *Rumphius.* The juice of Commia cochinchinensis is white, tenacious, emetic, purgative, and deobstruent. Cautiously administered, it is a good medicine in obstinate dropsy and obstructions. *Lour.* 743. The Quina Blanca of Vera Cruz is produced by the Croton Eluteria of Swartz, and is probably the Cascarilla of Europe. *Schiede in Ann. des Sc.* 18. 217. The drastic oil of Tiglium is expressed from the seeds of Croton Tiglium, formerly known in Europe under the name of *Grana molucca.* It is said, by Ainslie, to have proved in a singular manner emmenagogue. *Mat. Med.* 1. 108. A decoction of Croton perdicipes, called Pe de Perdis, Alcamphora, and Cocallera, in different provinces of Brazil, is much esteemed as a cure for syphilis, and as a useful diuretic. *Pl. Us.* 59. The root of another species, called Velame do Campo, C. campestris has a purgative root, also employed against syphilitic disorders. *Ib.* 60. The leaves of a species of Croton (C. gratissimum, *Burchell,*) are so fragrant as to be used by the Koras of the Cape of Good Hope as a perfume. *Burch.* 2. 263. Crozophora tinctoria yields the preparation called Turnsol; the plant itself is acrid, emetic, and drastic. An abundance of useful oil is obtained from two species of Elæococca; it is, however, only fit for burning and painting, on account of its acridity. *Ad. de J.* Six sorts of European Euphorbias are named, by Deslongchamps, as fit substitutes for Ipecacuanha, the best of which he states to be E. Gerardiana, the powdered root of which vomits easily in doses of 18 or 20 grains. *Ainslie,*

1. 123. The root of Euphorbia Ipecacuanha is said, by Barton, to be equal to the true Ipecacuanha, and in some respects superior; it is not unpleasant either in taste or smell. *Barton*, 1. 281. Various species of fleshy Euphorbia, especially the Euph. antiquorum and canariensis, produce the drug Euphorbium of the shops, which is the inspissated milky juice of such plants. In India it is mixed with the oil expressed from the seeds of Sessamum orientale, and used externally in rheumatic affections, and internally in cases of obstinate constipation. It is little used in Europe. Orfila places it among his poisons. *Ainslie*, 1. 121. Euphorbia papillosa is administered, in Brazil, as a purgative; but is apt, if given in too strong a dose, to cause dangerous superpurgations. *Pl. Usuelles*, 18. The juice of the leaves of Euphorbia nereifolia is prescribed by the native practitioners of India, internally as a purge and deobstruent, and externally, mixed with Margosa oil, in such cases of contracted limb as are induced by ill-treated rheumatic affections. The leaves have, no doubt, a diuretic quality. *Ainslie*, 2. 98. The leaves and seeds of Euphorbia thymifolia are given, by the Tamool doctors of India, in worm cases. and in certain bowel affections of children. *Ibd.* 2. 76. The same persons give the fresh juice of Euphorbia pilulifera in aphthous affections. The fresh acrid juice of Euphorbia Tirucalli is used in India as a vesicatory. *Ib.* 2. 133. The Ethiopians are said, by Virey, to form a mortal poison for their arrows from the juice of Euphorbia heptagona. *Hist. des Médic.* 299. The juice of Excæcaria Agallocha, and even its smoke when burnt, affects the eyes with intolerable pain, as has been experienced occasionally by sailors sent ashore to cut fuel, who, according to Rumphius (2. 238.), having accidentally rubbed their eyes with the juice, became blinded, and ran about like distracted men, and some of them finally lost their sight. The famous Manchineel tree, Hippomane Mancinella, is said to be so poisonous, that persons have died from merely sleeping beneath its shade. This is doubted, indeed, by Jacquin, who, however, admits its extremely venomous qualities; but it is by no means improbable that the story has some foundation in truth, particularly if, as Ad. de Jussieu truly remarks, the volatile nature of the poisonous principle of these plants is considered. The juice of Hura crepitans is stated to be of the same fatal nature as that of Excæcaria; its seeds are said to have been administered to negro slaves as purgatives, in number not exceeding 1 or 2, with fatal consequences. *Ad. de J.* The powdered fruit of Hyænanche globosa is used in the colony of the Cape of Good Hope to poison hyænas, as nux vomica to poison stray dogs in Europe. From the seeds of Jatropha glauca the Hindoos prepare, by careful expression, an oil which, from its stimulating quality, they recommend as an external application in cases of chronic rheumatism and paralytic affections. *Ainslie*, 2. 6. The seeds of Jatropha Curcas are purgative and occasionally emetic; an expressed oil is obtained from them, which is reckoned a valuable external application in itch and herpes; it is also used, a little diluted, in chronic rheumatism. The varnish used by the Chinese for covering boxes is made by boiling this oil with oxide of iron. The leaves are considered as rubefacient and discutient; the milky juice is supposed to have a detergent and healing quality, and dyes linen black. *Ibid.* 2. 46. The roots of the Jatropha Manihot, or Mandiocca, yield a flour (Cassava) of immense importance in South America: this is obtained by crushing the roots, after the bark has been removed, and then straining off the water; after which the mass is gradually dried in pans over a fire. Tapioca is a preparation of the same root. The seeds of several species of Jatropha are purgative, but they sometimes act so dangerously as to require extreme caution in administering them. Mercurialis perennis is purgative and dangerous. According to Sloane, it has sometimes produced violent vomiting, incessant diarrhœa, a burning heat in the head, a deep and long stupor, convulsions, and even death;

yet this very plant, when boiled, has been eaten as a potherb. The leaves of Maprounea brasiliensis, or the Marmeleiro do Campo of Brazil, yields a black dye, which is, however, fugitive. A decoction of its root is also administered in derangement of the stomach;—a most remarkable circumstance. if we consider the close relation that is borne by it to Manchineel and other most poisonous trees. According to Auguste de St. Hilaire, the Maprounea is destitute of the milky juice of Sapium, Excæcaria, Hippomane, and other dangerous genera. *Pl. Us.* 65. The seeds of Omphalea are eaten safely, if the embryo is first removed; if this is not done, they are cathartic. Both Pedilanthus tithymaloides and padifolius are used medicinally in the West Indies: the former, known under the name of Ipecacuanha, is used for the same purposes as that drug; the latter, called the Jew Bush, or Milk plant, is used in decoction of the recent plant as an antisyphilitic, and in cases of suppression of the menses. *Hamilt. Prodr. Fl. Ind.* 43. The root, leaves, and young shoots of Phyllanthus Niruri are considered, in India, deobstruent, diuretic, and healing. The leaves are very bitter, and a good stomachic. *Ainslie*, 2. 151. Some other species, particularly Ph. urinaria, are powerful diuretics. The fruit of Phyllanthus Emblica is frequently made into pickle; it is acid, and, when dry, very astringent. *Ibid.* 1, 240. The bruised leaves of Phyllanthus Conami are used for inebriating fishes. *Aubl.* 928. The boiled leaves of Plukenetia corniculata are said to be an excellent potherb, for which purpose the plant is cultivated in Amboyna. *Rumph.* The purgative quality of Ricinus, the Castor oil plant, is well known; the root is said to be diuretic. The juice of Sapium aucuparium is reputed poisonous. A case is mentioned by Tussac (*Journ. Bot.* 1813. 1. 117.) of a gardener whose nostrils became swollen and seized with erysipelatous phlegmasis, in consequence of the fumes only of this plant. The root of Tragia involucrata is reckoned, by the Hindoo doctors, among those medicines which they conceive to possess virtues in altering and correcting the habit in cases of cachexia, and in old venereal complaints attended with anomalous symptoms. *Ainslie*, 2. 62. There is reason to believe that the timber imported from the coast of Africa, under the name of African Teak, belongs to some tree of this order. From a species of a tree, stated by Brown to be of an unpublished genus, it is said that a substance resembling caoutchouc is procured in Sierra Leone. *Congo*, 444. The true caoutchouc is furnished by Siphonia elastica, a Surinam and Brazilian tree.

GENERA.

§ 1. Buxeæ, Bartl.
Drypetes, Vahl.
Sarcococca, Lindl.
Plagianthus, Forst.
Thecacoris, Adr. J.
Adenocrepis, Bl.
Pachysandra, Mich.
Buxus, L.
Tricera, Schreb.
Crantzia, Sw.
Securinega, Juss.
Geblera, F. et M.
Savia, Willd.
Actephila, Bl.
Leiocarpus, Bl.
Amanoa, Aubl.
Richeria, Vahl.
Flüggea, Willd.

§ 2. Phyllantheæ, Bartl.
Epistylium, Sw.
Scepasma, Bl.
Gynoon, Adr. Juss.
Glochidium, Forst.
Bradleia, Gærtn.
Glochidionopsis, Bl.
Anisonema, Adr. J.
Leptonema, Adr. J.
Poranthera, Rudge.
Cicca, L.
Cheramela, Rumph.
? Tricarium, Lour.
Emblica, Gærtn.
Kirganelia, Juss.
Phyllanthus, L.
Nymphanthus, Lour.
? Breynia, Forst.
Niruri, Adans.
Conami, Aubl.
Melanthesa, Bl.
Sauropus, Bl.
Cyclostemon, Bl.
Trigostemon, Bl.
Ryparosa, Bl.
Xylophylla, L.
Genesiphylla, L'Her.
Menarda, Commers.
Micranthea, Desf.
Agyneja, L.
Andrachne, L.
Telephioides, Mœnch.
Limeum, Forsk.
Eraclissa, Forsk.
Arachne, Neck.
Cluytia, Ait.
Clutia, Bœrh.
Altora, Adans.
Cratochwilia, Neck.
Briedelia, Willd.

§ 3. Ricineæ, Bartl.
Argythamnia, P. Br.
Ateramnus, P. Br.
Ditaxis, Vahl.
Chiropetalum, A. de J.
Caperonia, A. St. H.
Crozophora, Neck.
Tournesolia, Scop.
Croton, L.
Ricinocarpus, Boerh.
Brunsvia, Neck.
Cascarilla, Adans.
Tridesmis, Lour.
Aroton, Neck.
Luntia, Neck.
Cinogasum, Neck.
Crotonopsis, Michx.
Leptomon, Rafin.
Friesia, Spreng.
Adelia, L.
Bernardia, Houst.
Hæmatospermum, Wall.
Baliospermum, Bl.
Spathiostemum, Bl.
Acidoton, Sw.
Adriana, Gaudich.
Adisca, Bl.
Cheilosa, Bl.
Rottlera, Roxb.
Mallotus, Lour.
Codiæum, Rumph.
Phyllaurea, Lour.

Gelonium, Roxb.
Erythrocarpus, Bl.
Hemicyclia, W. et A.
Hisingera, Hell.
Mozinna, Orteg.
Loureria, Cav.
Amperea, Adr. J.
Ricinocarpus, Desf.
Echinosphæra, Sieb.
Rœperia, Spreng.
Ricinus, L.
Janipha, Kunth.
Manihot, Adans.
Jatropha, Kunth.
Castiglionia, R. et P.
Curcas, Adans.
Bromfeldia, Neck.
Cnidoscolus, Pohl.
Jussievia, Houst.
Bivonæa, Rafin.
Adenorhopium, Pohl.
Elæococca, Commers.
Dryandra, Thunb.
Vernicia, Lour.
Ostodes, Bl.
Aleurites, Forst.
Ambinux, Commers.
Camirium, Rumph.
Anda, Pis.
Joannesia, Velloz.
Siphonia, Rich.
Hevea, Aubl.
Mabea, Aubl.
Elateriospermum, Bl.
Hyænanche, Lamb.
Toxicodendron, Thb.
Garcia, Vahl.

§ 4. Acalypheæ, Bartl.

Alchornea, Sw.
Hermesia, Bonpl.
Cleidion, Bl.
Conceveibum, Rich.
Claoxylon, Adr. J.
Erythrochilus, Bl.
Macaranga, Pet. Thou.
Panopia, Noronh.
Mappa, Adr. J.
Caturus, L.
Galurus, Spreng.
Acalypha, L.
Cupameni, Adans.
Mercurialis, L.
Anabæna, Adr. J.
Plukenetia, L.
Tragia, Plum.
Schorigeram, Adans.
Cnesmosa, Bl.

§ 5. Hippomaneæ, Bartl.

Cnemidostachys, Mart.
Microstachys, Adr. J.
Sapium, Jacq.
Stillingia, L.
Adenopeltis, Adr. J.
Triadica, Lour.
Homalanthus, Bartl.
Omalanthus, A. de J.
Carumbium, Rnwdt.
Hippomane, L.
Pachystemon, Bl.
Hura, L.
Gyrostemon, Desf.
Sebastiania, Spreng.
Excæcaria, L.
Gymnanthes, Sw.
Gussonia, Endl.
Baloghia, Endl.
Colliguaya, Molin.
Gommia, Lour.
Styloceras, Adr. J.
Maprounea, Aubl.
Ægopricon, L. fil.
Omphalea, L.
Omphalandria, P. Browne.
Duchola, Adans.

§ 6. Euphorbieæ, Bartl.

Dalechampia, L.
Anthostema, Adr. J.
Hendecandra, Eschs.
Euphorbia, L.
Tithymalus, Tourn.
Athymalus, Neck.
Keraselma, Neck.
Treisia, Haw.
Dactylanthes, Haw.
Medusea, Haw.
Galarrhoeus, Haw.
Esula, Haw.
Anisophyllum, Haw.
Pedilanthus, Neck.
Monotaxis, Brongn.
Pseudanthus, Sieb.

Margaritaria, L. fil.
Suregada, Roxb.
Hexadica, Lour.
Homonoia, Lour.
Cladodes, Lour.
Echinus, Lour.
Lascadium, Rafin.
Synzyganthera, R. et P.
Didymandra, Willd.
Peridium, Schott.
Pera, Mut.

Order LXXXVII.* EMPETRACEÆ. The Crowberry Tribe.

Empetreæ, *Nutt. Gen.* 2. 233.; *Don. in Edinb. New Phil. Journ.* (1826); *Hooker in Bot. Mag. t.* 2758. (1827); *Lindley's Synopsis*, 224. (1829); *Bartl. Ord. Nat.* p. 372. (1830); *Arnott in Edinb. Encycl.* 129. (1832).

Essential Character. — *Flowers* unisexual. *Sepals* hypogynous imbricated scales. *Stamens* equal in number to the inner sepals, and alternate with them; *anthers* roundish, 2-celled, the innermost of which are sometimes petaloid, the cells distinct, bursting longitudinally. *Ovary* superior, seated in a fleshy disk, 3- 6- or 9-celled; *ovules* solitary, ascending; *style* 1; *stigma* radiating, the number of its rays corresponding with the cells of the ovary. *Fruit* fleshy, seated in the persistent calyx, 3- 6- or 9-celled; the coating of the cells bony. *Seeds* solitary, ascending; *embryo* taper, in the axis of fleshy watery albumen; *radicle* inferior.—Small acrid *shrubs* with heathlike evergreen *leaves* without stipules; and minute *flowers* in their axils.

Affinities. According to Don this order holds a kind of intermediate place between Euphorbiaceæ and Celastraceæ, agreeing in habit with the former, especially with Micranthea, and some species of Phyllanthus, more than with the latter. In this view Arnott and Bartling concur. Until lately I had an idea that a relation might be better established with Urticaceæ and Myricaceæ, but I now feel that I was wrong, and give it up.

Geography. A very small group, comprising a few species from North America, the south of Europe, and the Straits of Magellan.

Properties. Unknown.

GENERA.

Empetrum, L.
Corema, Don.
Ceratiola, Michx.

Order LXXXVIII. STACKHOUSIACEÆ.

Stackhouseæ, *R. Br. in Flinders*, 555. (1814).

Essential Character.—*Calyx* 1-leaved, 5-cleft, equal, with an inflated tube. *Petals* 5, equal, arising from the top of the tube of the calyx; their claws combined in a tube longer than the calyx; their limb narrow, stellate. *Stamens* 5, distinct, unequal (2 alternately shorter), arising from the throat of the calyx. *Ovary* superior, 3- or 5-lobed, the lobes distinct, each with a single erect ovule; *styles* from 3 to 5, sometimes combined at the base; *stigmas* simple. *Fruit* of from 3 to 5, indehiscent, winged, or wingless pieces; *column* central, persistent. *Embryo* erect, in the axis of, and almost as long as, the fleshy *albumen.—Herbaceous* plants. *Leaves* simple, entire, alternate, sometimes minute. *Stipules* lateral, very minute. *Spike* terminal, each flower with 3 bracts.

Affinities. Between Celastraceæ and Euphorbiaceæ, according to Brown; from the latter of which they differ in the structure of their fruit, and in the position of their seeds, besides other characters; from the former in the presence of stipules, in the cohesion of the petals in a tube, in the want of a fleshy disk, in the deeply lobed ovary, and so on.

Geography. A few New Holland shrubs compose all that is known of the order.

Properties. Unknown.

GENUS.

Stackhousia, Sm.

Order LXXXIX. FOUQUIERACEÆ.

Fouquieraceæ, *DC. Prodr.* 3. 349. (1828).

Essential Character.—*Sepals* 5, imbricated, ovate, or roundish. *Petals* 5, combined in a long tube, arising from the bottom of the calyx or torus, regular. *Stamens* 10 or 12, arising from the same line as the petals, but distinct from them, exserted; *anthers* 2-celled. *Ovary* superior, sessile; *style* filiform, trifid at the apex; *ovules* numerous. *Capsule* 3-cornered, 3-celled, 3-valved; *valves* bearing the dissepiments in the middle. *Seeds* in part abortive, compressed, winged, affixed to the axis; *embryo* straight, in the centre of thin fleshy *albumen; cotyledons* flat.—*Trees* or *shrubs*. *Leaves* entire, oblong, fleshy, clustered in the axil of a spine or a cushion. *Flowers* scarlet, arranged in a terminal spike or panicle.

Affinities. Separated from Portulacaceæ by De Candolle, as he tells us (*Mém. Portul.* 4.), for the following reasons: 1. because the petals cohere in a long tube of the same nature as that of gamopetalous Crassulaceæ: 2. because the capsule consists of three loculicidal cells, that is to say, which separate through the middle, forming three septiferous valves; and, 3. because the embryo is straight, with flat cotyledons, and stationed in the centre of fleshy albumen. They approach the monopetalous Crassulaceæ in the structure of their flower; and Turneraceæ and Loasaceæ in the form of their fruit. *DC;* much more, however, Stackhousiaceæ, and hence the Euphorbial alliance in general which they may be considered to connect with Portulacaceæ in the Silenal alliance,

Geography. All Mexican.

Properties. Unknown.

GENUS.

Fouquiera, DC.

Order XC. CELASTRACEÆ.

Celastrineæ, *R. Brown in Flinders*, 22. (1814); *DC. Prodr.* 2. 2. (1825); *Ad. Brongniart Mémoire sur les Rhamnées*, 16. (1826); *Lindl. Synops.* 74. (1829).

Essential Character.—*Sepals* 4 or 5, imbricated, inserted into the margin of an expanded torus. *Petals* inserted by a broad base, under the margin of the disk, with an imbricate æstivation. *Stamens* alternate with the petals, inserted into the disk, either at the margin or within it; *anthers* innate. *Disk* large, expanded, flat, closely surrounding the ovary, covering the flat expanded torus. *Ovary* superior, immersed in the disk and adhering to it, with 3 or 4 cells; *cells* 1- or many-seeded; *ovules* ascending from the axis, attached to a short funiculus. *Fruit* superior; either a 3- or 4-celled capsule, with 3 or 4 septiferous valves; or a dry drupe, with a 1- or 2-celled nut, the cells of which are 1- or many-seeded. *Seeds* ascending, seldom inverted by resupination, either provided with an aril, or without one; *albumen* fleshy; *embryo* straight; *cotyledons* flat and thick, with a short inferior radicle.—*Shrubs*. *Leaves* simple, alternate or opposite. *Flowers* in axillary cymes.

Anomalies. Flowers unisexual in Maytenus. Petals none in Alzatea.

Affinities. Formerly confounded with Rhamnaceæ, this order was first separated by Brown, who distinguished it particularly by the relation which its stamens bear to the petals. It also differs in its imbricated calyx, and in its disk being hypogynous. According to Brongniart, Celastraceæ have more relation to several orders with hypogynous stamens than to any with perigynous ones, erpecially to Malpighiaceæ, to which they are related through Hippocrateæ, which are in fact, according to Brown, scarcely distinct from Celastraceæ. *Brong. Mém.* p. 15. Manifestly akin to such genera as Phyllanthus in Euphorbiaceæ.

Geography. Natives of the warmer parts of Europe, North America, and Asia, but far more abundant beyond the tropics than within them; a great number of species inhabit the Cape of Good Hope. Some are found in Chile and Peru, and a few in New Holland.

Properties. I find little recorded about the properties of the species of this order, except a remark by De Candolle, that a decoction of the young branches of Maytenus is employed in Chile as a wash for swellings produced by the poisonous shade of the tree Lithi. *Essai*, 123. ed. 2.; and a few observations by Royle (*Illustr.* p. 167.) He mentions an acrid principle having been detected among the species, which acts with a more or less activity; and the seeds of several yield an oil which is useful for burning. That of Celastrus nutans is said in India to be of a stimulant nature, and to be used in medicine. The bark of Evonymus tingens is in the inside of a beautiful light yellow colour, similar to that of some species of Rhamnus; it is used to mark the *tika* on the forehead of Hindoos, and might be employed as a dye. It is also considered useful in diseases of the eye. The leaves of Celastrus edulis, *Kat* of the Arabs, would appear from Forskahl's account, to be of a stimulating nature.

GENERA.

Evonymus, L.	Polycardia, Juss.	Pleurostylia, W. et A.	Crocoxylon, Eckl.
Celastrus, L.	Elæodendron, Jacq.	Actegeton, Bl.	Fraunhoferia, Mart.
Catha, Forsk.	*Rubentia*, Commers.	Kurrimia, Wall.	Microtropis, Wall.
Evonymoides, Mœn.	*Neerija*, Roxb.	*Bhesa*, Arnott.	Olinia, Thunb. (15)
Hænkea, R. et P.	*Schrebera*, Retz.	Wimmeria, Schlecht.	
Maytenus, Feuill.	*Portenschlagia*, Trat.	Asterocarpus, Eckl.	Alzatea, R. et P.
Cyrilla, L.	Ptelidium, Pet. Thou.	Scytophyllum, Eckl.	Tralliana, Lour.
Mylocaryum, W.	*Seringia*, Spreng.	Lauridia, Eckl.	Perrottetia, H. B. K.
Cliftonia, Sol.	Dulongia, H. B. K.	Mystroxylon, Eckl.	Schæffera, Jacq.

Sub-Order HIPPOCRATEÆ.

Hippocraticeæ, *Juss. Ann. Mus.* 18. 483. (1811).—Hippocrateaceæ, *Kunth in Humb. N. G. Am.* 5. 136. (1821); *DC. Prodr.* 1. 567. (1829).

Essential Character.—*Sepals* 5, very seldom 4 or 6, very small, combined as far as the middle, persistent. *Petals* 5, very seldom 4 or 6, equal, hypogynous? somewhat imbricated in æstivation. *Stamens* 3, very seldom 4 or 5; *filaments* cohering almost as far as the apex into a tube dilated at the base, and forming about the ovary a thick disk-like cup; *anthers* 1-celled, opening transversely at the apex, 2- or even 4-celled. *Ovary* concealed by the tube, 3-cornered, distinct; *style* 1; *stigmas* 1-3; *ovules* erect. *Fruit* either consisting of 3 samaroid carpels, or berried with from 1 to 3 cells. *Seeds* in each cell 4, or more, but definite, attached to the axis in pairs, some of them occasionally abortive, erect, without albumen; *embryo* straight; *radicle* pointing towards the base; *cotyledons* flat, elliptical oblong, somewhat fleshy, cohering when dried.—Arborescent or climbing *shrubs*, which are almost always smooth. *Leaves* opposite, simple, entire or toothed, somewhat coriaceous. *Racemes* axillary, in corymbs or fascicles. *Flowers* small, not shewy.

Affinities. The ternary number of the stamens, along with the quinary number of the petals and sepals, is the prominent characteristic of this sub-order, which was formerly included in Aceraceæ by Jussieu, which is placed between Erythoxyleæ and Marcgraaviaceæ by De Candolle, but which is, to all appearance, much more nearly related to Celastraceæ, as Brown has remarked; for "the insertion of the ovules is either towards the base, or is central; the direction of the radicle is always inferior." *Brown, Congo,* 427. In fact there seems to be nothing to divide Hippocrateæ from Celastraceæ except the cohesion of the filaments of the former into a cup. The samaroid fruit, which is so remarkable, and which connects the order with Malpighiaceæ, is not universal, but merely characteristic of certain genera. In Hippocratea ovata the testa and cotyledons are furnished in the inside with innumerable trachea-like threads; the same economy has been remarked by Du Petit Thouars in the pericarp of Calypso. *DC. Prodr.* 1. 567. The only similar cases of this curious structure with which I am acquainted are in Collomia, in which I have detected it (*Bot. Reg.* fol. 1166.), and in Casuarina, in which it has been described: plants having no apparent affinity with Hippocrateæ.

Geography. The principal part are South American, about 1-seventh are natives of Africa or the Mauritian Islands, and the same number has been recorded as East Indian.

Properties. The fruit of Tonsella (Salacia) pyriformis, a native of Sierra Leone, is eatable. It is about the size of a Bergamot Pear; its flavour is rich and sweet. *Hort. Trans.* The nuts of Hippocratea comosa are oily and sweet. *Swartz.* 1. 78.

GENERA.

Hippocratea, L.	Salacia, L.	Lacepedea, H. B. K.
Anthodon, R. et P.	*Tontelea*, Aubl.	*Triceraja*, Willd.
Anthodus, Mart.	*Johnia*, Roxb.	Calypso, Thouars.
Raddisia, Leand.	*Tonsella*, Schreb.	
	Sicelium, P. Browne.	

Sub-Order. TRIGONIEÆ.

Trigoniaceæ. *Martius Conspectus*, No. 247. (1835).

The idea of this sub-order (?), which contains at present but the single genus Trigonia, originated with Cambessédes, who, in referring (*Fl. Bras. merid.* 2. 113) it to Hippocrateæ, instead of Polygalaceæ, considers it destined to become the type of a new order, allied on the one hand to Hippocrateæ, and on the other to Leguminosæ, with which it has great relationship on account of the number and relative position of the parts of the flower. Von Martius,

in naming the order, places it next Moringaceæ; and it is not improbable that there may be some connection between the two.

The following is the character given by Cambessédes of the genus.

Trigonia, *Aubl.*—*Calyx* persistent, more or less deeply 5 parted; the segments rather unequal. *Petals* 5, unequal; the upper larger, gibbous at the base, concave, ascending; the two lateral smaller, flat; the two lowest converging, unequal-sided, keeled. *Stamens* 10-12, out of the centre, over against the lower petals; *filaments* combined in a tube which is longitudinally split in front, the 2-4 lateral ones smaller and imperfect; *anthers* fixed by their back, turned inwards, 2-celled, the cells opening by a longitudinal cleft. *Glands* (abortive stamens) 2-4, opposite the upper petal, at the base of the ovary. *Pistil* free; *style* continuous; *stigma* terminal, 3-lobed; *ovary* 3-celled, with several ovules in each cell; *ovules* attached to the inner angle of the cells. *Capsule* 3-cornered, 3-celled, septicidally 3-valved; the valves forming the partitions by their inflexed edges. *Seeds* attached to a central 3-cornered axis, woolly. *Testa* papery; *albumen* fleshy. *Embryo* central, straight, with a small radicle remote from the hilum; *cotyledons* large, round, flat. —Climbing sarmentaceous *shrubs*. *Leaves* stipulate, opposite, quite entire. *Flowers* racemose; the racemes axillary, or panicled and terminal. *Æstivation* of calyx and petals imbricated. *Stamens* erect in the bud. *Fl. Bras. Merid.* 2. 112.

Order XCI. STAPHYLEACEÆ. The Bladder-Nut Tribe.

Celastrineæ, § Staphyleaceæ, *DC. Prodr.* 2. 2. (1825).—Staphyleaceæ, *Lindl. Synops.* 75. (1829); *Ed. Pr. No.* 97. (1830); *Martius Conspectus, No.* 249. (1835).

Essential Character.—*Sepals*, 5, connected at the base, coloured, with an imbricated æstivation. *Petals* 5, alternate, with an imbricated æstivation. *Stamens* 5, alternate with the petals, perigynous. *Disk* large, urceolate. *Ovary* 2- or 3-celled, superior; *ovules* erect; *styles* 2 or 3, cohering at the base. *Fruit* membranous or fleshy, indehiscent or opening internally, often deformed by the abortion of some of the parts. *Seeds* ascending, roundish, with a bony testa; *hilum* large, truncate; *albumen* none; *cotyledons* thick.—*Shrubs*. *Leaves* opposite, pinnate, with both common and partial stipules. *Flowers* in terminal, stalked racemes.

Anomalies. Flowers unisexual in Turpinia.

Affinities. Combined with Celastraceæ by De Candolle, but distinguished by Ad. Brongniart (*Mém. sur les Rhamnées*, p. 16.), this order appears to me to be essentially characterised by its opposite pinnated stipulate leaves, and to indicate an affinity between Celastraceæ and Sapindaceæ.

Geography. The very few species which belong here are irregularly scattered over the face of the globe. Of the genus Staphylea, 1 is found in Europe, 1 in North America, 1 in Japan, 2 in Jamaica, 1 in Peru; and of Turpinia, 1 is Mexican, and 1 East Indian.

Properties. Unknown.

GENERA.

Staphylea, L.	Turpinia, Venten.
Staphylodendron, Tourn.	*Dalrympelea*, Roxb.
? Bumalda, Thunb.	

Order XCII. MALPIGHIACEÆ. The Barbadoes Cherry Tribe.

Malpighiaceæ, *Juss. Gen.* 252. (1789); *Ann. Mus.* 18. 479. (1811); *DC. Prodr.* 1. 577. (1824).

Essential Character.—*Sepals* 5, slightly combined, persistent, generally with a definite number of conspicuous glands. *Petals* 5, unguiculate, inserted in a hypogynous disk,

occasionally rather unequal, very seldom wanting. *Stamens* 10, alternate with the petals, seldom fewer, occasionally solitary; *filaments* either distinct, or partly monadelphous; *anthers* roundish. *Ovary* 1, usually 3-lobed, formed of 3 carpels, more or less combined; *styles* 3, distinct or combined; *ovules* suspended. *Fruit* dry or berried, 3-celled or 3-lobed, occasionally 1- or 2-celled by abortion. *Seeds* solitary, pendulous, without albumen; *embryo* more or less curved, or straight; *radicle* short; *lobes* leafy or thickish.—Small *trees* or *shrubs*, sometimes climbing. *Leaves* opposite, scarcely ever alternate, simple, without dots, with stipules mostly. *Flowers* in racemes or corymbs. *Pedicels* articulated in the middle, with 2 minute bracts.

Anomalies. Styles sometimes distinct. Leaves in an African species alternate. Petals occasionally wanting.

Affinities. Distinguished from Aceraceæ by the unguiculate petals, the glandular calyx, and the symmetrical flowers. Brown remarks, that the insertion of the ovule is always towards its apex, or considerably above its middle; and the radicle of the embryo is uniformly superior, in which point Banisteria offers no exception to the general structure, although Gærtner has described its radicle as inferior. *Congo*, 426. The claws to the petals and the samaroid fruit, distinguish the order readily from those in its neighbourhood. Those genera of Hippocrateæ, which have a similar fruit, have sessile petals.

Geography. Almost exclusively found in the equinoctial parts of America; of 180 species enumerated by De Candolle, only 5 are East Indian, 1 is found at the Cape, 1 in Arabia, and 5 in equinoctial Africa, or the contiguous islands.

Properties. Little is known of this subject. The wood of some kinds is bright red. The fruit of many is eaten in the West Indies; the hairs of a few species are painfully pungent. The bark of Malp. Moureila, according to Aublet, is employed in Cayenne as a febrifuge. The bark of the *Chapara Manteca*, Malpighia crassifolia, is astringent, and is used in infusion or decoction taken inwardly, as an antidote to the Rattlesnake bite. It is also employed successfully as a remedy for abcesses in the lungs. *Edinb. N. Ph. Journal, June*, 1830, p. 169.

GENERA.

§ 1. Malpighieæ, DC.
Malpighia, L.
Byrsonima, Rich.
Bunchosia, Juss.
Galphimia, Cav.
Caucanthus, Forsk.

§ 2. Hiptageæ, DC.
Hiptage, Gærtn.
Gærtnera, Schreb.
Molina, Cav.
Platynema, W. et A.
Tristellateia, Pet.Thou.
Zymum, Noronh.
Thryallis, L.
Aspicarpa, Rich.
Acosmus, Desv.
Gaudichaudia, H.B.K.
Camarea, A. St. H.

§ 3. Banisterieæ, DC.
Banisteria, L.
Heteropteris, H. B. K.
Mascagnia, Berter.
Triopteris, L.
Tetrapteris, Cav.
Vargasia, Bertero.
Triaspis, Burch.
Acridocarpus, Guill.
Anomalopteris, G.Don.
Tarrietia, Bl.

Sub-Order. ERYTHROXYLEÆ.

Erythroxyleæ, *Kunth in Humb. N. G. Am.* 5. 175. (1821); *DC. Prodr.* 1. 573. (1824).

Essential Character.—*Sepals* 5, combined at the base, persistent. *Petals* 5, hypogynous, broad at the base, with a plaited scale there, equal, the margins lying upon each other in æstivation. *Stamens* 10; *filaments* combined at the base into a cup; *anthers* innate, erect, 2-celled, dehiscing lengthwise. *Ovary* 1-celled, or 3-celled, with 2 cells spurious; *styles* 2, distinct; *stigmas* 3, somewhat capitate, or united almost to the point; *ovule* solitary, pendulous. *Fruit* drupaceous, 1-seeded. *Seed* angular; *albumen* corneous; *embryo* linear, straight, central; *cotyledons* linear, flat, leafy; *radicle* superior, taper, straight; *plumule* inconspicuous.—*Shrubs* or *trees*; young shoots often compressed and covered with acute imbricated scales. *Leaves* alternate, seldom opposite, usually smooth; *stipules* axillary. *Flowers* small, whitish or greenish. *Peduncles* with bracts at the base.

Affinities. Separated from Malpighiaceæ by Kunth on account of the

appendages of the petals, the presence of albumen, the fruit being often 1-celled by abortion, and the peculiar habit. *DC.* But there do not appear to be peculiarities enough for more than a sub-division of Malpighiaceæ.

Geography. Chiefly West Indian and South American. A few are found in the East Indies, and several in the Mauritius and Madagascar.

Properties. The wood of some is bright red; that of E. hypericifolium is called in the Isle of France *Bois d'huile*. A permanent reddish brown dye is obtained from the bark of Erythroxylum suberosum, called in Brazil *Gallinha choca* and *Mercurio do campo*. *Pl. Us.* 69.

Erythroxylon Coca is a plant much used by the miners of Peru for its remarkable power in stimulating the nervous system, in which respect it much resembles opium. Its leaves are chewed with a small mixture of finely powdered chalk. No effects that have been ascribed to the immoderate use of opium are exceeded by what seems the consequence of chewing the Coca leaf. See a curious account of this plant in *Pöppig's reise in Chile*, vol 2. translated; *in Hooker's Companion to the Bot. Mag.* vol. 1. p. 161.

GENERA.

Erythroxylum, L.
Sethia, H. B. K.

Alliance V. *SILENALES.*

Essential Character.—*Embryo* rolled round mealy albumen; or, if this is not the case, herbaceous plants with the joints of the stem tumid; or with scales replacing leaves upon rod-like branches. Almost all herbs or small shrubs.

The lowest form of the Syncarpous group; and apparently a degeneration of Malvales, with which the genera accord in the general appearance of the flowers, and sometimes, as in Illecebraceæ, in the highly developed stipules. The alliance touches closely upon the Gynobaseous group by Silenaceæ, which agree with Geraniaceæ in their tumid nodi, &c. Illecebraceæ and Alsinaceæ may be considered part of the connection between Polypetalous and Incomplete orders, agreeing in some respects with Chenopodiaceæ among the latter. Tamaricaceæ differ from the essential character in having the embryo straight, and without albumen, instead of being rolled round mealy albumen. Yet the mass of its affinities seems to fix that order where it at present stands.

Order XCIII. PORTULACACEÆ. The Purslane Tribe.

Portulaceæ, *Juss. Gen.* 313. (1789) *in part; A. St. Hil. Mém. Plac. Cent.* 42. (1815); *DC. Prodr.* 3. 351. (1828); *Lindl. Synops.* 62. (1829); *DC. Mém. de la Soc. d'Hist. Nat. de Paris*, (*Aug.* 1827).

Essential Character.—*Sepals* 2, seldom 3 or 5, cohering by the base. *Petals* generally 5, occasionally 3, 4, or 6, either distinct or cohering in a short tube, sometimes wanting. *Stamens* inserted along with the petals irregularly into the base of the calyx or hypogynous, variable in number, all fertile, sometimes opposite the petals; *filaments* distinct; *anthers* versatile, with 2 cells, opening lengthwise. *Ovary* superior, 1-celled; *style* single, or none; *stigmas* several, much divided. *Capsule* 1-celled, dehiscing either transversely or by 3 valves, occasionally 1-seeded and indehiscent. *Seeds* numerous, if the

fruit is dehiscent; attached to a central placenta; *albumen* farinaceous; *embryo* curved round the circumference of the albumen, with a long *radicle*.—Succulent *shrubs* or *herbs*. *Leaves* alternate, seldom opposite, entire, without stipules, or sometimes with membranous ones. *Flowers* axillary or terminal, usually ephemeral, expanding only in bright sunshine.

Anomalies. Sepals 5 in Trianthema and Cypselea. Petals sometimes wanting. Ovary half-inferior in some Portulacas.

Affinities. Related in every point of view to Alsinaceæ, from which they scarcely differ except in their perigynous stamens, which are opposite the petals when equal to them in number, and their two sepals; the latter character is not, however, absolutely constant. The presence of scarious stipules in several Portulaceæ, although perhaps an anomaly in the order, indicates their affinity with Illecebraceæ, from which the monospermous genera of Portulacaceæ are distinguished by the want of symmetry in their flowers, and by the stamens being opposite the petals instead of the sepals. So close is the relationship between these orders, that several of the genus Ginginsia in Portulacaceæ have been referred to Pharnaceum in Illecebraceæ. De Candolle remarks, that his Ginginsia brevicaulis resembles certain species of Androsace, and that Portulacaceæ have been more than once compared to Primulaceæ (*Mém.* p. 14.); and the same author states, in another place (*Prodr.* 3. 351.), that the genera with indefinite stamens and hairy axils approach Cactaceæ, while the apetalous genera tend towards apetalous Ficoideæ (Tetragoniaceæ).

Geography. A fourth of the order inhabits the Cape of Good Hope, rather more than another fourth is found in South America, 1 species only in Guinea, 2 in New Holland, 1 in Europe, and the remainder in various parts of the world. They are always found in dry parched places.

Properties. Insipidity, want of smell, and dull green colour, are the usual qualities of this order, of which the only species of any known use are common Purslane and Claytonia perfoliata, which resemble each other in property; and Talinum patens which is used in Brazil for the same purposes as Purslane in Europe. *Fl. Bras. Merid.* 2. 193.

GENERA.

Portulaca, L.
Meridiana, L.
Lemia, Vand.
Meridia, Neck.
Anacampseros, Sims.
Rulingia, Ehrh.
Talinum, Adans.
Phemeranthus, Rafin.
Calandrinia, H. B. K.
Cosmia, Domb.
Phacosperma, Haw.
Portulacaria, Jacq.
Hœnkea, Salisb.
Ullucus, Lozan.
Claytonia, L.
Limnia, L.
Montia, L.
Leptrina, Rafin.
Grahamia, Hooker.

Order. XCIV. SILENACEÆ. The Dianthus Tribe.

Caryophylleæ, § 5 et 6, *Juss. Gen.* 299. (1789).—Sileneæ, *DC. Prodr.* 1. 351. (1824); *Lindl. Synops.* p. 43. (1829).—Sileneæ, *Bartl. Ord. Nat.* 305. (1830).

Essential Character.—*Sepals* 4-5, continuous with the peduncle; cohering in a tube, persistent. *Petals* 4-5, hypogynous, unguiculate, inserted upon the pedicel of the ovary; occasionally wanting. *Stamens* twice as many as the petals, inserted upon the pedicel of the ovary along with the petals; *filaments* subulate, sometimes monadelphous; *anthers* innate. *Ovary* stipitate on the apex of a pedicel (called the gynophore); *stigmas* 2-5, sessile, filiform, papillose on the inner surface. *Capsule* 2-5-valved, either 1-celled or 2-5-celled, in the latter case with a loculicidal dehiscence. *Placenta* central, in the 1-celled capsules distinct, in the 2-5-celled capsules adhering to the edge of the dissepiments. *Seeds* indefinite in number, rarely definite; *albumen* mealy; *embryo* curved round the albumen,

sometimes straight; very rarely spiral, with hardly any albumen; *radicle* pointing to the hilum.—*Herbaceous* plants, occasionally becoming *suffrutescent*. *Stems* tumid at the articulations. *Leaves* always opposite and entire, often connate at the base.

Affinities. On the one hand these plants are allied to Frankeniaceæ, with which they agree in their unguiculate petals, bearing processes at their orifice, and in some measure in habit; and on the other to Linaceæ, from which they are principally distinguished by their unilocular, or, if plurilocular, several-seeded capsules, albuminous seeds, and tubular calyx. Geraniaceæ, Oxalidaceæ, Violaceæ, and Portulacaceæ, are all also allied in many particulars, but they are readily distinguished. Elatinaceæ differ in their exalbuminous seeds and capitate stigmas. Macræa, a genus of mine, which Don states to be the same as Viviania, a neglected genus of Cavanilles (see *Jameson's Journal, Jan.* 1830, p. 70), if really belonging to the order, differs remarkably in the curved embryo lying, according to Hooker, in the midst of fleshy albumen, in its dry persistent petals, and in the vernation of both the calyx and petals; but I incline to think that this remarkable genus indicates the existence of an order allied to Frankeniaceæ Geraniaceæ or more closely than to Silenaceæ.

Geography. Natives principally of the temperate and frigid parts of the world, where they inhabit mountains, hedges, rocks, and waste places. Those which are found within the tropics are usually natives of high elevations and mountainous tracts, almost always reaching the limits of eternal snow, where many of them exclusively vegetate. Some Silenes are scattered in many different parts of the globe. According to the calculation of Humboldt, Silenaceæ and Alsinaceæ together constitute $\frac{1}{2}\frac{1}{2}$ of the flowering plants of France, $\frac{1}{2}\frac{1}{7}$ of Germany, $\frac{1}{1}\frac{1}{7}$ Lapland, $\frac{1}{7}\frac{1}{2}$ of North America.

Properties. Remarkable for little except their uniform insipidity. A few, such as the Dianthuses and Lychnis, are handsome flowers; but the greater part are mere weeds. Saponaria officinalis, Gypsophila Ostruthium, Lychnis dioica, and L. chalcedonica, have saponaceous properties: Saponaria has been used in syphilis. A decoction of the root of Silene virginica is said to have been employed in North America as anthelmintic. *DC.*

GENERA.

Drypis, L.	Gypsophila, L.	Cucubalus, L.	Agrostemma, L.
Velezia, L.	*Vaccaria*, Dod.	*Scribæa*, Fl. Wett.	*Githago*, Desf.
Acanthophyllum, Mey.	*Rokejeka*, Forsk.	*Lychnanthus*, Gmel.	
Dianthus, L.	*Banffya*, Baumg.	Silene, L.	Viviania, Cav.
	Acosmia, Benth.	Lychnis, L.	*Macræa*, Lindl.
	Saponaria, L.		*Cæsarea*, Camb.

Order XCV. ALSINACEÆ. The Chickweed Tribe.

Caryophylleæ, § 1, 2, 3, *Juss. Gen.* 299. (1789).—Alsineæ, *DC. Fl. Franc. Ed.* 3. 4. 766. (1805); *Bartl. Ord. Nat.* 204. (1830); *Fenzl Versuch.* (1833).—Caryophylleæ, § 2. *DC. Prodr.* 1. 388. (1824).—Queriaceæ, *DC. Prodr.* 3. 379. (1828).—Minuartieæ, *Id.* (1828).

Essential Character.—*Sepals* 4-5, slightly imbricated in æstivation. *Petals* a like number, sessile, often two-lobed, deciduous, occasionally 0; inserted on the outside of a sort of fleshy ring, which is more or less and sometimes very manifestly perigynous. *Stamens* double the petals, seldom a like number, or fewer, inserted into the edge of the fleshy ring; *anthers* incumbent, 2-celled, opening longitudinally, without a connective. *Ovary* 1-celled, many-seeded. *Stigmas* 2-5, linear, long, distinct, sessile, or placed on a

like number of styles. *Capsule* 1-celled, with as many valves as stigmas. *Seeds* indefinite, rarely definite and solitary, reniform or angular, attached to a free central placenta, or to funiculi arising from the base of the cavity. *Embryo* curved round mealy, or somewhat fleshy, albumen; *radicle* next the hilum; *cotyledons* leafy in germination.—*Herbaceous* plants, occasionally rather shrubby with tumid joints to the stem. *Leaves* opposite, undivided, often connate at the base. *Stipules* 0.

Affinities. Principally known from Silenaceæ by the 5-leaved calyx, and sessile petals; known from Illecebraceæ by nothing but the want of stipules; all the stipulate plants formerly placed here must consequently be transferred to Illecebraceæ.

Geography. Found in the cool and temperate parts of the world, especially in mountainous tracts.

Properties. None.

GENERA.

Hymenella, DC.
Triplateia, Bartl.
Buffonia, L.
Sagina, L.
Colobanthus, Bartl.
Cherleria, Haller.
Siebera, Rchb.
Someravera, Hopp.
Alsine, Wahl.
b. Minuartia, Lœfl.
c. Queria, id.
Alsinella, Benth.
Dolophragma, Fenzl.
Honkenya, Ehr.
Halianthus, Fries.
Adenarium, Raf.
Merckia, Fisch.
Arenaria, L.
Sabularia, Rchb.
Möhringia, L.
Heterochroa, Bunge.
Gouffeia, Rob. et Cast.
Eremogone, Fenzl.
Strephodon, Ser.
Cerastium, L.
Esmarckia, Rchb.
b. Mœnchia, Ehr.
Holosteum, L.
Odontostemma, Bent.
Brachystemma, Don.
Stellaria, L.
b. Leucostemma, Benth.
c. Schizotechium, Fenzl.
Larbrea, A. St. H.
Malachium, Fries.
Spergella, Rchb.
Spergulastrum, Mx.
Micropetalon, Pers.
Schiedea, Cham.
Dichoglottis, F. et M.
Adenonema, Bge.

Order XCVI. TAMARICACEÆ. The Tamarisk Tribe.

Tamariscineæ, *Desvaux, in a Dissertation read before the French Institute* (*in* 1815), *according to the Ann. Sc. Nat.* 4. 344. (1825); *A. St. Hil. Mém. Mus.* 2. 205. (1816); *Ehrenb. in Annales des Sciences*, 12. 68. (1827); *DC. Prodr.* 3. 95. (1828); *Lindl. Synops.* 61. (1829).

Essential Character.—*Calyx* 4- or 5-parted, persistent, with an imbricated æstivation. *Petals* inserted into the base of the calyx, withering, with an imbricated æstivation. *Stamens* hypogynous, either equal to the petals in number, or twice as many, distinct or monadelphous. *Ovary* superior; *style* very short; *stigmas* 3. *Capsule* 3-valved, 1-celled, many-seeded; *placentæ* 3, either at the base of the cavity, or along the middle of the valves. *Seeds* erect or ascending, comose; *albumen* none; *embryo* straight, with an inferior radicle. —*Shrubs* or *herbs*, with rod-like branches. *Leaves* alternate, resembling scales, entire. *Flowers* in close spikes or racemes.

Affinities. According to De Candolle (*Prodr.* 3. 95.), who places the order among those with perigynous stamens, it is related to Portulacaceæ (or Illecebraceæ), on account of the resemblance between its flowers and those of Telephium; but it differs in the parietal exalbuminous comose seeds. Also allied to Lythraceæ and Onagraceæ, but different from the former in the imbricated æstivation, the petals arising from the bottom of the calyx, and parietal seeds; and from the latter in the superior ovary, and the imbricated æstivation of the calyx. Ehrenberg asserts the order to have hypogynous stamens (*Ann. des Sc.* 12. 77.), and this agrees with my own observations. The same botanist, in separating the Tamarix songarica of Willdenow from Tamaricaceæ, and referring it to the vicinity of Reaumuria, establishes the affinity of Tamaricaceæ to Reaumuriaceæ. In many respects it is very like Frankeniaceæ. In the midst of all these conflicting affinities and analogies, it seems

most advisable to keep the order near Illecebraceæ with which it accords in its syncarpous unilocular, often 3-valved fruit, and scale-like leaves.

Geography. Exclusively confined to the northern hemisphere, and even to its eastern half, that is, to the old world, on which the species extend as far as the Cape de Verds. They usually grow by the sea-side, but occasionally by the edges of rivers and torrents. The maximum of species and of individuals also is found in the basin of the Mediterranean. The order appears bounded on the south by the 8° or 9° parallel of N. lat., and on the north by that of 50° and 55° in Siberia, Germany, and England. *Ehrenb.*

Properties. The bark is slightly bitter, astringent, and probably tonic. T. gallica and africana are remarkable for the quantity of sulphate of soda which their ashes contain, *DC.* Ehrenberg found that the Manna of Mount Sinai is produced by a variety of Tamarix gallica. This substance, being analysed by Mitscherlich, was found to contain no crystallisable Mannite, but to consist wholly of pure mucilaginous sugar. *Ann. des Sc.* l. c. The galls of T. indica, dioica, Furas and orientalis are highly astringent, and are used both in medicine and in dyeing. *Royle.*

GENERA.

Tamarix, L.
Myricaria, Desv.
Bronnia, H. B. K.
Trichaurus, Arn.

Order XCVII. ILLECEBRACEÆ. The Knot-Grass Tribe.

Herniariæ, *Cat. Hort. Par.* (1777).—Illecebreæ, *R. Brown Prodromus*, 413. (1810); *Lindl. Synops.* 60. (1829).—Paronychieæ, *Aug. St. Hil. Mém. Plac. lib.* p. 56. (1815); *Juss. Mém. Mus.* 1. 387. (1815); *DC. Prodr.* 3. 365. (1828); *Mémoire sur les Paronych.* (1829); *Bartl. Ord. Nat.* p. 301. (1830).

Essential Character.—*Sepals* 5, seldom 3 or 4, sometimes distinct, sometimes cohering more or less. *Petals* minute, inserted upon the calyx between the lobes, occasionally wanting. *Stamens* perigynous exactly opposite the sepals, if equal to them in number, sometimes fewer by abortion, sometimes more numerous; *filaments* distinct; *anthers* 2 celled. *Ovary* 1-celled, rarely 3-celled, with 1 or more *ovules*, superior; *styles* 2-5, either distinct or partially combined. *Fruit* small, dry, 1-celled, rarely 3-celled, either indehiscent, or opening with 3 valves. *Seeds* either numerous, upon a free central placenta, or solitary and pendulous from a funiculus originating in the base of the cavity of the fruit; *albumen* farinaceous; *embryo* lying on one side of the albumen, curved more or less, with the radicle always pointing to the hilum; *cotyledons* small.—*Herbaceous* or *half-shrubby* branching plants, with opposite or alternate, often fascicled, sessile, entire *leaves*, and scarious *stipules*. *Flowers* minute, with scarious bracts.

Affinities. Very near Portulacaceæ, Amarantaceæ, and Alsinaceæ, from which they are distinguished with difficulty. By excluding Scleranthaceæ, which I consider, with Brown, a distinct order, their scarious stipules will distinguish them from the Silenaceæ and Alsinaceæ; and there is scarcely any other character that will; for there are Alsinaceæ that have perigynous stamens, as Larbrea and Honkenya, and Illecebraceæ which have hypogynous ones, as Polycarpæa, Stipulicida, and Ortegia. From Portulacaceæ they are scarcely to be known with absolute certainty, except by the position of the stamens before the sepals instead of the petals, and the number of the sepals. With Crassulaceæ, particularly Tillæa, they agree very much in habit, but their concrete carpels will always distinguish them. De Candolle comprehends in the order various plants which have not stipules; but as the latter organs seem to be an essential part of the character, I should exclude his Queriaceæ, and Minuartieæ, which will be reduced to Alsinaceæ. According to Cambes-

sédes, in the *Flora Brasiliæ Merid.* (2. 175), the genus Spergularia, in which the petals and stamens are very often perigynous, the styles sometimes consolidated at their base, and the stamens 5 in number, establishes a passage between Alsinaceæ and Illecebraceæ, and tends to confirm the opinion of Bartling, who considers these two orders as belonging to the same alliance.

Geography. The south of Europe and the north of Africa are the great stations of the order, where the species grow in the most barren places, covering with a thick vegetation soil which is incapable of bearing any thing else. A few are found at the Cape of Good Hope; and North America, including Mexico, comprehends several.

Properties. A trace of astringency pervades the order, and is the only sensible property that it is known to possess.

GENERA.

§ 1. Illecebreæ, Bart.
Herniaria, L.
Gymnocarpum, Forsk.
Anychia, Michx.
Polpoda, Presl.
Steudelia, Presl.
Dicarpæa, Presl.
Hapalosia, Wall.
Illecebrum, L.
Paronychia, Juss.
Plottzia, Arnott. (16)
Pentacæna, Bartl.
Acanthonychia, DC.
Balardia, Camb.
Arversia, Camb.
Cardionema, DC.
Pollichia, Sol.
Neckeria, Gmel.
Meerburgia, Mœnch.
§ 2. Sperguleæ, Bartl.
Cerdia, Fl. Mex.
Lœflingia, L.
Ortegia, Lœfl.
Cypselea, Turp.
Radiana, Rafin.
Polycarpon, Lœfl.
Stipulicida, Michx.
Polycarpæa, Lam.
Hagæa, Vent.
Mollia, Willd.
Lahaya, R. et S.
? Polia, Lour.
Spergula, L.
Stipularia, Haw.
Lepigonum, Fries.
Drymaria, Willd.
Spergularia, Pers.
§ 3. Mollugineæ, Bartl.
Ginginsia, DC.
Pharnaceum, L.
Mollugo, L.
Adenogramma, Rchb.
Physa, Pet. Thou.
Aylmeria, Mart.
§ 4. Telephieæ, DC.
Corrigiola, L.
Telephium, L.
Limeum, L.

Cometes, Burm.
Saltia, R. Br. olim.
Pteranthus, Forsk.

Group VI. Gynobaseosæ.

Essential Character.—*Carpels* seldom or ever exceeding 5, always in a single whorl diverging at the base and separated by the interposition of a conical gynobase which throws them into an oblique position. *Stamens* in most cases distinct from the calyx. *Flowers* rarely unisexual.

In most cases this gynobasic structure is exceedingly obvious, especially after the ovary is a little advanced towards maturity; for then the obliquity of the cells or carpels becomes more apparent. Very often the gynobase is excessively enlarged or lengthened, as in Ochna and Geraniales; sometimes it remains as a column, from which the carpels separate, as in Rutaceæ; sometimes it is merely a short cone, round which the carpels are placed, as in Coriales. Nevertheless, instances occur in which plants not belonging to this group may, by the inexperienced botanist, be confounded with it; these mostly occur in Malvaceæ, Rosaceæ and Euphorbiaceæ. The instances of an approach to a gynobasic structure in Malvaceæ and Rosaceæ are chiefly those where a considerable number of carpels are placed round a fleshy axis; the number will in such cases prevent any error being committed, for no Gynobaseous order has more than 5 carpels, except accidentally. Euphorbiaceæ, which are much more like gynobasic plants, and which, in fact, constitute an approach to Rutales, are known by their completely unisexual flowers, and by their carpels being in no degree *obliquely* fitted to the central column.

Alliance I. *RUTALES.*

Essential Character.—*Style* single; or if it is ever divided into several pieces, then the leaves are marked with pellucid dots.

In general, the dotted leaves sufficiently mark the genera of this alliance; but for the sake of Ochnaceæ, Zygophyllaceæ, &c. it is necessary to add the character of the style being quite single up to the point. The Flœrkeal alliance, which agrees in this last circumstance, has its fruit divided into deep lobes, as in Labiatæ and Boraginaceæ. Moreover, the general character of Rutales is to have a woody stem; Flœrkeales are soft herbs, and their gynobase is never fleshy, by which they are known from Ochnaceæ, where it is remarkably succulent and enlarged. Rutales connect the Syncarpous alliance and this by means of Phebalium, which has quite the appearance of a Croton in Euphorbiaceæ.

Order XCVIII. OCHNACEÆ.

Ochnaceæ, *DC. Ann. Mus.* 17. 398. (1811); *Prodr.* 1. 735. (1824).

Essential Character.—*Sepals* 5, persistent, imbricated in æstivation. *Petals* hypogynous, definite, sometimes twice as many as the sepals, deciduous, spreading, imbricated in æstivation. *Stamens* 5, opposite the sepals, or 10, or indefinite in number, arising from a hypogynous disk; *filaments* persistent; *anthers* 2-celled, innate, opening by pores. *Carpels* equal in number to the petals, lying upon an enlarged, tumid, fleshy disk (the *gynobase*); their *styles* combined in one; *ovule* erect. *Fruit* composed of as many pieces as there were carpels, indehiscent, somewhat drupaceous, 1-seeded, articulated with the gynobase, which grows with their growth. *Seeds* without albumen; *embryo* straight; *radicle* short; *cotyledons* thick.—Very smooth *Trees* or more generally *under-shrubs*, sometimes downy, having a watery juice. *Leaves* alternate, simple, entire, or toothed, with 2 stipules at the base. *Flowers* usually in racemes, with an articulation in the middle of the pedicels.

Affinities. Very near Rutaceæ, from which they are distinguished by their erect ovules, the dehiscence of their anthers, and many more characters. They are to Polypetalous plants what Labiatæ and Boraginaceæ are to Monopetalous.

Geography. Found in tropical India, Africa and America.

Properties. Walkera serrata has a bitter root and leaves, and is employed in Malabar, in decoction in milk or water, as a tonic, stomachic, and anti-emetic. The bark of Ochna hexasperma is used in Brazil as a cure of the sores produced in cattle by the punctures of insects. It probably acts as an astringent. *Pl. Usuelles*, 38.

GENERA.

§ 1. Ochneæ, DC.	Gomphia, Schreb.	Walkera, Schreb.	§ 2. Casteleæ, DC.
Ochna, L.	*Curatea*, Aubl.	*Meesia*, Gærtn.	Castelea, Turp.
Diporidium, Bartl.	*Correia*, Velloz.	? Euthemis, Jack.	Elvasia, DC.

Order XCIX. SIMARUBACEÆ. The Quassia Tribe.

Simarubaceæ, *Rich. Anal. de Fr.* 21. (1808).—Simarubeæ, *DC. Diss. Ochn. Ann. Mus.* 17. 323. (1811); *Prodr.* 1. 733. (1824); *Adrien de Juss. Rutacées*, 129. (1825).

Essential Character.—*Flowers* hermaphrodite, or occasionally unisexual. *Calyx* in 4 or 5 divisions. *Petals* the same number, longer, either spreading or combined in a tube; *æstivation* twisted. *Stamens* twice as many as the petals, each arising from the back of a

hypogynous scale. *Ovary* 4- or 5-lobed, placed upon a stalk from the base of which the stamens arise, 4- or 5-celled, each cell with 1 suspended ovule; *style* simple; *stigma* 4- or 5-lobed. *Fruit* consisting of 4 or 5 drupes arranged around a common receptacle, indehiscent. *Seeds* pendulous, with a membranous integument; *embryo* without *albumen*; *radicle* superior, short, drawn back within the thick cotyledons. *Trees* or *shrubs*. *Leaves* without stipules, alternate, occasionally simple, most usually compound without dots. *Peduncles* axillary or terminal. *Flowers* whitish, green, or purple. The different parts bitter.

Affinities. Akin to Zygophyllaceæ in their stamens inserted upon hypogynous scales, and to Ochnaceæ in their deeply-lobed ovary, or nearly separate ovaries; from these latter they are distinguished by their want of a succulent disk, their suspended not erect ovules, and their anthers bursting by longitudinal slits, not by terminal pores. A. de Jussieu says, "They are known from all Rutaceous plants by the co-existence of these characters; namely, ovaries with but one ovule, indehiscent drupes, exalbuminous seeds, a membranous integument of the embryo, and by the radicle being retracted within thick cotyledons."

Geography. All natives of tropical America, India, or Africa, with the exception of 1 Nipal plant.

Properties. All intensely bitter. The wood of Quassia is well known. A plant called Paraïba in Brazil, the Simaruba versicolor of St. Hilaire, possesses such excessive bitterness that no insects will attack it. Specimens of it placed among dried plants which were entirely devoured by the larvæ of a species of Ptinus, remained untouched. The Brazilians use an infusion in brandy as a specific against the bite of serpents, and also employ it with very great success to cure the lousy diseases to which people are subject in those countries. *Pl. Usuelles*, no 5.

GENERA.

Quassia, L.	*Zwingera*, Schreb.	*Locandi*, Adans.	*Mauduyta*, Comm.
Simaruba, Aubl.	*Phyllostemma*, Neck.	*Vittmannia*, Vahl.	Nima, Hamilt.
Simaba, Aubl.	Samadera, Gærtn.	*Niota*, Lam.	Harrisonia, R. Br.
Aruba, Aubl.	*Samandura*, L.	*Biporeia*, Pet. Thou.	

Order C. RUTACEÆ. The Rue Tribe.

Rutæ, *Juss. Gen.* 296. (1789) *in part*.—Rutaceæ, *DC. Prodr.* 1. 709. (1824).—Ruteæ, *Adrien de Juss. Rutacées*, 78. (1825); *Aug. de St. Hilaire Fl. Bras. Mer.* 1. 93. (1825). Diosmeæ, *R. Brown in Flinders*, (1814); *Ad. de Jussieu Rutacées*, 1. 83. (1825).—Fraxinelleæ, *Nees and Martius Nov. Act. Bonn.* 11. 149. (1823).—Cusparieæ, *DC. Mem. Mus.* 9. 141. (1822); *Prodr.* 1. 729. (1824), a § *of* Rutaceæ.

Essential Character.—*Flowers* hermaphrodite, regular or irregular. *Calyx* in 4 or 5 divisions. *Petals* either as many as the divisions of the calyx, distinct, or combined into a kind of spurious monopetalous corolla, or occasionally wanting; *æstivation* for the most part twisted-convolute, very rarely somewhat valvular. *Stamens* equal in number to the petals, or twice or thrice as many, or even fewer in consequence of abortion, hypogynous, very rarely perigynous, placed on the outside of a disk or cup surrounding the ovary, and either free or combined with the base of the calyx, or sometimes obsolete. *Ovary* sessile or stalked, its lobes equal to the number of petals, or fewer; *ovules* twin and collateral, or one above the other, rarely 4, seldom more; *style* single, occasionally divided towards the base into as many parts as there are lobes of the ovary; *stigma* simple or dilated. *Fruit* consisting of several capsules, either cohering firmly or more or less distinct. *Seeds* twin or solitary, with a testaceous integument; *embryo* with a superior *radicle*, which is either straight or oblique, and *cotyledons* of variable form; *albumen* present or absent.—*Trees* or *shrubs*, very rarely *herbaceous* plants. *Leaves* without stipules, opposite or alternate, sim-

ple or pinnate, covered with pellucid resinous dots. *Flowers* axillary or terminal. All the parts aromatic.

Anomalies. Some of the genera are monopetalous, others have the carpels in great part distinct. Empleurum has no petals. Dictamnus and some others have irregular flowers and more ovules than 2. According to Brown, there is a New Holland genus, with perigynous stamens, 10 segments of the calyx, 10 petals, and indefinite stamens.

Affinities. There are two principal divisions in this order; the one Ruteæ proper, which have seeds containing albumen, and a fruit the sarcocarp of which is said not to separate from the endocarp; the other Diosmeæ, whose seeds have no albumen, and whose sarcocarp and endocarp divide into distinct bodies when the fruit is ripe. But Aug. de St. Hilaire (*Fl. Bras.* 1. 74.) suspects that those two parts are equally separable in Ruteæ, and that the specimens in herbaria which have been found otherwise were gathered before their fruit was quite ripe. At all events the difference is too slight for the character of an order; and the absence or presence of a small quantity of albumen can no longer be insisted upon now that so many cases of its absence or presence in the same order are known; indeed, Hortia, a Diosmeous genus, has albumen, according to Aug. de St. Hilaire. Ruteæ are allied to Zygophyllaceæ through Peganum, which A. de Jussieu actually stations here, although its stipulate leaves, destitute of pellucid dots, seem to determine its greatest affinity to be with Zygophyllaceæ. A. de Jussieu, from whose excellent memoir upon Rutaceæ I have borrowed the greater part of my remarks upon Rutaceæ, Zygophyllaceæ, Xanthoxylaceæ, and Simarubaceæ, speaks thus of Diosmeæ. (*Mém.* p. 19.) :—

"Diosmeæ are a group to which Mr. Brown gives that name, with the exception, however, of some of the genera which he refers to it; and they are that by the characters of which botanists have generally defined Rutaceæ. It is not necessary to describe the floral envelopes, the stamens, the disk, or the structure of the seed, because these parts vary according to the sections, which are in part characterised by their differences, and they will be better examined in their respective places. But it is important to understand the ovaries, and especially the pericarp, the structure of which is very characteristic. The ovaries, whether combined by their central axis, or more or less distinct, always contain 2 ovules; if 4, or sometimes but 1 are found, this occurs only in genera stationed at the extreme limits of the group. They are collateral, or more frequently placed one above the other, and then one is usually ascending, and the other suspended. This position, which at first sight appears singular, is very natural; for the ovary is usually pierced by the vessels of the style only in the middle, and it is at that point that the two ovules are inserted, both at nearly the same height. If, therefore, they are placed one above the other, it is indispensable that one should ascend, and the other descend. These ovules may be considered peritropal, rather than either ascending or suspended, or, in other terms, attached by their middle rather than by either extremity." —"If the ovary of a Diosmea is divided across, its coat will be found to consist of two layers, the outer rather the most fleshy, and the inner thin or almost absent on the side next the axis, the side which is traversed from bottom to top by the vessels of the peduncle. These vessels, at a certain height, meet those of the style, either at the point of its insertion or below it; united to these, they penetrate the cavity of the cell, the shell of which they pierce, and there form funiculi, to which the ovules are attached. Thus far the structure of Diosmeæ is little different from that of other Rutaceous plants. But this becomes modified as the ovary advances towards the state of fruit. The endocarp hardens by degrees, and at the same time separates from the sarcocarp. Its form resembles that of a bivalve shell, and may be more especially compared to that of a mussel; it presents two extremities, one superior, the

other inferior, two lateral faces which are more or less convex, and two edges more or less acute, which unite them, the one external, the other internal. The two valves are woody and touch at the edges, except perhaps at a part of their inside where they are separated; this space is filled by a membrane which passes from one to the other: it is either slightly fleshy, or, which is more common, extremely thin, thickened in the middle by the passage of the vessels of the seed which penetrate it; and as, after having pierced it, they are almost immediately inserted into the seed, the latter appears to be actually borne by the membrane itself. When the fruit is perfectly ripe, the sarcocarp of each cell opens from above inwards, following a longitudinal furrow, which had become visible some time previously. Its inner surface is seen to be covered by projecting lignified vessels, which are directed obliquely from the inner edge towards the outer, and are indicated externally by some transverse projections. The endocarp is loose in the inside of the shell, unless at its membrane, by means of which it continues to preserve some degree of adhesion with the other parts; but it soon opens, the two valves separate in different directions, and force out the seeds. When this separation takes place, the membrane is torn all round, and either falls away or sticks to the seed. In the latter case it is found attached to the hilum, if one seed only has ripened; but then in removing it, the remains of the abortive ovule may be found on one side. If both seeds have arrived at maturity, they are usually seen one resting on the other by their contiguous flattened extremities, and the membrane extends along their inner edge, being enlarged at their point of contact, where two transverse prolongations are perceptible."

The same author then proceeds to point out the inaccuracy of calling, with some, this endocarp an aril—a name which, as Auguste de St. Hilaire somewhere remarks, has been applied to as many different things as the Linnean term nectarium; or, applying with others the same name to the persistent membrane.

Diosmeæ differ from Ruteæ not only in the remarkable structure of their fruit, but also in having two ovules in each cell, and exalbuminous seeds; with Humiriaceæ they have an analogy through the tribe called Cusparieæ, some of which have monadelphous stamens; with Aurantiaceæ they agree in their dotted leaves, definite stamens, occasional production of double embryos, fleshy disk, and sometimes in habit in the tribe of Cusparieæ. Xanthoxylaceæ and Simarubaceæ accord with them in a multitude of points. See further Aug. de St. Hilaire *Fl. Bras. Merid.* 1. 94., especially for what concerns the genera.

Geography. Ruteæ are found in the south of Europe, whence they extend in our hemisphere as far as the limits of the Old World, following the southern part of the temperate zone, and very rarely advancing within the tropics. *Ad. de J.* Of Diosmeæ, one genus, Dictamnus, is found in the south of Europe. The Cape of Good Hope is covered with different species of Diosma and nearly allied genera; New Holland abounds in Boronias, Phebaliums, Correas, Eriostemons, and the like; great numbers inhabit the equinoctial regions of America.

Properties. Ruteæ are characterised by their powerful odour and their bitterness; they act principally on the nerves. Common Rue, and another species, are said to be emmenagogue, anthelmintic, and sudorific. The Diosmas, or Bucku plants, of the Cape, are well known for their powerful and usually offensive odour; they are recommended as antispasmodics, The American species possess, in many cases, febrifugal properties. There is an excellent bark of this nature, used by the Catalan Capuchin friars of the missions on the river Carony in South America, called the Quina de la Guayna, or de la Angostura, or Angostura bark: this, which has been successively ascribed to Brucea

ferruginea and two species of Magnolia, is now known to be the produce of Cusparia febrifuga (Bonplandia trifoliata *W.*), a plant of this family. *Humb. Cinch, For.* p. 38. *Eng. ed.* Evodia febrifuga, one of the Quinas of Brazil, has a bark so powerfully febrifugal as to compete with that of Cinchona. A bark much spoken of by the miners of Brazil, under the name of Casca de larangeira da terra, and in which Cinchonine was detected by Dr. Gomez, probably belongs to this tree. *Pl. Usuelles,* no. 4. One of the Quinas of Brazil is the Ticorea febrifuga: its bark is a powerful medicine in intermittent fevers. *Ibid.* 16. Hortia Braziliana possesses similar properties, but in a less degree. *Ibid.* 17. An infusion of the leaves of Ticorea jasminiflora is drank in Brazil as a remedy for the disease called by the Brazilian Portuguese Bobas, and by the French Frambæsia. *A. St. Hil. Hist.* 141. Dictamnus abounds in volatile oil to such a degree, that the atmosphere surrounding it actually becomes inflammable in hot weather. Its root was formerly esteemed as a sudorific and vermifuge.

GENERA.

§ 1. Ruteæ, A. de J.
Ruta, L.
Aplophyllum, A. de J.
Bœninghausenia, Reichenb.
Cyminosma, Gærtn.
Jambolifera, L.
Gela, Lour.
Acronychia, Bl.
§ 2. Dictmeæ, A. de J.
A. Genuinæ.
Euchætis, Bartl.
Diosma, L.
Hænkea, Schmidt.
Coleonema, Bartl.
Acmadenia, Bartl.
Adenandra, Willd.
Glandulifolia, Wend.
Okenia, Dietr.
Barosma, Willd.
Baryosma, R. et S.
Parapetalifera, Wen.
Hartogia, Berg.
Macrostylis, Bartl.
Calodendron, Thunb.
Pallasia, Houtt.
Empleurum, Soland.
B. Boronieæ, A. de J.
Correa, Sm.
Antomarchia, Colla.
Mazeutoxeron, La B.
Diplolæna, R. Br.
Phebalium, Vent.
Philotheca, Rudg.
Crowea, Sm.
Eriostemon, Sm.
Boronia, Sm.
Zieria, Sm.
C. Pilocarpeæ, A. de J.
Melicope, Forst.
Entoganum, Banks.
Evodia, Forst.
Esenbeckia, H. B. K.
Polembryum, Ad. J.
Geijera, Schott.
Colythrum, Schott.
Metrodorea, A. St. H.
Pilocarpus, Vahl.
Hortia, Vand.
Choysia, H. B. K.
D. Cusparieæ, A. de J.
Spiranthera, A. St. H.
Terpnanthus, Nees.
Almeidea, A. St. H.
Aruba, Nees.
Galipea, Aubl.
Cusparia, Humb.
Bonplandia, W.
Angostura, R. et S.
Conchocarpus, Mik.
Ravia, Nees.
Lasiostemon, Nees.
Obentonia, Velloz.
Raputia, Aubl.
Sciuris, Schreb.
Pholidandra, Neck.
Diglottis, Nees.
Erythrochiton, Nees.
Ticorea, Aubl.
Ozophyllum, Schreb.
Sciuris, Nees.
Monniera, Aubl.
Avbletia, Rich.
? Monodynamus, Pohl.
E. Dictamneæ, A. de J.
Dictamnus, L.
Fraxinella, Tourn.

Picrasma, Bl.
Guindilia, Gill.
Philagonia, Bl.
Juliania, Lex. et Ll.

Order CI. ZYGOPHYLLACEÆ. The Bean Caper Tribe.

Zygophylleæ, *R. Brown in Flinders,* (1814); *DC. Prodr.* 1. 703. (1824); *Adrien de Juss. Rutacées,* 67. (1825).

Essential Character.—*Flowers* hermaphrodite, regular. *Calyx* divided into 4 or 5 pieces, with convolute æstivation. *Petals* unguiculate, alternate with the segments of the calyx and a little longer, in æstivation, which is usually convolute, at first very short and scale-like. *Stamens* double the number of the petals, dilated at the base, sometimes naked, sometimes placed on the back of a small scale, hypogynous. *Ovary* simple, surrounded at the base with glands or a short sinuous disk, more or less deeply 4- or 5-furrowed, with 4 or 5 cells; *ovules* in each cell 2 or more, attached to the inner angle, pendulous, or occasionally erect; *style* simple, usually with 4 or 5 furrows; *stigma* simple, or with 4 or 5 lobes. *Fruit* capsular, rarely somewhat fleshy, with 4 or 5 angles or wings, bursting by 4 or 5 valves bearing the dissepiments in the middle, or into as many close cells; the sarcocarp not separable from the endocarp. *Seeds* usually fewer than the ovules, either compressed and scabrous when dry, or ovate and smooth, with a thin herbaceous integument. *Embryo* green; *radicle* superior; *cotyledons* foliaceous; *albumen* whitish, between horny and cartilaginous, in Tribulus wanting. *Ad. J.*—*Herbaceous* plants, *shrubs,* or *trees,* with a

very hard wood, the branches often articulated at the joints. *Leaves* opposite, with stipules, very seldom simple, usually unequally pinnate, not dotted. *Flowers* solitary, or in pairs or threes, white, blue, or red, often yellow.

Anomalies. Ovules occasionally erect. Tribulus has the fruit separating into spiny nuts, with transverse phragmata, and no albumen. Melianthus has very irregular flowers.

Affinities. Nearly related to Oxalidaceæ, from which, however, they are distinguished by a multitude of characters. With Simarubaceæ they accord in the stamens springing from the back of a hypogynous scale; a structure well worth more attentive consideration than it has yet received. Something analogous to it will be found in Silenaceæ. Adrien de Jussieu also observes that the petals are remarkable for their being, in an early state, minute and hidden by the calyx, which they only exceed about the time of flowering, while in other Rutaceous orders the petals are always larger than the calyx. The distinguishing characters in the vegetation or habit of this order are, the leaves being constantly opposite, with lateral or intermediate stipules, being generally compound, and always destitute of the pellucid glands which universally exist in true Rutaceæ. *Brown in Denham*, 26. It is also a very common character of the order to have the radicle at that extremity of the seed which is most remote from the hilum; but this, which is of great importance in many natural families, is of less value in Zygophyllaceæ. (See many good remarks upon this subject in Brown's *Appendix to Denham*, p. 27.)

Geography. Guaiacum, Porlieria, and Larrea, are peculiar to America. Fagonia is distributed over the south of Europe, the Levant, Persia, and India. Zygophyllum inhabits the same regions, and also the south of Africa, and is represented in New Holland by Röpera. Tribulus is found in all the Old World within the tropics, or in countries bordering upon them. *Ad. de J.* Melianthus, a most anomalous genus, is remarkable for being found both at the Cape of Good Hope and in Nipal, without any intermediate station.

Properties. Zygophyllum Fabago is sometimes employed as an anthelmintic. The ligneous plants of the order are remarkable for the extreme hardness of their wood. All the Guaiacums are well known for their exciting properties; the bark and wood of Guaiacum sanctum and officinale have a somewhat bitter and acrid flavour, and are principally employed as sudorifics, diaphoretics, or alteratives; they contain a particular matter often designated as resin or gum-resin, but which is now considered a distinct substance, called Guaiacine. *DC.* Porlieria hygrometrica has similar properties. The wood of Guaiacum officinale, or Lignum vitæ, is remarkable for the direction of its fibres, each layer of which crosses the preceding diagonally; a circumstance first pointed out to me by Professor Voigt.

GENERA.

§ 1. Tribuleæ, A. de J.
Tribulus, L.
Figaræa, Viv.
Ehrenbergia, Mart.
Kallstræmia, Scop.
Biebersteinia, Steph.

§ 2. Zygophylleæ, A. de J.
Peganum, L.
Fagonia, L.
Seezenia, R. Br.
Rœpera, A. de J.
Zygophyllum, L.
Fabago, Tourn.
Larrea, Cav.
Porliera, R. et P.
Guajacum, L.

Trichanthera, Ehr.
Anatropa, Ehr.
Plectrocarpa, Hook.

Melianthus, L.

Order CII. XANTHOXYLACEÆ.

Terebintaceæ, *Juss. Gen.* 368. (1789) *in part.*—Xanthoxyleæ, *Nees and Martius in Nov. Act. Bonn.* 11. (1823); *Adrien de Jussieu Rutacées*, p. 114. (1825).—Pteleaceæ, *Kunth. Ann. des Sc.* 2. 345. (1824).—Terebintaceæ, trib. 6. *DC. Prodr.* 2. 82. (1825).

Essential Character.—*Flowers* unisexual, regular. *Calyx* in 3, or more commonly in 4 or 5 divisions. *Petals* the same number, very rarely none, usually longer than the calyx; *æstivation* generally twisted, convolute. *Stamens* equal to the petals in number, or twice as many, arising from around the base of the stalk of the abortive carpels; in the female flowers wanting or imperfect. *Ovary* made up of the same number of carpels as there are petals, or of a smaller number, either altogether combined, or more or less distinct; *ovules* in each cell 2, collateral, or one above the other, very seldom 4; *styles* more or less combined, according to the degree of cohesion of the carpels. *Fruit* either berried or membranous, sometimes of from 2 to 5 cells, sometimes consisting of several drupes or 2-valved capsules, of which the sarcocarp is fleshy and partly separable from the endocarp. *Seeds* solitary or twin, pendulous, usually smooth and shining, with a testaceous integument; *embryo* lying within fleshy albumen; *radicle* superior; *cotyledons* ovate, flat.—*Trees* or *shrubs*. *Leaves* without stipules, alternate or opposite, either simple, or more commonly abruptly or unequally pinnate, with pellucid dots. *Flowers* axillary or terminal, gray, green, or pink. The various parts bitter or aromatic.

Affinities. This is one of the families which comprehend genera with both distinct and concrete carpels; the latter are often entirely distinct, even in the ovary; but most frequently there is a union, or at least a cohesion, of the styles, by which their tendency to concretion may be recognised. In a few instances the carpels are absolutely solitary. "The place originally assigned, and for a long time preserved, for most of the genera of Xanthoxylaceæ, proves sufficiently how near the affinity is between them and (what used to be called) Terebintaceæ. If, with Brown and Kunth, the latter are divided into several orders, Xanthoxylaceæ will be most immediately allied to Burseraceæ and Connaraceæ, agreeing with the former in the genera with a simple fruit, and with the latter in those with a compound one. Notwithstanding the distance which usually intervenes in classifications between Aurantiaceæ and Terebintaceæ, there are nevertheless many points of resemblance between them; Correa de Serra has pointed out a passage from one to the other through Cookia; Kunth, in new-modelling the genus Amyris, and in considering it the type of a distinct order, suspects its near affinity with Aurantiaceæ; we cannot, therefore, be surprised at the existence also of relations between the latter and Xanthoxylaceæ. A mixture of bitter and aromatic principles, the presence of receptacles of oil that are scattered over every part, which give a pellucid dotted appearance to the leaves, and which cover the rind of the fruit with opaque spaces,—all these characters give the two families a considerable degree of analogy. This has already been indicated by Jussieu in speaking of Toddalia, and in his remarks upon the families of Aurantiaceæ and Terebintaceæ; and it is confirmed by the continual mixture, in all large herbaria, of unexamined plants of Terebintaceæ, Xanthoxylaceæ, and Aurantiaceæ. The fruit of the latter is, however, extremely different; their seeds resembling, as they do, Terebintaceæ, are on that very account at variance with Xanthoxylaceæ, but at the same time establish a further point of affinity between them and some Rutaceous plants which are destitute of albumen. Unisexual flowers, fruit separating into distinct cocci, seeds solitary or twin in these cocci, enclosing a usually smooth and blackish integument, which is even sometimes hollowed out on its inner edge; a fleshy albumen surrounding an embryo the radicle of which is superior, are all points of analogy between Xanthoxylaceæ and Euphorbiaceæ, particularly between those which have in their male flowers from 4 to 8 stamens inserted round the rudiment of a pistil, and in the female flowers cells with 2 suspended, usually collateral, ovules. Finally, several

Xanthoxylaceous plants have in their habit, and especially in their foliage, a marked resemblance to the Ash. The dicœcious flowers of Fraxinus, its ovary, the two cells of which are compressed, having a single style, 2 ovules in the inside, and scales on the outside, and which finally changes into a samara which is 1-celled and 1-seeded by abortion, all establish certain points of contact between Ptelea and Fraxinus." *Ad. de Juss.*

Geography. Most of the species belong to America, especially to the tropical parts; some are found in temperate regions; they are rare in Africa; some exist in the Isles of France and Madagascar, many are natives of India and China, and 1 is found in New Holland.

Properties. Nearly all aromatic and pungent. The Fagaras are popularly called Peppers in the countries where they are found. Xanthoxylum Clava and fraxineum are powerful sudorifics and diaphoretics; they are remarkable, according to Barton, for their extraordinary power in exciting salivation, whether applied immediately to the gums or taken internally: these two plants are reputed to have been used successfully in paralysis of the muscles of the mouth and in rheumatic affections. Xanthoxylum caribæum is held to be a febrifuge. *DC.* A plant called *Coentrilho* in Brazil (Xanthoxylum hiemale) is employed as a remedy for pain in the ear, for which purpose the powder of its bark is made use of. Its wood is very hard, and valuable for building. *Pl. Usuelles*, 37. The fruit of Ptelea has a strong, bitter, aromatic taste, and is said to have been used with some success as a substitute for hops. *DC.* The bark of a species of Brucea is stated by Horsfield to be of a bitter nature, and to possess properties similar to those of Quassia Simarouba. *Ainslie*, 2. 105. The green parts of Br. sumatrana are intensely bitter. *Roxb.* The Brucea antidysenterica contains a poisonous principle called Brucia, which is similar in its effects to Strychnia, but 12 or 16 times less energetic than that alkali. *Turner*, 652. In Japan the capsules of X. piperitum are employed as a substitute for pepper; in India various species have a like use. The capsules and seeds of X. hostile, called *tej-bul* by the natives, are employed in northern India for intoxicating fish; they are also given as the *Faghureh* of Avicenna. X. piperitum and Avicennæ are used in China and Japan as an antidote against all poisons; they would, undoubtedly, in many cases be of considerable use as a stimulant remedy. The bark of the root of Toddalia aculeata is said to be employed as a cure for the remittent fevers caught in the jungles of the Indian Hills. *Royle's Illustr.* 157.

GENERA.

Dictyoloma, A. de J.
Pitavia, Molin.
Galvezia, R. et P.
Brucea, Mill.
Gonus, Lour.?
Brunellia, R. et P.
Xanthoxylum, L.
Fagara, L.
Pterota, Adans.
Ochroxylum, Schreb.
Kampmannia, Rafin.
Langsdorfia, Leand.
Pohlana, Nees.
Aubertia, Bory.
Blackburnia, Forst.
Labordia, Gaudich.
Boymia, A. de J.
Lacuris, Wall.
Toddalia, Juss.
Crantzia, Schreb.
Scopolia, Sm.
Vepris, Commers.
Asteropus, Spr.
Ptelea, L.
Bellucia, Adans.
Ailanthus, Desf.
Eurycoma, Jack.

Alliance II. *GERANIALES.*

Essential Character.—*Styles* distinct, at least near the point. *Carpels* combined in the ovary. *Leaves* never dotted. *Stamens* very often monadelphous. *Flowers* never unisexual.

In the opinion of Auguste de St. Hilaire all the orders forming this alli-

ance, ought to be considered as one (*Fl. Bras. Mer.* 1. 95.), and he would even add Linaceæ; but that assemblage of plants has not a gynobasic structure. It, however, seems to connect the Gynobaseous with the Syncarpous group, and to point out the relation between Silenaceæ, Geraniaceæ, and Malvaceæ. To the latter order, indeed, Geraniaceæ approach very nearly even in the stipulation of the leaves and the general appearance of the species. The analogy of this same natural order and Violales points out the passage to the Parietous group. For many valuable observations upon the mutual connection between the orders of this alliance see *Röper de floribus et affinitatibus Balsaminearum.* Basileæ, 1830, 8vo.

Order CIII. GERANIACEÆ. The Geranium Tribe.

Gerania, *Juss. Gen.* 268. (1789).—Geraniaceæ, *DC. Fl. Fr.* 4. 828. (1805); *Prodr.* 1. 637. (1824); *Lindl. Synops.* 56. (1829).

Essential Character.—*Sepals* 5, persistent, ribbed, more or less unequal, with an imbricated æstivation; 1 sometimes saccate or spurred at the base. *Petals* 5, seldom 4 in consequence of 1 being abortive, unguiculate, equal or unequal, either hypogynous or perigynous. *Stamens* usually monadelphous, hypogynous, twice or thrice as many as the petals; some occasionally abortive. *Ovary* composed of 5 pieces placed round an elevated axis, each 1-celled, 1-seeded; *styles* 5, cohering round the elongated axis. *Fruit* formed of 5 pieces, cohering round a lengthened indurated axis; each piece consisting of 1 cell, containing 1 seed, having a membranous pericarp, and terminated by an indurated style, which finally curls back from the base upwards carrying the pericarp along with it. *Seeds* solitary, pendulous, or ascending, without albumen. *Embryo* curved; *radicle* pointing to the base of the cell; *cotyledons* foliaceous, convolute, and plaited.—*Herbaceous plants* or *shrubs*. *Stems* tumid, and separable at the joints. *Leaves* either opposite or alternate; in the latter case opposite the peduncles; often stipulate.

Anomalies. Petals none in Rhynchotheca, which also has albumen.

Affinities. In many points nearly related to Oxalidaceæ, Balsaminaceæ, and Tropæoleæ, with which they are by some botanists associated. They are, however, distinguished by the peculiar dehiscence of the fruit, their stems with tumid joints, their convolute plaited cotyledons, and habit. Their analogy with Vitaceæ is pointed out in speaking of that order. In many respects they border close upon Malvaceæ, agreeing with that order in their lobed stipulate leaves, monadelphous stamens, and convolute embryo. The genus Rhynchotheca, which is remarkable for having a flat embryo in the axis of albumen is regarded by Aug. de St. Hilaire as a proof of the identity of this order and Oxalidaceæ. The beaked fruit, however, of Geraniaceæ, and the very general presence of stipules, sufficiently divide that order from the remainder of its alliance. The suspended position of the seed has been given as a general character of Geraniaceæ; but the position of the ovules varies according to species in the genera Erodium and Geranium; and in consequence of the inequality of growth the seed is always ascending in the capsule. *Aug. de St. H., Fl. Bras.* 1. 104.

Geography. Very unequally distributed over various parts of the world. A great proportion is found in the Cape of Good Hope, chiefly of the genus Pelargonium; Erodium and Geranium are principally natives of Europe, North America, and Northern Asia, and Rhynchotheca of South America. It is remarkable that Pelargonium is found in New Holland.

Properties. An astringent principle and an aromatic or resinous flavour are the characteristics of this order. The stem of Geranium spinosum burns like a torch, and gives out an agreeable odour. The root of Geranium maculatum is considered a valuable astringent in North America, where it is some-

times called Alum root. *Barton*, 1. 155. In North Wales Geranium Robertianum has acquired celebrity as a remedy for nephritic complaints. *Ibid.* Some of the Pelargoniums are acidulous, but this genus is chiefly known as an object of garden culture, for which its great beauty, and the facility with which the species or supposed species intermix, render it well adapted.

GENERA.

Sarcocaulon, DC.Eckl.	*Polyactium*, DC.Eck.	*Peristera*, DC. Eckl.	*Cortusina*, DC. Eckl.
Monsonia, Linn.	*Dimacria*, Sweet.	*Phymatanthus*, Swt.	*Isopetalum*, Eckl.
Geranium, L.	*Ligularia*, Sweet.	*Campylia*, Sweet.	*Eumorpha*, Eckl.
Erodium, L'Herit.	*Otidia*, Sweet.	*Dibrachia*, Sweet.	*Calliopsis*, Sweet.
Scolopacium, Eckl.	*Myrrhidium*,	*Jenkinsonia*, Sweet.	Halgania, Gaud.
Hoarea, Sweet.	DC. Eckl.	*Chorisma*, Sweet.	? Euryanthe, Schlecht.
Pelargonium, L'Herit.		*Ciconium*, Sweet.	Rhynchotheca, R.et P.

Order CIV. BALSAMINACEÆ. The Balsam Tribe.

Balsamineæ, *Ach. Rich. Dict. Class.* 2. 173. (1822); *DC. Prodr.* 1. 685. (1824); *Lindl. Synops.* 59. (1829); *Röper de Floribus et Affinitatibus Balsaminearum.* (1830); *Wight and Arnott, Prodr. Fl. Ind. Penins.* 1. 134. (1834).—Hydrocereæ, *Blume Bijdr.* 241. (1825); *Ed. Prior, No.* 125. (1830).

Essential Character.—*Sepals* 5, or by abortion 3, irregular, deciduous, with an imbricated æstivation; the *two exterior* opposite, lateral, somewhat unsymmetrical, with a valvate æstivation, but giving way for the projection of the spur of the odd sepal; the *odd sepal* spurred, symmetrical, with an equitant æstivation in the bud, looking towards the axis of the axillary racemose or umbellate inflorescence, containing honey; the *two inner sepals* very small, sometimes scale-shaped, sometimes unsymmetrical, larger, orbicular, always coloured, appearing at the side of the flower, which is opposite to the spurred sepal, and at the base of the odd petal; (usually altogether abortive in Balsamina). *Petals* either distinct or a little adhering, 5, combined into 3, irregular, deciduous, alternate with the sepals; the *odd petal* regular, placed between the inner scalelike sepals, in front of the bract, wrapping up a great part of the remainder of the flower in æstivation; the *four remaining petals* unsymmetrical, united more or less on each side of the flower in pairs; their two larger lobes next the spur, their two smaller next the odd petal; æstivation convolute. *Stamens* 5, symmetrical, alternate with the petals; those alternate with the odd petal longer than the others. *Carpels* 5, alternate with the stamens consolidated into a 5-celled ovary. (*Röper* abridged). *Stigma* sessile, more or less divided in 5; *cells* 5, two-, or many-seeded. *Fruit* capsular, with 5 elastic valves, and 5 cells formed by membranous projections of the placenta, which occupies the axis of the fruit, and is connected with the apex by 5 slender threads; sometimes succulent and indehiscent. *Seeds* solitary, or numerous, suspended; *albumen* none; *embryo* straight, with a superior *radicle* and plano-convex *cotyledons.*—Succulent *herbaceous* plants. *Leaves* simple, opposite or alternate, without stipules. *Peduncles* axillary.

Affinities. So nearly related to Geraniaceæ, that this order is, in the opinion of some botanists, a mere section of it. It is, however, distinguishable by its gynobase not being lengthened into a beak, by its straight embryo, and exstipulate leaves, and also by the absence of that aromatic resinous secretion which is so highly developed in some Geraniaceæ. Tropæoleæ and Hydrocereæ, formerly separated from Balsaminaceæ, appear to be in reality mere forms of that order; the first, however, having flowers with a regular type of structure may still deserve a place as a sub-order.

The anomalous structure of the genera Impatiens and Balsamina has given rise to some ingenious speculation, of which a full detail will be found in Röper's work above quoted; the idea of this ingenious botanist is adopted in the present edition. Kunth takes a different view of the subject; the following is the substance of his remarks.

Linnæus attributed to the Impatiens Balsamina a calyx of 2 leaves, 5 unequal petals, a nectary, a single ovary, a sessile stigma, and a unilocular polyspermous capsule, opening in 5 valves. M. de Jussieu describes it nearly in the same way, with the exception of considering the capsule as having 5 cells, and the corolla as consisting of 4 petals, the lower of which is spurred. These erroneous characters have been reproduced by most authors. Dr. Hooker alone refers the part which has the spur to the calyx, which he consequently makes to consist of 3 pieces. M. Achille Richard has come nearest the truth in the *Dictionnaire Classique*, where he describes the calyx as consisting of 4 pieces, and the 4 petals united in pairs. The fact is, that the structure is usually this: the centre of the flower is occupied by an ovarium, surmounted by a stigma divided into 5 acute lobes. Around this stand 5 hypogynous stamens, placed in a single row and at equal distances from each other. Hence the normal number of the parts of the flower should be 5. The corolla, however, consists of 2 bifid petals placed right and left, with a wider space between their upper than their lower edges. Upon comparing the position of these with the stamens, it appears that each occupies the place of 3 stamens, whence it is impossible to doubt that they each consist of 2 soldered together. On the other hand, the space between them, which answers to 2 stamens, is an equal proof of the abortion of a fifth petal. And this view of the structure is confirmed by the sepals. Thus on the outside of each pair of petals, at their base, is found a leaflet, the situation of which is opposite a stamen; and opposite the space left by the abortion of the fifth petal is a large broad leaflet, made up by the union of 2 sepals. The position of the fifth sepal, which is that which is spurred, is between 2 petals and opposite a stamen.

Geography. Natives of damp places among bushes in the East Indies; 1 is found in Madagascar, 1 in Europe, 2 in North America, and 1 in Russia in Asia.

Properties. Chiefly remarkable for the elastic force with which the valves of the fruit separate at maturity, expelling the seeds. For a supposed explanation of this phenomenon, see Dutrochet, *Nouvelles Recherches sur l'Exosmose et Endosmose*. According to De Candolle, the species are diuretic.

GENERA.

Balsamina, Riv.	Hydrocera, Bl.
Impatiens, L.	*Tytonia*, G. Don.

Sub-Order. TROPÆOLEÆ. The Nasturtium Tribe.

Tropæoleæ, *Juss. Mem. Mus.* 3. 447. (1817); *DC. Prodr.* 1. 683. (1824).

Essential Character.—*Sepals* 5, the upper one with a long distinct spur; *æstivation* quincuncial. *Petals* 5, unequal, irregular, the 2 upper sessile and remote, arising from the throat of the calyx, the 3 lower stalked and smaller, sometimes abortive. *Stamens* 8, perigynous distinct; *anthers* innate, erect, 2-celled. *Ovary* 1, 3-cornered, made up of 3 carpels; *style* 1; *stigmas* 3, acute; *ovules* solitary, pendulous. *Fruit* indehiscent, separable into 3 pieces from a common axis. *Seeds* large, without albumen, filling the cavity in which they lie; *embryo* large; *cotyledons* 2, straight, thick, consolidated together into a single body; *radicle* lying within projections of the cotyledons.—Smooth *herbaceous* plants, of tender texture and with an acrid taste, trailing or twining. *Leaves* alternate, without stipules, petiolate, with radiating ribs. *Peduncles* axillary, 1-flowered.

Anomalies. Magallana has winged fruit, 1-celled and 1-seeded by abortion. In Chymocarpus the calyx is valvular, and the petals only 2.

Affinities. Very near Geraniaceæ, with which they agree even in their spur (which in Pelargonium is often present, but adnate to the pedicel). From

true Balsaminaceæ they are known by their more regular flowers, and by their fruit not having a bony lining to the cells when it is succulent. Don thinks the order allied to Capparidaceæ!

Geography. All natives of South America, mostly upon high land.

Properties. The fleshy fruit of Tropæolum majus is acrid, and possesses the properties of Cress; and De Candolle remarks, that the caterpillar of the Cabbage butterfly feeds exclusively upon Cruciferæ and Tropæolum, The root of Tr. tuberosum is eaten in Peru. Chymocarpus is used in Brazil as an antiscorbutic, under the Portuguese name of *Chagas da Miuda*. *Pl. Usuelles*, 41.

GENERA.

Tropæolum, L.
Magallana, Cav.
Chymocarpus, Don.

Order CV. OXALIDACEÆ. The Woodsorrel Tribe.

Oxalideæ, *DC. Prodr.* 1. 689. (1824); *Lindl. Synops.* 59. (1829).

Essential Character.—*Sepals* 5, sometimes slightly cohering at the base, persistent, equal. *Petals* 5, hypogynous, equal, unguiculate, with a spirally-twisted æstivation. *Stamens* 10, usually more or less monadelphous, those opposite the petals forming an inner series, and longer than the others; *anthers* 2-celled, innate. *Ovary* with 5 angles and 5 cells; *styles* 5, filiform; *stigmas* capitate or somewhat bifid. *Fruit* capsular, membranous, with 5 cells, and from 5 to 10 valves. *Seeds* few, fixed to the axis, enclosed within a fleshy integument, which curls back at the maturity of the fruit, and expels the seeds with elasticity. *Albumen* between cartilaginous and fleshy. *Embryo* the length of the albumen, with a long radicle pointing to the hilum, and foliaceous cotyledons.—*Herbaceous plants, undershrubs*, or *trees*. *Leaves* alternate, compound, sometimes simple by abortion, very seldom opposite or somewhat whorled.

Affinities. Formerly included in Geraniaceæ, from which, in the judgment of many, the order is not sufficiently distinct. According to De Candolle it is rather allied to Zygophyllaceæ; an opinion which their compound leaves appear to confirm. Averrhoa differs from the rest in its arborescent habit. The species are generally described with an aril; but, according to Auguste de St. Hilaire, the part so called is nothing but the outer integument of the seed. *Pl. Us.* 43.

Geography. Natives of all the hotter and temperate parts of the world, most abundantly known in America and the Cape of Good Hope, and most rarely in the East Indies and equinoctial Africa.

Properties. Averrhoa Bilimbi and the pinnated Oxalis called Biophytum have sensitive leaves. Their foliage is generally acid, so that they are fit to supply the place of sorrel. Some of the species are astringent, and have been employed in spitting of blood. Oxalis acetosella contains pure oxalic acid. *Turner*, 623. Several species of Oxalis are used in Brazil against malignant fevers. *Pl. Usuelles*, 43. The fruit of Averrhoa is intensely acid. A species of Oxalis (crenata) found in Columbia bears tubers like a potato, and is one of the plants called Arracacha: the tubers are insipid, and not worth cultivation; for which, however, they have been recommended of late years; the stalks of this species are intensely acid, and make an excellent preserve.

GENERA.

Averrhoa, L.
Biophytum, DC.
Oxalis, L.
Ledocarpum, Desf.
Balbisia, Cav.
Cruckshanksia, Hook.

Alliance III. *CORIALES.*

Essential Character.—*Styles* and *stigmas* perfectly distinct, with a somewhat lateral origin: *Carpels* quite distinct.

These may be regarded as Rutales with the separation of the carpels, which in that alliance is only imperfectly effected, completed.

Order CVI. CORIARIACEÆ.

Coriarieæ, *DC. Prodr.* 1. 739. (1824.)

Essential Character.—*Flowers* either hermaphrodite, or monœcious, or diœcious. *Calyx* campanulate, 5-parted, ovate. *Petals* 5, alternate with the lobes of the calyx, and smaller than they are, fleshy, with an elevated keel in the inside. *Stamens* 10, arising from the torus, 5 between the lobes of the calyx and the angles of the ovary, 5 between the petals and the furrows of the ovary; *filaments* filiform; *anthers* oblong, 2-celled. *Ovary* seated on a thickish gynobase, 5-celled, 5-angled; *style* 0; *stigmas* 5, long, subulate; *ovules* solitary, pendulous, or ascending. *Carpels* 5, when ripe close together but separate, indehiscent, 1-seeded, sometimes surrounded with glandular lobes. *Seed* pendulous or ascending; *albumen* none; *embryo* straight; *cotyledons* 2, fleshy.—*Shrubs*, with opposite branches, often 3 on each side, 2 of them being secondary to an intermediate principal one. *Leaves* opposite or alternate, simple, entire. *Buds* scaly. *Racemes* terminal, and axillary.

Affinities. Placed by De Candolle immediately after Ochnaceæ, with which the order no doubt agrees in having its ovaries distinct, and surrounding a fleshy axis; but the stigmas in Coriariaceæ are long, linear, and distinct, with no style, while Ochnaceæ have a single style connecting the carpels and minute stigmas; the former, therefore, are apocarpous, the latter syncarpous. Coriariaceæ are also certainly allied to Rutaceæ, but they differ from them as they do from Ochnaceæ; and besides, the carpels are in Rutaceæ connate. With Connaraceæ they agree in several points, while they are different in others. Upon the whole, their exact affinity may be considered unsettled. If Ercilla belongs here, the position of the leaves and the ovules will be of no importance, for in both those respects the two genera differ.

De Candolle understands Coriaria as apetalous, but I do not see upon what principle, either of structure or analogy. In his *Essai sur les Propriétés Médicales* he referred it to the vicinity of Rhamnaceæ, p. 350. Jussieu referred it to Malpighiaceæ.

Geography. Chile and Peru, the south of Europe, north of Africa, New Zealand, and Mexico.

Properties. Coriaria myrtifolia is used by dyers for staining black. Its fruit is poisonous. It is said that several soldiers of the French army in Catalonia were affected by eating it; 15 became stupified, and 3 died. *DC.* Its leaves have been used to adulterate Senna, and have produced fatal consequences. *Fée.* The fruit of Coriaria napalensis is frequently eaten in the north of India without inconvenience. *Royle.*

GENERA.

Coriaria, L.
Ercilla, Ad. de J.
Bridgesia, Hooker.

Order CVII. SURIANACEÆ.

Essential Character.— *Calyx* 5-parted, slightly imbricated. *Petals* the like number, equal, shortly clawed. *Stamens* indefinite, hypogynous, placed in a single row; *filaments* subulate; *anthers* roundish, incumbent, bursting internally by 2 longitudinal fissures. *Carpels* 5, distinct, attached to a very short gynobase, 1-celled with 2 ascending collateral ovules; *styles* rising from near the base of the carpels; *stigmas* simple. *Pericarp* woody. *Seed* solitary, erect, compressed. *Embryo* annular, without albumen, terete, with the *cotyledons* about the same length as the radicle which is turned to the hilum.—*Woody plants*. *Leaves* alternate, without stipules. *Hairs* capitate, jointed. *Flowers* racemose.

Affinities. I have intentionally constructed the foregoing character upon Suriana alone. If Heterodendron and Cneorum really belong to the same order, as De Candolle (*Prodr.* 2. 91) suggests, the number of parts in the flower will vary from 3 to 5, the ovules will be sometimes pendulous (as in Cneorum) and petals will occasionally be absent (as in Heterodendron). Suriana itself appears, meanwhile, to be very near Coriariaceæ, and also Geraniaceæ, as Kunth has remarked. Its relation either to Rosaceæ, or any Terebintaceæ, is not obvious.

Geography. Found in all the warmer parts of the world; South America, India, New Holland, New Caledonia, the South of Europe, and the Canaries.

Properties. Unknown.

GENERA.

Suriana.
? Heterodendron, Desf.
? Cneorum, L.

Alliance IV. *FLÖRKEALES.*

Essential Character.—*Herbs*. A simple *style*. *Fruit* divided into deep lobes. *Gynobase* never fleshy. *Stamens* perigynous.

Order CVIII. LIMNANTHACEÆ.

Limnantheæ, *R. Br. in Lond. and Edinb. Philosoph. Mag. July* 1833; *Lindley Bot. Reg. t.* 1673. (1834); *Nixus Plantarum, p.* 11. (1833); *Martius Conspectus, No.* 272. (1835).

Essential Character.—*Calyx* 3-5- parted, persistent, valvate in æstivation. *Petals* 3-5, regular, convolute in æstivation. *Stamens* twice the number of the petals, either equal in length, or those opposite the petals shortest, perigynous; the *filaments* opposite the sepals at least having a projection on the outside at their base. A thin perigynous *disk*. *Ovary* consisting of as many distinct carpels as sepals, opposite to which they are placed; *carpels* firmly combined by a single solid *style*, with 3-5 simple *stigmas*. *Nuts* 3-5, berried, one-seeded. *Seed* erect; *embryo* large amygdaloid, without albumen, the radicle next the hilum.—Soft *herbaceous plants*. *Leaves* divided, hairless, without stipules. *Flowers* axillary.

Affinities. The gynobasic structure, the deeply-lobed ovary, the solid style, the regular flowers, bring this little order near Rutaceæ, from which it differs in its soft texture, its dotless leaves, its indehiscent, somewhat berried, fruit, &c. It also approaches Geraniaceæ in its one-seeded carpels and regular flowers, but the valvate æstivation of its calyx, &c. remove it from them. It is probably with Tropæoleæ that the affinity is greatest; with that sub-order

Limnanthaceæ agree in the number of the parts of the flower, the deeply-lobed ovary, the single style, the number of the lobes of the fruit, and the texture of the pericarp; and Limnanthes has, moreover, exactly the taste of Tropæolum majus. Under these circumstances I am almost doubtful whether the order ought not to enter the Geranial alliance; but then its stamens placed at the edge of a thin perigynous disk, and the little projection at the base of the filaments, seem to point to a different type of structure. The disk led me formerly to consider one of the two genera (Flörkea), of which the order consists, allied to Sanguisorbeæ; and I have no doubt, in fact, that it is one of the transitions from the Gynobaseous to the Apocarpous group.

GEOGRAPHY. Natives of the temperate parts of North America.

PROPERTIES. Limnanthes is pungent.

GENERA.

Limnanthes, R. Br.
Flörkea, W.

GROUP VII. Apocarpogæ.

ESSENTIAL CHARACTER.—*Carpels* distinct either wholly, or at least by their upper ends and styles. *Ovary* without parietal placentæ, or a gynobase. *Calyx* not in a broken whorl. No epigynous disk.

No difficulty need occur in recognizing the orders of this group if the foregoing character be attentively considered. It joins the last group by Flörkeales, Magnoliaceæ, in the albuminous group, by Calycanthaceæ, and Ranunculaceæ by Rosaceæ, and Burseraceæ and Spondiaceæ, in Syncarposæ, by Balsamales. Its principal anomalies consist in apetalous genera and species.

ALLIANCE I. *ROSALES.*

ESSENTIAL CHARACTER.—*Albumen* wholly absent.

Perhaps there is no positive character which can divide this from the other alliances, for even the want of albumen is liable to exception, as in Leguminosæ. The alliance is, however, known practically as follows:—it never has two diverging carpels, as Saxales; nor a succulent texture, as Crassales; nor balsamic juice, as Balsamales. So that its characters are negative rather than positive. Sanguisorbeæ are a degenerate form of Rosaceæ, connecting them with Incompletæ.

ORDER CIX. ROSACEÆ. THE ROSE TRIBE.

ROSACEÆ, *Juss. Gen.* 334. *in part* (1789); *DC. Prodr.* 2. 525. *in part* (1825); *DC. and Duby Botan. Gall. in part* (1828); *Lindl. Synops.* p. 88. (1829).

ESSENTIAL CHARACTER.—*Calyx* 4- or 5-lobed, with a disk either lining the tube or surrounding the orifice; the fifth lobe next the axis. *Petals* 5, perigynous, equal. *Stamens* indefinite, arising from the calyx, just within the petals, in æstivation curved inwards; *anthers* innate, 2-celled, bursting longitudinally. *Ovaries* superior, either solitary or several, 1-celled, sometimes cohering into a plurilocular pistil; *ovules* 2, or more, suspended, very

rarely erect; *styles* lateral; *stigmas* usually simple, and emarginate on one side. *Fruit* either 1-seeded nuts, or acini, or follicles containing several seeds. *Seeds* suspended, rarely ascending. *Embryo* straight, with a taper short radicle pointing to the hilum, and flat cotyledons. *Albumen* usually almost obliterated when the seeds are ripe; if present, fleshy.—*Herbaceous* plants or *shrubs*. *Leaves* simple or compound, alternate, usually with 2 stipules at their base.

Anomalies. Stipules absent in Lowea. Albumen present in Neillia, according to Don.

Affinities. The genera of this order naturally divide into four principal groups, distinguished from each other by their structure, and in some measure by their sensible properties. Rosaceæ proper have distinct carpels, which do not adhere to the calyx, and are simply astringents; Pomeæ differ in having the carpels adherent to a succulent calyx: they are astringents and tonics; Amygdaleæ have solitary carpels becoming drupes, gum in their bark, and hydrocyanic acid in their leaves; Sanguisorbeæ are apetalous, with a much reduced calyx, whose tube is hardened. Neuradeæ are undoubtedly plants improperly referred here.

Rosaceæ proper are distinguished from Pomeæ by their superior fruit and usually suspended seeds; from Leguminosæ by their regular petals and stamens, and especially by the odd segment of the 5-lobed calyx of that order being anterior, not posterior; from Chrysobalanaceæ by their styles proceeding from the side of the ovary near the apex, and not from the base, by their regular petals and stamens, and by their fruit not being a drupe. Related in many points to Saxifragaceæ, which have albumen and two diverging carpels.

Geography. Natives chiefly of the temperate or cold climates of the northern hemisphere; a very few are found on high land within the tropics, and an inconsiderable number in the southern hemisphere. Only one species is found in the West Indies, viz. Rubus jamaicensis; thirteen are natives of high land in the East Indies, within the tropics, viz. Potentilla Leschenaultiana, and twelve species of Rubus; the South American species chiefly consist of a few kinds of Rubus; at the Cape of Good Hope the order is unknown.

Properties. No Rosaceous plants are unwholesome; they are chiefly remarkable for the presence of an astringent principle, which has caused some of them to be reckoned febrifuges. The root of Tormentilla is used for tanning in the Feroe Isles. *DC.* Potentilla anserina has been used by tanners; P. reptans as a febrifuge. *Ibid.* Geum urbanum and rivale have been compared, for efficacy, to Cinchona. *Ibid.* The fruits of many species of Fragaria (Strawberry) and Rubus (Raspberry and Blackberry) are valuable articles of the dessert. The leaves of Rubus arcticus and Rosa rubiginosa have been employed as substitutes for Tea. *Ibid.* The roots of Gillenia trifoliata and stipulacea are emetic, and perhaps tonic. *Barton*, 1. 69. They are used in the United States as Ipecacuanha. *DC.* The root of Spiræa ulmaria has been used as a tonic. *A. R.* Agrimonia eupatoria yields a decoction useful as a gargle. *Ibid.* The root of Rubus villosus is a popular astringent medicine in North America. Two or three tea-spoonsful of the decoction, administered three or four times a-day, has been found useful in cholera infantum. *Barton*, 2. 157. One of the most powerful anthelmintics in the world belongs to this family. It is an Abyssinian plant, known to botanists by the name of Brayera anthelmintica. Upon the authority of Brayer, after whom it is named, two or three doses of the infusion are sufficient to cure the most obstinate case of tænia. See *Brayer's Notice upon the subject.* The various species of Rosa form some of the greatest beauties of the garden. The fruit of R. canina and other allied species is astringent, and employed in medicine against chronic diarrhœa and other maladies. The petals of R. damascena yield a highly fragrant essential oil, called Attar of Roses; those of

R. gallica are astringent when dried with rapidity, and are sometimes found useful in cases of debility, such as leucorrhœa, diarrhœa, &c. *A. R.*

GENERA.

§ 1. Roseæ, DC.
Rosa, L.
Rhodophora, Neck.
Lowea, Lindl.
§ 2. Potentilleæ, DC.
Dryadeæ, Vent.
Fragariaceæ, Rich.
Rubus, L.
Cylactis, Rafin.
Dalibarda, L.
Fragaria, L.
Duchesnea, Sm.
Comarum, L.
Horkelia, Schlecht.
Potentilla, L.
Bootia, Big.
Tormentilla, L.
Trichothalamus, Leh.
Chamærhodos, Bge.
Sibbaldia, L.
Dryas, L.
Cowania, Don.
Geum, L.
Sieversia, Willd.
Adamsia, Fisch.
Laxmannia, Fisch.
Waldsteinia, Willd.
Comaropsis, Rich.
Agrimonia, L.
Aremonia, Neck.
Amonia, Nestl.
Spallanzania, Poll.
Brayera, Kunth.
§ 3. Spirææ, Juss.
Ulmariæ, Vent.
Neillieæ, Arnott.
Purshia, DC.
Tigarea, Pursh.
Kunzia, Spreng.
Kerria, DC.
Adenostoma, H. et A.
Spiræa, L.
Physocarpus, Camb.
Ulmaria, Mœnch.
Gillenia, Mœnch.
Icotorus, Raf.
Schizonotus, Lindl. (17)
Lutkea, Bong.
Eriogynia, Hook.
Lindleya, H. B. K.
Rhinanthera, Bl.
Neillia, Don.
§ 4. Quillaiæ, Don.
Quillaija, Juss.
Smegmadermos, R. et P.
Smegmaria, W.
Kageneckia, R. et P.
Lydæa, Molin.
Vauquelinia, Corr.

? § 6. Neuradeæ, *DC. Prodr.* 2. 548. (1825); *Martius Conspectus, No.* 314. (1835).—Grieleæ, *Sweet.*

Calyx 5-cleft, with a short tube adhering to the ovary, the lobes somewhat incumbent or valvate in æstivation. *Petals* 5. *Stamens* 10. *Carpels* 10, combined in a 10-celled compressed capsule. *Seeds* solitary, obliquely pendulous.—*Herbaceous* plants, native of sandy plains, suffrutescent at the base, and usually decumbent. *Leaves* with 2 stipules, downy, sinuate-pinnatifid, or bipinnatifid. *Seeds* germinating in the capsule. *DC.*

Neurada, Juss. Grielum, Linn.

Sub-Order. POMEÆ. The Apple Tribe.

Rosaceæ, § Pomaceæ, *Juss. Gen.* 334. (1789); *DC. Prodr.* 2. 626. (1825).—Pomaceæ, *Lindl. in Linn. Trans.* 13. 93. (1821); *Synops.* 103. (1829).

Essential Character.—*Calyx* superior, 5-toothed; the odd segment posterior. *Petals* 5, unguiculate, inserted in the throat of the calyx; the odd one anterior. *Stamens* indefinite, inserted in a ring in the throat of the calyx. *Disk* thin, clothing the sides of the tube of the calyx. *Ovaries* from 1 to 5, adhering more or less to the sides of the calyx and each other; *ovules* usually 2, collateral, ascending, very rarely solitary; *styles* from 1 to 5; *stigmas* simple. *Fruit* a pome, 1- to 5-celled, seldom spuriously 10-celled; the endocarp either cartilaginous, spongy, or bony. *Seeds* ascending, solitary. *Albumen* none; *embryo* erect, with flat *cotyledons*, or convolute ones in Chamæmeles, and a short conical *radicle*.—*Trees* or *shrubs*. *Leaves* alternate, stipulate, simple, or compound. *Flowers* in terminal cymes, white or pink.

Anomalies. In Amelanchier the simple ovaries are spuriously 2-celled. In Cratægus the ovaries are very rarely solitary.

Affinities. Closely allied to Rosaceæ proper, from which they differ in the adhesion of the ovaries with the sides of the calyx, and more or less with each other. The fruit is always a pome; that is, it is made up of a fleshy calyx adhering to fleshy or bony ovaries, containing a definite number of seeds. Pomeæ are peculiarly distinguished by their ovules being in pairs, and side by side; while Rosaceæ, when they have 2 or more ascending ovules, always have them placed one above the other. Cultivated plants of this sub-order are very apt to produce monstrous flowers, which depart sometimes in a most remarkable degree from their normal state. No order can be more instructively studied with a view to morphological inquiries; particularly the common Pear when in blossom. A remarkable permanent monster of this kind, with

14 styles, 14 ovaries, and a calyx with 10 divisions in two rows, is described in the *Revue Encyclopédique*, (43. 762.); it exhibits a tendency, on the part of Pomeæ, to assume the indefinite ovaries and double calyx of Rosaceæ. I have seen a Prunus in a similar state. Amygdaleæ are known by their superior solitary ovary and drupaceous fruit, and by the presence of hydrocyanic acid, which, however, exists in Cotoneaster microphylla, a plant of this sub-order.

Geography. Found plentifully in Europe, Northern Asia, the mountains of India, and North America; rare in Mexico, unknown in Africa, except on its northern shore, and in Madeira, and entirely absent from the southern hemisphere; a solitary species is found in the Sandwich Islands.

Properties. The fruit as an article of food, and the flowers for their beauty, are the chief peculiarities of this order, which consists exclusively of trees and bushes, without any herbaceous plant. The Apple, the Pear, the Medlar, the Quince, the Service, the Rowan Tree or Mountain Ash, are all well known, either for their beauty or their use. The wood of the Pear is almost as hard as Box, for which it is even substituted by wood engravers; the timber of the Beam Tree (Pyrus Aria) is invaluable for axletrees. The bark of Photinia dubia is used in Nipal for dyeing scarlet. *DC. Prodr.* 238. Malic acid is contained, in considerable quantity, in apples; it is also almost the sole acidifying principle of the berries of the Mountain Ash (Pyrus aucuparia). *Turner*, 634.

GENERA.

Cratægus, L.	Cotoneaster, Medic.	Pyrus, L.
Raphiolepis, Lindl.	Amelanchier, Med.	*Sorbus*, L.
Chamæmeles, Lindl.	Mespilus, L.	*Aronia*, Pers.
Photinia, Lindl.	*Mespilophora*, Neck.	Cydonia, Tourn.
Eriobotrya, Lindl.	Osteomeles, Lindl.	*Chænomeles*, Lindl.

Sub-Order. AMYGDALEÆ. The Almond Tribe.

Amygdaleæ, *Juss. Gen.* 340. *a* § *of* Rosaceæ (1789).—Drupaceæ, *DC. Fl. Française*, 4. 479. (1805); *Prodr.* 2. 529. (1825) *a* § *of* Rosaceæ; *Lindl. Synops.* 89. (1829) *a* § *of* Rosaceæ.

Essential Character.—*Calyx* 5-toothed, deciduous, lined with a disk; the fifth lobe next the axis. *Petals* 5, perigynous. *Stamens* 20, or thereabouts, arising from the throat of the calyx, in æstivation curved inwards; *anthers* innate, 2-celled, bursting longitudinally. *Ovary* superior, solitary, simple, 1-celled; *ovules* 2, suspended; *styles* terminal, with a furrow on one side, terminating in a reniform *stigma*. *Fruit* a drupe, with the putamen sometimes separating spontaneously from the sarcocarp. *Seeds* mostly solitary, suspended, in consequence of the cohesion of a funiculus umbilicalis, arising from the base or the cavity of the ovary, with its side. *Embryo* straight, with the radicle pointing to the hilum; *cotyledons* thick; *albumen* none.—*Trees* or *shrubs*. *Leaves* simple, alternate, usually glandular towards the base; *stipules* simple, mostly glandular. *Flowers* white or pink. *Hydrocyanic acid* present in the leaves and kernel.

Affinities. Distinguished from Rosaceæ and Pomeæ by their fruit being a drupe, their bark yielding gum, and by the presence of hydrocyanic acid; from Leguminosæ by the latter character, and also by their regular petals and stamens, and especially by the odd segment of the 5-lobed calyx of that order being inferior, not superior; from Chrysobalanaceæ, by their hydrocyanic acid, terminal styles, and regular petals and stamens. I have seen a monstrous Plum with an indefinite number of ovaries arising irregularly from the tube of the calyx, and therefore exhibiting a tendency, on the part of this sub-order, to assume one of the distinguishing characters of Rosaceæ. It is not a little

remarkable that here, where we have a close approach to the structure of Mimoseæ in Leguminosæ, we have also the only instance among Rosaceæ of an approach to the property possessed by that sub-order of yielding gum in the bark; the peculiar astringency of some species is also analogous to that of Acacia Catechu and the like.

Geography. Natives exclusively of the northern hemisphere, where they are found in cold or temperate climates. One species, Cerasus occidentalis, is a native of the West Indies; a kind of Almond, Amygdalus microphylla, inhabits hot arid plains in Mexico; and another, A. cochinchinensis, is reputed to grow in the woods of Cochinchina.

Properties. The astringent febrifugal properties of Rosaceæ, with which order these are usually combined, are also found in Amygdaleæ; as in the bark of Cerasus virginiana, which is prescribed in the United States, and of the C. capollim of Mexico. They are, however, better known for yielding an abundance of prussic, or hydrocyanic, acid, a deadly principle residing in the leaves and kernel; in consequence of which some of the species are poisonous to cattle which feed upon them: as, for example, the Cerasus capricida, which kills the goats of Nipal; and the C. virginiana, which is known in North America to be dangerous. They all of them, also, yield a gum, analogous to gum tragacanth. Notwithstanding, however, the poisonous principle that is present in them, their fruit is, in many cases, a favourite food; that of the Amygdalus (peach and nectarine), Prunus (plum), and Cerasus (cherry), are among the most delicious with which we are acquainted; the seed of Amygdalus is familiar to us under the name of almonds, and its oil under the name of oil of almonds. The bark of the root of Cerasus capollim is used in Mexico against dysentery. *DC.* The leaves of Prunus spinosa (sloe), and Cerasus avium (wild cherry), have been employed as a substitute for tea. *Ibid.* The former are well known to afford one of the means used in Europe for adulterating the black tea of China. Prunus domestica, or the common plum, yields those fruits sold in the shops under the name of prunes, which are chiefly prepared in France, from the varieties called the St. Catherine and the green-gage; and in Portugal from a sort which derives its name from the village of Guimaraens, where they are principally dried. They contain so large a quantity of sugar, that brandy is distilled from them when fermented; and it has even been proposed to manufacture sugar from them. *A. R.* The kernel of Prunus brigantiaca yields a fixed oil, called *Huile des Marmottes*, which is used instead of olive or almond oil. *Ibid.* The bark of Prunus spinosa is one of the substances that has been reported to resemble Jesuits' bark in its effects. *Ibid.* Prunus cocomilia yields a bark, the febrifugal properties of which are spoken of very highly. According to Tenore, it is a specific for the cure of the dangerous intermittent fevers of Calabria, where it grows. A variety of Cerasus avium is used, in the Vosges and the Black Forest, for the preparation of the liqueur known under the name of Kirschenwasser. The flowers of Amygdalus persica (peach) are gently laxative, and are used advantageously for children. The kernel of Cerasus occidentalis is used for flavouring the liqueur Noyau.

GENERA.

Prunus, L.	Armeniaca, Tourn.	*Amygdalophora*, Neck.	? Pygeum, Colebr.
Cerasus, Juss.	Amygdalus, L.		Polydontia, Bl.
Cerasophora, Neck.	*Persica*, Tourn.	*Trichocarpus*, Neck.	

Sub-Order. SANGUISORBEÆ. The Burnet Tribe.

Rosaceæ, § Sanguisorbeæ, *Juss. Gen.* 336. (1789); *DC. Prodr.* 2. 588. (1828); *Lindl. Synops.* 102. (1829); *Martius Conspectus, No.* 215. (1835).—Cliffortiaceæ, *Id. No.* 216.

Essential Character.—*Flowers* often unisexual. *Calyx* with a thickened tube and a 3- 4- or 5-lobed limb, its tube lined with a disk. *Petals* none. *Stamens* definite, sometimes fewer than the segments of the calyx, with which they are then alternate, arising from the orifice of the calyx; *anthers* 2-celled, innate, bursting longitudinally, occasionally 1-celled, bursting transversely. *Ovary* solitary, simple, with a style proceeding from the apex or the base; *ovule* solitary, always attached to that part of the ovary which is next the base of the style; *stigma* compound or simple. *Nut* solitary, enclosed in the often indurated tube of the calyx. *Seed* solitary, suspended or ascending; *embryo* without albumen; *radicle* superior or inferior; *cotyledons* large, plano-convex.—*Herbaceous* plants or *undershrubs*, occasionally spiny. *Leaves* simple and lobed, or compound, alternate, with stipules. *Flowers* small, often capitate.

Anomalies. The stipules of Cliffortia cohere with the leaves. Alchemilla arvensis has simple 1-celled anthers bursting transversely, and ascending ovules.

Affinities. This sub-order, usually combined with Rosaceæ, appears as if it demanded a distinct station, on account of its constantly apetalous flowers, its indurated calyx, and the reduction of carpels to one only; it is, however, not, as far as I know, distinguishable by any other characters. The presence of petals, a character assigned to Acæna, I have shown, in the *Botanical Register*, to have no existence. Usually the ovule is suspended, the style arising from below the apex of the carpel; but when the style proceeds from the base of the carpel, the ovule is ascending, in all cases adhering to the ovary immediately over against the origin of the style. Various kinds of adhesion between the leaves and the stipules take place in the genus Cliffortia, and have given rise to a number of errors; for an explanation of which, see De Candolle's remarks in the *Annales des Sciences Naturelles*, 1. 447. Von Martius has, I perceive, an order Cliffortiaceæ; but I am unacquainted with the grounds upon which it is cut off from Sanguisorbeæ.

Geography. Natives of heaths, hedges, and exposed places in Europe, North and South America beyond the tropics, and the Cape of Good Hope; in which latter country they represent the Rosaceæ of Europe.

Properties. Their general character is astringency. A decoction of Alchemilla vulgaris is slightly tonic. This is asserted, by Frederick Hoffmann, and others, to have the effect of restoring the faded beauty of ladies to its earliest freshness. Sanguisorba officinalis, or common Burnet, is a useful fodder. *A. R.*

GENERA.

Alchemilla, L.	Polylepis, R. et P.	Sanguisorba, L.	Cliffortia, L.
Aphanes, L.	Acæna, Vahl.	Poterium, L.	*Morilandia*, Neck.
Margyricarpus, R.et P.	*Ancistrum*, Forst.	*Pimpinella*, Adans.	*Nenax*, Gærtn.
			Cercocarpus, H. B. K.

Order CX. LEGUMINOSÆ, or FABACEÆ. } The Bean Tribe.

Leguminosæ, *Juss. Gen.* 345. (1789); *Bronn. Diss.* (1822); *DC. Prodr.* 2. 93. (1825); *Lindl. Synops.* 75. (1829).

Essential Character.—*Calyx* 5-parted, toothed, or cleft, inferior, with the odd seg-

ment anterior; the segments often unequal, and variously combined. *Petals* 5, or by abortion 4, 3, 2, 1, or none, inserted into the base of the calyx, either papilionaceous or regularly spreading; the odd petal posterior. *Stamens* definite or indefinite, perigynous, or hypogynous, either distinct or monadelphous, or diadelphous; very seldom triadelphous; *anthers* versatile. *Ovary* simple, superior, 1-celled, 1- or many-seeded; *style* simple, proceeding from the upper margin; *stigma* simple. *Fruit* either a legume or a drupe. *Seeds* attached to the upper suture, solitary or several, occasionally with an aril; *embryo* destitute of *albumen*, either straight or with the radicle bent upon the cotyledons; *cotyledons* either remaining under ground in germination, or elevated above the ground, and becoming green like leaves.—*Herbaceous* plants, *shrubs*, or vast *trees*, extremely variable in appearance. *Leaves* alternate, most commonly compound; *petiole* tumid at the base. *Stipules* 2 at the base of the petiole, and 2 at the base of each leaflet. *Pedicels* usually articulated, with 2 bractlets under the flower.

Anomalies. The Detariums are apetalous and drupaceous. Ceratonia, and five or six other genera, are also apetalous. Some Mimoseæ are monopetalous; the latter section and Swartzieæ have usually also hypogynous stamens. Diphaca and a species of Cæsalpinia have regularly 2 ovaries. Ormosia has 2 stigmas. *DC.* Sophora, and some others, have no stipules. Some have opposite leaves. Albumen present in Fillæa, *Guill.* Also in Cathartocarpus Fistula.

Affinities. The most common feature is, to have what are called papilionaceous flowers; and when these exist, no difficulty is experienced in recognising this order, for papilionaceous flowers are found no where else. Another and a more invariable character is to have a leguminous fruit; and, by one of these two characters all the plants of the family are known. It is remarkable, however, for the complete obliteration of one or other of these distinctions in many cases. Swartzieæ have the irregularity in the corolla carried so far that not more than 1 or 2 petals remain; Cæsalpinieæ have a less irregular flower, with spreading petals and stamens adhering to the calyx; while Mimoseæ have perfectly regular flowers and indefinite hypogynous stamens. Detarium, instead of a legume, bears a fruit not distinguishable from a drupe. This last circumstance is easily to be understood, if we bear in mind that a legume and a drupe differ more in name than reality, the latter being formed upon precisely the same plan as the former, but with this modification, that its pericarp is thickened, more or less fleshy on the outside and stony on the inside, 1-seeded, and indehiscent. Hence some of the regular-flowered genera with distinct stamens may be said to be Rosaceous in flower, and Leguminous in fruit. Simple, therefore, as the diagnosis of the order usually is, Brown is perfectly correct in asserting that, until he indicated the difference of the position of the odd lobe of the calyx in Leguminosæ and Rosaceæ (Amygdaleæ), no positive character had been discovered to distinguish the one order from the other. The presence of stipules at the base of the leaflets of the compound leaves of Leguminosæ is a character in the vegetation by which they may be known from Rosaceæ. Very few double flowers are known in this order; those of Spartium junceum and Ulex europœus are the most remarkable; the nature of the latter I have described in detail in the *Trans. of the Hort. Soc.* vol. 7. p. 237. Two ovaries are common in Wisteria sinensis; and the same phenomenon is to be seen, according to De Candolle, in Gleditschia: it appears also to be normal in Diphaca and Cæsalpinia digyna. Aug. de St. Hilaire is said (*DC. Mém.* 52.) to have found a Mimosa in Brazil with 5 carpels: on account of these, and other circumstances, De Candolle assumes the carpel of Leguminosæ to be solitary by abortion, and that a whorl of 5 is that which is necessary to complete the symmetry of the flowers. Of the accuracy of this view I am satisfied; but I think it might have been proved as satisfactorily from analogy, without the aid of such instances. In consequence of the highly irritable nature of the leaves of many of the plants of this order, and of the tendency to irritability discoverable in them all, some botanists have placed them at the extremity of their system, in

contact with the limits of the animal kingdom. See *Agardh Classes*, p. 4. and *Martius, H. R. M.* p.176. For observations upon the nature of this irritability, see *Dutrochet sur la Motilité, Paris*, 1824, in which the author endeavours to shew that the motion is the effect of galvanic agency; and the same writer's *Nouvelles Recherches sur l'Exosmose, &c.*, in which he alters the explanation of the manner in which galvanism produces the motion, adhering, however, to his opinion of that subtle principle being the real agent. This ingenious naturalist might have been satisfied with attributing the phenomenon to an inherent vital action, without puzzling himself with a vain search after first causes, which always leaves the most successful inquirer exactly where he set out. For remarks upon the order in general, see De Candolle's valuable Mémoire, published at Paris in 1825-6, in one thick volume 4to. The relation that is borne by this order to Chrysobalanaceæ will be explained under that order. To the tribes formerly included under the name of Terebintaceæ, Leguminosæ are nearly allied in many important circumstances, but are distinguished by their stipules, which nevertheless exist in Canarium among Burseraceæ, and which do not exist in Sophora, a Leguminous genus. With Xanthoxylaceæ they are allied through Ailanthus. The monadelphous stamens, irregular flowers, occasional simple ovary, style, and stigma of Polygalaceæ, are all so many points of affinity with Leguminosæ.

In many respects this order is one of the most important which the botanist can study, but especially as it serves to show how little real importance ought to be attached to dehiscence of fruit in determining the limits of natural orders. What may be called the normal fruit of Leguminosæ is a legume, that is to say, a dry simple ovary, with a suture running along both its margins, so that at maturity it separates through the middle of each suture into two valves; but every conceivable degree of deviation from this type occurs: the Arachis and many more are indehiscent; Detarium is drupaceous; in Carmichælia the valves separate from the suture, which remains entire, like the replum of Cruciferæ; in all lomentaceous genera, such as Ornithopus, the valves are indehiscent in the line of the suture, but separate transversely; in Entada a combination of the peculiarities of Carmichælia and lomentaceæ occurs; and, finally, in Hæmatoxylon the valves adhere by the suture and split along the axis. The divisions which have been proposed in this extensive order are of unequal value; it is possible that two of them, namely, Mimoseæ and Cæsalpinieæ may deserve, as Brown seems to think, the rank of sub-orders; for they really appear to be of the same importance with reference to Papilionaceæ, as Amyridaceæ, Connaraceæ, Anacardiaceæ, and Burseraceæ, with respect to each other. I give them, however, as I find them in De Candolle.

His first and most important division depends upon the form of the embryo, out of which arise the divisions called Curvembriæ and Rectembriæ; viz.—

CURVEMBRIÆ.

Radicle bent back upon the cotyledons.

These are distinguished into two tribes by the structure of their flowers, viz.—

Tribe 1. PAPILIONACEÆ. R. Br.

Calyx with distinct lobes. Stamens perigynous. Corolla papilionaceous.

The germination of this tribe varies thus:—some of the species push their cotyledons above ground, which become green, resembling leaves; and of these none bear seeds which are eaten by man or animals: others germinate with their cotyledons under ground, and it is among these only that all the kinds which bear what we call pulse are found: the former De Candolle calls *Phyl-*

lolobeæ, and they are divided by him into sections, viz. 1. § Sophoreæ, 2 § Loteæ, 3. § Hedysareæ; the latter he designates as *Sarcolobeæ*, which comprehend, 4. § Vicieæ, 5. § Phaseoleæ, 6. § Dalbergieæ.

Tribe 2. SWARTZIEÆ. DC.

Calyx bladdery, with indistinct lobes. Stamens hypogynous. Corolla none, or petals only 1 or 2.

RECTEMBRIÆ.

Radicle of the embryo straight.

The tribes are known by the position of their stamens and the æstivation of their petals.

Tribe 3. CÆSALPINIEÆ. R. Br.

Petals imbricated in æstivation, and stamens perigynous.

Of the genera comprehended in this tribe, those which have petals, and their stamens variously combined, are called § Geoffrieæ; such as have petals, the stamens being distinct, are § Cassieæ; and a couple of genera, with drupaceous fruit and no petals, constitute § Detarieæ.

Tribe 4. MIMOSEÆ. R. Br.

Sepals and petals valvate in æstivation. Stamens hypogynous.

The reader is referred to the 2d volume of De Candolle's *Prodromus* for further information upon these divisions.

GEOGRAPHY. The geographical distribution of this order has been considered with great care by De Candolle, from whom I take the substance of what follows.

One of the first things that strikes the observer is, that if a number of genera of Leguminosæ have as extensive a range as those of other orders, there is a very considerable number of which the geographical limits are clearly defined. Thus the genera of New Holland are in most cases unknown beyond that vast island; the same may be said of North and South America, and the Cape of Good Hope; and there are between 14 and 15 genera unknown beyond the limits of Europe and the neighbouring borders of Asia and Africa. About 92 genera out of 280 are what are called sporadic, or dispersed over different and widely separated regions, such as Tephrosia, Acacia, Glycine, and Sophora. The species are found more or less in every part of the known world, with the exception, perhaps, of the island of Tristan d'Acugna and St. Helena, neither of which do they inhabit; but they are distributed in extremely unequal proportions; in general they diminish sensibly in approaching the pole, especially the Rectembriæ, which are unknown in northern regions. This will be apparent from the following table :—

	Curvembr.	*Rectembr.*
Europe, with the exception of the Mediterranean	184	0
Siberia	128	1
United States	167	16
China, Japan, and Cochinchina	64	13
Levant	247	3
Basin of the Mediterranean	466	2
Canaries	21	0
Arabia and Egypt	78	9
Mexico	90	62
West Indies	134	87
East Indies	330	122
Equinoctial America	246	359
Equinoctial Africa	81	49
New Holland	154	75
Isles of Southern Africa	29	13
South America beyond the tropics	18	11
Cape of Good Hope	334	19
South Sea Islands	11	2

This distribution, if condensed, will give the following results:—

Equinoctial zone	. 910 .	. 692
Beyond the tropics to the north	.1277 .	. 35
——————————— south	. 417 .	. 107

Properties. This order is not only among the most extensive that are known, but also one of the most important to man, with reference to the objects either of ornament, of utility, or of nutriment, which it comprehends. When we reflect that the Cercis, which renders the gardens of Turkey resplendent with its myriads of purple flowers; the Acacia, not less valued for its airy foliage and elegant blossoms than for its hard and durable wood; the Braziletto, Logwood, and Rosewoods of commerce; the Laburnum; the classical Cytisus; the Furze and the Broom, both the pride of the otherwise dreary heaths of Europe; the Bean, the Pea, the Vetch, the Clover, the Trefoil, the Lucerne, all staple articles of culture by the farmer, are so many species of Leguminosæ; and that the Gums Arabic and Senegal, Kino, and various precious medicinal drugs, not to mention Indigo, the most useful of all dyes, are products of other species,—it will be perceived that it would be difficult to point out an order with greater claims upon the attention. It would be in vain to attempt to enumerate all its useful plants or products, in lieu of which I shall speak of the most remarkable, and of those which are least known, and in so doing I shall classify the products according to the tribes already defined.

Tribe 1. Papilionaceæ.

The general character of this Tribe is, *its nutritious, or at least wholesome,* characters; thus the § Trifolieæ, comprehending *Clover, Medick, Lucerne, Trefoil,* &c. are valuable fodder plants, as are also *Saintfoin,* Ornithopus or *Serradilla,* various Astragali, Crotalaria juncea, Desmodium diffusum, Indigofera enneaphylla, &c.——As pulse, we have *Peas, Beans, Lentils, Pigeon peas* (Cajanus), the seeds of various species of Dolichos, Phaseolus, &c.——Of the *nutritious* or *saccharine* qualities of other parts we have several useful instances. The roots of the liquorice (Glycyrrhiza glabra) contain an abundance of a sweet subacrid mucilaginous juice, which is much esteemed as a pectoral; similar qualities are ascribed to Trifolium alpinum roots. The roots of Abrus precatorius possess exactly the properties of the liquorice root of the shops. *Ainslie,* 2. 79. In Java they are found demulcent. Those of Dolichos tuberosus and bulbosus, Apios, Pueraria, and Lathyrus tuberosus, are wholesome food. According to Don (*Prodr.* no. 247.), Manna is produced by several species related to Alhagi Maurorum. It is remarkable that this secretion is not formed in India, Arabia, or Egypt, the climate of Persia and Bokhara seeming alone suited for its production. *Royle.*——The *purgative properties* of Leguminosæ are principally confined to the tribe Cæsalpinieæ. They, however, occur in Colutea arborescens and Coronilla Emerus in the present tribe; as well as certain species of Genista, Cytisus, Robinia, and Clitoria. *Royle.*——*Many are tonics and astringents.* The bark of Sesbania grandiflora is powerfully bitter and tonic. The root of Hedysarum sennoides is accounted in India tonic and stimulant. *Ainslie,* 2. 53. African Kino is the produce of Pterocarpus erinacea, *R. Br.,* Gum Dragon and Saunders wood of Pterocarpus Draco and Santalinus, Gum Lac of Erythrina monosperma. The Dalbergia monetaria of Linnæus yields a resin very similar to Dragon's Blood. *Ainslie,* 1. 115. A similar juice is yielded by Butea frondosa and superba. *DC.* The seed of Psoralea corylifolia is considered by the native practitioners of India stomachic and deobstruent. *Ainslie,* 2. 141. A strong infusion of the root of Mucuna pruriens, sweetened with honey, is used by the native practitioners of India in cases of cholera morbus. *Ainslie,* 1. 93. The irritating effects of the hairs, or Cowhage, that clothe the pods of this plant

are well known. A decoction of the bitter root of Galega purpurea (Tephrosia) is prescribed by the Indian doctors in cases of dyspepsia, lientery, and tympanitis. *Ainslie*, 2. 49. The powdered leaf of Indigofera Anil is used in hepatitis. *Ibid.* 1. 179. The leaves of the Phaseolus trilobus (called *Sem*, or *Simbi*) are considered by Indian practitioners cooling, sedative, antibilious, and tonic, and useful as an application to weak eyes. *Trans. M. and P. Soc. Calc.* 2. 406. The roots and herbage of Baptisia tinctoria have been found to possess antiseptic and sub-astringent properties. They have also a cathartic and emetic effect. *Barton*, 2. 57. This emetic quality is also possessed by others. The root of Clitoria Ternatea is emetic. *Ainslie*, 2. 140; and similar properties will be found to exist among the tribe Mimoseæ.——Others are *diuretics*, as the roots of Beans, Genistas, Ononis, Anthyllis cretica, &c. *DC.* ——*A few produce gum;* Tragacanth is yielded by Astragalus verus and similar spiny species; this is, however, very different from the gum of Mimoseæ.——*Among dyes* are Indigo, produced from various species of Indigofera, especially tinctoria, and Tephrosia Apollinea. The flowers of Butea frondosa and superba yield a beautiful dye, and the roots form strong rope. *Royle.*——*Several afford timber* of excellent quality, especially the Robinia Pseudacacia, or *Locust tree*, which is light, bright yellow, hard, and extremely durable, but brittle; the wood of Laburnum is a light olive green, beautifully grained, and suitable for cabinet-makers' purposes. Pterocarpus dalbergioides, and several species of Dalbergia, are remarkable in India for the excellence of their wood. *Sissoo*, the timber of the Dalbergia of that name, is one of the most valuable of forest-trees.——Occasionally *narcotic properties* have been recognized. The seeds of Lathyrus Aphaca are said to produce intense headach if eaten abundantly: the seeds of the Laburnum are poisonous; they contain a principle called Cytisine. Those of Abrus precatorius, Anagyris fœtida, and others, have a similar property. See an analysis of Cytisus, Anagyris, and Coronilla seeds, in *Mém. Soc. Phys. Genev.* v. 75. The leaves and branches of Tephrosia are used for intoxicating fish; the leaves of Ornithopus scorpioides are capable of being employed as vesicatories. The juice of Coronilla varia is poisonous. The roots of Phaseolus radiatus are narcotic. *Royle.*——Finally, besides these purposes, certain species have been found to be useful in other ways. The volatile oil of Dipterix (or Coumarouma) odorata, or Tonka Bean, has been ascertained to be a peculiar principle called Coumarin. It was mistaken by Vogel for Benzoic acid. *Turner*, 660. It may be found in a crystallised state between the skin and the kernel, and exists abundantly in the flowers of Melilotus officinalis. *Ed. P. J.* 3. 407. It has been found that a peculiar acid, called Carbazotic, is formed by the action of nitric acid upon Indigo. *Turner*, 641. Sulphur exists in combination with different bases in peas and beans. *Ed. P. J.* 14. 172. The leaves of Coronilla picta are highly esteemed among the Hindoos, on account of the virtues they are said to possess in hastening suppuration when applied in the form of a poultice, that is, simply made warm, and moistened with a little castor oil. *Ainslie*, 2. 64.

Tribe 2. Swartzieæ.

Nothing is known of their properties, except that Baphia yields the Kingwood of the cabinet-makers.

Tribe 3. Cæsalpinieæ.

Purgative properties are their great character; otherwise they much resemble Papilionaceæ. Senna is their most remarkable product. The Senna of the shops consists, according to Delile, of Cassia acutifolia, Cassia Senna, and Cynanchum Argel. He says the Cassia lanceolata of Arabia does not yield the Senna of commerce. The active principle of Senna is called Cathartine. It was discovered by Lassaigne and Fenuelle. *Ed. P. J.* 7. 389. Purgative

properties are also found in the pulp within the fruit of Cathartocarpus fistula and Ceratonia siliqua, and also of the Tamarind, the preserved pulp of which is so well known as a delicious confection. Malic acid exists in the Tamarind, mixed with tartaric and citric acids. *Turner*, 634. Cassia marilandica is found in North America a useful substitute for the Alexandrian Senna. *Barton*, 1. 143.——As an instance of *pulse*, in this tribe Ceratonia siliqua may be adduced, which, under the name of the Carob Tree, or Algaroba bean, is consumed in the south of Spain by horses.——Some are reported to produce *powerfully bitter and tonic effects*. Various species of Geoffræa, the bark of Cæsalpinia Bonduccella are of this class. The kernels of Guilandina Bonduccella are very bitter, and are supposed by the native doctors of India to possess powerful tonic virtues. When pounded small and mixed with castor oil, they form a valuable external application in incipient hydrocele. *Ainslie*, 2. 136. The leaves are a valuable discutient, fried with a little castor oil, in cases of hernia humoralis. *Ibid.* The native practitioners in India prescribe the dried buds and young flowers of Bauhinia tomentosa in certain dysenteric affections. *Ibid.* 2. 48. The bark of Bauhinia variegata, and also of Cassia auriculata, are, according to Roxburgh, used by the natives in tanning and dyeing leather, as well as in medicine. *Royle*.——The roots of Guilandina Nuga and Moringa are *diuretic*. *DC*.——*Among dyes* are Logwood, the wood of Hæmatoxylon campeachianum, and the red dye yielded by several Cæsalpinias. The colouring matter of Logwood is a peculiar principle, called Hæmatin. The *bukkum* or sappan wood of India belongs to Cæsalpinia sappan. A deep red is yielded by the chips of Adenanthera pavonina, it is called *rukta-chundun*, or red sandal wood. *Royle*.——Several *afford timber*. The Brazil wood of commerce is obtained from Cæsalpinia Brasiliensis. Some of the Indian species yield good timber; others, as Bauhinia racemosa and parviflora, have bark employed in making rope. An oil is expressed from the seeds of some, as Cæsalpinia oleosperma; others exude a mild gum, like the Mimoseæ, and some other plants, which have at the same time an astringent bark. A brownish coloured gum is said, by Roxburgh, to be afforded by his Bauhinia retusa; it is also collected from B. emarginata, in the Deyra Doon, and called *sem-ke-gond*. *Royle*. The resin *animi* is procured from Hymenæa Courbaril; the Copal of Mexico is supposed to be the produce of some plant allied to this. A fragrant resinous principle is exuded by Aloexylum Agallochum. *Id.* p. 185.

Tribe 4. Mimoseæ.

Astringency in the bark, and the production of a sort of gum in the same part, is the great characteristic of this tribe.——Of *gums*, Acacia verek yields *gum senegal* on the western coast of Africa; A. nilotica and seyal, *gum arabic* in Nubia; something similar is produced in New Holland by A. decurrens, and in India by A. arabica, farnesiana, and speciosa. *Royle*. For an account of the Gum forests, see *Fl. Seneg.* 1. 246.——As an instance of *pulse;* the seeds of Parkia africana are roasted as we roast coffee, then bruised, and allowed to ferment in water. When they begin to become putrid, they are well washed and pounded; the powder is made into cakes, somewhat in the fashion of our chocolate; they form an excellent sauce for all kinds of meat. The farinaceous matter surrounding the seeds forms a pleasant drink, and they also make it into a sweetmeat. *Brown in Denham*, 29.——*Tonic and astringent* qualities are also present here. The bark of Acacia Arabica is considered in India a powerful tonic; it is also extensively used in tanning leather. *Royle*. A decoction of its pods is used as a substitute for that of the seeds of Mimosa saponaria for washing. *Ibid.* 2. 142. Its tonic powers are connected with the astringent and tanning properties of several others. Some of the Algarobas or Prosopises of the western part of South America bear fruit, the pericarp of which consists almost wholly of tannin. The bark of some of the species of

Acacia abound to such a degree in tanning principles as to have become objects of commercial importance. In 1824 some tons of the extracts of Acacia bark were imported from New South Wales for the use of tanners. *Ed. P. J.* 11. 266. The pods of Cassia Sabak and Acacia nilotica are used in Nubia for tanning. *Delile Cent.* 10. The valuable astringent substance, called Catechu, or Terra Japonica, is procured by boiling and evaporating the brown heart-wood of Acacia Catechu, or Khair Tree: it is obtained by simply boiling the chips in water until the inspissated juice has acquired a proper consistency; the liquor is then strained, and soon coagulates into a mass. *Brewster*, 5. 349. See also *Royle's Illustr.* p. 182.——*Others are emetics.* According to Horsfield, the Acacia scandens of Java is emetic. *Ainslie*, 2. 108.——A few *are purgatives*. Properties of this kind exist in the pulp within the fruit of Mimosa fagifolia. The same may be said of Inga fæculifera, or the *Pois doux*, of St. Domingo, that bears pods filled with a sweet pulp, which the natives use. *Hamilt. Prodr.* 62.——Several *afford timber*. The fine Jacaranda, or Rose-wood of commerce, so called because when fresh it has a faint but agreeable smell of roses, is produced by a species of Mimosa in the forests of Brazil. *Pr. Max. Trav.* 69. The timber of Acacia arabica and farnesiana is used in India for wheels and tent-pegs; that of other species attains a large size, as of A. Kalkera and A. speciosa; the latter is dark-coloured, and close-enough grained for making furniture. A. elata, xylocarpa, sundra, odoratissima, stipulacea, and cinerea, all yield it of good quality. *Royle.*——*Saponaceous qualities* reside in some species. The saponaceous legumes of Acacia concinna form a considerable article of commerce in India, and the seeds of Entada Pursætha, called *gela*, are used by the natives for washing their hair. *Royle.*——Finally, a small number are poisonous. The root of Mimosa, called Spongia, is accounted a poison in Brazil. *Ed. P. J.* 14. 267. It is reported that the leaves and branches of Acacia iuliflora are poisonous to cattle. The bark of some species, as of A. ferruginea and leucophæa, added to jagghery water, is distilled in India as an intoxicating liquor. *Royle.*

GENERA.

Tribe 1. Papilionaceæ, DC.

§ 1. Sophoreæ, DC.
Sophora, L.
Ammodendron, Fisch.
Styphnolobium, Schot.
Edwardsia, Salisb.
Ormosia, Jacks.
Virgilia, Lam.
Layia, H. et A.
Macrotropis, DC.
Anagyris, Lour.
Anagyris, L.
Piptanthus, Sweet.
Thermopsis, R. Br.
Thermia, Nutt.
Baptisia, Vent.
Cyclopia, Vent.
Ibbetsonia, Sims.
Podalyria, Lam.
Aphora, Neck.
Chorozemia, La Bill.
Podolobium, R. Br.
Oxylobium, Andr.
Callistachys, Vent.
Callistachya, Sm.
Brachysema, R. Br.
Gompholobium, Sm.
Burtonia, R. Br.
Jacksonia, R. Br.
Viminaria, Sm.
Sphærolobium, Sm.
Aotus, Sm.
Xeropetalum, R. Br.
Dillwynia, Sm.
Eutaxia, R. Br.
Sclerothamnus, R. Br.
Gastrolobium, R. Br.
Euchilus, R. Br.
Pultenæa, Sm.
Daviesia, Sm.
Mirbelia, Sm.
§ 2. Loteæ, DC.
¶ 1. Genisteæ, DC.
Hovea, R. Br.
Poiretia, Sm.
Physicarpos, Poir.
Plagiolobium, Sweet.
Lalage, Lindl.
Platylobium, Sm.
Cheilococca, Salisb.
Platychilum, Delaun.
Bossiæa, Vent.
Westonia, Spreng.
Goodia, Salisb.
Scottia, R. Br.
Scottea, DC.
Templetonia, R. Br.
Rafnia, Thunb.
Ædmannia, Thunb.
Vascoa, DC.
Borbonia, L.
Achyronia, Wendl.
Liparia, L.
Priestleya, DC.
Hallia, Thunb.
Heylandia, DC.
Crotalaria, L.
Chrysocalyx, G. et P.
Lupinus, L. (18)
Pycnospora, R. Br.
Xerocarpus, G. et P.
Clavulium, Desv.
Hypocalyptus, Thunb.
Wiborgia, Thunb.
Viborgia, Spreng.
Loddigesia, Sims.
Dichilus, DC.
Lebeckia, Thunb.
Sarcophyllum, Thunb.
Aspalathus, L.
Eriocalyx, Neck.
Ulex, L.
Stauracanthus, Link.
Spartium, L.
Spartianthus, L.
Genista, Lam.
Salzwedelia, Fl. Wet.
Voglera, Fl. Wett.
Cytisus, L.
Calycotome, Link.
Viborgia, Mœnch.
Adenocarpus, DC.
Ononis, L.
Anonis, Tourn.
Natrix, Mœnch.
Requienia, DC.
Anthyllis, L.
¶ 2. Trifolieæ, DC.
Medicago, L.
Hymenocarpus, Savi.
Diploprion, Viv.
Trigonella, L.
Buceras, Mœnch.
Falcatula, Brot.
Pocockia, Ser.

Melilotus, Tourn. Juss.
Trifolium, L.
Paramesus, Presl.
Amarenus, Presl.
Amoria, Presl.
Micrantheum, Presl.
Galearia, Presl.
Calycomorphum, Presl.
Mystullus, Presl.
Dactyphyllum, Raf.
Lupinaster, Mœnch.
Pentaphyllon, Pers.
Dorycnium, Tourn.
Leobordea, Del.
Bonjeania, Rchb.
Lotus, L.
Krokeria, Mœnch.
Lotea, Medic.
Tetragonolobus, Scop.
Scandalida, Neck.
Cyamopsis, DC.
Hemispadon, Endl.
Hosackia, Benth.
Podolotus, Benth.
¶ 3. Clitorieæ, DC.
Psoralea, L.
Dorycnium, Mnch.
Ruteria, Mnch.
Indigofera, L.
Clitoria, L.
Ternatea, Kunth.
Vexillaria, Hffg.
Neurocarpum, Desv.
Martia, Leand.
Martiusia, Schult.
Cologania, H. B. K.
Galactia, P. Browne.
Shuteria, W. et A.
Johnia, W. et A.
Pitcheria, Nutt.
Odonia, Bert.
Vilmorinia, DC.
Barbiera, DC.
Grona, Lour.
Collæa, DC.
Atylosia, W. et A.
Dunbaria, W. et A.
Otoptera, DC.
Pueraria, DC.
Dumasia, DC.
Glycine, L.
Pseudarthria, W. et A.
Polytropia, Presl.
Chætocalyx, DC.
Bonninghausenia, Spr.
¶ 4. Galegeæ, DC.
Petalostemum, Michx.
Kuhnistera, Lam.
Cylipogon, Rafin.
Dalea, L.
Parosella, Cav.
Glycyrrhiza, L.
Liquiritia, Mœnch.
Galega, L.
Tephrosia, Pers.
Needhamia Scop.
Brissonia, Neck.
Erebinthus, Mitch.
Reineria, Mœnch.
Amorpha, L.
Bonafidia, Neck.
Eysenhardtia, H.B.K.
Nissolia, Jacq.
Machærium, Pers.
Müllera, L. fil.
Lonchocarpus, H.B.K.
Xiphocarpus, Presl.
Robinia, L.
Pseudacacia, Tourn.
Poitæa, DC.
Poitea, Vent.
Sabinea, DC.
Coursetia, DC.
Herminiera, G. et P.
Sesbania, Pers.
Sesbana, P. Br.
Agati, Rheede.
Glottidium, Desv.
Piscidia, L.
Piscipula, Lœfl.
Ichthyomethia, P. Br.
Daubentonia, DC.
Corynella, DC.
Corynitis, Spreng.
Caragana, Lam.
Halimodendron, Fisch.
Halodendron, DC.
Diphysa, Jacq.
Calophaca, Fisch.
Colutea, L.
Sphærophysa, DC.
Swainsonia, Salisb.
Lessertia, DC.
Sulitra, Med.
Sutherlandia, R. Br.
Colutia, Mœnch.
Streblorhiza, Endl.
Clianthus, Sol.
Donia, Don.
Carmichaëlia, R. Br.
¶ 5. Astragaleæ, DC.
Phaca, L.
Oxytropis, DC.
Astragalus, L.
Güldenstadtia, Fisch.
Biserrula, L.
¶ 6. Hedysareæ, DC.
Scorpiurus, L.
Scorpius, Lois.
Bonaveria, Scop.
Coronilla, L.
Emerus, Tourn.
Arthrolobium, Desv.
Astrolobium, DC.
Ornithopus, L.
Ornithopodium, Tourn.
Hippocrepis, L.
Securigera, DC.
Bonaveria, Scop.
Securilla, Pers.
Diphaca, Lour.
Pictetia, DC.
Ormocarpum, P. Br.
Amicia, H. B. K.
Poiretia, Vent.
Turpinia, Pers.
Myriadenus, Desv.
Geissaspis, W. et A.
Zornia, Gmel.
Stylosanthes Sw.
Adesmia, DC.
Patagonium, Schrk.
Heteroloma, Desv.
Æschynomene, L.
Smithia, Ait.
Petagnana, Gmel.
Lourea, Neck.
Christia, Mœnch.
Uraria, Desv.
Doodia, Roxb.
Nicolsonia, DC.
Perottetia, DC.
Desmodium, Desv.
Dicerma, DC.
Phyllodium, Desv.
Taverniera, DC.
Hedysarum, L.
Echinolobium, Desv.
Rathkea, Thonn.
Onobrychis, Tourn.
Eleiotis, DC.
Lespedeza, Michx.
Ebenus, L.
Flemingia, Roxb.
Ostryodium, Desv.
Lourea et *Moghania*, Jaume St. H.
Alhagi, Tourn. Desv.
Manna, Don.
Alysicarpus, Neck.
Hallia, Jaume St. H.
Fabricia, Scop.
Bremontiera, DC.
¶ 7. Vicieæ, DC.
Cicer, L.
Faba, DC.
Vicia, L.
Wiggersia, Fl. Wett.
Ervum, L.
Ervilia, Link.
Pisum, L.
Lathyrus, L.
Cicerella, Mœnch.
Orobus, L.
Platystylis, Sweet.
h. Phaseoleæ, DC.
Callicysthus, Endl.
Abrus, L.
Sweetia, DC.
Macranthus, Lour.
Rothia, Pers.
Teramnus, P. Brown.
Amphicarpæa, DC.
Amphicarpa, Ell.
Savia, Rafin.
Falcata, Gmel.
Kennedya, Vent.
Caulinia, Mœnch.
Amphodus, Lindl.
Rhynchosia, Lour.
Acryphyllum, Lour.
Glycine, Nutt.
Eriosema, DC.
Fagelia, Neck.
Wisteria, Nutt.
Thyrsanthus, Ell.
Kraunhia, Rafin.
Apios, Mœnch.
Bradlea, Adans.
Phaseolus, L.
Strophostyles, Ell.
Phasellus, Mœnch.
Nomismia, W. et A.
Cantharospermum, W. et A.
Plectrotropis, Thonn.
Diesingia, Endl.
Cyrtotropis, Wall.
Soja, Mœnch.
Dolichos, L.
Vigna, Savi.
Lablab, Adans.
Lablavia, Don.
Dolichos, Gærtn.
Pachyrrhizus, Rich.
Cacara, Pet. Thou.
Parochetus, Hamilt.
Dioclea, H. B. K.
Hymenospron, Sprng.
Psophocarpus, Neck.
Botor, Adans.
Pillera, Endl.
Camptosema, H. et A.
Canavalia, DC.
Canavali, Adans.
Malochia, Savi.
Tœniocarpum, Desv.
Mucuna, Adans.
Hornera, Neck.
Stizolobium, Pers.
Negretia, R. et P.
Citta, Lour.
Labradia, Swed.
Carpopogon, Roxb.
Calopogonium, Desv.
Cruminium, Desv.
Cajanus, DC.
Cajan, Adans.
Cylista, Ait.
Erythrina, L.
Mouricon, Adans.
Rudolphia, Willd.
Butea, Roxb.
Plaso, Adans.
¶ 8. Dalbergieæ, DC.
Derris, Lour.
Endespermum, Blume.
Millettia, W. et A.
Pongamia, Lam.
Galedupa, Lam.
Semeionotis, Schott.
Dalbergia, L.
Solori, Adans.
Pterocarpus, L.

Sommerfeldtia, Thon.
Moutouchia, Aubl.
Griselina, Neck.
Amphymenium, H. B. K.
Drepanocarpus, Mey.
Ecastaphyllum, P. Br.
Amerimnum, P. Br.
Brya, P. Br.
Aldina, Adans.
Deguelia, Aubl.
Cylizoma, Neck.
———
Crafordia, Rafin.
Phyllolobium, Fisch.
Sarcodum, Lour.
Viborguia, Ort.
Varenea, DC.
Amphinomia, DC.
Lacara, Spreng.
Harpalyce, Fl. Mex.
Steganotropis, Lehm.

Tribe 2. Swartzieæ, DC.

Swartzia, Willd.
Possira, Aub.
Rittera, Schreb.
Hælzelia, Neck.
Tounatea, Aubl.
Gynanthistrophe, Poit.
Baphia, Afzel.
Zollernia, Mart.

Tribe 3. Cæsalpinieæ, DC.

¶ 1. Geoffroyeæ, DC.
Arachis, L.
Voandzeia, Pet. Thou.
Cryptolobus, Spreng.
Peraltea, H. B. K.
Brongniartia, H. B. K.
Andira, Lam.
Vouacapoua, Aubl.
Geoffroya, Jacq.
Acouroa, Aubl.
Drakensteinia, Neck.
Brownea, Jacq.
Dipterix, Schreb.
Baryosma, Gærtn.
Coumarouna, Aubl.
Heinzia, Scop.
Taralea, Aubl.
Bolducia, Neck.
¶ 2. Cæsalpineæ legitimæ, DC.
Gleditschia, L.
Gymnocladus, Lam.
Anoma, Lour.
Guilandina, L.
Coulteria, H. B. K.
Tara, Molin.
Gourliea, H. et A.
Cæsalpinia, L.
Campecia, Adans.
Ticanto, Adans.
Poinciana, L.
Poincia, Neck.
Mezoneurum, Desf.
Pterolobium, R. Br.
Reichardia, Roth.
Hoffmanseggia, Cav.
Melanosticta, DC.
Pomaria, Cav.
Hæmatoxylon, L.
Parkinsonia, L.
Cadia, Forsk.
Spændoncea, Desf.
Panciatica, Picciav.
Zuccagnia, Cav.
Ceratonia, L.
Hardwickia, Roxb.
Jonesia, Roxb.
Saraca, L.
Tachigalia, Aubl.
Cubæa, Schreb.
Valentynia, Neck.
Tachia, Pers.
Baryxylum, Lour.
Moldenhauera, Schr.
Dolichonema, Neow.
Colvillea, Bojer.
Humboldtia, Vahl.
Batschia, Vahl.
Amherstia, Wall.
Tamarindus, L.
Cassia, L.
Cathartocarpus, Pers.
Bactyrilobium, Wlld.
Senna, Tourn.
Grimaldia, Schrank.
Exostyles, Schott.
Pöppigia, Presl.
Apoplanesia, Presl.
Labichea, Gaudich.
Metrocynia, Pet. Thou.
Afzelia, Sm.
Pancovia, Willd.
Schotia, Jacq.
Cynometra, L.
Intsia, Pet. Thou.
Eperua, Aubl.
Rotmannia, Neck.
Panzera, Willd.
Parivoa, Aub.
Adleria, Neck.
Dimorpha, Willd.
Anthonota, Pal. Beauv.
Outea, Aubl.
Vouapa, Aubl.
Macrolobium, Schrb.
Kruegeria, Neck.
Valcarcelia, Lga.
Hymenæa, L.
Schnella, Raddi.
Bauhinia, L.
Casparia, Kunth.
Pauletia, Cav.
Phanera, Lour.
Cercis, L.
Siliquastrum, Tourn.
Palovea, Aubl.
Ginannia, Scop.
Aloexylon, Lour.
Amaria, Mutis.
Bowdichia, H. B. K.
Crudia, Willd.
Cyclas, Schreb.
Apalatoa, Aubl.
Touchiroa, Aubl.
Vouarana, Aubl.
Parivoæ, sp. Aubl.
Waldschmidtia, Neck.
Castanospermum, Hook.
———
Dialium, L.
Aruna, Aubl.
Cleyria, Neck.
Codarium, Soland.
Vatairea, Aubl.

Tribe 4. Mimoseæ, DC.

Entada, Adans.
Gigalobium, P. Br.
Mimosa, L.
Gagnebina, Neck.
Parkia, R. Br.
Erythrophleum, R. Br.
Inga, Plum. Willd.
Amosa, Neck.
Schrankia, Willd.
Darlingtonia, DC.
Desmanthus, Willd.
Neptunia, Lour.
Caillea, G. et P.
Dichrostachys, W. et A.
Fillæa, G. et P.
Adenanthera, L.
Prosopis, L.
Dimorphandra, Schott.
Lagonychium, M. Bieb.
Acacia, Neck.
Vachellia, W. et A.

§ Detarieæ, DC.
Detarium, Juss.
Cordyla, Lour.
Cordylia, Pers.
Calycandra, Lepr.

Order CXI. CONNARACEÆ.

Terebintaceæ, *Juss. Gen.* 368. (1789) *in part.*—Connaraceæ, *R. Brown in Congo*, 431. (1818); *Kunth in Ann. Sc. Nat.* 2. 359. (1824).—Terebintaceæ, trib. 7. *DC. Prodr.* 2. 84. (1825).

Essential Character.—*Flowers* hermaphrodite, rarely unisexual. *Calyx* 5-parted,

regular, persistent; *æstivation* either imbricate or valvular. *Petals* 5, inserted on the calyx, imbricated, rarely valvate in æstivation. *Stamens* twice the number of petals, hypogynous, those opposite the petals shorter than the others; *filaments* usually monadelphous. *Ovary* solitary and simple, or several, each with a separate style and stigma; *ovules* 2, collateral, ascending; *styles* terminal; *stigmas* usually dilated. *Fruit* dehiscent, single, or several together, splitting lengthwise internally. *Seeds* erect, in pairs or solitary, with or without albumen, often with an aril; *radicle* superior, at the extremity opposite the hilum; *cotyledons* thick in the species without albumen, foliaceous in those with albumen.—*Trees* or *shrubs*. *Leaves* compound, not dotted, alternate, without stipules. *Flowers* terminal and axillary, in racemes or panicles, with bracts.

Affinities. Connarus can only be distinguished from Leguminosæ by the relation the parts of its embryo have to the umbilicus of the seed (*Brown in Congo*, 432.); that is to say, by the radicle being at the extremity most remote from the hilum. This observation must, however, be understood to refer only to some particular cases in Leguminosæ, and also to the fructification; the want of stipules and regular flowers being usually sufficient to distinguish Connaraceæ. From Anacardiaceæ and other similar orders this is at once known by the total want of resinous juice. Brown considers that Cnestis approaches Averrhoa in Oxalidaceæ, and this genus, according to Adrien de Jussieu, is allied to Xanthoxylaceæ through Brunellia.

Geography. All found in the tropics of Asia, Africa, and America.

Properties. Unknown.

GENERA.

Connarus, L.
Rourea, Aubl.
Robergia, Schreb.
Malbrancia, Neck.
Omphalobium, Gærtn.
Cnestis, Juss.
? Tetradium, Lour.

Order CXII. CHRYSOBALANACEÆ.
The Cocoa-Plum Tribe.

Chrysobalaneæ, *R. Brown, in Tuckey's Voyage to the Congo, App.* (1818); *DC. Prodr.* 2. 525. *a* § *of* Rosaceæ (1825); *Bartl. Ord. Nat. p.* 405. (1830).

Essential Character.—*Calyx* 5-lobed, sometimes bracteolate at the base. *Petals* more or less irregular, either 5 or none. *Stamens* either definite or indefinite, usually irregular either in size or position. *Ovary* superior, solitary, 1- or 2-celled, cohering more or less on one side with the calyx; *ovules* twin, erect; *style* single, arising from the base; *stigma* simple. *Fruit* a drupe of 1 or 2 cells. *Seed* usually solitary, erect. *Embryo* with fleshy cotyledons, and no albumen.—*Trees* or *shrubs*. *Leaves* simple, alternate, stipulate, with no glands, and veins that run parallel with each other from the midrib to the margin. *Flowers* in racemes, or panicles, or corymbs.

Anomalies. Hirtella has fleshy albumen and leafy cotyledons, according to Gærtner; and one species of the same genus is described as apetalous. Prinsepia has a semipetaloid irregular calyx and no petals.

Affinities. The obvious affinity of this order is with Amygdaleæ, from which it differs in having irregular stamens and petals, and a style proceeding from the base of the ovary. With Rosaceæ proper, to which Chrysobalanaceæ have a strict relation, they agree in the same manner as Amygdaleæ, excepting the characters just pointed out. To Leguminosæ with drupaceous fruit, they approach closely in the irregularity of their stamens and corolla, and especially in the cohesion which takes place between the stalk of the ovary and the sides of the calyx; a character found, as De Candolle well remarks, in Jonesia and Bauhinia, undoubted leguminous plants: Chrysobalanaceæ are dis-

tinguished from this latter order by the position of their style and ovules and by the relation which is borne to the axis of inflorescence by the odd lobe of the calyx being the same as found in Rosaceæ. Brown remarks (*Congo*, 434), that the greater part of the order has the flowers more or less irregular, and that the simple ovary of Parinarium has a dissepiment in some degree analogous to the movable dissepiment of Banksia and Dryandra; but we now know, from the more recent observations of this learned botanist upon the ovule, that this dissepiment arises differently. The analogy of structure, as to the dissepiment of Parinarium, is to be sought in Amelanchier.

Geography. Principally found in the tropical regions of Africa and America; none are recorded as natives of Asia; but there is reason to believe, from specimens of large trees seen in the forests of India, without flowers or fruit, by Wallich, that one or two species of Parinarium are indigenous in equinoctial Asia; and Royle's genus Prinsepia, founded upon a spiny plant from Nipal, is apparently referable to this order. One species of Chrysobalanus is found as far to the north as the pine-barrens of Georgia in North America; a climate, however, as in all the regions bounding the Gulf of Mexico on the north, much more heated than that of most other countries in the same parallel of latitude.

Properties. No medicinal properties have been ascribed to Chrysobalanaceæ. The fruit of Chrysobalanus Icaco is eaten in the West Indies, under the name of cocoa plum; another is brought to market in Sierra Leone (C. luteus); and the Rough-skinned, or Gray plum of the same colony is the produce of Parinarium excelsum. The kernel of Parinarium campestre and montanum is said by Aublet to be sweet and good to eat. The seeds of Prinsepia utilis yield by expression a useful oil. *Royle.*

GENERA.

Chrysobalanus, L.
Moquilea, Aubl.
Couepia, Aubl.
Acioa, Aubl.
Acia, Willd.
Dulacia, Neck.
Parinarium, Juss.
Parinari, Aubl.
Dugortia, Neck.
Petrocarya, Schreb.
Grangeria, Commers.
Licania, Aubl.
Hedycrea, Schreb.
Thelyra, Pet. Thou.
Hirtella, L.
Causea, Scop.
Cosmibuena, R. et P.
Stylobasium, Desf.
Prinsepia, Royle.
Cycnia, Lindl.

Order CXIII. CALYCANTHACEÆ.

The Carolina Allspice Tribe.

Calycantheæ, *Lindl. in Bot. Reg. fol.* 404. (1819); *DC. Prodr.* 3. 1. (1828).—Calycanthinæ, *Link. Enum.* 2. 66. (1822).

Essential Character.—*Sepals* and *petals* confounded, indefinite, imbricated, combined in a fleshy tube. *Stamens* indefinite, inserted in a fleshy rim at the mouth of the tube, the inner sterile. *Anthers* adnate, turned outwards. *Ovaries* several, simple, 1-celled with one terminal style, adhering to the inside of the tube of the calyx; *ovules* solitary, or sometimes 2, of which one is abortive, ascending. *Nuts* enclosed in the fleshy tube of the calyx, 1-seeded, indehiscent. *Seed* ascending: *albumen* none; *cotyledons* convolute, with their face next the axis; *radicle* inferior.—*Shrubs*, with square stems, having 4 woody imperfect axes, surrounding the central ordinary one. *Leaves* opposite, simple, scabrous, without stipules. *Flowers* axillary, solitary.

Affinities. Jussieu originally placed this order at the end of Rosaceæ (*Gen.*); he subsequently referred it to Monimiaceæ; and I afterwards formed it into a particular family. With Monimiaceæ it is less nearly related than it appears to be, the principal points of resemblance being the disposition of several nuts

within a fleshy calyx in both orders; for Calycanthaceæ can scarcely be considered apetalous, as Monimiaceæ are, on account of the obvious petals of Chimonanthus. The imbricated sepals, in Calycanthus chocolate-coloured and becoming confounded with the petals, the fragrance of the flowers, and the plurality of ovaries, seem to indicate an affinity with Wintereæ, especially with Illicium; but the decidedly perigynous stamens and fleshy calyx enclosing the ovaries in its tube, the highly developed embryo, and want of albumen, are great objections to such an approximation. Combretaceæ agree in having an exalbuminous embryo with convolute cotyledons; but with this their resemblance ceases. Myrtaceæ also agree in this same particular, in the case of Punica; and their opposite leaves, without stipules, frequent fragrance, and perigynous stamens, strengthen the affinity indicated by the embryo. Rosaceæ, to which Jussieu originally referred Calycanthus, agree in the perigynous insertion of their stamens, in the peculiar structure of their calyx, the tube of which in Rosa is entirely analogous to that of Calycanthaceæ, in the superposition of their ovules when two are present, and in the high developement of their exalbuminous embryo; upon the whole, therefore, no order appears to have so much affinity with Calycanthaceæ as Rosaceæ; and the sagacity of Jussieu, in originally referring Calycanthus to that order, is completely confirmed by the discovery recently made by Lowe, that the cotyledons of Chamæmeles, a genus of Rosaceæ, are convolute. This, I think, fixes the station of Calycanthaceæ in the neighbourhood of Rosaceæ, from which the order is distinguished by its imbricated sepals, and its anthers, partly fertile and partly sterile, being turned outwards. This order is also characterised by the singular structure of the wood, a peculiarity originally remarked by Mirbel in one species, and which I have since ascertained to exist in all. In the stems of these plants there is the usual deposit of concentric circles of wood around the pith, and, in addition, four very imperfect centres of deposition on the outside next the bark; a most singular structure, which may be called, without much inaccuracy, an instance of exogenous and endogenous growth combined in the same individual. A good figure of this interesting fact has been given by Mirbel in the *Annales des Sciences Naturelles*, vol. 14. p. 367. It must be also added that the woody tissue of this order exhibits disks extremely like those of Coniferæ.

Geography. Natives of North America and Japan.

Properties. The aromatic fragrance of the flowers is their only known quality.

GENERA.

Calycanthus, L.
Buttneria, Duham.
Beureria, Ehret.
Basteria, Adans.

Chimonanthus, Lindl.
Meratia, Nees.

Alliance II. *SAXALES.*

Essential Character.—*Carpels* two, united at the base, diverging at the apex; many seeded. *Embryo* in the midst of albumen.

The divarication of the carpels is so singular as to form a positive mark of distinction between this alliance and the last, from which it is further distinguished by the albuminous seeds. Unless attention is paid to these circumstances, either separately or combined, it may be confounded with the last alliance.

Order CXIV. BAUERACEÆ.

A section of Cunoniaceæ, *R. Brown in Flinders*, 548. (1814); *DC. Prodr.* 4. 13. a § of Saxifragaceæ. (1830).—Baueraceæ, *Ed. Pr. No.* 40. (1830); *Martius Conspect. No.* 226. (1835).

Essential Character.—*Sepals* 8, foliaceous, inferior. *Petals* the same number, alternate with them, arising from the base of the calyx. *Stamens* indefinite, obscurely perigynous; *anthers* oblong, bursting by two pores at the apex. *Carpels* 2, a little inferior, coherent, each 1-celled, with numerous ovules attached to a common central axis; *style* one, filiform, to each carpel. *Fruit* capsular, opening at the apex. *Seeds* indefinite, attached to a central placenta; *embryo* in the axis of fleshy albumen, with a long taper radicle, pointing to the hilum.—*Shrubs*. *Leaves* toothed, ternate, opposite, without stipules. *Flowers* solitary, axillary.

Affinities. I distinguish this small order both from Saxifragaceæ and Cunoniaceæ by its indefinite stamens, anthers dehiscing by pores, and by its peculiar habit. It has always been considered an anomaly, with whichsoever of those two orders it has been combined, and is now conveniently separated from them. The origin of the petals and stamens appears at first sight to be hypogynous. But if a flower be carefully cut through vertically, it will be found that the ovary coheres slightly with the calyx, and that the petals and stamens take their origin from above the point of cohesion. They are consequently perigynous, and not hypogynous. Don considers the lateral leaves of Bauera as modified stipules, analogous to the true stipules of Caldcluvia, a genus of Cunoniaceæ. (*Jamieson's Journal, June* 1830.)

Geography. Natives of New Holland.

Properties. None that are known, except beauty.

GENUS.

Bauera, Andr.

Order CXV. CUNONIACEÆ.

Cunoniaceæ, *R. Br. in Flinders*, 548. (1814); *Ed. Prior. No.* 39. (1830); *Don in Edinb. New Phil. Journ. June* 1830, *in part*; *Martius Conspectus, No.* 223. (1835).—Saxifragaceæ, § Cunonieæ, *DC. Prodr.* 4. 7. (1830).

Essential Character.—*Calyx* 4 or 5 cleft, half superior or nearly inferior. *Petals* 4 or 5, occasionally wanting. *Stamens* perigynous, definite, 8-10. *Ovary* 2-celled; the cells having 2 or many seeds; *styles* 2, sometimes combined. *Fruit* 2-celled, capsular or indehiscent, with two bracts. *Embryo* in the axis of fleshy albumen.—*Trees* or *shrubs*. *Leaves* opposite, compound or simple, usually with interpetiolar *stipules*.

Anomalies. Petals sometimes wanting. Stamens indefinite in Belangera.

Affinities. More readily distinguished from Saxifragaceæ by their widely different habit than by any very important characters in the fructification. *Brown in Flinders*, 548. The shrubby habit and remarkable interpetiolar stipules are their principal character. Don supposes them strictly allied to Philadelphaceæ. Baueraceæ are known by their indefinite stamens, porous anthers, and want of stipules. Geissois referred hither by Don, differs in many essential points. It is more like a polyspermous Acer.

Geography. Natives of the Cape, South America, and the East Indies.

Properties. A Weinmannia is used in Peru for tanning leather, and its

astringent bark is employed to adulterate the Peruvian bark. The Indian Weinmannias appear to possess similar astringent qualities. *DC.*

GENERA.

Callicoma, R. Br.	Weinmannia, L.	Belangera, Camb.	Dietericia, Ser.
Calycomis, R. Br.	Pterophylla, Don.	*Polystemon*, Don.	Arnoldia, Bl.
Ceratopetalum, Sm.	Schizomeria, Don.	Caldcluvia, Don.	Codia, Forst.
Cunonia, L.	Leiospermum, Don.	Platylophus, Don.	
Osterdykia, Burm.			? Gumillæa, R. P.

Order CXVI. SAXIFRAGACEÆ. The Saxifrage Tribe.

Saxifragæ, *Juss. Gen.* 308. (1789); *Vent. Tabl.* 2. 277. (1799).—Saxifrageæ, *DC. and Duby*, 207. (1828); *Lindl. Synops.* 66. (1829).—Saxifragaceæ, *DC. Prod.* 4. 1. (1830).

Essential Character.—*Calyx* either superior or inferior, of 4 or 5 sepals, which cohere more or less at their base. *Petals* 5, or none, inserted between the lobes of the calyx. *Stamens* 5-10, inserted either into the calyx (perigynous), or beneath the ovary (hypogynous); *anthers* 3-celled, bursting longitudinally. *Disk* either hypogynous or perigynous, sometimes nearly obsolete, sometimes annular and notched, rarely consisting of 5 scales. *Ovary* inferior, or nearly superior, usually consisting of 2 carpels, cohering more or less by their face, but distinct and diverging at the apex; sometimes 2-celled with a central placenta; sometimes 1-celled with parietal placentæ. *Styles* none. *Stigmas* sessile on the tips of the lobes of the ovary. *Fruit* generally a membranous 1- or 2-celled capsule with the cells divaricating when ripe. *Seeds* numerous, very minute; usually with long hexagonal reticulations on the side of a transparent testa. *Embryo* taper, in the axis of fleshy albumen, with the radicle next the hilum.—*Herbaceous* plants, often growing in patches. *Leaves* simple, either divided or entire, alternate, without stipules. *Flower-stems* simple, often naked.

Anomalies. Parnassia has 4 parietal placentæ opposite the lobes of the stigma. Petals sometimes absent. In Heuchera the flowers are irregular, and there are stipules.

Affinities. Most nearly allied to Rosaceæ, with the herbaceous part of which this order agrees in habit, and from which it differs in the polyspermous, didymous, partially concrete carpels, albuminous seeds, and want of stipules. From Cunoniaceæ it is divided rather by the habit, and by the want of stipules, than by any thing very positive in the fructification; the principal characteristic feature of which consists in the more perfect concretion of the carpels. Baueraceæ are known by their habit, indefinite stamens, and peculiar dehiscence of the anthers. To Alsinaceæ their habit allies them; but they differ in the insertion of the stamens, placentation, situation of the embryo, and otherwise. Portulacaceæ, which may be compared with this order, particularly on account of the situation of the stamens, want of stipules, and albuminous seeds, differ essentially in the structure of the embryo, in the want of symmetry in the parts of the flower, and in placentation. Grossulaceæ, however different they are in habit, agree very much in the general structure of the flower; they differ in the ovary being completely concrete and inferior, with two parietal placentæ, in the seeds being attached to long umbilical cords, in the albumen being corneous, and the embryo extremely minute. De Candolle further remarks that the order approaches Crassulaceæ, differing in having a smaller number of carpels which are partially united both with each other and the calyx, and in being destitute of glands at the base of the carpels; he also compares it with Viburneæ, in consequence of the likeness of Hydrangea to that sub-order, &c. &c. See *Prodr.* 4. 2. Chrysosplenium is remarkable for the want of petals; and Parnassia, which I think, upon the whole, is a genuine

genus of this order, exhibits the singular anomaly of placentæ being opposite the lobes of the stigma, an unilocular ovary, the shell of which consists of two distinct plates connected by an intervening loose substance, and a peculiar developement of an hypogynous disk, which assumes the form of 5 fringed scales, alternate with the stamens, and of a highly curious structure. Drummondia has the stamens equal in number to the petals and opposite them, thus indicating some analogy with the monopetalous Primulaceæ.

Geography. Little elegant herbaceous plants, usually with white flowers, cæspitose leaves, and glandular stems: some of the species have yellow flowers, others have red, but none blue. They are natives of mountainous tracts in Europe and the northern parts of the world, frequently forming the chief beauty of that rich turf which is found near the snow in high Alpine stations. Some grow on rocks and old walls, and in hedge-rows, or near rivulets, or in groves.

Properties. According to De Candolle, the whole order is more or less astringent. The root of Heuchera americana is a powerful astringent, whence it is called in North America Alum root. *Barton.* 2. 162. Otherwise the species possess no known properties; for the old idea of their being lithontriptic appears to have been derived from their name rather than their virtues.

GENERA.

§ 1. Hydrangeæ, DC.
Hydrangea, L.
Hortensia, Juss.
Primula, Lour.
Cornidia, R. et P.
Sarcostyles, Presl.
Cianitis, Reinw.
Adamia, Wall.
Broussaisia, Gaudch.
§ 2. Saxifrageæ, DC.
Saxifraga, L.
Porphyrion, Tausch.
Antiphyllum, Haw.
Calliphyllum, Gaud.
Dactyloides, Tausch.
Muscaria, Haw.
Triplinervium, Gaud.
Micranthes, Tausch.
Dermasea, Haw.
Arabidia, Tausch.
Spatularia, Haw.
Micropetalum, Tausch.
Cotylea, Haw.
Boykinia, Nutt.
Leiogyne, Don.
Aizoonia, Tausch.
Chondrosea, Haw.
Cotyledon, Gaud.
Trigonophyllum, Gaud.
Porophyllum, Gaud.
Bergenia, Mönch.
Geryonia, Schr.
Megasea, Haw.
Eropheron, Tausch.
Robertsonia, Haw.
Hydatica, Tausch.
Diptera, Borkhs.
Aulaxis, Haw.
Hirculus, Tausch.
Kingstonia, Gray.
Leptarrhena, R. Br.
Chrysosplenium, L.
Cryptopetalum, H. et A.
Mitella, Tourn.
Tellima, R. Br.
Lithophragma, Nutt.
Drummondia, DC.
Tiarella, L.
Astilbe, Hamilt.
Heuchera, L.
Donatia, Forst.
Lepuropetalum, Elliott.
Vahlia, Thunb.
Bistella, Caill.
Oresitrophe, Bge.
Hoteia, Morr.
Oreanthus, Raf.
Zahlbruckneria, Rchb.
Parnassia, L.

Alliance III. *CRASSALES.*

Essential Character.—*Carpels* several, quite distinct, continuous with the styles, which are little more than the tapering ends of the ovaries. *Seeds* very numerous with albumen.

These characters and the succulent habit are so distinctive, that nothing further need be said concerning the alliance.

Order CXVII. CRASSULACEÆ. The House-leek Tribe.

Sempervivæ, *Juss. Gen.* 207. (1789).—Succulentæ, *Vent. Tabl.* 3. 271. (1799).—Crassulæ, *Juss. Dict. des Sc. Nat.* 11. 369. (1818).—Crassulaceæ, *DC. Bull. Philom.* n. 49. p. 1. (1801); *Fl. Fr. ed.* 3. v. 4. p. 271. (1805); *Mémoire* (1828); *Prodr.* 3. 381. (1828); *Lindl. Synops.* 63. (1829).—Sedeæ, *Spreng.*

Essential Character—*Sepals* from 3 to 20, more or less united at the base. *Petals* inserted in the bottom of the calyx, either distinct or cohering in a monopetalous corolla.

Stamens inserted with the petals, either equal to them in number and alternate with them, or twice as many, those opposite the petals being shortest, and arriving at perfection after the others; *filaments* distinct, subulate; *anthers* of 2 cells, bursting lengthwise. *Hypogynous scales* several, 1 at the base of each carpel, sometimes obsolete. *Ovaries* of the same number as the petals, opposite to which they are placed around an imaginary axis, 1-celled, tapering into stigmas. *Fruit* consisting of several follicles, opening by the suture in their face. *Seeds* attached to the margins of the suture, variable in number; *embryo* straight in the axis of the albumen, with the radicle pointing to the hilum.—Succulent *herbs* or *shrubs*. *Leaves* entire or pinnatifid; *stipules* none. *Flowers* usually in cymes, sessile, often arranged unilaterally along the divisions of the cymes.

Anomalies. Penthorum is not succulent. This genus and Diamorpha have the ovaries concrete. Some are monopetalous, particularly the genus Cotyledon. Petals and stamens often almost hypogynous. Tillæa has definite ovules.

Affinities. These are all remarkable for the succulent nature of their stems and leaves, in which they resemble Cactaceæ, Portulacaceæ, and certain genera of Euphorbiaceæ, Asclepiadaceæ, and Asphodelaceæ; but this analogy goes no further. Their real affinity is probably with Saxifragaceæ through Penthorum, and with Illecebraceæ through Tillæa, as De Candolle has remarked. In both those orders the hypogynous scales of Crassulaceæ are wanting. Are not these bodies analogous to the scales out of which the stamens of Zygophyllaceæ spring? If so, an unsuspected affinity exists between these orders. De Candolle observes (*Mémoire*, p. 5.) that there is no instance of a double flower in the order, although this might have been expected from their analogy in structure with Alsinaceæ. Sempervivum tectorum exhibits almost constantly the singular phenomenon of anthers bearing ovules instead of pollen.

Geography. It appears, from De Candolle's researches, that of the 272 species of which the order consists, 133 are found at the Cape of Good Hope, 2 in South America beyond the tropics, 2 in the same country within the tropics, none in the West Indies or the Mauritian Islands, 8 in Mexico, 7 in the United States, 12 in Siberia, 18 in the Levant, 52 in Europe, 18 in the Canaries, 1 in southern Africa beyond the limits of the Cape, 9 in Barbary, 3 in the East Indies, 4 in China and Japan, and 2 in New Holland. To these are to be added several species from the Himalayas. They are found in the driest situations, where not a blade of grass nor a particle of moss can grow, on naked rocks, old walls, sandy hot plains, alternately exposed to the heaviest dews of night and the fiercest rays of the noon-day sun. Soil is to them a something to keep them stationary, rather than a source of nutriment, which in these plants is conveyed by myriads of mouths, invisible to the naked eye, but covering all their surface, to the juicy beds of cellular tissue which lie beneath them.

Properties. Refrigerant and abstergent properties, mixed sometimes with a good deal of acridity, distinguish them. The fishermen of Madeira rub their nets with the fresh leaves of the *Ensião* or Sempervivum glutinosum, by which the nets are rendered as durable as if tanned, provided they are steeped in some alkaline liquor. Malic acid exists in Sempervivum tectorum combined with lime. *Turner*, 634. Kalanchoe Brasiliensis appears to form an exception to the general acrid and stimulating properties of the order. The Brazilians use it as a refrigerant. *Aug. de St. H. Fl. Bras.* 2. 197.

GENERA.

Tillæa, L.
Bulliarda, DC.
Dasystemon, DC.
Septas, L.

Crassula, L.
Gomara, Adans.
Turgosea, Haw.
Globulea, Haw.

Curtogyne, Haw.
Grammanthes, DC.
Vauanthes, Haw.

Rochea, DC.
Larochea, Pers.
Kalosanthes, Haw.
Dietrichia, Tratt.

Kalanchoë, Adans.
Calanchoë, Pers.
Vereia, Andr.
Verea, Willd.
Bryophyllum, Salisb.
Physocalycium, Vest.
Cotyledon, L.
Pistorinia, DC.
Umbilicus, DC.
Echeveria, DC.
Sedum, L.
Rhodiola, L.
Anacampseros, Adans.
Sempervivum, L.
Monanthes, Haw.
Diamorpha, Nutt.
Tetraplascium, Kze.
Penthorum, L.
Kolleria, Presl.

Alliance IV. *BALSAMALES.*

Essential Character.—*Carpels* not two polyspermous and diverging at the apex; nor numerous, with a scale at the base of each; but solitary, or few in number. *Leaves* and bark abounding in balsamic juice.

This comprehends the principal point of the Terebintaceæ of Jussieu. It joins Gynobaseosæ by Rutales, and Syncarposæ by Rhamnales.

Order CXVIII. AMYRIDACEÆ.

Terebintaceæ, *Juss. Gen.* 368. (1789) *in part.*—Amyrideæ, *R. Brown in Congo*, 431. (1818); *Kunth in Ann. Sc. Nat.* 2. 353. (1824).—Terebintaceæ, trib. 5. *DC. Prodr.* 2. 81. (1825).

Essential Character.—*Calyx* small, regular, persistent, in 4-5 divisions. *Petals* 4-5, with imbricated æstivation, or none. *Stamens* double the number of the petals, hypogynous. *Ovary* superior, 1-celled, seated on a thickened disk; *stigma* capitate; *ovules* 2-6, pendulous. *Fruit* indehiscent, sub-drupaceous, or samaroid, or leguminous, 1-2-seeded, glandular. *Seed* without albumen; *cotyledons* fleshy; *radicle* superior, very short.—*Trees* or *shrubs*, abounding in resin. *Leaves* compound, with pellucid dots. *Inflorescence* axillary and terminal, panicled. *Pericarp* covered with granular glands, filled with an aromatic oil.

Affinities. The general structure of this order is that of Anacardiaceæ, but in qualities it more nearly resembles Burseraceæ. Kunth suggests its relation to Aurantiaceæ, to which its dotted leaves, capitate stigmas, and pericarps filled with reservoirs of oil, appear to approximate it. Myrospermum agrees with Samydaceæ in the remarkable glandular marking of the leaves, in which the pellucid spaces are both round and linear, a very singular and uncommon character, first pointed out by Brown. *Congo*, 444.

Geography. Natives exclusively of the tropics of India and America, with the exception of one species found in Florida.

Properties. Fragrant resinous shrubs. The Gum Elemi Tree of Nevis is, according to Dr. Hamilton, a plant related to the genus Amyris, which he calls A.? hexandra. *Prodr. Fl. Ind.* 35. The gum-resin, called Bdellium, is probably produced by a species of Amyris; the Niouttout of Adanson, according to Virey, *Hist. Nat. des Méd.* 291; the Amyris Commiphora Roxb. according to Royle. *Illustr.* 176. The layers of the liber of a species of Amyris were found by Cailliaud to be used by the Nubian Mahometans as paper, on which they write their legends. *Delile Cent.* 13. Amyris toxifera is said to be poisonous. *DC.* Resin of Coumia is produced by A. ambrosiaca. *Ibid.* All the species of the genus Copaifera, and 16 are known, yield the Balsam of Copaiva; but it is not in all of them of equal quality. C. multijuga is said by Von Martius to afford the greatest abundance. *Hayne in Linnæa*, 1826. 418. The Balsam is known in Venezuela under the name of Tacamahaca. *DC. Prodr.* 2. 508. Myrospermum peruiferum, the Quinquino of Peru, produces a fragrant resin, in much use both for burning as a perfume,

and for medicinal purposes, called the Balsam of Tolu. *Lambert's Illustration*, 95. Both it and the Balsam of Peru are also yielded, according to Ach. Richard, by M. toluiferum. *Ann. des Sc.* 2. 172.

GENERA.

Amyris, L.	Sabia, Colebr.	Myrospermum, Jacq.	Copaifera, L.
Elemifera, Plum.	? Tapiria, Juss.	*Toluifera*, L.	*Copaiva*, Jacq.
? Spathelia, L.	*Salaberria*, Necker.	*Myroxylon*, Mart.	
	Joncquetia, Schreb.		

Order CXIX. ANACARDIACEÆ. The Cashew Tribe.

Terebintaceæ, *Juss. Gen.* 368. (1789) *in part.*—Cassuvieæ *or* Anacardieæ, *Brown in Congo*, 431. (1818); *Bartl. Ord. Nat. p.* 395. (1830).—Terebintaceæ, *Kunth in Ann. des Sc. Nat.* 2. 333. (1824). Trib. 1 and 2. *DC. Prodr.* 2. 62. &c. (1825); *Juss. Dict. des Sc. Nat.* v. 53. (1828); *Arnott in Encycl. Britt.* p. 106. (1832).

Essential Character.—*Flowers* usually unisexual. *Calyx* usually small and persistent, with 5, or occasionally 3-4, or 7 divisions. *Petals* equal in number to the segments of the calyx, perigynous, (occasionally wanting,) imbricated in æstivation. *Stamens* equal in number to the petals and alternate with them, or twice as many or even more, equal or alternately shorter, or partly sterile; *filaments* distinct, or in the genera without a disk cohering at the base. *Disk* fleshy, annular or cup-shaped, hypogynous, occasionally wanting. *Ovary* single, very rarely 5 or 6, of which 4 or 5 are abortive, superior, (very rarely inferior), 1-celled; *styles* 1 or 3, occasionally 4, sometimes none; *stigmas* as many; *ovule* solitary, attached by a cord to the bottom of the cell. *Fruit* indehiscent, most commonly drupaceous. *Seed* without albumen; *radicle* either superior or inferior, but always directed towards the hilum, sometimes curved suddenly back; *cotyledons* thick and fleshy, or leafy.—*Trees* or *shrubs*, with a resinous, gummy, caustic, or even milky juice. *Leaves* alternate, simple, or ternate or unequally pinnate, without pellucid dots. *Flowers* terminal or axillary, with bracts.

Anomalies. Holigarna has an inferior ovary. The stamens of Melanorhæa are indefinite and hypogynous.

Affinities. The order called Terebintaceæ by Jussieu and many other botanists has been broken up into several by Brown and Kunth, but preserved entire by De Candolle, who does not, however, appear to have devoted particular attention to the subject, by Arnott and others. I follow the former botanists, abandoning altogether the name Terebintaceæ, which is about equally applicable to either Anacardiaceæ, Burseraceæ, Connaraceæ, Spondiaceæ, or Amyridaceæ, the five orders which have been formed at its expense. All these are nearly related to each other, and whatever affinity is borne by one of them will be participated in by them all in a greater or less degree. They are distinguished from Rhamnaceæ by their resinous juice, superior ovary, imbricated calyx, and stamens not opposite the petals; from Celastraceæ by several of the same characters, and want of albumen; from Rosaceæ and Leguminosæ by their definite stamens, dotted leaves, very minute stipules if any, resinous juice, solitary ovules, or by some one or other of these characters. To Rutaceæ they approach, and also to Xanthoxylaceæ, from which some of them differ in their perigynous stamens. Melanorhæa is remarkable for its indefinite stamens, and especially for its hypogynous petals becoming enlarged, foliaceous, and deep red as the fruit advances to maturity.

Geography. Chiefly natives of tropical America, Africa, and India; a few are found beyond the tropics, both to the north and south. Pistacias and some species of Rhus inhabit the south of Europe; many of the latter genus occupy stations in North America and Northern India, and also at the Cape

of Good Hope; Duvaua and Schinus inhabit exclusively Chile and the adjacent districts.

Properties. Large trees, with inconspicuous flowers, abounding in a resinous, sometimes acrid, highly poisonous juice, are the ordinary representatives of this order, to which belong the Cashew Nut, the Pistacia Nut, and the Mango fruit. Some trees are celebrated for yielding a clammy juice, which afterwards turns black, and is used for varnishing in India. One kind is from the common Cashew nut. The varnish of Sylhet is chiefly procured from Semecarpus anacardium, the marking nut-tree of commerce; and the varnish of Martaban from the *theet-see* or *Kheu*, a plant called by Wallich Melanorhæa usitatissima. All these varnishes are extremely dangerous to some constitutions; the skin, if rubbed with them, inflames and becomes covered with pimples that are difficult to heal; the fumes have been known to produce a painful swelling and inflammation of the skin, which, in a case recorded by Brewster, extended from the hands as far as the face and eyes, which became swelled to an alarming degree. I have known an instance of similar effects having been produced by roasting the nuts of Anacardium occidentale. But there are some constitutions that are not affected in any degree by such poisons. These varnishes are at first white, and afterwards become black. This has been ascertained by Brewster to arise from the recent varnish being an organised substance, consisting of an immense congeries of small parts, which disperse the sun's rays in all directions, like a thin film of unmelted tallow; while the varnish which has been exposed to the air loses its organised structure, becomes homogeneous, and then transmits the sun's rays of a rich, deep, uniform red colour. *Brewster*, 8. 100. The same is probably the substance mentioned by Ainslie (1. 190) as the Black Lac of the Burmah country, with which the natives lacker various kinds of ware. The valuable black hard varnish called *Japan lacquer*, is obtained from Stagmaria verniciflua in the Indian archipelago: this resin is extremely acrid, causing excoriations and blisters if applied to the skin. *Ed. P. J.* 6. 400. A black varnish well known in India is manufactured from the nuts of Semecarpus anacardium and the berries of Holigarna longifolia. *Ibid.* 4 450. Augia produces a varnish in China and Siam. *Wallich.* The leaves of some species of Schinus are so filled with a resinous fluid, that the least degree of unusual repletion of the tissue causes it to be discharged; thus some of them fill the air with fragrance after rain; and S. Molle, Duvaua latifolia, and some others expel their resin with such violence when immersed in water as to have the appearance of spontaneous motion, in consequence of the recoil. See *Bot. Reg.* 1580. Schinus Arroeira is said by Auguste de St. Hilaire to cause swellings in those who sleep under its shade. *Ibid.* 14. 267. The fresh juicy bark of this shrub is used in Brazil for rubbing newly-made ropes with, which it covers with a very durable bright dark-brown coating. The juice of the same plant is applied by the Indians in diseases of the eye. *Pr. Maxim. Trav.* 270. This last plant, and also Rhus coriaria, possess acid qualities. The fruit of Cassuvium occidentale and Anacardium orientale is said to exercise a singular effect upon the brain. *Virey Bull. Pharm.* 1814. p. 271. Mastich is the produce of Pistacia atlantica and Lentiscus; Scio turpentine is yielded by Pistacia Terebinthus; a substance like mastich is exuded by Schinus Molle, and the Peruvians use it for strengthening their gums. The juice of many species of Rhus is milky, stains black, and is sometimes, as in Rhus toxicodendron and radicans, extremely poisonous. Rhus coriaria, a powerful astringent, is used by tanners. The bark of Rhus glabrum is considered a febrifuge, and is also employed as a mordant for red colours. Several Comocladias stain the skin black. *DC.* Rhus Cotinus, *Arbre à perruque* of the French, and Venetian Sumach of the English, has wood called *young fustick*, which is astringent as well as

the fruit. Rhus vernix, a Japanese tree, exudes a whitish resinous juice, which soon becomes black in the air. R. succedaneum and verniciferum have a similar property. *Royle.*

GENERA.

§ 1. ANACARDIEÆ, DC.

Anacardium, Rottb.
Cassuvium, Lam.
Acajuba, Gærtn.
Rhinocarpus, Berter.
Semecarpus, L.
Anacardium, Lam.
Holigarna, Roxb.
Mangifera, L.
Buchanania, Roxb.
Melanorrhæa, Wall.
Augia, Lour.
Stagmaria, Jack.
Gluta, L.
Syndesmis, Wall.
Dupuisia, Guill.
Cambessedea, Kunth.
Pistacia, L.
Terebinthus, Juss.
Astronium, Jacq.
Comocladia, P. Br.
Cyrtocarpa, H. B. K.
Picramnia, Sw.
Pegia, Colebr.
Solenocarpus, W. et A.
Coniogeton, Bl.

§ 2. SUMACHINEÆ, DC.

Rhus, L.
Toxicodendron, Tourn.
Pocophorum, Neck.
Schmalzia, Desv.
Lobadium, Rafin.
Phlebochiton, Wall.
Odina, Roxb.
Mauria, H. B. K.
Duvaua, Kunth.
Schinus, L.
Lithrea, H. et A.
Heudelotia, Guill.
Dyctioloma, DC.
Tricera, Lour.
Trattinickia, W.
Huertea, R. et P.
Asaphes, DC.
Boscia, Thunb.
Rumphia, L.
Thysanus, Lour.
Barbylus, P. Browne.
Barola, Adans.
Lunanea, DC.
Edwardsia, Raf.

SUB-CLASS II. INCOMPLETÆ.

ESSENTIAL CHARACTER.—*Corolla* absent in all cases; *Calyx* sometimes complete, and consisting either of several distinct sepals or of several combined into a tube; very often incompletely formed; also often altogether absent.

If we look merely at the paper characters of this and the first sub-class, we shall consider them very clearly distinguished from each other; if we turn to the detail of anomalies in the Polypetalous sub-class, we shall be surprized to find how many instances there are where plants belonging to polypetalous orders, having no petals, would be referable to the Incomplete sub-class. I know of no way of getting over this difficulty, except by practice, by remembering, in the first place, that Polypetalous orders have seldom an imperfect calyx, and by endeavouring to identify apetalous Polypetalæ with some of the orders of Incompletæ, and when it is found that this cannot be accomplished, turning to the Polypetalous division, and acting with the plant in question as if it had petals. No truly polypetalous order can possibly, if common care be applied to the investigation, be confounded with any apetalous order, even if the petals are not taken into account. For example, Euphorbiaceæ, which are so often apetalous, have nothing like a station in Incompletæ; let us try this. They cannot belong to Rectembryosæ, because their calyx is always perfect if present; Euphorbia itself would technically belong to Achlamydosæ, and its flowers being in an involucre it might seem to belong to Monimiales; it could not, however, be one of Atherospermaceæ, because its anthers do not burst by recurved valves: is it, then, a genus of Monimiaceæ? certainly not, for its ovary is 3-celled and not 1-celled; as it cannot be possibly referred to any other part of the Incomplete sub-class, it must then of necessity be some apetalous form of Polypetalæ, and this ascertained, its true station will be easily found. And so of other cases. The fact is, that in Polypetalous orders there is a manifest *tendency* (nixus) to produce petals; in the Incomplete sub-class there is no such tendency, but on the contrary, the force of developement is often so weak as to be scarcely able to complete even the calyx itself.

It may be asked then, would it not be better to combine Incompletæ and Polypetalæ? Upon paper it looks as if it would; in nature it is otherwise: a

botanist will hardly doubt that the genera comprehended under the name of Incompletæ are in reality of a lower degree of organization than Polypetalæ; and the student need be under no alarm about the difficulty that may appear to be connected with these anomalies and exceptions, for after a very little experience he will be scarcely conscious of their existence.

Incompletæ are connected with Polypetalæ most immediately by way of Lauraceæ and Myristicaceæ, or Empetraceæ and Euphorbiaceæ; Chloranthaceæ probably join them with Gnetaceous Gymnosperms; and Menispermaceæ certainly constitute a passage to Smilaceous Endogens, as Aristolochiaceæ possibly do to Araceæ.

The sub-class separates naturally into the five following groups.

1. **Rectembryosæ.** Calyx very imperfect. Embryo straight.
2. **Achlamydosæ.** Calyx and corolla altogether absent.
3. **Tubiferosæ.** Calyx tubular, often resembling a corolla (and with some of the characters of the other groups).
4. **Columnosæ.** Stamens monadelphous, and ovary many-(six)-celled; or, at all events, the latter character combined with an epigynous flower.
5. **Curvembryosæ.** Embryo curved round mealy albumen; or having the form of a horse-shoe; or spiral; (calyx rarely tubular).

The attention of botanists requires to be especially called to this part of the class of Exogens. In consequence of the species being little cultivated, and uninviting in appearance, they have been much neglected; but there can be no doubt that a careful investigation of the large numbers of unarranged and undetermined Incomplete or Apetalous plants which now encumber every herbarium of much extent would place the limits of the following orders in a much clearer light, and richly reward the industry of the botanist who should have energy enough to undertake, and skill enough to execute, the very difficult task of putting them in order.

Group I. Rectembryosæ.

Essential Character.—*Calyx* exceedingly imperfect, very often only rudimentary, ragged, and more a shapeless membrane than a calyx; sometimes more regular. *Embryo* straight, either with or without albumen.

If it were not for the Datiscal alliance, which is the least developed form of this group, Rectembryosæ would be nearly the same as the old Amentaceæ, except that a part is stationed in the Salical alliance of Achlamydosæ. The genera consist chiefly of trees with inconspicuous flowers, many of which are arranged in catkins. The group can only be confounded with Curvembryosæ, and they are usually herbaceous plants, their flowers are never in catkins, and their calyx is far more completely developed than in this group; to say nothing of the distinction in their curved embryo.

Alliance I. *AMENTALES.*

Essential Character.—*Flowers* in catkins. *Carpels* always 2 or more, combined into a solid pistil. All *Trees* or arborescent *shrubs*.

The syncarpous nature of their ovaries divides these from every other

alliance in the same group, except the Ulmal, in which the flowers do not grow in catkins, and the Datiscal, which consists of polyspermous herbaceous plants. It is true that some Urtical orders have several carpels; but when that happens, either the flowers are not in catkins, or the fruit not enclosed in a cupule. Amentales pass distinctly into Urticales by Garryaceæ.

Order CXX. CUPULIFERÆ, or CORYLACEÆ. } The Nut Tribe.

Cupuliferæ, *Rich. Anal. du Fr.* (1808); *Lindl. Synops.* 239. (1829); *Blume Flora Javæ*, (1829).—Corylaceæ, *Mirb. Elem.* 906. (1815).—Quercineæ, *Juss. in Dict. Sc. Nat.* vol. 2. *Suppl.* 12. (1816).

Essential Character.—*Flowers* unisexual; males amentaceous, females aggregate or amentaceous. *Males: Stamens* 5 to 20, inserted into the base of the scales or of a membranous calyx, generally distinct. *Females: Ovaries* crowned by the rudiments of a superior calyx, seated within a coriaceous involucre (*cupule*) of various figure, and with several cells and several ovules, the greater part of which are abortive; *ovules* twin or solitary, pendulous; *stigmas* several, sub-sessile, distinct. *Fruit* a bony or coriaceous 1-celled nut, more or less enclosed in the involucre. *Seeds* solitary, 1, 2, or 3, pendulous; *embryo* large, with plano-convex fleshy cotyledons, and a minute superior radicle.—*Trees* or *shrubs*. *Leaves* with stipules, alternate, simple, often with veins proceeding straight from the midrib to the margin.

Affinities. Plants of this order are known among European trees by their amentaceous flowers and peculiarly veined leaves; from all other plants they are distinguished by their apetalous superior rudimentary calyx, fruit enclosed in a peculiar husk or cup, and nuts containing but 1 cell and 1 or 2 seeds, in consequence of the abortion of the remainder. They are akin to Salicaceæ and Betulaceæ, from which the presence of a calyx and, in the former case, very often the veining of their leaves, distinguish them. To Urticaceæ they are nearly allied, but differ in their many-celled ovary, pendulous ovules, and superior calyx.

Geography. Inhabitants of the forests of all the temperate parts of the continent both of the Old and New World; extremely common in Europe, Asia, and North America; more rare in Barbary and Chile, and the southern parts of South America; and unknown at the Cape. The species which are found within the tropics of either hemisphere are chiefly Oaks and Chestnuts, which abound in the high lands, but are unknown in the valleys of equatorial regions. For an admirable account of the species of Java, see *Blume's Flora*.

Properties. An order which comprehends the Oak, the Hazel Nut, the Beech, and the Spanish Chestnut, can scarcely require much to be said to a European reader of its properties, which are of too common a use to be unknown even to the most ignorant. Whatever excellence may be found in the timber of the European species is not at all inferior in that of hotter countries. Blume tells us that that of his Lithocarpus javensis is called *Passan-Batu*, or Stone-oak, because of its hardness. Gallic acid exists abundantly in the Oak. The leaves of Quercus falcata are employed, on account of their astringency, externally in cases of gangrene; and the same astringent principle, which pervades all the order, has caused them to be employed even as febrifuges, tonics, and stomachics. Cork is the bark of Quercus suber; it contains a peculiar principle called Suberin (*Turner*, 700), and an acid called the Suberic (*Ibid.* 641). The galls that writing ink is prepared from are the produce of the Oak, from which they derive their astringency. The acorns of

a species known in the Levant under the name of Velonia (Quercus ægilops) are imported for the use of dyers.

GENERA.

Carpinus, L.	Corylus, L.	Castanea, Gærtn.	Lithocarpus, Bl.
Ostrya, Scop.	Fagus, L.	Quercus, L.	Synædrys (19).

Order CXXI. BETULACEÆ. The Birch Tribe.

Amentaceæ, *Juss. Gen.* 407. (1789) *in part*; *Lindl. Synops.* § 228. (1829).—Betulineæ, *L. C. Richard MSS. A. Richard, Elém. de la Bot. ed.* 4. 562. (1828).

Essential Character.—*Flowers* unisexual, monœcious, amentaceous; the males sometimes having a membranous lobed calyx. *Stamens* distinct, scarcely ever monadelphous; *anthers* 2-celled. *Ovary* superior, 2-celled; *ovules* definite, pendulous; *style* single, or none; *stigmas* 2. *Fruit* membranous, indehiscent, by abortion 1-celled. *Seeds* pendulous, naked; *albumen* none; *embryo* straight; *radicle* superior.—*Trees* or *shrubs*. *Leaves* alternate, simple, with the primary veins often running straight from the midrib to the margin; *stipules* deciduous.

Affinities. This order approaches more near to Urticaceæ and Cupuliferæ than either Platanaceæ or Salicaceæ, which may be considered dismemberments of it. In the male flowers of several species there is a distinct membranous calyx, very like that of Ulmus; the seeds are definite and pendulous, and the leaves have the same venation as Cupuliferæ. It is well distinguished by the 2 distinct cells of the fruit, and by the want of a cupule to the female flowers.

Geography. Inhabitants of the woods of Europe, Northern Asia, and North America, and even making their appearance on the mountains of Peru and Columbia.

Properties. Fine timber-trees, usually with deciduous leaves; their bark astringent, and sometimes employed as a febrifuge; but chiefly valued for their importance as ornaments of a landscape. Their wood is often light, and of inferior quality, but that of the Black Birch of North America is one of the hardest and most valuable we know.

GENERA.

Betula, L.
Alnus, W.

Order CXXII. SCEPACEÆ.

Essential Character.—*Flowers* unisexual (diœcious). Males in catkins. *Calyx* 4-5-leaved, imbricated, very minute and membranous. *Stamens* 2-5; *filaments* short, straight, not elastic; *anthers* 2-celled, opening by longitudinal parallel sutures; *connective* inconspicuous. Females in short axillary racemes. *Calyx* of six sepals in two whorls (always?), inferior, the inner ones in one species at least 3-lobed. *Ovary* with two cells, in each of which there are two ovules; *style* 0; *stigma* with two short emarginate lobes, or with 4 equal fringed ones; *ovules* collateral, pendulous, with a broad scale projecting from the placenta and covering over the foramen, their ends often buried in hairs projecting from the base of the cell. [In *Lepidostachys Roxburghi* the *Capsule* round, two-celled, 4-valved; the endocarp thin, tough, and separable from the friable sarcocarp. *Seeds* single or two, enveloped in a succulent *aril*; *embryo* green in the axis of albumen, with obovate cotyledons and a

radicle next the hilum. *Roxb.*]—*Trees.* *Leaves* coriaceous, alternate, with membranous *stipules* which form the scales of the buds.

Affinities. Here are evidently distinct traces of a new type of organization, which, however imperfectly they may be yet shadowed out, are nevertheless too remarkable to be passed over unnoticed. The foregoing character has been drawn up from what materials I happen to possess, and will probably require great correction hereafter, when more species and genera shall have been discovered. In the meanwhile, it is obvious that there is no published natural order that will include amentaceous plants with arillate albuminous seeds and a dehiscent 2-celled pericarp. Scepaceæ have in their male state much the aspect of Cupuliferæ or Betulaceæ, and one of them has actually been considered an Alnus by Roxburgh; but the females have more the appearance of Antiaris, or some such Urticaceous genus. The fruit, which is very remarkable, I only know from Roxburgh's account, the substance of which is quoted from the Flora Indica. The manner in which the plates of the placenta overlap the foramen (I believe not till after impregnation) is exceedingly curious; these are no doubt what ultimately become the aril. In the genus Scepa the ends of the ovules are buried in a thick mass of hairs proceeding from the placentary suture near the base of the cell.

Geography. Natives of the tropical forests of India.

Properties. The wood of the *Kokra*, Lepidostachys Roxburghi, is very hard, and is used for various œconomical purposes. *Roxb.*

GENERA.

Scepa. (20)
Lepidostachys, Wall. (21)
? Hymenocardia, Wall. (22)

Alliance II. *URTICALES.*

Essential Character.—*Carpels* solitary, or more than one combined in a syncarpous pistil. *Stems* continuous, without sheaths. *Flowers*, if in catkins, never producing fruit with a cupule.

The remarks made under Amentales shew how that alliance is to be distinguished from this, concerning the most usual characters of which it may be said, that it is upon the whole a less complicated form of structure, and that it exhibits the mass of the group in a state where solitary carpels and unisexual flowers are the prevailing characteristics; for although there are three orders in which the fruit consists of two or more carpels, yet in very much the greater portion of species the carpels are uniformly solitary. It is clearly connected with Amentales through Garryaceæ, which would be Cupuliferous if they had a cupule, more than one cell, and alternate leaves. Urticaceæ themselves form the type of the alliance, and are pretty accurately known by their unisexual, usually clustered, flowers, elastic stamens, membranous calyx, and seed-like fruit; to which may be added, their rough leaves: the other orders are more or less closely allied to each other and to Urticaceæ, but are apparently quite distinct; they all, however, but especially Stilaginaceæ, require much revision, and must be so greatly extended, that whatever characters may now be assigned must be considered merely provisional.

Order CXXIII. GARRYACEÆ.

Garryaceæ, *Lindl. in Bot. Regist.* 20. *t.* 1686. (July 1834).

Essential Character.—*Flowers* unisexual (dicœcious). Males: *Calyx* 4-leaved. *Stamens* 4, not elastic. Females: *Calyx* superior, two-toothed. *Ovary* one-celled; *styles* 2, setaceous; *ovules* 2, pendulous, with funiculi as long as themselves. *Pericarp* berried, indehiscent, two seeded. *Embryo* very minute, in the base of fleshy albumen.—A *shrub*. *Leaves* opposite, without *stipules*. *Flowers* arranged in pendulous amentaceous racemes, within connate bracts. *Wood* without distinct concentric zones, or *vasiform tissue* (dotted ducts).

Affinities. Of this curious type of structure only one genus and one species have been discovered, concerning which the following observations will be found in the *Botanical Register*, in the place above referred to.

"In its amentaceous inflorescence, imperfect flowers, superior calyx, and mode of germination, *Garrya* is very similar to *Cupuliferæ*, from which it differs most essentially in its wood without concentric circles, or vasiform tissue (dotted vessels), its opposite exstipulate leaves, simple fruit, and minute embryo lying in a great mass of albumen. The latter characters bring it near *Piperaceæ* and their allies, especially *Chloranthaceæ*, with which its zoneless wood (for *Chloranthus* has no annual zones), simple fruit, and opposite leaves, also agree; but the stipules of *Chloranthaceæ*, together with its naked bisexual flowers, and articulated stems, distinctly separate that order. *Urticaceæ* and *Stilaginaceæ* may also be compared with *Garrya* on account of their imperfect unisexual flowers, somewhat amentaceous inflorescence, and simple fruit; but their superior fruit, alternate leaves, and more perfectly formed wood, are important points of difference. *Gnetaceæ* may also be compared to *Garrya* on account of their opposite exstipulate leaves, amentaceous unisexual flowers appearing from the axils of connate bracts, their minute embryo lying in a great mass of albumen, and imperfect zoneless wood, which in both cases is chiefly constituted of woody fibre (the sides of which are marked with numerous brownish granules), and of annular and reticulated vessels lying scattered sparingly among the tubes of woody fibre. Finally, *Henslovia*, an imperfectly known genus, with regularly zoned wood filled with dotted ducts, like those of *Ulmus*, is not to be overlooked in comparing *Garrya* with other genera, on account of its imperfect unisexual flowers and opposite exstipulate leaves; but the natural order (*Hensloviaceæ*), of which it must be considered the type, is too little known to enable us to carry the comparison further."

Geography. West side of the dividing mountain range of North America, in temperate latitudes.

Properties. Unknown.

GENUS.

Garrya, Douglas.

Order CXXIV. HENSLOVIACEÆ.

Hensloviaceæ, *Lindl. in Bot. Reg.* 20. *fol.* 1686. (July 1834); *Martius Conspectus, No.* 77. (1835).

Essential Character.—*Flowers* unisexual (dicœcious). *Calyx* 5-parted, lined with a woolly disk, [with a valvate æstivation. Males: *Stamens* 5, alternate with the sepals, perigynous, long, exserted, inflexed in æstivation, *Griffith in litt.*]; *anthers* 2-celled, with a

broad connective, the lobes oblique, bursting longitudinally. A rudiment of an ovary. FEMALES; *Ovary* superior, 2-celled with very numerous ovules attached horizontally to a placenta in the axis; *style* cylindrical; *stigma* obsoletely two-lobed; [*ovules* with a large conspicuous foramen next the hilum, *Griffith in litt.*]—*Trees* [with the habit and inflorescence of Combretaceæ. *Griffith*]. *Leaves* opposite, entire, without stipules. *Wood* regularly zoned, with very abundant vasiform tissue (dotted ducts).

AFFINITIES. Little as I have to add to what was already known concerning the remarkable plants that constitute the type of this small order, that little is important as confirming the propriety of its separation. My own observations on the structure of the wood shew that it is composed to a great extent of the dotted or vasiform tissue so prevalent in Ulmus. My invaluable friend, Mr. Griffith, in a letter dated Merqui, in Burmah, Dec. 28, 1834, has added the particulars enclosed in brackets. The order is too little known to afford materials for much speculation as to its affinities. Brown points out the striking resemblance of the branches and leaves, especially the abrupt termination of the former, to Oleaceæ, especially Syringa; but beyond this all further relation between these plants seems to cease. (*Wall. Plant. as. rar. III.* 14.) Mr. Griffith notices the conformity of the habit and inflorescence to Combretaceæ; and it is not impossible that it may turn out, when more known, to be an apetalous polyspermous form of the Rhamnal alliance, to which its definite perigynous stamens alternate with the sepals and valvate calyx seem to approximate it. It must, however, be observed that its unisexual flowers, large perigynous disk, and long exserted stamens, with a very wide connection, bring it close to Stilaginaceæ, although the fruit is so different.

GEOGRAPHY. Trees of Tropical India.

PROPERTIES. Unknown.

GENUS.

Henslovia, Wall.

TREWIACEÆ.

ESSENTIAL CHARACTER.—*Flowers* dicœcious. MALES: *Sepals* 3-4, with a valvate æstivation. *Stamens* numerous, arising from a common central point. FEMALES: *Calyx* inferior, 3-4-toothed. *Style* 4-cleft. *Drupe* 4-celled with a single seed in each. *Embryo* inverted and amply furnished with albumen, *Roxb.* [Segments of the style reflexed, feathery within, *Willd.* *Fruit* berried, with 4 *stones*, each of which is one-seeded; *seeds* pendulous without albumen, *Gærtn.*]—A tree. *Leaves* opposite, exstipulate, entire. *Flowers*; *males* in long racemes; *females* axillary, solitary.

AFFINITIES. Here again seems to be the type of an unpublished order. It is clearly distinct from Urticaceæ and their allies, and yet it cannot be far removed from them. In the conflicting statements as to its real structure there is little further left, upon which we can seize. Bartling refers Tetragastris as a synonym to Hedwigia among Burseraceæ, I know not on what authority. Roxburgh considers it the same as this (*Fl. Ind.* 3. 837.), and so does Adrien de Jussieu. *Euphorb.* 33.

GEOGRAPHY. Natives of tropical India,

PROPERTIES. Unknown.

GENUS.

Trewia, L.
Tetragastris, Gærtn.

Order CXXV. URTICACEÆ. The Nettle Tribe.

Urticeæ, *Juss. Gen.* 400. (1789); *Gaudichaud in Freyc. Voyage* (1826); *Bartl. Ord. Nat.* 105. (1830); *Arnott in Edinb. Encycl.* 129. (1832).—Urticaceæ, *Endlich. Prodr. Norf.* 37. (1833).—Artocarpeæ, *R. Brown in Congo* (1818); *Blume Bijdr.* 479. (1825); *Ed. Prior. No.* 80. (1830); *Bartl. Ord. Nat.* 104. (1830).—Sycoideæ, *Link Handb.* 1. 292. (1829).—Pholeosantheæ and Cænosantheæ, *Blume Bijdr.* (1825).—Batideæ, *Martius Conspect. No.* 70. (1835).—Moreæ, *Endl. Prodr.* 40. (1833).

Essential Character.—*Flowers* monœcious or diœcious, scattered or clustered, or in catkins, or close heads. *Calyx* membranous, lobed, persistent. *Stamens* definite, distinct, inserted into the base of the calyx, and opposite its lobes; *anthers* curved inwards in æstivation, turned backwards with elasticity when bursting. *Ovary* superior, simple; *ovule* solitary, erect or suspended; *stigma* simple. *Fruit* a simple indehiscent nut, surrounded either by the membranous or fleshy calyx; or a fleshy receptacle, either covered by numerous nuts, lying among the persistent fleshy calyxes, or enclosing them within its cavity; occasionally consisting of a single nut, covered by a succulent involucre. *Embryo* straight, curved, or spiral, with or without albumen; *cotyledons* flat; *radicle* always pointing to the hilum.—*Trees, shrubs*, or *herbs*, sometimes lactescent. *Leaves* alternate, usually covered either with asperities or stinging hairs, with membranous *stipules*, which are deciduous or convolute in vernation.

Affinities. I am convinced, after the most careful attention that I have been able to give this extensive and little studied order, that all the assemblages of genera whose names are cited at the head of this article must be considered mere forms of one common type. Artocarpeæ I formerly distinguished by their suspended ovules and milky properties; but Arnott states that he finds the former peritropal, and supposing their position to be uniformly suspended in the genus Artocarpus and its immediate allies, yet there is this in the character of Artocarpeæ, which would, even under such circumstances render it useless, that it forms an unnatural assemblage, for it would take from the true Urticeæ Cannabis, and Humulus, on account of the position of their ovules, while it would exclude them along with Morus and some others because they do not milk. As to Batideæ recently separated from Urticaceæ by Von Martius, on account of their supposed naked flowers and bicarpellary fruit, it must be remarked that in the former character this distinguished Botanist has been misled by Roxburgh, and that in the latter he has been equally deceived, for Batis has a common Urticaceous fruit; and it agrees with many genera of the order in its embryo having the radicle turned down upon the cotyledons. On account of this character and its habit, and notwithstanding its stamens being alternate with the segments of the calyx, it is better to let it remain at present in Urticaceæ as one of the connecting links between that order and Curvembryosæ. The existence of a curved embryo in Urticaceæ shows how very nearly Chenopodiaceæ and Urticaceæ are really allied; they, in fact, scarcely differ except in the stipulation, hispid surface, elastic stamens, and I may add narcotic properties of the latter. Polygonaceæ are distinguished generally by their ochreæ, and always by their radicle lying at the end of the seed most remote from the hilum; Euphorbiaceæ by their tricoccous, or at least pluricarpellary fruit; and Ulmaceæ by their hermaphrodite flowers and bicarpellary fruit.

The only attempt that has yet been made to reduce the genera to order, is that by Gaudichaud, of which an account will be found in the first volume of Presl's Repertorium Botanicum, as well as in the place above quoted. This arrangement has not been yet examined critically, but as it seems in general to form natural groups, I have admitted it without scruple upon the authority of the very excellent Botanist, with whom it has originated. It should, how-

ever, be observed, that Endlicher objects to many of the genera. *Prodr. fl. norf.* 38. *&c.*

Geography. Widely dispersed over every part of the world; appearing in the most northern regions, and in the hottest climates of the tropics; growing now upon dry walls, where there is scarcely nutriment for a moss or a lichen, and inhabiting the dampest recesses of the forest. Elatostemeæ, Boehmerieæ, Cecropieæ, Chlorophoreæ, Dorstenieæ, Daphnitideæ, Artocarpeæ, Pouroumeæ, Misandreæ, and Batideæ are either altogether confined to the tropics where the order is most abundant, or at all events occur only in very temperate countries.

Properties. The tenacity of the fibres of many species is such that cordage has been successfully manufactured from them. The leaves of Hemp are powerfully narcotic. The Turks know its stupifying qualities under the name of Malach. Linnæus speaks of its vis narcotica, phantastica, dementens, anodyna, and repellens. Even the Hottentots use it to get drunk with, and call it Dacha. The Arabians name it Hashish. *Ainslie*, 2. 189. A most powerfully narcotic gum-resin, called in Nipal Cheris or Cherris, is supposed to be obtained from a variety of Cannabis sativa. *Ibid.* 2. 73. The effects of the venomous sting of the common nettles, Urtica dioica, urens, and pilulifera of Europe, are too well known. They are, however, not to be compared for an instant with those of some Indian species. Leschenault de la Tour (*Mém. Mus.* 6. 362.) thus describes the effect of gathering Urtica crenulata in the Botanic Garden at Calcutta:—"One of the leaves slightly touched the first three fingers of my left hand: at the time I only perceived a slight pricking, to which I paid no attention. This was at seven in the morning. The pain continued to increase; in an hour it had become intolerable: it seemed as if some one was rubbing my fingers with a hot iron. Nevertheless, there was no remarkable appearance; neither swelling, nor pustule, nor inflammation. The pain rapidly spread along the arm, as far as the armpit. I was then seized with frequent sneezing and with a copious running at the nose, as if I had caught a violent cold in the head. About noon I experienced a painful contraction of the back of the jaws, which made me fear an attack of tetanus. I then went to bed, hoping that repose would alleviate my suffering; but it did not abate; on the contrary, it continued nearly the whole of the following night; but I lost the contraction of the jaws about seven in the evening. The next morning the pain began to leave me, and I fell asleep. I continued to suffer for two days; and the pain returned in full force when I put my hand into water. I did not finally lose it for nine days." A similar circumstance occurred, with precisely the same symptoms, to a workman in the Calcutta Garden. This man described the sensation, when water was applied to the stung part, as if boiling oil was poured over him. Another dangerous species was found by the same botanist in Java (U. stimulans), but its effects were less violent. Both these seem to be surpassed in virulence by a nettle called *daoun setan*, or devil's leaf, in Timor; the effects of which are said, by the natives, to last for a year, or even to cause death. The common Hop, Humulus lupulus, is remarkable, as is well known, for its bitterness; the active principle of it is called by chemists Lupulin. It is here also that the Fig, the Bread-fruit, the Jack, and the Mulberry, are found,—a curious instance of wholesome or harmless plants in an order which contains the most deadly poison in the world, the Upas of Java; the juice, however, of even those which have wholesome fruit, is acrid and suspicious; and in a species of Fig, Ficus toxicaria, is absolutely venomous. The juice of all of them contains a greater or less abundance of caoutchouc, and the Cecropia peltata is reported to yield American caoutchouc. But Humboldt doubts whether this is the fact, as its juice is difficult to inspissate. *Cinch. For.* p. 44. The

seeds of a plant nearly allied to Cecropia, called Musanga by the Africans of the Gold Coast, as well as those of Artocarpus, are eatable as nuts. The famous Cow Tree, or Palo de Vacca, of South America, which yields a copious supply of a rich and wholesome milk, belongs to this order; it is supposed to be related to Brosimum. Brosimum alicastrum abounds in a tenacious gummy milk; its leaves and young shoots are much eaten by cattle, but when they become old they cease to be innocuous. The roasted nuts are used instead of bread, and have much the taste of Hazel nuts. *Swartz*, 1. 19. A kind of paper is manufactured from Broussonetia papyrifera. The bark of the Morus alba contains moroxylic acid in combination with lime. *Turner*, 640. Fustick, a yellow dye, is the wood of Morus tinctoria. The seeds of Ficus religiosa are supposed by the doctors of India to be cooling and alterative. *Ainslie*, 2. 25. The leaves of Ficus septica are emetic. *Ibid.* The Cochinchinese consider that plant caustic and anthelmintic. The bark of Ficus racemosa is slightly astringent, and has particular virtues in hæmaturia and menorrhagia. The juice of its root is considered a powerful tonic. *Ibid.* 2. 31. The white glutinous juice of Ficus indica is applied to the teeth and gums, to ease the toothache; it is also considered a valuable application to the soles of the feet when cracked and inflamed. The bark is supposed to be a powerful tonic, and is administered by the Hindoos in diabetes. *Ibid.* 2. 11. Gum lac is obtained from Ficus indica in great abundance. The tenacity of life in some plants of this family is remarkable. A specimen of Ficus australis lived and grew suspended in the air, without earth, in one of the hothouses in the Botanic Garden, Edinburgh, for eight months, without experiencing any apparent inconvenience. *Ed. P. J.* 3. 80. The celebrated Banyan Tree of India is Ficus religiosa. Prince Maximilian, of Wied Neuwied, says that the colossal Wild Fig-trees "are one of the most grateful presents of nature to hot countries: the shade of such a magnificent tree refreshes the traveller when he reposes under its incredibly wide-spreading branches, with their dark green shining foliage. The Fig-trees of all hot countries have generally very thick trunks, with extremely strong boughs, and a prodigious crown." *Travels*, p. 104. Is it possible that the Indian poison with which the Nagas tip their arrows, of the tree that produces which nothing is known, can belong to this tribe? See, for an account of the effect of this poison, *Brewster's Journal*, 9. 219. The poisonous property of the Upas has been found to depend upon the presence of that most virulent of all principles, called strychnia. *Turner*, 650. Batis yields Barilla in great abundance. *Jacq.* Dorstenia contrayerva, has bitterish roots, a remarkable overpowering odour, with a little pungency. It is supposed to be an antidote to the bites of venomous animals. *Fée.* The tree *Ule* of Papantla, from which *Caoutchouc* is obtained in that country is supposed by Chamisso and Schlechtendahl to be a plant of this order. Deppe, in his original ticket, asks if it be not Castilloa elastica? *Linnæa, VI.* 385.

GENERA.

§ 1. Elatostemeæ, Gaudich.
Elatostema, Forst.
Sciophila, Bl.
Pellionia, G.
Langeveldia, G.
Pilea, Lindl.
Dubreuilia, G.

§ 2. Ureræ, G.
Urtica, L.
Urera, G.
Fleurya, G.
Laportea, G.
Girardinia, G.

§ 3. Boehmerieæ, G.
Boehmeria, L.
Duretia, G.
Neraudia, G.
Procris, Comm.
Vanieria, Lour.

§ 4. Parietarieæ, G.
Parietaria, L.
Helxine, Req.
Gesnouinia, G.
Freirea, G.
Thaumuria, G.
Haynea, Schum.
Pouzolzia, G.
Rousselia, G.
Soleirolia, G.

§ 5. Forskahleæ, G.
Forskahlea, L.
Droguetia, G.
Australina, G.
Clibadium, Allem.

§ 6. Cecropieæ, G.
Cecropia, L.
Musanga, Chr. Sm.
Coussapoa, Aubl.

§ 7. Cannabineæ, Blume, Bijdr. (1825).
Cannabis, L.
Humulus, L.

§ 8. Chlorophoreæ, G.
Chlorophora, G.

Antiaris, Lesch.
Ipo, Pers.
Gynocephalus, Bl.
Conocephalus, Bl.
§ 9. Moreæ, G. et Broussonetiæ, G.
Morus, L.
Albrandia, G.
Fatoua, G.
Broussonetia, Vent.
Papiria, Lam.
§ 10. Ficeæ, G.
Ficus, L.
§ 11. Dorsteniæ, G.
Dorstenia, L.
Kosaria, Forsk.
Sychinum, G.
§ 12. Daphnitideæ, N. ab E.
Laurophyllus, Thunb.
Daphnitis, Spr.
Dilobeia, Thouars.
§ 13. Artocarpeæ, G.
Artocarpus, L.
Sitodium, Gærtn.
Rademachia, Thunb.
Polyphema, Lour.
Perebea, Aubl.
? Bagassa, Aubl.
? Hedycaria, Forst.
Olmedia, R. P.
Maclura, Nutt.
§ 14. Pourouмeæ, G.
Pourouma, Aubl.
Bruea, G.
§ 15. Misandreæ, G.
Misandra, Comm.
Gunnera, L.
Panke, Feuill.
§ 16. Batideæ, Mart.
Batis, L.
Borya, W.
Bigelovia, Sm.
Forestiera, Poir.
Pyrenacantha, Hook.
Tinda, Rheede.
Epicarpurus, Bl.
Aporosa, Bl.
Pteranthus, Forsk.
Louichea, L'Herit.
Brosimum, Sw.
Galactodendron, Kth.
Solenostigma, Endl.
Trophis, L.
Streblus, Lour.
Castilloa, Deppe.
Ule.

Sub-Order. CERATOPHYLLEÆ.

Ceratophylleæ, *DC. Prodr.* 3. 73. (1828); *Lindl. Synops.* 225. (1829).

Essential Character.—*Flowers* monœcious. *Calyx* inferior, many-parted. *Male: Stamens* from 12 to 20; *filaments* wanting; *anthers* 2-celled. *Female: Ovary* superior, 1-celled; *ovule* solitary, pendulous; *stigma* filiform, oblique, sessile. *Nut* 1-seeded, indehiscent, terminated by the hardened stigma. *Seed* pendulous, solitary; *albumen* 0; *embryo* with 4 cotyledons, alternately smaller; *plumula* many-leaved; *radicle* superior. (*DC.*)—Floating *herbs*, with multifid cellular *leaves*.

Affinities. In consequence of the number of its cotyledons, Richard placed this order near Coniferæ, with which it seems to have no kind of affinity. De Candolle urges its relation to Hippuris and Myriophyllum, among Halorageæ, from which it differs in its superior ovary; and he inquires whether Naias, which, according to some, is dicotyledonous, does not belong to the same order. Agardh places it among Fluviales. Surely it is better to consider it a degeneration of Urticaceæ, to which so many of its characters refer it, and as bearing the same relation to them as Podostemaceæ and Callitrichaceæ to some unknown order, or as Pistiaceæ to Araceæ.

Geography. Found in ditches in Europe.

Properties. Unknown.

GENUS.

Ceratophyllum, L.

Order CXXVI. ULMACEÆ. The Elm Tribe.

Ulmaceæ, *Mirbel Elém.* 905. (1815); *Lindl. Synops.* 225. (1829.)—Celtideæ, *Rich.*; *Gaudich. in Freyc. Voy.* 507. (1826).

Essential Character.—*Flowers* hermaphrodite or polygamous, never in catkins. *Calyx* divided, campanulate, inferior, irregular. *Stamens* definite, inserted into the base of the calyx; erect in æstivation. *Ovary* superior, 2-celled; *ovules* solitary, pendulous; *stigmas* 2, distinct. *Fruit* 1- or 2-celled, indehiscent, membranous or drupaceous. *Seed* solitary, pendulous; *albumen* none, or in very small quantity; *embryo* straight or curved, with foliaceous cotyledons; *radicle* superior.—*Trees* or *shrubs*, with scabrous, alternate, simple, deciduous leaves, and stipules.

Affinities. Nearly related to Urticaceæ, from which they are only distinguishable by their 2-celled fruit and hermaphrodite flowers; they are often combined with that order.

Geography. Natives of the north of Asia, the mountains of India, China,

North America, and Europe; in the latter of which countries they form valuable timber-trees.

Properties. The inner bark of the Elm is slightly bitter and astringent, but it does not appear to possess any important quality. The substance which exudes spontaneously from it is called Ulmin; it is also found in the Oak, Chestnut, and other trees, and, according to Berzelius, is a constituent of most kinds of bark. *Turner*, 700.

GENERA.

Planera, Gmel.	Ulmus, L.	Sponia, Commers.
Abelicea, Sm.	Celtis, L.	Mertensia, H. B. K.

Order CXXVII. STILAGINACEÆ.

Stilagineæ, *Agardh's Classes*, 199. (1824); *Von Martius Hort. Reg. Monac.* (1829).

Essential Character.—*Flowers* unisexual. *Calyx* 3- or 5-parted. *Corolla* 0. *Stamens* 2, or more, arising from a tumid receptacle; *filaments* capillary; *anthers* innate, 2-lobed, with a fleshy connective and vertical cells opening transversely. *Ovary* superior; *stigma* sessile, 3-4-toothed. *Fruit* drupaceous, with 1 seed and the remains of another. *Seed* suspended; *embryo* green, with foliaceous cotyledons, lying in the midst of copious fleshy albumen.—*Trees* or *shrubs*. *Leaves* alternate, simple, with deciduous stipules.

Affinities. An obscure order, of the limits of which nothing has been well made out. Judging from the genera Stilago and Antidesma, it is very near Urticaceæ, from which it is chiefly distinguished by the great cushion-shaped disk, remarkable anthers, and unelastic filaments; in all which characters it resembles Hensloviaceæ, which are dicarpellary and polyspermous. The male specimens have sometimes a striking resemblance in inflorescence to East Indian Cupuliferæ.

Geography. Natives of the East Indies.

Properties.

GENERA.

Stilago, L.
Antidesma, L.

Order CXXVIII. MYRICACEÆ. The Gale Tribe.

Myriceæ, *Rich. Anal. du Fr.* (1808); *Ach. Rich. Elem. de la Bot. ed.* 4. 561. (1828); *Lindl. Synops.* 242. (1829); *Blume Fl. Javæ*; *Bartl. Ord. Nat.* 98. (1830).

Essential Character.—*Flowers* unisexual, amentaceous, achlamydeous. *Males: Stamens* 6, rarely 8, somewhat monadelphous; *anthers* 2- or 4-celled, opening lengthwise. *Females: Ovary* 1-celled, surrounded by several hypogynous scales; *ovule* solitary, erect, with a foramen in its apex; *stigmas* 2, subulate, or dilated, and petaloid. *Fruit* drupaceous, often covered with waxy secretions, and with the hypogynous scales of the ovary, become fleshy and adherent; or dry and dehiscent, with the scales distinct. *Seed* solitary, erect; *embryo* without albumen; *cotyledons* 2, plano-convex; *radicle* short, superior.—*Leafy shrubs*, with resinous glands and dots, the leaves alternate, simple, with or without stipules.

Affinities. One of the approaches made by these plants is to Ulmaceæ and Betulaceæ, from the former of which they are readily known by their amentaceous flowers and want of a perianth; from the latter by their erect ovules, aromatic leaves, and 1-celled ovary. In the latter respect they resem-

ble Piperaceæ, from which, however, they differ materially in other points. Blume rejects Nageia because of its opposite leaves and albuminous seeds, without, however, stating to what order that genus really belongs. Comptonia he thinks the same as Myrica.

Geography. Found in the cold parts of Europe and North America, the tropics of South America, the Cape of Good Hope, and India.

Properties. Aromatic shrubs, or trees of considerable size. Comptonia asplenifolia possesses astringent and tonic properties, and is much used in the domestic medicine of the United States, in cases of diarrhœa. *Barton*, 1. 224. The root of Myrica cerifera is a powerful astringent, and wax is obtained in great abundance from its berries. The fruit of Myrica sapida is about as large as a cherry, and, according to Buchanan, is a pleasant acid and eatable in Nipal. *Don*, p. 56. It has a pleasant, refreshing, acidulous taste. *Wall. Tent.* 60.

GENERA.

Myrica, L.
Comptonia, Banks.
Putranjiva, Wall.
? Clarisia, R. et P.

Order CXXIX. JUGLANDACEÆ. The Walnut Tribe.

Juglandeæ, *DC. Théorie*, 215. (1813); *Kunth in Ann. des Sc. Nat.* 2. 343. (1824); *Blume Fl. Jav.*; *Bartl. Ord. Nat.* 397. (1830).

Essential Character.—*Flowers* unisexual, usually monœcious. *Calyx* in the males oblique, membranous, irregularly divided, attached to a single bract; in the females superior, with 4 divisions, which are sometimes permanent and leafy. *Petals* in the males 0; in the females occasionally present, and 4 in number, arising from between the calyx and the styles, and cohering at the base. *Stamens* indefinite, (3-36), hypogynous; *filaments* very short, distinct; *anthers* thick, 2-celled, innate, bursting longitudinally. *Disk* 0. *Ovary* inferior, incompletely 2-4-celled; *ovule* solitary, erect; *styles* 1 or 2, and very short, or none; *stigmas* much dilated, either 2 and lacerated, or discoid and 4-lobed. *Fruit* drupaceous, 1-celled, with 4 imperfect partitions. *Seed* 4-lobed; *embryo* shaped like the seed; *albumen* 0: *cotyledons* fleshy, 2-lobed, wrinkled; *radicle* superior.—*Trees*. *Leaves* alternate, unequally pinnated, without pellucid dots or stipules. *Flowers* racemose.

Affinities. These have usually been mixed with Terebintaceæ, to which they, however, do not appear so closely allied as to Cupuliferæ, with which they accord in their unisexual flowers, and superior calyx, and, in the case of the genus Synædrys, in their lobed embryo. Among apetalous orders, their pinnated resinous undotted leaves particularly distinguish them.

Geography. Chiefly found in North America; a few are East Indian; one species, the common Walnut, is a native of the Levant and Persia; another, of Caucasus; and a third, of the West India Islands.

Properties. The seed of the Walnut is esteemed for its sweetness and wholesome qualities. It abounds in a kind of oil, of a very drying nature. The rind of the fruit, and even the skin of the kernel, are extremely astringent. Juglans cathartica or cinerea is esteemed anthelmintic and cathartic; the fruit of several kinds of Hickory is eaten in America. The timber of all is valuable; that of J. regia for its rich deep brown colour when polished, and that of Carya alba for its elasticity and toughness.

GENERA.

Juglans, L.
Carya, Nutt.
Hicorius, Rafin.
Pterocarya, Nutt.
Engelhardtia, Lesch.
Pterilema, Rnwdt.
Dammara, Rumf.
? Decostea, Ruiz. et P.

Alliance III. *CASUARALES.*

Essential Character.—*Carpels* solitary. *Stems* jointed and furnished with sheaths.

This singular character designates the Casuaraceæ at first sight, and shews an approach at this part of the system to Equisetaceæ among Gymnosperms.

Order CXXX. CASUARACEÆ.

Casuarineæ, *Mirb. in Ann. Mus.* 16. 451. (1810); *R. Brown in Flinders*, 2. 571. (1814).

Essential Character.—*Flowers* unisexual. Males: *Flowers* whorled about the articulations of the jointed rachis. *Bracts* 2, membranous, right and left of a two-leaved calyx, the sepals of which stand fore and aft, and adhere at their points, and at the time of flowering are separated from their bases and carried up by the stamen in the form of a calyptra to the anther. *Stamen* 1; *filament* subulate; *anther* erect, two-celled, with parallel contiguous cells opening by a longitudinal fissure. Females, in very dense spikes. Rachis not jointed. *Flowers* numerous, solitary in the axils of imbricated bracts. *Calyx* 0. *Ovary* lenticular, with a solitary ovule. *Styles* 2, united at base. *Caryopsides* winged, hidden in thickened bracts, sessile. *Seed* erect, without albumen. *Embryo* inverted.—Branching weeping trees, with jointed shoots, the internodes of which are striated. *Leaves* 0; in their room short, toothed, ribbed sheaths. *Flowers* in spikes. *Chiefly from Bartling.*

Affinities. Brown, in the Appendix to *Flinders's Voyage*, has the following observations on the structure of this remarkable genus.

"In the male flowers of all the species of Casuarina, I find an envelope of four valves, as Labillardiére has already observed in one species, which he has therefore named C. quadrivalvis. *Plant. Nov. Holl.* 2. p. 67. t. 218. But as the two lateral valves of this envelope cover the others in the unexpanded state, and appear to belong to a distinct series, I am inclined to consider them as bracteæ. On this supposition, which, however, I do not advance with much confidence, the perianthium would consist merely of the anterior and posterior valves; and these, firmly cohering at their apices, are carried up by the anthera, as soon as the filament begins to be produced, while the lateral valves or bracteæ are persistent; it follows from it, also, that there is no visible perianthium in the female flower; and the remarkable economy of its lateral bracteæ may, perhaps, be considered as not only affording an additional argument in support of the view now taken of the nature of the parts, but also as in some degree again approximating Casuarina to Coniferæ, with which it was formerly associated. The outer coat of the seed or caryopsis of Casuarina consists of a very fine membrane, of which the terminal wing is entirely composed; between this membrane and the crustaceous integument of the seed, there exists a stratum of spiral vessels, which Labillardiére, not having distinctly seen, has described as an 'integumentum arachnoideum;' and within the crustaceous integument there is a thin proper membrane, closely applied to the embryo, which the same author has entirely overlooked. The existence of spiral vessels, particularly in such quantity, and, as far as can be determined in the dried specimens, unaccompanied by other vessels, is a structure at least very unusual in the integuments of a seed or caryopsis, in which they are very seldom at all visible; and have never, I believe, been observed in such abundance as in this genus, in all whose species they are equally obvious."

Blume remarks that Casuarina is undoubtedly related to Myrica in its ovaries, its single erect ovule, and its exalbuminous inverted embryo; but it differs so much in its habit, that it is better, with Mirbel, to consider it a distinct family, which differs from Myricaceæ, in its fructification, especially in its achenia with membranous wings included between two lateral scales, which,

as they grow up, are collected into a compact cone. Myrica, on the contrary, has distinct drupes, each somewhat immersed in a somewhat fleshy involucre (or calyx), which, although at first hypogynous, is eventually, after fecundation, extended beyond the ovary, with which it is conglutinated. Of such an involucre there is no trace in Casuarina, since the lateral scales, surrounding each achenium like a 2-valved capsule, by no means answer to the calycine involucre of Myricaceæ, but rather to those interior bractlets which we observe at the base of the drupes in Myricaceæ. *Fl. Jav.*

Geography. New Holland, Malayan and South Sea plants.

Property. Timber excellent.

GENUS.

Casuarina, L.

Alliance V. *DATISCALES.*

Essential Character.—*Carpels* several. *Seeds* numerous. *Leaves* alternate.

By no means a natural assemblage. It is probable that both the orders comprehended for the moment under this alliance have some other station.

Order CXXXI. DATISCACEÆ.

Datisceæ, *R. Brown in Denham*, 25. (1826); *Bartl. Ord. Nat.* 419. (1830).

Essential Character.—*Flowers* unisexual. *Calyx* of the males divided into several pieces; of the females superior, toothed. *Stamens* several; *anthers* 2-celled, membranous, linear, bursting longitudinally. *Ovary* 1-celled, with polyspermous parietal placentæ; *stigmas* equal in number to the placentæ, recurved. *Fruit* capsular, opening at the vertex, 1-celled, with polyspermous parietal placentæ. *Seeds* enveloped in a membranous finely reticulated integument, with a cupulate membranaceous strophiole; *embryo* straight, without *albumen*, its *radicle* very long, turned towards the *hilum*. *Cotyledons*, very short.—*Herbaceous* branched *plants*. *Leaves* alternate, cut, compound, without stipules. *Flowers* in axillary racemes.

Affinities. Brown, in deciding that Datisca has no affinity with Reseda, in which I now agree, does not say to what he supposes the order it represents to be allied. We must suppose, however, that Cannabis among Urticaceæ was in his view. So little is at present known of the other genera, that I can only leave it here with its character a little improved by Bartling.

Geography. The very few species of which this order consists are scattered over North America, Siberia, northern India, the Indian archipelago, and the south-eastern corner of Europe.

Properties. Datisca is bitter.

GENERA.

Datisca, L.
Tetrameles, R. Br.
Tricerastes, Presl.

Order CXXXII. LACISTEMACEÆ.

Lacistemeæ, *Martius N. G. et Sp. Pl.* 1. 154. (1824).

Essential Character.—*Calyx* in several narrow divisions, inferior, covered over by a dilated bract. *Corolla* wanting. *Stamens* hypogynous, standing on one side of the ovary with a thick 2-lobed connective, at the apex of each of whose lobes is placed a single cell of an anther, bursting transversely. *Ovary* superior, seated in a fleshy disk, 1-celled, with several *ovules* attached to parietal placentæ; *stigmas* 2 or 3, sessile or on a style. *Fruit* capsular, 1-celled, splitting into 2 or 3 valves, each of which bears a placenta in its middle. *Seed* usually, by abortion, solitary, suspended, with a fleshy aril; *integument* crustaceous; *albumen* fleshy; *embryo* inverted, with plane *cotyledons* and a superior straight cylindrical *radicle*.—*Small trees* or *shrubs*. *Leaves* simple, alternate, with stipules. *Flowers* disposed in clustered axillary catkins.

Affinities. Von Martius, the founder of this order, which he divides from Urticaceæ, speaks of it thus: "The peculiar character consists in the presence of a distinct perianth, while the amentaceous inflorescence is an indication of an affinity with apetalous orders of a lower grade." The same botanist indicates its affinity with Chloranthaceæ in the structure of the filament, and with Samydaceæ in that of the fruit, "the monadelphous stamens of both which may be perhaps considered a higher kind of evolution of the fleshy disk in the bottom of the flower of Lacistema." In habit they are said to be something like Piperaceæ, but more arborescent.

Geography. Natives of low places in woods in equinoctial America.

Properties. Unknown.

GENERA.

Lacistema, Mart.
Nematospermum, Rich.

Group II. Achlamydosæ.

Essential Character.—Neither *calyx* nor *corolla* present.

To this there is no exception. Euphorbia among syncarpous polypetalous plants, agrees technically with the character; but as the student will find no order in this place with which that genus corresponds, he will easily discover that it has no station here, but is a deteriorated state of some polypetalous order.

Alliance I. *PIPERALES.*

Essential Character.—*Carpels* either solitary, or if more than one quite distinct. *Flowers* in spikes. *Embryo* always very minute in the base of fleshy albumen.

Order CXXXIII. CHLORANTHACEÆ.

Chloranthæ, *R. Brown in Bot. Mag.* 2190. (1821); *Lindl. Collect. Bot.* 17. (1821); *Meyer de Houttuynia atque Saurureis*, 51. (1827); *Blume Flora Javæ*, (1829.)

Essential Character.—*Flowers* naked, spiked, hermaphrodite, or unisexual, with a supporting scale. *Stamens* lateral; if more than 1, connate, definite; *anthers* 1-celled,

bursting longitudinally, each adnate to a fleshy connective, which coheres laterally in various degrees (2-celled, according to some); *filament* slightly adhering to the ovary. *Ovary* 1-celled; *stigma* simple, sessile; *ovule* pendulous. *Fruit* drupaceous, indehiscent. *Seed* pendulous; *embryo* minute, placed at the apex of fleshy albumen, with the radicle inferior, and consequently remote from the hilum; *cotyledons* divaricate.—*Herbaceous* plants or *under-shrubs*, with an aromatic taste. *Stems* jointed, tumid under the articulations. *Leaves* opposite, simple, with sheathing petioles and minute intervening *stipules*. *Flowers* in terminal spikes.

Affinities. Nearly allied to Saururaceæ and Piperaceæ, from both which they differ in the want of a sac to the embryo, and in the pendulous ovule, and opposite leaves with intermediate stipules. Their anthers consist of a fleshy mass, upon the face of which the cell lies that bears the pollen; whether these anthers are 1- or 2-celled, is a matter of doubt; one botanist considering those which have 2 cells to be double anthers, another understanding those with 1 cell to be half anthers. Blume describes a calyx as being sometimes present in a rudimentary state, adhering to the ovary, and hence he suspects some affinity between these plants and Opercularineæ. But I am persuaded that no such rudiment exists: it is not represented in Blume's figures.

Geography. Natives of the hot parts of India and South America, the West Indies, and Society Islands,

Properties. The whole plant of Chl. officinalis has an aromatic fragrant odour, which is gradually dissipated in drying; but its roots retain a fragrant camphorated smell, and an aromatic, somewhat bitter, flavour. They are found to possess very nearly the properties of Aristolochia serpentaria, and in as high a degree. There seems to be no doubt that it is a stimulant of the highest order. See *Blume Fl. Jav.*

GENERA.

Ascarina, Forst.	*Creodus*, Lour.	Hedyosmum, Sw.
Chloranthus, Sw.	*Cryphæa*, Hamilt.	*Tafalla*, Ruiz et Pav.
Nigrina, Thunb.	*Peperidia*, Rchb.	

Order CXXXIV. SAURURACEÆ.

Saurureæ, *Rich. Anal.* (1808); *Meyer de Houttuynia atque Saurureis*, (1827); *Martius Hort. Monac.* (1829).

Essential Character.—*Flowers* naked, seated upon a scale, hermaphrodite. *Stamens* 6, clavate, hypogynous, persistent; *filaments* slender; *anthers* continuous with the filament, cuneate, with a thick connective and 2 lateral lobes bursting longitudinally. *Ovaries* 4, each distinct, with 1 ascending ovule and a sessile recurved *stigma*, or connate into a 3- or 4-celled pistil, with a few ovules ascending from the edge of the projecting semi-dissepiments. *Fruit* either consisting of 4 fleshy indehiscent nuts, or a 3- or 4-celled capsule, opening at the apex and containing a few ascending seeds. *Seeds* with a membranous integument; *embryo* minute, lying in a fleshy lenticular sac, which is seated on the outside of hard mealy *albumen* at the end most remote from the hilum.—*Herbaceous* plants, growing in marshy places, or floating in water. *Leaves* alternate, with *stipules*. *Hairs* jointed. *Flowers* growing in spikes.

Affinities. Very near Piperaceæ, with which they agree in habit, but from which they differ in the compound nature of their ovary, and their numerous stamens. From repeated examination of the embryo of Saururus, I have no doubt whatever that the embryo has no kind of vascular connexion with the sac that contains it; and hence I adopt, the opinion of Brown, that this sac is in reality nothing but the remains of the amnios surrounding the embryo. For the opinions of Mirbel and Richard upon this subject, see the

figures and remarks of the former in *Ann. Mus.* 16. 449., and of the latter in *Humboldt and Bonpl. N. Gen. et Sp.* 1. 3.; the latter being unquestionably wrong in considering the sac a portion of the embryo. This order is one of those which tend to destroy the distinction between Monocotyledons and Dicotyledons. Its affinity with Fluviales is indicated by the floating habit and general appearance of Aponogeton, and with Typhaceæ by its anthers; but its foliage and stipules are those of Dicotyledons, and the structure of the seed and the position of the embryo in a fleshy sac demonstrate its vicinity to Piperaceæ.

Geography. Natives of North America, China, the north of India, and the Cape of Good Hope, growing in marshes or pools of water.

Properties. Unknown.

GENERA.

Houttuynia, Thunb.
Polycarpa, Lour.
Saururus, L.
Spathium, Lour.
Aponogeton, Thunb.

Order CXXXV. PIPERACEÆ. The Pepper Tribe.

Piperaceæ, *Rich. in Humb. Bonpl. et Kunth N. G. et Sp. Pl.* 1. 39. t. 3. (1815); *Meyer de Houttuynia atque Saurureis*, (1827).

Essential Character.—*Flowers* naked, hermaphrodite, with a bract on the outside. *Stamens* definite or indefinite, arranged on one side or all round the ovary, to which they adhere more or less; *anthers* 1- or 2-celled, with or without a fleshy connective; *pollen* smooth. *Ovary* superior, simple, 1-celled, containing a single erect *ovule; stigma* sessile, simple, rather oblique. *Fruit* superior, somewhat fleshy, indehiscent, 1-celled, 1-seeded. *Seed* erect, with the embryo lying in a fleshy sac placed at that end of the seed which is opposite the hilum, on the outside of the albumen.—*Shrubs* or *herbaceous* plants. *Leaves* opposite, verticillate, or alternate in consequence of the abortion of one of the pair of leaves, without *stipules*. *Flowers* usually sessile, sometimes pedicellate, in spikes which are either terminal, or axillary, or opposite the leaves.

Affinities. As we approach the Monocotyledonous division of vegetables, we find the distinction between them and Dicotyledons, as derived from their anatomical structure, becoming weaker and weaker; but at the same time it appears to me that sufficient distinctions are still visible between these two modes of growth. Of this Piperaceæ are an instance. According to Richard, they are Monocotyledonous; an opinion in which Blume concurs, after an examination of abundance of species in their native place of growth. See *Ann. des Sc.* 12. 222. But if the medullary rays constitute the great anatomical difference between these divisions of the vegetable kingdom (and I know of no other which is absolute), then Piperaceæ are surely Dicotyledonous, as is shewn by Meyer (*Dissertatio de Houttuynia*, 38) and as may be ascertained by any one who will look at an old stem of any Pepper; add to this, the veins of their leaves having a distinct articulation with the stem, and the 2-lobed embryo; and it seems to me impossible to doubt their being properly stationed among Dicotyledons. In this view they are closely related to Polygonaceæ, Saururaceæ, and Urticaceæ, from all which, however, they are distinguished by obvious characters; and also to Chloranthaceæ, from which they differ in the point of attachment of the ovule, and in the distinct existence of the remains of the amnios in the form of a sac around the embryo. In the opinion of those who believe Piperaceæ to be Monocotyledons, their station is near Araceæ, with

which, indeed, they must be considered in any point of view to be in some measure connected.

Geography. Exclusively confined to the hottest parts of the world. They are extremely common in tropical America and the Indian archipelago, but, according to Brown, are very rare in equinoctial Africa. Only 3 species have been found on the west coast; several exist at the Cape of Good Hope. *Congo*, 464.

Properties. Common Pepper, so well known for its pungent, stimulant, aromatic quality, represents the ordinary property of the order, which is not confined to the fruit only, but which pervades all the parts in a greater or less degree. The Cubebs of the shops, remarkable for their extraordinary power of allaying inflammation in the urethra and in the mucous membrane of the intestinal canal, are the dried fruit of Piper cubeba. *Ainslie*, 1. 98. The chemical principle called Piperin has been found in Black Pepper. *Turner*, 700. Piper anisatum has a strong smell of Anise, and a decoction of its berries is used to wash ulcers. Betel, an acrid stimulating substance, much used for chewing by the Malays, is the produce of Piper Betel, and Siriboa. Finally, P. inebrians possesses narcotic properties, of which the South Sea islanders avail themselves for preparing an intoxicating beverage. *DC.*

GENERA.

Piper, L.	Ottonia, Spr.
Peperomia, R. et P.	Laurea, Gaud.

Alliance II. *SALICALES.*

Essential Character.—*Flowers* amentaceous. *Fruit* mostly many-seeded, when 1-seeded in globular heads.

This and the next are the only alliances in this group in which an arborescent stature is acquired. By this circumstance they are at once distinguished. From Monimiales the want of an involucre in Salicales sufficiently separates that alliance.

Order CXXXVI. SALICACEÆ. The Willow Tribe.

Amentaceæ, *Juss. Gen.* 407. (1789) *in part; Lindl. Synops.* § 229. (1829).—Salicineæ, *L. C. Richard MSS.; Ach. Richard. Elem. de la Bot. ed.* 4. 560. (1828).

Essential Character.—*Flowers* unisexual, either monœcious or dicœcious, amentaceous. *Stamens* distinct or monadelphous; *anthers* 2-celled. *Ovary* superior, 1- or 2-celled; *ovules* numerous, erect, at the base of the cell or adhering to the lower part of the sides; *style* 1 or 0; *stigmas* 2. *Fruit* coriaceous, 1- or 2-celled, 2-valved, many-seeded. *Seeds* either adhering to the lower part of the axis of each valve, or to the base of the cell, comose; *albumen* 0; *embryo* erect; *radicle* inferior.—*Trees* or *shrubs*. *Leaves* alternate, simple, with deliquescent primary veins, and frequently with glands; *stipules* deciduous or persistent.

Affinities. The hairy seeds, and polyspermous 2-valved fruit, distinguish this order from Betulaceæ, the only other with which it is likely to be confounded. It is usually combined with that order and Cupuliferæ, under the name of Amentaceæ; but it is more consonant with modern views of division to keep them all separate.

Geography. Natives, generally, of the same localities as Betulaceæ, but

extending further to the north than the species of that order. The most northern woody plant that is known is a kind of Willow, Salix arctica. They are found sparingly in Barbary, and there is a species of Willow even in Senegal.

Properties. Valuable trees, either for their timber or for economical purposes; the Willow, the Sallow, and the Poplar, being the representatives. Their bark is usually astringent, tonic, and stomachic; that of Populus tremuloides is known as a febrifuge in the United States; the leaves of Salix herbacea, soaked in water, are employed in Iceland for tanning leather. Willow bark has been found by Davy to contain as much tanning principle as that of the Oak. *Ed. P. J.* 1. 320. It has lately acquired a great reputation in France as a febrifuge. A crystallizable principle, called *Salicine*, has been obtained from Salix helix, which, according to Majendie, arrests the progress of a fever with the same power as sulphate of quinia. (See *Journ. of the R. Inst. Oct.* 1830, p. 177).

GENERA.

Salix, L.
Populus, L.

Order CXXXVII. PLATANACEÆ. The Plane Tribe.

Plataneæ, *Lestiboudois* according to *Von Martius. Hort. Reg. Monacensis*, p, 46. (1829.)

Essential Character.—*Flowers* amentaceous, naked; the sexes in distinct catkins. *Stamens* single, without any floral envelope, but with several small scales and appendages mixed among them; *anthers* linear, 2-celled. *Ovaries* terminated by a thick style, having the stigmatic surface on one side; *ovules* solitary, or two, one above the other, and suspended. *Nuts*, in consequence of mutual compression, clavate, with a persistent recurved style. *Seeds* solitary, or rarely in pairs, pendulous, elongated; *testa* thick; *embryo* long, taper, lying in the axis of fleshy albumen, with the radicle turned to the extremity next (opposite, *A. Rich.*) the hilum.—*Trees* or *shrubs*. *Leaves* alternate, palmate, or toothed, with scarious sheathing stipules. *Catkins* round, pendulous.

Affinities. Formerly comprehended in the order called Amentaceæ, this is particularly known by its round heads of flowers, its 1-celled ovary, containing 1 or 2 pendulous ovules, and its embryo lying in fleshy albumen, by which it is distinguishable from both Betulaceæ, Myricaceæ, and Artocarpeæ, with all which, especially the latter, it has a close affinity. From the latter, indeed, it is chiefly known by the want of calyx, by the presence of albumen, and the absence of milk; the habit of the two orders being much the same. Bartling combines Platanus with Artocarpeæ, perhaps rightly. According to Gærtner, the radicle is next the hilum; according to Achille Richard (*Dict. Class.* 14. 23.), it is at the other extremity.

Geography. Natives of Barbary, the Levant, and North America.

Properties. Noble timber-trees, the wood of which is extremely valuable; the bark of Platanus is remarkable for falling off in hard irregular patches, a circumstance which arises from the rigidity of its tissue, on account of which it is incapable of stretching as the wood beneath it increases in diameter.

GENUS.

Platanus, L.

Order CXXXVIII. BALSAMACEÆ.

Balsamifluæ, *Blume Fl. Javæ.*

Essential Character.—*Catkins* unisexual, roundish. Males: *Anthers* numerous, oblong, nearly sessile; with no calyx, but mixed with a few minute scales and covering the common receptacle. Females: *Ovaries* 2-celled, collected into a globe, each surrounded by a few scales; *styles* 2, long. *Fruit* a kind of cone composed of indurated connected scales, in the cavities of which lie obconical, 2-lobed, 2-celled capsules. *Seeds* numerous, or solitary by abortion, compressed, membranous, winged, attached internally to the middle of the dissepiments in a peltate manner. *Embryo* inverted, in the midst of albumen.—*Tall trees*, yielding balsam. *Leaves* alternate, simple or lobed, with glandular serratures at the edges. *Stipules* deciduous. *Female* catkins on longer stalks than the males, and below them. *Blume.*

Affinities. Especially known from all the neighbouring orders by their 2-lobed, 2-celled polyspermous capsules, and their albuminous embryo. They are nearest Betulaceæ in the structure of their fruit. Their balsamic products have no parallel among similar plants, except in a slight degree in Salicaceæ.

Geography. The tropics of India, and the warmer parts of North America and the Levant, are the countries of this order.

Properties. The fragrant resin Storax is yielded by several species of Liquidambar.

GENERA.

Liquidambar, L.
Altingia, Nor.

Alliance III. *MONIMIALES.*

Essential Character.—*Flowers* placed within an involucre. *Sexes* distinct. Aromatic *trees* or *shrubs.*

In this alliance we have the same form among Incomplete plants as Euphorbia exhibits in Polypetalous ones, namely, an involucre assuming the appearance of a calyx and enclosing in its cavity a number of simple, perfectly naked, monandrous or monogynous flowers. Further than this, there seems no relation with Monimiales and Euphorbia; the former are much more closely akin to Urticaceæ, with which they accord in the nature of their carpels, and in the general character of the receptacle-like involucre of such plants as Ambora, &c. Their naked flowers and aromatic opposite leaves are sufficient to distinguish them. Bartling assigns the alliance pellucid dots in the leaves; but although they exist in Ruizia they are by no means universal.

Order CXXXIX. MONIMIACEÆ.

Monimieæ, *Juss. in Ann. Mus.* 14. 130. (1809); *DC. Ess. Med.* 265. (1816); *Bartl. Ord. Nat.* 103. (1830); *Arnott in Edinb. Encycl.* 129. (1832).

Essential Character.—*Flowers* unisexual. Involucre tubular, toothed or lobed at the apex, with valvular æstivation. *Stamens* indefinite, covering all the inside of the involucre; *anthers* 2-celled, bursting longitudinally. *Ovaries* several, superior, 1-celled, distinct, enclosed within the tube of the involucre, each with its own *style* and *stigma*; *ovule* pendulous. *Fruit* consisting of several 1-seeded nuts, enclosed within the enlarged involucre. *Seed* pendulous; *embryo* in the midst of an abundant *albumen*; *radicle* superior.—Aroma-

tic *trees* or *shrubs*. *Leaves* opposite, without stipules. *Hairs* stellate. *Flower* heads axillary, in short racemes.

Affinities. Allied to Urticaceæ, from which they differ principally in their naked flowers enclosed within a calyx-like involucre, and in their opposite aromatic leaves; also to Lauraceæ, from which they are known by the dehiscence of their anthers, the number of their ovaries, and their naked flowers; and to Atherospermaceæ, which agree in sensible qualities, and in the number of their ovaries, but which differ in the dehiscence of the anthers, and in the erect position of the ovules. With Calycanthaceæ they have also some relation.

Geography. All natives of South America.

Properties. All the parts of the bark and leaves exhale an aromatic odour, which is compared by travellers to that of Laurels or Myrtles. *DC.* Ruizia, the *Boldu* of Chili, produces a succulent fruit which is eaten by the natives. Both the wood and leaves are very fragrant; the former makes a kind of charcoal, which is preferred beyond all other kinds by smiths. *Bridges in litt.*

GENERA.

Ambora, Juss. Ruizia, R. et Pav. Mithridatea, Comm. Mollinedia, R. et P.
Tambourissa, Sonn. *Boldea*, Juss. Brongniartia, Bl.
Monimia, Pet. Thou. *Peumus*, Pers.

Order CXL. ATHEROSPERMACEÆ.

Atherospermeæ, *R. Brown in Flinders*, 553. (1814); *Arnott in Edinb. Encycl.* 130. (1832).

Essential Character.—*Flowers* unisexual. *Involucre* calyx-like, tubular, divided at the top into several segments, usually placed in two rows, the inner of which is partly petaloid; to these are superadded some scales in the female involucres. *Stamens* in the males very numerous in the bottom of the involucre, with scales among them; in the females fewer, and arising from the orifice of the involucre; *anthers* adnate, 2-celled, bursting with a valve which separates from the base to the apex. *Ovaries* several in each involucre, usually indefinite, each with a single erect ovule; *styles* simple, arising either from the side or the base; *stigmas* simple. *Nuts* terminated by the persistent styles become feathery, enclosed in the enlarged tube of the involucre. *Seed* solitary, erect; *embryo* short, erect, at the base of soft, fleshy albumen; *radicle* inferior.—*Trees*. *Leaves* opposite, without stipules. *Flower-heads* axillary, solitary.

Affinities. The anthers of this order are the same as those of Lauraceæ and Berberaceæ, from the latter of which they differ entirely, but with the former of which they agree in their aromatic odour. The order is nearly related to Monimiaceæ, with which it is even combined by Jussieu and Bartling; but it differs in the position of the ovule, and in the structure of the anthers.

Geography. Natives of New Holland and South America.

Properties. Aromatic shrubs.

GENERA.

Atherosperma, Lab. Laurelia, Juss. Citrosma, R. et P.
Pavonia, R. et P.

Alliance IV. *PODOSTEMALES.*

Essential Character.—*Flowers* solitary. *Carpels* 2, or 3, combined. *Seeds* very numerous and minute. Obscure water *plants*, either with minute leaves, or with the stem

and leaves all confounded in one broad mass, or else with the latter decomposed into capillary segments.

The discovery of the genus Philocrene, which has three sepals, diminishes the probability of this alliance being rightly grouped, and the observations by Bongard, who considers the supposed sterile stamens of Podostemum to be in reality an imperfect calyx, induce me still more to suspect it should be stationed in the Rectembryose group near Lacistemaceæ. Nevertheless I allow it to retain its present place until further information can be had concerning the African portion of the order. If there is any type of structure more nearly approaching that of Asexual plants, or Acrogens, than any other, it must be surely this which with the habit of Marchantiaceæ and Jungermanniaceæ has so much he structure of flowering plants. According to Bongard, the species have neither spiral vessels, nor stomates; the latter would of course be absent on account of the submersed habits of the species of Mourera to which his observations chiefly apply.

Order CXLI. PODOSTEMACEÆ.

Podostemeæ, *Richard and Kunth in Humb. N. G. et Sp.* 1. 246. (1815); *Martius Nov. G. et Sp.* 1. 6. (1822); *Bartl. Ord. Nat.* 72. (1830); *Arnott in Edinb. Encycl.* p. 137. (1832); *Bongard in Mem. de l'Acad. Imp. Petersb. VI. ser. III.* 69. (1834).

Essential Character.—*Flowers* naked, or with a very imperfect calyx, or with 3 sepals, hermaphrodite, bursting through an irregularly lacerated spathe. *Stamens* hypogynous, varying from 1 to an indefinite number, either placed all round the ovary or on one side of it, distinct or monadelphous; *anthers* oblong, 2-celled, bursting longitudinally. *Ovary* 2- or 3-celled, with numerous ovules attached to a fleshy central placenta; *styles* or *stigmas* 2 or 3, and sessile. *Fruit* slightly pedicellate, ribbed, capsular, opening by 2 or 3 valves, which fall off from the dissepiment, which is parallel with them. *Seeds* numerous, minute, according to Von Martius, entirely homogeneous; but according to Bongard containing an exalbuminous dicotyledonous *embryo*.—*Herbaceous* branched floating plants [without stomates or spiral vessels, *Bong.*]. *Leaves* capillary, or linear, or lacerated irregularly, or minute and densely imbricated, decurrent on the stem, with which they are not articulated. *Flowers* axillary or terminal, inconspicuous.

Affinities. Von Martius has the following remarks upon this curious order. "It is very doubtful in what part of the natural series Podostemeæ should be arranged; for they are connected with so many other orders, in so various and complicated a manner, that it is highly probable that several genera, the affinities of which will be more apparent, still remain to be discovered. Nothing can be more singular than the mixture of different characters which they exhibit. Thus, the structure of their spathes, and the want of a true calyx and corolla, approximate them to Naiades (Fluviales) and Araceæ, while the character of their stamens and fruit is very much that of Juncaginaceæ; the former of these, however, differ in their lower degree of organisation, and the latter in the presence of a more or less perfect perianth, and in the composition of their capsule. Lemna, a genus closely allied to Araceæ, seems to be more related to them in its spathe, hypogynous stamens, habit, and mode of life, but is distinguished by its less highly developed few-seeded fruit. Again Mniopsis, in its ramification, in the form and position of its leaves, and in its stipules, and Lacis and Podostemum in the character of their spathe and the emersion of their pedicels at the time of flowering, call remarkably to mind the habit of Jungermanniæ; so that we should probably not be far from the truth, if we were to say that this order forms a transition from Naiades (Fluviales) to Juncaginaceæ, on the one hand touching upon Araceæ, thus being, as it were, a sort of noble analogy of Hepaticæ among monocotyledons." *Nov. G. et Sp.* 1. 7. Upon this it was difficult to make

any additional remark, so long as no more was known of the structure of Podostemaceæ. It however always appeared to me impossible to concur in opinion with Kunth, Richard, von Martius, Arnott, &c. who considered the order monocotyledonous; for the following reasons. In the first place, the habit is that of dicotyledons, as for instance Podostemum of a starved pepper; Mourera and Lacis of Ranunculaceæ, not only in the resemblance of their leaves to those of aquatic Ranunculi, but in that of their flowers to those of Thalictrum; Hydrostachys has its flowers arranged in the way of those of Saururus. Moreover the vernation of the leaves of Mourera is that of dicotyledons rather than of monocotyledons. These reasons have not appeared satisfactory to Bongard, who accordingly adopts the opinion of Martius and others; it is not a little curious, however, that this clever botanist should himself have furnished the first and only direct evidence that has yet been offered, that Podostemaceæ are really dicotyledonous, and consequently that he is in the wrong; for although he calls the embryo, p. 70, monocotyledonous, he represents it t. 3 and 5, as dicotyledonous, as it moreover evidently is, from the terms of his own description.

Geography. Natives of rocks in rivers, still waters and damp places in South America and the islands off the east coast of Africa; 1 species is found in North America.

Properties. Some species of Lacis yield, when burnt, a considerable quantity of salt from their ashes: *Schomburgk*.

GENERA.

Podostemon, Mich.	Mourera, Aubl. (23.)	Philocrene, Bong.	Hydrostachys, Thouar.
? Dicræia, Pet. Th.	*Marathrum*, Humb.	Mniopsis, Martius.	Tristicha, Thouars.
	Lacis, Schreb.	*Crenias*, Spreng.	

Alliance V. *CALLITRICHALES.*

Essential Character.—*Carpels* several, combined in a solid pistil, single-seeded. Floating plants.

Order CXLII. CALLITRICHACEÆ.

Callitrichineæ, *Link Enum.* 1. 7. (1821); *Lavielle in Ann. Soc. Linn. Par.* p. 229. (1824); *DC. Prodr.* 3. 71. (1828); *a* § *of* Halorageæ. *Lindl. Synops.* 242. (1829).

Essential Character.—*Flowers* usually unisexual, monœcious, naked, with 2 fistular coloured bracts. *Stamens* single; *filaments* filiform, furrowed along the middle; *anther* reniform, 1-celled, 2-valved; the valves opening fore and aft. *Ovary* solitary, 4-cornered, 4-celled; *ovules* solitary, peltate; *styles* 2, right and left, subulate; *stigmas* simple points. *Fruit* 4-celled, 4-seeded, indehiscent. *Seeds* peltate; *embryo* inverted in the axis of fleshy *albumen*; *radicle* very long, curved, superior; *cotyledons* very short.—Small aquatic *herbaceous* plants, with opposite, simple, entire *leaves*. *Flowers* axillary, solitary, very minute.

Affinities. I have remarked in my *Synopsis*, that "the affinity of this order to other dicotyledons appears to be of the same nature as that borne by Lemna to monocotyledons: they each exhibit the lowest degree of organisation known in their respective classes." Brown considers the order allied to Halorageæ: an opinion in which there is much plausibility, and in which Botanists seem to be generally disposed to concur. The great objection to it is this; Halorageæ are a reduced form of Onagraceæ, with the petals often

absent, and the calyx sometimes diminished to what seems a mere rim; but in reality, in consequence of the ovary being inferior, the whole of the tube of the calyx as well as its rim remains adhering to the ovary, so that the calyx is not in fact materially diminished; but Callitrichaceæ are absolutely achlamydeous. Now I think we have only one instance among Polypetalous Exogens of an entire loss of both calyx and corolla, and that is in the genus Euphorbia; but in that instance the non-developement of those organs is probably owing to the want of room for their formation in the contracted involucre within whose tube they are crowded; but in Callitrichaceæ no pressure whatever is exercised, but the flowers are at liberty to develope to whatever extent their nature will admit of. For these reasons I consider that Callitrachaceæ are to be looked upon as an absolutely achlamydeous order, and that being the case, it will necessarily take its place where I have now stationed it. It is quite true that no very striking affinity can be pointed out as yet between it and the other parts of the Achlamydeous group; but neither can this be done if it is referred to Onagrales, and yet that alliance, compared with Achlamydosæ, is very completely known. If it is said that its floating habit assimilates it with Myriophyllum in Halorageæ, so does the same habit associate it with Podostemaceæ. It is hardly worth pushing this discussion further, but other points worth notice will readily suggest themselves to any experienced botanist.

GEOGRAPHY. Natives of still waters in Europe and North America.

PROPERTIES. Unknown.

GENUS.

Callitriche, L.

GROUP III. Tubiferosæ.

ESSENTIAL CHARACTER.—*Calyx* tubular, often resembling a corolla. *Ovary* in most cases simple. *Embryo* never curved round albumen.

This may be considered as upon the whole, the most highly developed form of Incompletæ, the calyx being in all respects as perfect as that of Polypetalæ, and in some instances appendages at its orifice being produced which are analogous to petals, as in Thymelaceæ; in those cases, however, the succulent nature of the appendages, their not withering away, the absence of spiral vessels from them, concur to refer them to abortions of the petaline rather than of the staminal series. It is here that we have one of the most direct transitions to the Polypetalous sub-class, for the relation of Daphnales to Rhamnales, of Proteales to Loranthaceæ, and of Lauraceæ to Myristicaceæ, are not to be questioned. The only cases in which this group can be confounded with any other, are in such plants as Scleranthaceæ or Nyctaginaceæ; but those have an embryo curved round mealy albumen, and besides are readily to be recognised after a little study.

ALLIANCE I. *SANTALALES.*

ESSENTIAL CHARACTER. — *Calyx* adherent to the sides of the ovary. *Anthers* opening by longitudinal fissures.

Order CXLIII. SANTALACEÆ. The Sanders-Wood Tribe.

Santalaceæ, *R. Brown Prodr.* 350. (1810); *Juss. Dict. des Sc. Nat.* 47. 287. (1827); *Lindl. Synops.* 207. (1829); *Bartling Ord. Nat.* 112. (1830); *Arnott in Edinb. Encycl.* 128. (1832).—Osyrideæ, *Juss. in Ann. Mus. vol.* 5. (1802); *Martius Conspectus, No.* 82. (1835).—Nyssaceæ, *Juss. in Dict. des Sciences,* 35. 267. (1825). *Martius Conspectus, No.* 88. (1835).—Osyrinæ, *Link Handb.* 1. 371. (1829).

Essential Character.—*Calyx* superior, 4- or 5- cleft, half-coloured, with valvate æstivation. *Stamens* 4 or 5, opposite the segments of the calyx, and inserted into their bases. *Ovary* 1-celled, with from 1 to 4 *ovules,* fixed to the top of a central placenta near the summit; *style* 1; *stigma* often lobed. *Fruit* 1-seeded, hard and dry, and drupaceous. *Albumen* fleshy, of the same form as the seed; *embryo* in the axis, inverted, taper.—*Trees* or *shrubs,* sometimes *under-shrubs* or *herbaceous* plants. *Leaves* alternate, or nearly opposite, undivided, sometimes minute, and resembling stipules. *Flowers* in spikes, seldom in umbels, or solitary, small. *R. Br.*

Anomalies. Osyris differs in its dicœcious flowers, in having a trifid calyx with only three stamens, and, according to the younger Gærtner, an erect seed with an embryo curved and lying a little out of the axis of the albumen, with its radicle superior, and therefore turned away from the hilum.

Affinities. I consider their inferior fruit the true mark of this order, and that Anthoboleæ ought to be referred to Thymelaceæ. It is closely allied to Elæagnaceæ and Thymelaceæ. Brown observes (*Flinders,* 569.) that one of the most remarkable characters of the order consists in its unilocular ovary containing more than one, but always a determinate number of ovules, which are pendulous, and attached to the apex of a central receptacle. This receptacle varies in its figure in the different genera, in some being filiform, in others nearly filling the cavity of the ovary. I refer Nyssaceæ here, without any doubt. According to Jussieu, who is the only botanist that has much noticed that tribe, it contains but the single genus Nyssa, differing from Elæagnaceæ in its inferior ovary, albuminous pendulous seed, and superior radicle. It is more nearly allied to Santalaceæ; but its ovary contains, instead of three ovules adhering to a central placenta, one only, which is pendulous, and its embryo is not cylindrical, but has enlarged foliaceous cotyledons.

Geography. Found in Europe and North America, in the form of little obscure weeds; in New Holland, the East Indies, and the South Sea Islands, as large shrubs, or small trees.

Properties. Sanders-wood is the produce of Santalum album. In India it is esteemed by the native doctors as possessing sedative and cooling qualities, and as a valuable medicine in gonorrhœa. It is also employed as a perfume. *Ainslie,* 1. 377. The Thesiums are scentless and slightly astringent. *DC.*

GENERA.

Thesium, L.	*Calinux,* Rafin.	Quinchamalium, Juss.	Myoschilos, R. et P.
Comandra, Nutt.	Osyris, L.	Fusanus, L.	Nyssa, L.
Leptomeria, R. Br.	*? Helwingia,* Willd.	*Colpoon,* Berg.	? Octarillum, Lour.
Stemonurus, Blume.	Grubbia, Berg.	Sphærocarya, Wall.	Pseudanthus, Sieb.
Choretum, R. Br.	Arjona, Cav.	Santalum, L.	
Pyrularia, Mich.	Ophira, L.	*Sirium,* L.	? Cevallia, Lag.
Hamiltonia, Willd.			? Cervantesia, Fl. Per.

Alliance II. *DAPHNALES.*

Essential Character. *Calyx* inferior, with an imbricated æstivation. *Carpel* solitary. *Anthers* opening by longitudinal fissures.

Only differ from Penæales in the compound structure of the fruit of the latter.

Order CXLIV. ELÆAGNACEÆ. The Oleaster Tribe.

Elæagni, *Juss. Gen.* 75. (1789).—Elæagneæ, *Ach. Rich. Monogr.* (1823); *Lindl. Synopsis*, 208. (1829); *Bartl. Ord. Nat.* 113. (1830).

Essential Character.—*Flowers* dicœcious, rarely hermaphrodite. *Male: Calyx* 4-parted; *stamens* 3, 4, or 8, sessile; *anthers* 2-celled. *Female: Calyx* inferior, tubular, persistent; the *limb* entire, or 2-4-toothed. *Ovary* superior, simple, 1-celled; *ovule* solitary, ascending, stalked; *stigma* simple, subulate, glandular. *Fruit* crustaceous, enclosed within the calyx become succulent. *Seed* erect; *embryo* straight, surrounded by very thin fleshy *albumen*; *radicle* short, inferior; *cotyledons* fleshy.—*Trees* or *shrubs*, usually covered with leprous scales. *Leaves* alternate, or opposite, entire, without stipules. *Flowers* axillary, often fragrant.

Affinities. Its leprous leaves, superior fruit, tubular calyx, and apetalous flowers, will at all times distinguish the Oleaster tribe, which touches at one point Thymelaceæ, from which it is known by the position of its ovule; at another Proteaceæ, known by their valvate irregular calyxes, and dehiscent fruit; at a third Santalaceæ, which have the ovary inferior; and also at a fourth Combretaceæ, which have petals, convolute cotyledons, and a superior calyx. As lepidote, or scurfy leaves, form one of the distinguishing marks of this little order, it may be worth noticing that the principal natural orders in which a similar organization occurs are Malpighiaceæ, which are polypetalous and tricarpous, Euphorbiaceæ which are tricoccous, Rutaceæ which are polypetalous and polycarpous, Solanaceæ which are monopetalous, and Chenopodiaceæ. It is obvious that the latter is the only one of these orders with which Elæagnaceæ can be confounded; and from that they are readily known by their tubular calyx and straight embryo.

Geography. The whole of the northern hemisphere, down to the equator, is occupied more or less by this family, from Canada and Japan to Guiana and Java; they are comparatively rare south of the line.

Properties. The berries of Hippophae rhamnoides are occasionally eaten; the fruit of Elæagnus orientalis is almost as large as a Jujube, and is known in Persia as an article of the dessert, under the name of Zinzeyd; that of E. arborea and conferta is eaten in Nipal.

GENERA.

Elæagnus, L.	Hippophaë, L.
Shepherdia, Nutt.	Conuleum, Rich.

Order CXLV. THYMELACEÆ. The Mezereum Tribe.

Thymelææ, *Juss. Gen.* 76. (1789); *R. Br. Prodr.* 358. (1810); *Lindley's Synopsis*, 208. (1829); *Bartling Ord. Nat.* 114. (1830); *Arnott in Edinb. Encycl.* 127. (1832).—Daphnoideæ, *Vent. Tabl. II.* 235. (1799).—Anthoboleæ, *Martius Conspectus, No.* 81. (1835).—Exocarpeæ, *Arnott in Edinb. Encycl.* 128, a § of Santalaceæ, (1832).

Essential Character.—*Calyx* inferior, tubular, coloured; the limb 4-cleft, seldom

5-cleft, with an imbricated æstivation. *Corolla* 0, or sometimes scale-like petals in the orifice of the calyx. *Stamens* definite, inserted in the tube or its orifice, often 8, sometimes 4, less frequently 2; when equal in number to the segments of the calyx or fewer, opposite to them; *anthers* 2-celled, dehiscing lengthwise in the middle. *Ovary* solitary, with one solitary pendulous ovule; *style* 1; *stigma* undivided. *Fruit* hard, dry, and nut-like, or drupaceous. *Albumen* none, or thin and fleshy; *embryo* straight; *cotyledons* plano-convex; *radicle* short, superior; *plumule* inconspicuous.—*Stem* shrubby, very seldom herbaceous, with tenacious bark. *Leaves* without stipules, alternate or opposite, entire. *Flowers* capitate or spiked, terminal or axillary, occasionally solitary. *R. Br.*

Affinities. Closely akin to Santalaceæ, Elæagnaceæ, and Proteaceæ, from all which the order is readily known by obvious characters; especially from the two latter by the pendulous ovules, and from the former by the inferior calyx. Aquilariaceæ, placed by De Candolle near Chailletiaceæ, among polypetalous orders, differ from Thymelaceæ chiefly in their 2-valved fruit; the scales in the throat of several genera of Thymelaceæ being of the same nature as the bodies called petals in Aquilariaceæ. I refer Anthoboleæ here, because of their superior fruit, a character which seems to me of more importance than the position of the ovules. It appears from the Botanical Appendix to Flinders's Voyage, that there is a very remarkable species of Exocarpus which bears its flowers upon the margins of dilated foliaceous branches, after the manner of Xylophylla. Martius considers Anthoboleæ a distinct order, adopting in that respect the suggestion of Jussieu; this great botanist supposed that Cervantesia of the Flora Peruviana might possibly belong to them; it seems, however, to belong rather to Santalaceæ.

Geography. Natives sparingly of Europe, and the northern parts of the world, common in the cooler parts of India and South America, and abundant at the Cape of Good Hope and in New Holland.

Properties. The great feature of this order is the causticity of the bark, which acts upon the skin as a vesicatory, and causes excessive pain in the mouth if chewed. A decoction of it is said to have been found useful in venereal complaints. The berries of Daphne Laureola are poisonous to all animals except birds. *DC.* The bark is composed of interlaced fibres, which are extremely tough, but which are easily separable; in Jamaica a species is found which is called the Lace Bark Tree, in consequence of the beautifully reticulated appearance of the inner bark: cordage has been manufactured from several species. A very soft kind of paper is made from the inner bark of Daphne Bholua, in Nipal. *DC. Prodr.* 68. Daphne Gnidium and Passerina tinctoria are used in the south of Europe to dye wool yellow.

GENERA.

Dirca, L.
Lagetta, Juss.
Daphne, L.
Scopolia, L. fil.
Capura, L.
Linostoma, Wall.
Nectandra, Roxb.
Schœnobiblus, Mart.
Diarthron, Turcz.
Passerina, L.
Stellera, L.
Struthiola, L.
Lachnæa, L.
Dais, L.
Gnidia, L.
Struthia, Roy.
Thymelina, Hsgg.
Pimelea, Banks.
Thecanthus, Wikstr.
Drapetes, Lam.
Cansiera, Juss.
Eriosolena, Bl.
Drimyspermum, Reinw.
Wikströmia, Endl.
Neea, R. et P.

§ Anthoboleæ, Bartl.
Anthobolus, R. Br.
Exocarpus, Lab.

Order CXLVI. HERNANDIACEÆ.

Hernandieæ, *Blume Bijdr.* 550. (1825); *Arnott in Edinb. Encycl.* 126. (1832).

Essential Character.—*Flowers* monœcious or hermaphrodite, with a calycine involucel to the females or hermaphrodites. *Calyx* petaloid, inferior, tubular, 4-8-parted, deci-

duous. *Stamens* definite, inserted into the calyx in two rows, of which the outer is often sterile; *anthers* bursting longitudinally. *Ovary* superior, 1-celled; *ovule* pendulous; *style* 1, or none; *stigma* peltate. *Drupe* fibrous, 1-seeded. *Seed* solitary, pendulous; *embryo* without albumen, inverted; *cotyledons* somewhat lobed, shrivelled, oily.—*Trees*. *Leaves* alternate, entire. *Spikes* or *corymbs* axillary or terminal.

Affinities. Adopted from Blume. It appears very near Thymelaceæ, differing almost solely in the fibrous drupaceous fruit, lobed cotyledons, and the presence of a sort of involucre to the female or hermaphrodite flowers. Hernandia has been hitherto referred to Lauraceæ or Myristicaceæ, from both of which it is obviously very different.

Geography. Natives of the Indian archipelago and Guiana.

Properties. The bark, seed, and young leaves, are all slightly purgative. According to Rumphius, the fibrous roots of Hernandia sonora, chewed and applied to wounds caused by the Macassar poison, form an effectual cure. The juice of its leaves is a powerful depilatory; it destroys hair wherever it is applied, without pain. The wood appears to be very light. According to Aublet, that of H. guianensis takes fire readily from a flint and steel, and is used as amadou. The seeds of Inocarpus are entire, and have a taste similar to Chesnuts.

GENERA.

Hernandia, L.
Inocarpus, Forst.

Order CXLVII. AQUILARIACEÆ. The Agallochum Tribe.

Aquilarineæ, *R. Brown Cong.* p. 25. (1818); *DC. Prodr.* 2. 59. (1825); *Royle Illustr.* 171. (1835).

Essential Character.—*Calyx* turbinate or tubular; limb 5-cleft; segments spreading, persistent, with an imbricated æstivation; the orifice furnished with 10 or 5 bearded scales (sterile stamens). *Stamens* 10 or 5, in the latter case opposite the segments of the calyx; *filaments*, except where united to the tube of the calyx, short or 0, smooth, inserted into the orifice of the calyx a little lower down than the scales. *Anthers* narrow, oblong, attached by their back below the middle, 2-celled, opening internally and lengthwise. *Ovary* superior, sessile or stipitate, downy, compressed, 1-celled, having internally upon each flattened side a linear prominent placenta resembling a dissepiment; hence spuriously 2-celled, with a very narrow partition; *ovules* two, of which one is suspended from each placenta, tapering downwards; *style* 0, or conical and threadshaped; *stigma* large, simple. *Capsule* pear-shaped, compressed, sessile, or stipitate, 1-celled, 2-valved; *valves* bearing in the middle the placentæ which almost touch each other. *Seeds* one on each placenta, or one sometimes abortive, rising up by aid of a funiculus originating near the apex of the placenta; furnished with a tail-like aril, which descends straight from the hilum to the bottom of the capsule; *albumen* 0; *cotyledons* thick, fleshy, hemispherical; *radicle* straight, superior.—*Trees*. *Branches* smooth, with a tough bark. *Leaves* alternate, on short stalks, entire, without *stipules*, when full grown smooth, shining, with very fine veins which run together into a marginal vein just within the margin. *Arnott in litt.*

Affinities. De Candolle places this order between Chailletiaceæ and Terebintaceæ, but with indications of doubt, and an erroneous character; and Brown seems willing (*Congo*, 444.) to consider the order a section of Chailletiaceæ, adding, that it would not be difficult to shew its affinity to Thymelaceæ. In this I fully concur, after an examination of a specimen of Aquilaria Agallochum, for which I am indebted to the East India Company; in fact, Aquilariaceæ chiefly differ from Thymelaceæ in their dehiscent fruit, and probably also in the direction of their radicle. In both orders the ovary is superior and 1-celled, both have similar scale-like bodies at the orifice of the calyx, and

no petals, both suspended ovules, a single style, and capitate stigma. I am indebted to Mr. Arnott for an amended character of the order, so framed as to include Gyrinops, as also for new generic characters of the two genera. Mr. Arnott remarks, in confirmation of the affinity between Aquilariaceæ and Thymelaceæ, that the latter have sometimes 10 stamens.

Geography. Natives of the East Indies.

Properties. *Aloes wood, Agila wood,* or *Eagle wood,* containing a fragrant resinous substance, of a dark colour, is the inside of the trunk of the Aquilaria ovata and A. Agallochum. It is considered a cordial by some Asiatic nations, and has been prescribed in Europe in gout and rheumatism. *Ainslie,* 1. 479. For a valuable account of this substance, see *Royle,* as above quoted.

GENERA.

Aquilaria, Lam. (24)
Ophiospermum, Lour.
Gyrinops, Gærtn. (25)

Alliance III. *PROTEALES.*

Essential Character.—Æstivation of calyx valvate. *Stamens* opposite its lobes. *Fruit* simple, follicular.

All the plants of this alliance have a remarkably hard cuticle; they are clearly known by the above character.

Order CXLVIII. PROTEACEÆ.

Proteaceæ, *Juss. Gen.* (1789); *R. Brown in Linn. Trans.* 10. 15. (1809); *Prodr.* 363. (1810); *Suppl. Prim.* (1830).

Essential Character.—*Calyx* 4-leaved, or 4-cleft, with a valvular æstivation. *Stamens* 4, sometimes in part sterile, opposite the segments of the calyx. *Ovary* simple, superior; *style* simple; *stigma* undivided. *Fruit* dehiscent or indehiscent. *Seed* without albumen; *embryo* with two, or occasionally several *cotyledons,* straight; *radicle* inferior.—*Shrubs* or small *trees.* *Branches* usually umbellate. *Leaves* hard, dry, divided or undivided, opposite or alternate, without *stipules;* their cuticle often covered equally on both sides with stomates.

Affinities. There is no difficulty in distinguishing this order; the hard woody texture of whose leaves, and irregular tubular calyxes having a valvate æstivation, stamens placed upon the lobes, along with a dehiscent fruit, at once characterise it. By these marks it is known from Elæagnaceæ, and all other orders. One of the most complete systematic monographs is Brown's upon these, in the Linnæan Society's Transactions, from which I find much to extract. According to this botanist, "the radicula pointing towards the base of the fruit in all Proteaceæ, is a circumstance of the greatest importance, in distinguishing the order from the most nearly related tribes; and its constancy is more remarkable, as it is not accompanied by the usual position or even uniformity in the situation of the external umbilicus." *Linn. Trans.* 10. 36. Brown has also remarked, with his usual acuteness, that in consequence of the presence of hypogynous squamæ, we may expect to find octandrous genera belonging to this family. See *Flinders,* 2. 606. The same writer observes (*Flinders,* 568), that there is a peculiarity in the structure of the stamina of certain genera of Proteaceæ, namely, Simsia, Conospermum,

and Synaphea, in all of which these organs are connected in such a manner that the cohering lobes of two different anthers form only one cell. Another anomaly equally remarkable exists in Synaphea, the divisions of whose barren filament so intimately cohere with the stigma, as to be absolutely lost in its substance, while the style and undivided part of the filament remain perfectly distinct. In another place he remarks: "A circumstance occurs in some species of Persoonia, to which I have met with nothing similar in any other plant: the ovarium in this genus, whether it contain one or two ovula, has never more than one cell; but in several of the 2-seeded species, a cellular substance is, after fecundation, interposed between the ovula, and this gradually indurating, acquires in the ripe fruit the same consistence as the putamen itself, from whose substance it cannot be distinguished; and thus, a fruit originally of one cell becomes bilocular; the cells, however, are not parallel, as in all those cases where they exist in the unimpregnated ovarium, but diverge more or less upwards." *Brown in Linn. Trans.* 10. 35. This is subsequently explained, by the same author (*King's Appendix*), by the cohesion of the outer membranes of the two collateral ovules, originally distinct, but finally constituting this anomalous dissepiment, the inner membrane of the ovule consequently forming the outer coat of the seed.

Geography. "The favourite station of Proteaceæ is in dry, stony, exposed places, especially near the shore, where they occur also, though more rarely, in loose sand. Scarcely any of them require shelter, and none a good soil. A few are found in wet bogs, or even in shallow pools of fresh water; and one, the Embothrium ferrugineum of Cavanilles, grows, according to him, in salt marshes. Respecting the height to which plants of this order ascend, a few facts are already known. The authors of the Flora Peruviana mention, in general terms, several species as being alpine; and Humboldt, in his valuable Chart of Equinoctial Botany, has given the mean height of Embothrium emarginatum about 9300 feet, assigning it a range of only 300 feet. On the summits of the mountains of Van Diemen's Island, in about 43° south lat., at the computed height of about 4000 feet, I have found species of Embothrium, as well as other genera, hitherto observed in no other situation. Embothrium, however, as it is the most southern genus of any extent, so it is also, as might have been presumed, the most alpine of the family. Two genera only of this order are found in more than one continent: Rhopala, the most northern genus, though chiefly occurring in America, is to be met with also in Cochin China, and in the Malay archipelago; and Embothrium, the most southern genus of any extent, is common to New Holland and America. It is remarkable, that Proteaceæ are almost entirely confined to the southern hemisphere. This observation originated with Mr. Dryander; and the few exceptions hitherto known to it, occur considerably within the tropic. The fact is the more deserving of notice, as their diffusion is very extensive in the southern hemisphere, not merely in latitude and longitude, but also in elevation; for they are not only found to exist in all the great southern continents, but seem to be generally, though very unequally, spread over their different regions: they have been observed also in the larger islands of New Zealand and New Caledonia; but hitherto neither in any of the lesser ones, nor in Madagascar. As in America they have been found in Terra del Fuego, in Chile, Peru, and even Guiana, it is reasonable to conclude that the intermediate regions are not entirely destitute of them. But with respect to this continent, it may be observed, that the number of species seems to be comparatively small; their organisation but little varied; and further, that they have a much greater affinity with those of New Holland than of Africa. Of the botany of South Africa scarce any thing is known, except that of the Cape of Good Hope, where this family occurs in the greatest abundance and variety; but even from

the single fact of a genuine species of Protea having been found in Abyssinia by Bruce, it may be presumed that in some degree they are also spread over this continent. With the shores, at least, of New Holland, under which I include Van Diemen's Island, we are now somewhat better acquainted; and in every known part of these, Proteaceæ have been met with. But it appears, that both in Africa and New Holland the great mass of the order exists about the latitude of the Cape of Good Hope, in which parallel it forms a striking feature in the vegetation of both continents. What I am about to advance respecting the probable distribution of this family in New Holland must be very cautiously received, as it is in fact chiefly deduced from the remarks I have myself made in Captain Flinders's Voyage, and subsequently during my short stay in the settlements of New South Wales and Van Diemen's Island, aided by what was long ago ascertained by Sir Joseph Banks, and by a very transitory inspection of an herbarium collected on the west coast, chiefly in the neighbourhood of Shark's Bay, by the botanists attached to the expedition of Captain Baudin. From knowledge so acquired, I am inclined to hazard the following observations:—The mass of the order, though extending through the whole of the parallel already mentioned, is by no means equal in every part of it; but on the south-west coast forms a more decided feature in the vegetation of the country, and contains a far greater number of species, than on the east; and in that part of the south coast which was first examined by Captain Flinders, it seems to be more scanty than at either of the extremes. On the west coast also, the species, upon the whole, are more similar to those of Africa than on the east, where they bear a somewhat greater resemblance to the American portion of the order. From the parallel of the map, the order diminishes in both directions; but the diminution towards the north is probably more rapid on the east than on the west coast. Within the tropic, on the east coast, no genera have hitherto been observed, which are not also found beyond it; unless that section of Grevillea, which I have called Cycloptera, be considered as a genus: whereas, at the southern limit of the order several genera make their appearance, which do not occur in its chief parallel. The most numerous genera are also the most widely diffused. Thus Grevillea, Hakea, Banksia, and Persoonia, extensive in species in the order in which they are here mentioned, are spread nearly in the same proportion; and they are likewise the only genera that have as yet been observed within the tropic. Of such of the remaining genera as consist of several species, some, as Isopogon, Petrophila, Conospermum, and Lambertia, are found in every part of the principal parallel, but hardly exist beyond it. Others, as Josephea and Synaphea, equally limited to this parallel, have been observed only towards its western extremity; while Embothrium (comprehending, for the present, under this name all the many-seeded plants of the order), which is chiefly found on the east coast, and makes very little progress towards the west, advances to the utmost limit of south latitude, and there ascends to the summits of the highest mountains. Genera consisting of one or very few species, and which exhibit generally the most remarkable deviations from the usual structure of the order, are the most local, and are found either in the principal parallel, or in the highest latitude. The range of species in the whole of the order seems to be very limited; and the few cases which may be considered as exceptions to this, occur in the most extensive genera, and in such of their species as are most strictly natives of the shores. Thus Banksia integrifolia, which grows more within the influence of the sea than any plant of the order, is probably also the most widely extended, at least in one direction, being found within the tropic, and in as high a latitude as 40°. It is remarkable, however, that with so considerable a range in latitude, its extension in longitude is comparatively small: and it is still more worthy of notice, that no species of this

family has been found common to the eastern and western shores of New Holland." *Brown in Linn. Trans.* 10.

Properties. Handsome evergreen shrubs, much prized by gardeners for the neatness of their appearance, and the beauty or singularity of their flowers; but of no known use, except as fire-wood, for which they are commonly employed at the Cape of Good Hope. The fruit of Guevina is sold like nuts in the markets of Chile, under the name of Avellano.

GENERA.

Aulax, Berg.
Leucadendron, R. Br.
Conocarpos, Adans.
Eurystermum, Salis.
Chasme, Salisb.
Petrophila, R. Br.
Isopogon, R. Br.
Protea, L.
Erodendron, Salisb.
Leucospermum, R. Br.
Diastella, Salisb.
Mimetes, Salisb.
Serruria, Salisb.
Nivenia, R. Br.
Paranomus, Salisb.
Sorocephalus, R. Br.
Soranthe, Salisb.
Spatalla, Salisb.
Adenanthos, La Bill.
Simsia, R. Br.
Conospermum, Sm.
Synaphea, R. Br.
Franklandia, R. Br.
Symphionema, R. Br.
Agastachys, R. Br.
Cenarrhenes, La Bill.
Persoonia, Sm.
Linkia, Cav.
Brabejum, L.
Guevina, Mol.
Quadria, Ruiz. Pav.
Bellendena, R. Br.
Anadenia, R. Br.
Grevillea, R. Br.
Lyssanthe, Salisb.
Stylurus, Salisb.
Hakea, Schrad.
Conchium, Sm.
Lambertia, Sm.
Xylomelum, Sm.
Orites, R. Br.
Helicia, Lour.
Helittophyllum, Bl.
Ropala, Aubl.
Rhopala, Schreb.
Euplassa, Salisb.
Knightia, R. Br.
Embothrium, Forst.
Oreocallis, R. Br.
Telopea, R. Br.
Hylogyne, Salisb.
Lomatia, R. Br.
Tricondylus, Salisb.
Stenocarpus, R. Br.
Cybele, Salisb.
Banksia, Linn. f.
Hemiclidia, R. Br.
Dryandra, R. Br.
Josephia, Salisb.
? Cylindria, Lour.
Andriopetalum, Pohl.

Alliance IV. *LAUREALES.*

Essential Character.—*Anthers* opening by valves which curve backwards. *Carpels* solitary, either superior or inferior.

Order CXLIX. LAURACEÆ. The Cinnamon Tribe.

Lauri, *Juss. Gen.* 80. (1789);—Laurinæ, *Vent. Tabl.* (1799); *R. Brown Prodr.* 401. (1810); *Nees in Wall. Pl. as. rar.* 2. 58. (1831); *Laurin. Expositio*, (1833).

Essential Character.—*Calyx* 4-6-cleft, with imbricated æstivation, the limb sometimes obsolete. *Stamens* definite, perigynous, opposite the segments of the calyx, and usually twice as numerous; the 3 innermost, which are opposite the 3 inner segments of the calyx, sterile or deficient; the 6 outermost scarcely ever abortive; *anthers* adnate, 2-4-celled; the cells bursting by a longitudinal persistent valve from the base to the apex; the outer anthers valved inwards, the inner valved outwards [or both valved inwards]. *Glands* usually present at the base of the inner filaments. *Ovary* single, superior, with one or two single pendulous ovules; *style* simple; *stigma* obtuse. *Fruit* baccate or drupaceous, naked or covered. *Seed* without albumen; *embryo* inverted; *cotyledons* large, plano-convex, peltate near the base!; *radicle* very short, included, superior; *plumule* conspicuous, 2-leaved.—*Trees*, often of great size. *Leaves* without stipules, alternate, seldom opposite, entire or very rarely lobed. *Inflorescence* panicled or umbelled. *R. Br.*

Affinities. Distinguished from all incomplete apetalous dicotyledons, except Atherospermaceæ, by the peculiar dehiscence of their anthers, and divided from that order by the ovule being pendulous, not erect. In sensible qualities they resemble Myristicaceæ, which are at once known by their unisexual flowers and columnar stamens. The order has been learnedly illustrated by Nees von Esenbeck, in the places above referred to, and his observations are worthy of deep attention from every scientific botanist. I have

been obliged by him with his latest views of the genera of the order which are given in the list that follows this article.

Geography. Trees inhabiting cool places in the tropics of either hemisphere; in a very few instances only, straggling to the northward in North America and Europe, No genus is known to exist in any part of the continent of Africa. This is the more remarkable, as several species of Laurus have been found both in Teneriffe and Madeira, and some other genera exist in Madagascar, and in the Isles of France and Bourbon, *Brown, Congo*, 464.

Properties. It would be difficult to name another order at once so important and uniform in its qualities as this, the species being universally aromatic, warm, and stomachic. Cinnamon and Cassia are the produce of various species; the most genuine are yielded by Laurus Cinnamomum and L. Cassia; but L. Culilaban and Malabathrum can both be substituted for these spices: the Cinnamon of the Isle of France is Laurus cupularis, that of Peru is L. Quixos. The Cinnamon of Santa Fé is produced by Laurus Cinnamomoides. *Humb. Cinch. For.* 27. *Eng. ed.* The Sassafras nuts of the London shops are the fruit of the Laurus Pucheri of the Flora Peruviana. *Ibid.* Camphor is yielded by Laurus Camphora and other species; even by the Cinnamon tree itself. The properties of all these are due to the presence of a volatile oil; but they also contain in many cases a fixed oil which is supposed to constitute the principal part of the fruit of Persea gratissima, so much esteemed in the West Indies under the name of the Avocado Pear; the same oil appears in the form of a greasy exudation in the fruit of Litsea sebifera. A species of Laurus in Sumatra, called by Jack, Parthenoxylon, yields an oil useful in rheumatic affections; and an infusion of the roots is drank as sassafras, the qualities of which it resembles. *Ed. P. J.* 6. 398. The bark of Laurus Benzoin is highly aromatic, stimulant, and tonic, and is extensively used in North America in intermittent fevers. The oil of the fruit is said to be stimulant. *Barton*, 2. 95. A plant of this family found in the forests of Spanish Guiana yields a volatile oil, with a warm and pungent taste and aromatic smell. It is employed externally as a discutient, and internally as a diaphoretic, diuretic, and resolvent. *Ed. P. J.* 12. 417. The volatile oil obtained from some species of Laurus found in vast forests between the Oronoko and the Parime, is produced in great abundance by merely making an incision into the bark with an axe, as deep as the liber. It gushes out in such quantity, that several quarts may be obtained by a single incision. It has the reputation of being a powerful discutient. For further information, see *Brewster's Journal*, 1. 134. In addition to these qualities, there is present in some species an acrid, red, or violet juice, like that found in Myristicaceæ; it is particularly abundant in L. parvifolia, globosa, fœtens, and caustica.

GENERA.

(Supplied by Professor C. G. Nees von Esenbeck, Dec. 1. 1835.)

§ 1. Cinnamomeæ, N. ab E.
Cinnamomum, Burm.

§ 2. Camphoreæ, N. ab E.
Camphora, N. ab E.

§ 3. Ocoteæ, N. ab E.
Apollonias, N. ab E.
Ocotea, Aubl.

§ 4. Perseæ, N. ab. E.
Persea, Gærtn.
Machilus, Rumf.
Bolda, Feuill.
Alseodaphne, N. ab. E.
Hufelandia, N. ab E.

§ 5. Cryptocaryeæ, N. ab E.
Endiandra, R. Br.
Beilschmiedia, N. ab E.
Cecidodaphne, N. ab E.
Cryptocarya, R. Br.
Agathophyllum, W.
Ravensara, Sonn.
Evodia, Gærtn.
Mespilodaphne, N. ab E.

§ 6. Acrodiclidia, N. ab E.
Aydendron, N. et M.
Evonymodaphne, N. ab E. (26)
Acrodiclidium, N. et M.
Misanteca, Schult.

§ 7. Nectandreæ, N. ab E.
Nectandra, Roland.
Pomatium, N. et M.

§ 8. Dicypellia, N. ab E.
Dicypellium, N. et M.
Licaria, Aubl.
Petalanthera, N. et M.
Pleurothyrium, N. ab E. (27)

§ 9. Oreodaphneæ, N. ab E.
Teleiandra, Nees.
Leptodaphne, N. et M.
Ajouea, Aubl.

Endlicheria, Nees.*
Oreodaphne, N. et M.
Camphoromæa, N. et M.
Strychnodaphne, N. et M.
Gymnobalanus, N. et M.

§ 10. Flaviforæ, N. ab E.
Sassafras, N. ab E.
Benzoin, N. ab E.

§ 11. Tetrantheræ, N. ab E.
Cylicodaphne, N. ab E.
Tetranthera, Jacq.
Polyadenia, N. ab E.
Laurus, Plin.

Lepidadenia, N. ab E.
Dodecadenia, N. ab E.
Actinodaphne, N. ab E.
Iozosmene, N. ab E.
Daphnidium, N. ab E.
Tetradenia, N. ab E.

Adenostemum, Pers.
Gomortega, R. et P.
Keulia, Molia.

? Scyphogyne, Ad. Br.

Order CL. ILLIGERACEÆ.

Illigereæ, *Blume in Ann. Sc. N. S.* 2. 95. (1834); *Martius Conspectus, No.* 83. (1835). —Gyrocarpeæ, a § of Lauraceæ, *Nees ab Esenb. Laurin. expositio* 20. (1833).

Essential Character.—*Flowers* hermapdrodite or polygamous by abortion. *Calyx* with the tube adherent to the ovary; the border superior, divided in two rows, deciduous, or in part persistent, and augmenting in size; the segments with an inflexed valvular æstivation. *Petals* 0. *Stamens* inserted in the top of the tube, opposite the external segments, and equal to them in numbers, furnished at the base on each side with a gland or appendage, or with glands mixed among them. *Anthers* 2-celled; the cells opening inwards from the base to the apex by a permanent valve. *Ovary* inferior, 1-celled; *ovule* solitary, pendulous; *style* 1, simple; *stigma* peltate or obtuse, somewhat oblique. *Fruit* indehiscent; *seed* nut-like, without albumen; *cotyledons* leafy, twisted together. *Blume.*

Affinities. The only writer who has treated of this order is Blume, who remarks that one of the genera belonging to it has the habit of Cucurbitaceæ or Passifloraceæ, its leaves being ternate and its stem twining; but that in reality the order has the same relation to Lauraceæ as Vaccinaceæ to Ericaceæ. I observe that Nees Von Esenbeck in his manuscript list of Lauraceous genera now omits Gyrocarpus, from which I infer that he assents to its forming an order apart.

Geography. Trees or shrubs found in the tropical parts of America and Asia.

Properties. Unknown.

GENERA.

Illigera, Bl.
Gyrocarpus, Jacq.

Order CLI. CASSYTHACEÆ.

Laurinæ, § Cassytheæ, *Nees ab Esenb. Laurin. Expos.* 20. (1833).—Cassytheæ, *Lindl. Nixus Pl.* 15. (1833).

Essential Character.—The general structure of Lauraceæ, but; the *stem* dodder-like, parasitical, leafless; *flowers* hermaphrodite; the series of stamens all perfect, without glands; *stamens* 9; *anthers* 4-celled, the 3 inner turned backwards; *caryopsis* included in the berried perianth crowned by the converging segments.

Affinities. Although this strange plant is universally comprehended among Lauraceæ, and notwithstanding that the climbing habit of Illigera seems to justify such a measure, yet I am persuaded that we must, if we would preserve our orders really in a natural state separate this, as we separate Orobanchaceæ and Monotropaceæ elsewhere. It is too violent a shock to our ideas of resemblance to include in the very same order a plant like our wild

* Si *Endlicheriam*, Presl. retines, huic nomen *Schauera* tribuas precor. N. ab E.

Cuscuta and the noble forest trees of which the majority of Lauraceæ consists. Besides it appears from the short character given above, from Nees Von Esenbeck's work, that there are distinctions enough even in the fructification to define Cassythaceæ as a peculiar order.

GEOGRAPHY. Found in the hotter parts of all the tropics.

PROPERTIES. Unknown.

GENUS.

Cassytha, L.

ALLIANCE V. *PENÆALES.*

ESSENTIAL CHARACTER.—*Carpels* several. *Calyx* with an imbricated or valvate æstivation.

These plants would belong to Thymælaceæ if it were not for their compound fruit, for there is nothing in the habit of Penæaceæ to prevent it.

ORDER CLII. PENÆACEÆ.

PENÆACEÆ, *R. Brown, verbally* (1820); *Guillemin in Dict. Class.* 13. 171. (1828); *Martius Hort. Monac.* (1829); *Kunth in Linnæa*, v. 667. (1830).

ESSENTIAL CHARACTER.— *Calyx* inferior, with 2 or more bracts at its base; hypocrateriform, with a 4-lobed limb valvate in æstivation, or deeply 4-parted imbricated in æstivation. *Stamens* either 4, arising from below the recesses of the limb, with which they alternate, or 8, arising from near the base of the calyx; *anthers* 2-celled, turned inwards, usually with membranous valves lying on the face of a thick fleshy connective, sometimes with fleshy valves, and an obliterated connective. *Ovary* superior, 4-celled, with a simple *style* and 4 *stigmas; ovules* either ascending, collateral, in pairs, or solitary and suspended; the foramen always next the placenta. *Fruit* capsular, 4-celled, dehiscent or indehiscent? *Seed* erect or inverted; *testa* brittle; *nucleus* a solid fleshy mass, with no distinction of *albumen* or *embryo*; *radicular end* next the hilum?; *hilum* fungous.—*Shrubs. Leaves* opposite, imbricated, without stipules. *Flowers* terminal and axillary, usually red.

AFFINITIES. According to an observation of Jussieu, this order is allied to Epacridaceæ; but I confess I am unable to perceive on what account. To me it appears related in the first degree to some apetalous dicotyledons, such as Proteaceæ, with some of which the species agree in habit, and in the case of Penæa fruticulosa even in the thickened connective and the structure of the lobes of the stigma, each of which is strikingly like that of a Grevillea. To Bruniaceæ they must be compared, notwithstanding the presence of petals in that order, for the sake of Linconia, in which the pendulous ovule agrees with Geissoloma, and the thickened connective of the anthers, which is common to several species, although not present in Geissoloma. The fungous hilum of the seed is similar to that of Polygalaceæ, with which, however, Penæaceæ have no other apparent relation.

This order exhibits a singular instance of two distinct kinds of æstivation and attachment of ovules among species which it is impossible to separate from each other. In true Penæa the æstivation is valvate, and the ovules ascending, while in Geissoloma the former is imbricate, and the latter suspended. Penæa has also tetrandrous flowers, with peculiarly fleshy anthers, while Geissoloma has octandrous flowers, with no peculiar fleshiness in the anthers. Considering the near affinity of this order to Thymelaceæ, this circumstance contributes very much to shake our confidence in the value of the position of

the ovule as a mark of distinction between Santalaceæ, Elæagnaceæ, and Thymelaceæ; and it further contributes to strengthen the opinion that the position of the ovule is unimportant in Urticaceæ.

Geography. Evergreen shrubs, natives of the Cape of Good Hope.

Properties. A subviscid, sweetish, somewhat nauseous gum-resin, called Sarcocolla, is produced by Penæa mucronata (and others). It was supposed by the Arabians to possess, as its name indicates, the power of agglutinating wounds. *Ainslie*, 1. 380. It contains a peculiar principle, named *Sarcocollin*, which has never been detected in any other vegetable matter, and which has the property of forming oxalic acid, being treated with nitric acid. *DC.*

GENERA.

Penæa, L.
Sarcocolla, Kth.
Geissoloma, Lindl.

Group IV. Columnosæ.

Essential Character.—*Stamens* usually monadelphous, and the *ovary* 3- 6-celled; or at all events the latter character combined with an inferior ovary. *Wood*, if any, destitute of concentric zones.

Alliance I. *NEPENTHALES.*

Essential Character.—*Calyx* inferior. *Stem* with a stratum of spiral vessels between the wood and bark. *Flowers* dicœcious.

Order CLIII. NEPENTHACEÆ. The Pitcher-Plant Tribe.

Aristolochiæ, § Nepenthinæ, *Link Handb.* 1. 369. (1829).

Essential Character.—*Flowers* dicœcious. *Calyx* 4-leaved, inferior, oppositely imbricated in æstivation. *Stamens* cohering in a solid column, bearing at the apex about 16 anthers, collected in various directions in one head; *anthers* 2-celled, opening longitudinally and externally. *Ovary* superior, 4-cornered, 4-celled, with an indefinite number of ascending ovules attached to the sides of the dissepiments; *stigma* sessile, simple. *Fruit* capsular, 4-celled, 4-valved, with the seeds sticking to the sides of the dissepiments, which proceed from the middle of the valves. *Seeds* indefinite, very minute, fusiform, with a lax outer integument; *albumen* oblong, much less than the seed, lying about the middle of the outer integument; *embryo* in the midst of fleshy albumen, with 2 cotyledons placed face to face; (*radicle* turned towards the hilum, *Ad. Brongn. Nees ab Esenbeck*; turned to the extremity opposite the hilum, *Richard*).—*Herbaceous* or *half-shrubby* caulescent plants. *Leaves* alternate, slightly sheathing at the base, with a dilated foliaceous petiole, pitcher-shaped at the end, which is articulated with a lid-like lamina. *Stem* without concentric zones, with an abundance of spiral vessels in both wood, pith and bark, and also with a dense layer of the same between the wood and the bark. *Racemes* terminal, dense, many-flowered.

Affinities. The relation that is borne by the highly curious plants which this order contains was not even guessed at until Adolphe Brongniart pointed out a resemblance between them and Cytinaceæ, which had not before been suspected, but which he considered so important as to justify him in placing it in the same order. While we admit the ingenuity with which this opinion

is sustained, it is impossible to agree with Brongniart in the conclusion at which he has arrived. To say nothing of the extreme dissimilarity in habit between these plants, the structure of their fruit appears to me essentially different; and the seeds of Cytinus being unknown, the resemblance between it and Nepenthes is reduced to a similarity in the arrangement of the anthers, which cannot in the present case be considered of much importance, as it in some degree depends upon the unisexuality of the flowers of both genera. The only intelligible approximation of the order has been made by Brown, who with his usual unerring sagacity points out its relation to Aristolochiaceæ; as to which the structure of the wood in some respects completely confirms his views. Like that order, it is zoneless, although plainly exogenous; but it has this in particular to characterise it, that the system of spiral vessels is developed in a degree unknown in any other plants. The water contained in the unopened pitcher of a plant which flowered in the Botanic Garden of Edinburgh, was found by Dr, Turner "to emit, while boiling, an odour like baked apples, from containing a trace of vegetable matter, and to yield minute crystals of superoxalate of potash on being slowly evaporated to dryness," *B. Mag.* 2798. There is a good account of the germination of Nepenthes, in Jameson's Journal for April 1830, from which it may be concluded that the long loose tunic of the seed is intended to act at first as a buoy, to float the seed upon the surface of the water, and afterwards as an anchor, to keep it fast upon the mud until it can have struck root.

GEOGRAPHY. All natives of swamps in the East Indies and China.

PROPERTIES. Unknown.

GENUS.

Nepenthes, L.
Phyllamphora, Lour.

ALLIANCE II. *ARISTOLOCHIALES.*

ESSENTIAL CHARACTER.—*Ovary* inferior.

ORDER CLIV. ARISTOLOCHIACEÆ. THE BIRTHWORT TRIBE.

ARISTOLOCHIÆ, *Juss. Gen.* (1789); *R. Brown Prodr.* 349. (1810); *Lindley's Synopsis*, 224. (1829); *Lindl. in Bot. Reg.* 1543. (*Dec.* 1832).—PISTOLOCHINÆ and ASARINÆ, *Link Handb.* 1. 367. (1829) —ASARINEÆ, *Bartl. Ord. Nat.* 81. (1830).

ESSENTIAL CHARACTER.—*Flowers* hermaphrodite. *Calyx* superior, tubular with 3 segments, which are valvate in æstivation, sometimes regular, sometimes very unequal. *Stamens* 6 to 10, epigynous, distinct, or adhering to the style and stigmas. *Ovary* inferior, 3- or 6-celled; *ovules* numerous, horizontally attached to the axis; *style* simple, *stigmas* radiating, as numerous as the cells of the ovary. *Fruit* dry or succulent, 3- or 6-celled, many seeded. *Seeds* with a very minute embryo placed in the base of fleshy albumen.—*Herbaceous* plants or *shrubs*, the latter often climbing. *Leaves* alternate, simple, stalked, often with leafy stipules. *Wood* without concentric zones. *Flowers* axillary, solitary, brown or some dull colour.

AFFINITIES. These are usually stationed upon the limits of monocotyledons and dicotyledons, agreeing with the former in the ternary division of the flower, and in some respects in habit; with the latter in the more essential points of their structure. De Candolle, in the *Botanicon Gallicum*, places them between Elæagnaceæ and Euphorbiaceæ, to the former of which they approach through Asarum, but with the latter of which their relation is not

obvious. To Passifloraceæ they may be compared, on account of the twining habit, alternate leaves, and leafy habit of many species; and to Cucurbitaceæ, on account of theirt wining habit, and inferior ovary. Brown, however, most correctly shews that their affinity is in reality with Nepenthaceæ.

Geography. Very common in the equinoctial parts of South America, and rare in other countries; found sparingly in North America, Europe, and Siberia; more frequently in the basin of the Mediterranean, and in small numbers in India.

Properties. These are in general tonic and stimulating; Aristolochia is, as its name implies, reputed emmenagogue, especially the European species rotunda, longa, and Clematitis. An infusion of the dried leaves of Aristolochia bracteata is given by native Indian practitioners as an anthelmintic; fresh bruised and mixed with castor oil, they are considered as a valuable remedy in obstinate psora. The root of Aristol. indica is supposed by the Hindoos to possess emmenagogue and antarthritic virtues; it is very bitter. Arist. odoratissima, a native of the West Indies, is a valuable bitter, and alexipharmic. *Ainslie*, 2. 5. The Aristolochia fragrantissima, called in Peru Bejuca de la Estrella, or Star Reed, is highly esteemed in Peru as a remedy against dysenteries, malignant inflammatory fevers, colds, rheumatic pains, &c. The root is the part used. See *Lambert's Illustrations of Cinchona*, p. 150, &c. The power of the root of Aristolochia serpentaria in arresting the progress of the worst forms of typhus, is highly spoken of by Barton, 2. 51. It has an aromatic smell, approaching that of Valerian, with a warm, bitterish, pungent taste. Asarum canadense, called Wild Ginger in the United States, is nearly allied in medical properties to the Aristolochia serpentaria. *Barton*, 2. 88. The root of Asarum europæum, or Asarabacca, is used by native practitioners in India as a powerful evacuant: they also employ the bruised and moistened leaves as an external application round the eyes in certain cases of ophthalmia. *Ainslie*, 1. 24, The leaves and roots of the same plant are emetic; but this quality is lost, according to De Candolle, by keeping or by steeping in vinegar. Hancock (*Quarterly Journal, July*, 1830, p. 334,) suspects the true *Gauco* remedy for the bite of snakes to be some species of Aristolochia, among the different kinds of which the natives of Spanish America chiefly seek their antidotes. The plant called *Raiz de Mato* is an aromatic bitter species, and is esteemed as a most certain remedy in the Oronoque and Venezuela for the bite of venomous serpents. Aristolochia trilobata has an aromatic stem, which is used against the bite of serpents. *Barren.* A. grandiflora has a powerful nauseous narcotic smell, and is poisonous to hogs and cattle. *Swartz fl. ind. occ.* 1568.

GENERA.

Aristolochia, L.
Bragantia, Lour.
Ceramium, Bl.
Munnichia, Bl.
Heterotropa, Morren.
Asarum, L.
Thottea, Rottb.
Hocquartia, Dumort.
Trichopodium, Lindl.
Trichopus, Gærtn.
Trimeriza, Lindl.

Group V. Curvembryosæ.

Essential Character.—*Embryo* curved round albumen, or having the form of a horse-shoe, or spiral; *calyx* rarely tubular, but sometimes long and petaloid.

The plants comprehended in this alliance are with difficulty distinguished in mass from Urticales, because the embryo of the latter is sometimes

curved, never, however, round mealy albumen, and because in some of this group the embryo is straight, but then mealy albumen is present. Yet I am persuaded that this is a truly natural combination, and I leave to more acute botanists to determine exactly what the combining character is, *if they can*. Nyctaginaceæ are the most highly developed form of the group, and seem to connect it more with Monopetalæ than any other order comprehended in it.

Alliance I. *CHENOPODIALES.*

Essential Character.—*Albumen* present. *Radicle* next the hilum.

Order CLV. AMARANTACEÆ. The Amaranth Tribe.

Amaranthi, *Juss. Gen.* 87. (1789).—Amaranthaceæ, *R. Brown Prodr.* 413. (1810); *Von Martius Monogr.* (1826); *Lindley's Synopsis*, 213. (1829).

Essential Character.—*Calyx* 3- or 5-leaved, hypogynous, scarious, persistent, occasionally with 2 bractlets at the base, and generally immersed in dry coloured bracts. *Stamens* hypogynous, either 5, or some multiple of that number, either distinct or monadelphous, occasionally partly abortive; *anthers* either 2-celled or 1-celled. *Ovary* single, superior, 1- or few-seeded; the *ovules* hanging from a free central funiculus; *style* 1 or none; *stigma* simple or compound. *Fruit* a membranous utricle. *Seeds* lentiform, pendulous; *testa* crustaceous; *albumen* central, farinaceous; *embryo* curved round the circumference; *radicle* next the hilum; *plumule* inconspicuous.—*Herbs* or *shrubs*. *Leaves* simple, opposite or alternate, without stipules. *Flowers* in heads or spikes, usually coloured, occasionally unisexual, generally hermaphrodite. *Pubescence* simple, the hairs divided by internal partitions.

Affinities. Different as this order appears to be from Chenopodiaceæ in habit, especially if we compare such a genus as Gomphrena with Chenopodium itself, it is so difficult to define the differences that distinguish the two orders, that, beyond habit, nothing certain can be pointed out. Brown remarks (*Prodr.* 413.), that he has not been able to ascertain any absolute diagnosis to distinguish them by; for the hypogynous insertion attributed to their stamens is not only not constant in the order, but is also found in some Chenopodiaceæ. Martius, in a learned dissertation upon the order, describes Chenopodiaceæ as being apetalous, and Amarantaceæ as polypetalous, considering the bractlets of these latter as a calyx, and that which I call a calyx a corolla. But it seems to me that this view of their structure is not borne out by analogy, and that it is impossible to believe the floral envelopes of the two orders to be of a different nature. I am certainly unable to indicate any better mode of distinguishing them than has been pointed out by those who have gone before me; and at the same time I cannot hesitate to keep asunder orders which it is evident that nature has divided. Bartling combines these plants in a single class, along with Caryophylleæ, Phytolaccaceæ, Scleranthaceæ, and Illecebraceæ; and there is no doubt of the affinity borne to each other by all these, as is pointed out by their habit and by the structure of their seeds. Illecebraceæ are in fact only known by their petals and great membranous stipules.

Geography. These plants grow in crowds or singly, either in dry, stony, barren stations, or among thickets upon the borders of woods, or a few even in salt marshes. They are much more frequent within the tropics than beyond them, and are unknown in the coldest regions of the world. 53 are found in tropical Asia, 105 in tropical America, but 5 in extra-tropical Asia, and but 21 in extra-tropical America; 5 are natives of

Europe, 28 of New Holland, and 9 of Africa and its Islands. See *Von Martius Monogr.*

Properties. Many of the species are used as potherbs, on account of the wholesome mucilaginous qualities of the leaves. Amaranthus obtusifolius is said to be diuretic. Several are objects of interest with gardeners for the beauty of their colouring and the durability of their blossoms. Gomphrena officinalis and macrocephala have a prodigious reputation in Brazil, where they are called Para todo, Perpetua, and Raiz do Padre Salerma: as the first of these names imports, they are esteemed useful in all kinds of diseases, especially in cases of intermittent fevers, colics, and diarrhœa, and against the bite of serpents. *Plantes Usuelles*, nos. 31. and 32.

GENERA.

Digera, Forsk.	Lestibudesia, Pet. Th.	Brandesia, Mart.	Achyranthes, L.
Deeringia, R. Br.	Hoplotheca, Nutt.	Bucholzia, Mart.	Desmochæta, DC.
Charpentiera, Gaud.	Gomphrena, L.	Alternanthera, Forsk.	Pupalia, Mart.
Chamissoa, H. B. K.	Hebanthe, Mart.	Trichinium, R. Br.	Microtea, Sw.
Allmannia, R. Br.	Philoxerus, R. Br.	Psilotrichum, Bl.	*Ancistrocarpus*, H. B. K.
Amarantus, L.	Rosea, Mart.	Cyathula, Lour.	
Aërva, Forsk.	Iresine, Willd.	Tryphera, Bl.	Mohlana, Mart.
Berzelia, Mart.	Trommsdorffia, Mart.	Saltia, R. Br.	Leiospermum, Wall.
? Polychroa, Lour.	Serturnera, Mart.	Ptilotus, R. Br.	Polyscalis, Wall.
Celosia, L.	Pfaffia, Mart.	Nyssanthes, R. Br.	Blepharolepis, N. ab E. (28)
Cladostachys, Don.	Mogiphanes, Mart.	Centrostachys, Wall.	

Order CLVI. CHENOPODIACEÆ. The Goosefoot Tribe.

Atriplices, *Juss. Gen.* 83. (1789).—Chenopodeæ, *Vent. Tabl.* 2. 253. (1799); *R. Brown Prodr.* 405. (1810); *C. A. Meyer in Led. Fl. Alt.* 1. 370. (1829); *Lindley's Synopsis*, 213. (1829); *Moquin Tandon in Ann. Sc. Nov. Ser.* 1. 203. (1834).—Cynocrambeæ, *Th. N. ab E. Gen. pl. Europ.* (1835).

Essential Character.—*Calyx* deeply divided, sometimes tubular at the base, persistent, with an imbricated æstivation. *Stamens* inserted into the base of the calyx, opposite its segments, and equal to them in number, or fewer. *Ovary* single, superior, or occasionally adhering to the tube of the calyx, with a single *ovule* attached to the base of the cavity; *style* in 2 or 4 divisions, rarely simple; *stigmas* undivided. *Fruit* membranous, not valvular, sometimes baccate. *Embryo* curved round farinaceous albumen, or spiral, or doubled together without albumen; *radicle* next the hilum; *plumule* inconspicuous.—*Herbaceous* plants or *under-shrubs*. *Leaves* alternate without stipules, occasionally opposite. *Flowers* small, sometimes polygamous.

Affinities. The difficulty of distinguishing these from Amarantaceæ has been discussed under the latter order. They are distinguished from Phytolaccaceæ, independently of the simplicity of the structure of their ovary by their stamens never exceeding the number of the segments of the calyx, to which they are opposite: in Phytolaccaceæ, if they are not more numerous than the segments of the calyx, they are alternate with them. Theodor Nees von Esenbeck separates Cynocrambeæ on account of the singular structure of their calyx and style, and, I presume, their having stipules.

Geography. Weeds inhabiting waste places in all parts of the world, but, unlike Amarantaceæ, abounding least within the tropics, and most in extra-tropical regions. They are exceedingly common in all the northern parts of Europe and Asia.

Properties. Some of these are used as potherbs, as Basella, Spinage, Garden Orach (Atriplex hortensis), and Chard Beet; the roots of others form valuable articles of food, as Beet and Mangel Wurzel, Many of them possess

an essential oil, which renders them tonic and antispasmodic; such are Chenopodium ambrosioides and botrys. Chenopodium Quinoa is a common article of food in Peru. But the most important of their qualities is the production of soda, which is yielded in immense quantities by the Salsolas, Salicornias, and others. The essential oil of Chenopodium anthelminticum, known in North America under the name of Worm-seed Oil, is powerfully anthelmintic. *Barton*, 2. 187. The seeds of Atriplex hortensis are said to be so unwholesome as to excite vomiting. Chevallier has remarked the singular fact, that Chenopodium vulvaria exhales pure ammonia during its whole existence. This is the only observation upon record of a gaseous exhalation of azote by perfect vegetables; and the facility with which this principle is abandoned by ammonia may perhaps explain the presence of azotic products in the vegetable kingdom. *Ann. des Sc. Nat.* 1. 444.

GENERA.

Salicornia, L.
Halocnemon, M. Bieb.
Caroxylon, Thunb.
Anabasis, L.
Brachylepis, Meyer.
Cyclolepis, M. Tand.
Villemetia, Merckl.
Bassia, All.
Salsola, L.
Nanophyton, Less.
Halimocnemis, Meyer.
Halogeton, Meyer.
Schanginia, Meyer.
Schoberia, Meyer.
Suæda, Forsk.
Lerchia, Hall.
Cochliospermum, Lga.
Kochia, Roth.
Chenolea, L.
Anisacantha, R. Br.
Sclerolæna, R. Br.
Cornulaca, DC.
Traganum, DC.
Hemichroa, R. Br.
Polycnemum, L.
Camphorosma, L.
Threlkeldia, R. Br.
Corispermum, L.
Ceratocarpus, L.
Diotis, Schreb.
Ceratospermum, Per.
Kraschenninnikovia, Güldenst.
Eurotia, Adans.
Crucita, Lœffl.
Spinacia, L.
Beta, L.
Acnida, L.
Axyris, L.
Halimus, Rchb.
Oligandra, Less.
Atriplex, L.
Obione, Gærtn.
Blitum, L.
Rhagodia, R. Br.
Enchylæna, R. Br.
Monolepis, Schr.
Galenia, L.
Chenopodium, L.
Teloxys, M. Tand.
Agathophytum, M. Tand.
Roubieva, M. Tand.
Acroglochin, Schrad.
Blitanthus, Rchb.
Lecanocarpus, Nees.
Anredera, Juss.
Hablizia, M. Bieb.
Boussingaultia, H. B. K.
Basella, L.
Dysphania, R. Br.

See the rudiments of an arrangement of this order into §, in Ledebour's *Fl. Altaica*, 1. 370; and by *Moquin Tandon in Ann. Sc. n. Ser.* 4. 209 (1835); neither is sufficiently extensive to be adopted here.

Order CLVI.* TETRAGONIACEÆ.

Affinities. I have already excluded from Ficoideæ or Mesembryaceæ all the apetalous genera usually referred to that order, considering that the tendency to produce petals is in that case of too powerful a nature to admit of exception. The apetalous genera formerly included among Mesembryaceæ are in fact so very much the same as Chenopodiaceæ, that I know of no character to distinguish them except their ovary being formed of several carpels. They, therefore, bear the same relation to Chenopodiaceæ as Datiscaceæ to Urticaceæ.

GENERA.

Tetragonia, L.
Sesuvium, L.
Aizoon, L.
Veslingia, Fabr.
Miltus, Lour.

Order CLVII. PHYTOLACCACEÆ.
The Virginian Poke Tribe.

Phytolaccæ, *R. Brown in Congo*, 454. (1818); *Bartl. Ord. Nat. p.* 299. (1830).—Riviniaceæ, *Agh.; Martius Conspectus, No.* 91. (1835).

Essential Character.—*Calyx* of 4 or 5 petaloid leaves. *Stamens* either indefinite, or, if equal to the number of the divisions of the calyx alternate with them. *Ovary* of from 1 to several cells, each containing 1 ascending *ovule; styles* and *stigmas* equal in number to the cells. *Fruit* baccate or dry, entire or deeply lobed, 1- or many-celled. *Seeds* ascending, solitary, with a cylindrical *embryo* curved round mealy *albumen*, with the *radicle* next the *hilum*.—*Under-shrubs* or *herbaceous* plants. *Leaves* alternate, entire, without stipules, often with pellucid dots. *Flowers* racemose.

Affinities. Nearly related to Chenopodiaceæ and Polygonaceæ, from the first of which they are distinguished by their multilocular ovary, and by their stamens exceeding the number of divisions of the calyx, or alternate with them; or if their ovary is simple by the calyx being petaloid, a circumstance which never occurs in Chenopodiaceæ. From Polygonaceæ they are known by the radicle being turned towards the hilum, and the want of stipules. Rivina, which has the albumen very much reduced in quantity, and a unilocular fruit, connects Phytolaccaceæ with Petiveriaceæ. Brown remarks (*Congo*, 455.) that these two orders, widely as they differ in the structure of the ovary, are connected by a species of Phytolacca related to P. abyssinica, in which the 5 cells are so deeply divided that they merely cohere by their inner angles; and also by Gisekia, which has 5 distinct ovaries.

Geography. Natives of either America, within or without the tropics, Africa, and India. Phytolacca decandra is naturalised in some of the southern parts of Europe.

Properties. A tincture of the ripe berries of Phytolacca decandra seems to have acquired a well-founded reputation as a remedy for chronic and syphilitic rheumatism, and for allaying syphiloid pains. By some it is said to be more valuable than Guaiacum. It has had no inconsiderable reputation as a remedy for Cancer; but it is no longer esteemed, and it is probable that it was only found serviceable in ill-conditioned sluggish ulcers, which are too frequently mistaken for real cancer. Its pulverised root is an emetic. *Barton*, 2. 220. And a spirit distilled from the berries is stated to have killed a dog in a few minutes, by its violent emetic effects. According to De Candolle, this plant is also a powerful purgative. But it acts so violently and is accompanied by such ambiguous narcotic symptoms as not to be at all calculated for internal use. *Barton*. The leaves are extremely acrid, but the young shoots, which lose this quality by boiling in water, are eaten in the United States as Asparagus.

GENERA.

Phytolacca, L.	Gisekia, L.	? Cryptocarpus, H. B. K.	Semonvillæa, Gay.
Anisomeria, Don.	*Kœlreutera*, Murr.		Gaudinia, Gay.
Rivina, L.	Bosea, L.		

Alliance II. *POLYGONALES.*

Essential Character.—*Albumen* present. *Radicle* at the end of the embryo most remote from the hilum.

Order CLVIII. POLYGONACEÆ. The Buck-wheat Tribe.

Polygoneæ, *Juss. Gen.* 82. (1789); *R. Brown Prodr.* 418. (1810); *Lindl. Synops.* 209. (1829); *Bentham in Linn. Trans. ined.* (1836).

Essential Character.—*Calyx* divided, inferior, imbricated in æstivation. *Stamens* definite, inserted in the bottom of the calyx; *anthers* dehiscing lengthwise. *Ovary* superior, with a single erect ovule; *styles* or *stigmas* several. *Nut* usually triangular, naked, or protected by the calyx. *Seed* with farinaceous albumen, rarely with scarcely any; *embryo* inverted, generally on one side; *plumule* inconspicuous; *radicle* at the end remote from the hilum.—*Herbaceous* plants, rarely *shrubs*. *Leaves* alternate, their stipules cohering round the stem in the form of an ochrea; when young, rolled backwards. *Flowers* occasionally unisexual, often in racemes.

Affinities. Brown remarks, that "the erect ovulum with a superior radicle together afford the most important mark of distinction between Polygonaceæ and Chenopodiaceæ, a character which obtains even in the genus Eriogonum, in which there is no petiolar sheath, and scarcely any albumen, the little that exists being fleshy." Generally speaking, however, the cohesion of the scarious stipules into a sheath, technically called an ochrea, or boot, is sufficient to distinguish Polygonaceæ from all other plants. Bentham admits two Tribes, Polygonaceæ which have loose flowers and ochreæ; and Eriogoneæ which have flowers in involucres and usually no stipules.

Geography. There are few parts of the world that do not acknowledge the presence of plants of this order. In Europe, Africa, North America, and Asia, they fill the ditches, hedges, and waste grounds, in the form of Docks and Persicarias; the fields, mountains, and heaths, as Sorrels and trailing or twining Polygonums; in South America and the West Indies they take the form of Coccolobas or sea-side grapes; in the Levant, of Rhubarbs; and even in the desolate regions of the North Pole they are found in the shape of Oxyria.

Properties. Sorrel on the one hand, and Rhubarb on the other, may be taken as the representatives of the general qualities of this order. While the leaves and young shoots are acid and agreeable, the roots are universally nauseous and purgative. To these two qualities is to be superadded a third, that of astringency, which is found in a greater or less degree in the whole order, but which becomes in Coccoloba uvifera so powerful as to rival gum Kino in its effects. Some of the Polygonums are extremely acrid, as the P. Hydropiper, which is said to blister the skin. There is a species of Polygonum, called Cataya in the language of the Brazilian Indians, an infusion of the ashes of which is used to purify and condense the juice of the sugar-cane. It has a very bitter peppery taste, and is employed on the Rio St. Francisco with advantage in the disease called O Largo, which is an enlargement of the colon, caused by debility. *Pr. Max. Trav.* 71. The stem of the Rheum has been supposed to contain a peculiar acid called the rheumic, but this is now known to be the oxalic. *Turner*, 641. Rumex acetosa contains pure oxalic acid. *Ibid.* 623. The principle in which the active property of Rhubarb exists is supposed to be a peculiar chemical substance called Rhubarbarin. *Ibid.* 701. Some information may be found upon the Rhubarbs of India in the *Trans. of the Med. and Phys. Soc. of Calcutta*, 3. 438. by Royle; but nothing certain has been collected by him with regard to the plant producing the true officinal substance. Many species of Polygonum are used in dyeing. The seeds of P. fagopyrum or Buck-wheat and tataricum are used as food, for the sake of their mealy albumen; those of P. aviculare are said to be powerfully emetic and purgative; but this is doubted, by Meisner. *Mon.* 49. The seeds of Polygonum barbatum are used as me-

dicine by Hindoo practitioners, to ease the pain of griping in the colic. *Ainslie*, 2. 2. The leaves of P. hispidum are said by Humboldt to be substituted, in South America, for Tobacco. *N. G. and Sp.* 2. 178.

GENERA.

§ 1. Polygoneæ, Bent.
Kœnigia, L.
Rumex, L.
Acetosa, Mœnch.
Lapathum, Mœnch.
Centropodium, Burch. (29)
Emex, Neck.
Vibo, Mœnch.
Oxyria, Hill.
Rheum, L.
Podopterus, H. B.
Triplaris, L.
Blochmannia, Weig.
Coccoloba, L.
Brünnichia, Banks.
Rajana, Walt.
Atraphaxis, L.
Antinoron, Raf.
Polygonella, Mich.
Tragopyrum, M. Bieb.
Ceratogonum, Meisn.
Polygonum, L.
Fagopyrum, Gærtn.
Calliphysa, F. et M.
Calligonum, L.
Pallasia, L.
Pterococcus, Pall.
Oxygonum, Burch. (30)
Espinosa, Lag.
§ 2. Eriogoneæ, Benth.
Eriogonum, Michx.
Chorizanthe, R. Br.
Mucronea, Benth.

Alliance III. *PETIVERIALES.*

Essential Character. *Albumen* absent. *Cotyledons* spiral.

Order CLIX. PETIVERIACEÆ.

Petiverieæ, *Agardh Classes*, (1825).—Petiveriaceæ, *Link Handb.* 1. 392. (1829).

Essential Character.—*Calyx* of several distinct leaves. *Stamens* perigynous, either indefinite, or, if equal to the segments of the calyx, alternate with them. *Ovary* superior, 1-celled; *styles* 3 or more; *stigma* lateral; *ovule* erect. *Fruit* 1-celled, indehiscent, dry. *Seed* erect, without *albumen*; *embryo* straight; *cotyledons* convolute; *radicle* inferior.—*Under-shrubs* or *herbaceous* plants, with an alliaceous odour. *Leaves* alternate, entire, with distinct stipules, often with minute pellucid dots. *Flowers* racemose.

Affinities. Obviously akin both to Phytolaccaceæ and Polygonaceæ, with the former of which Brown combines them. They are, however, distinguished from Phytolaccaceæ by the presence of stipules, and by their straight embryo destitute of albumen, and spiral cotyledons. From Polygonaceæ they are known by the same characters, and also by the radicle being turned towards the hilum, and the stipules not having the form of ochreæ.

Geography. West Indian or tropical American plants; for the Seguiera asiatica of Loureiro probably does not belong to the order.

Properties. Nothing is known of their qualities, except that Petiveria alliacea yields a strong smell of garlic.

GENERA.

Petiveria, L.
Seguiera, L.
? Villamilla, R. P.

Alliance IV. *SCLERALES.*

Essential Character.—Tube of the calyx hardened.

Order CLX. SCLERANTHACEÆ.

Scleranthe, *Link Enum.* 417. (1821); *DC. Prodr.* 3. 377. (1828) *a* § *of* Illecebreæ, *Lindley's Synopsis*, 217. (1829); *Bartl. Ord. Nat.* 300. (1830).

Essential Character.—*Flowers* hermaphrodite. *Calyx* 4- or 5-toothed, with an urceolate tube. *Stamens* from 1 to 10, inserted into the orifice of the tube. *Ovary* simple, superior, 1-seeded. *Styles* 2 or 1, emarginate at the apex. *Fruit* a membranous utricle enclosed within the hardened calyx. *Seed* pendulous from the apex of a funiculus, which arises from the bottom of the cell; *embryo* cylindrical, curved round farinaceous albumen. —Small *herbs*. *Leaves* opposite, without stipules. *Flowers* axillary, sessile.

Affinities. Referred by De Candolle to Illecebreæ, from which they differ in absence of petals and stipules, these plants appear to me to constitute a distinct order, more nearly related to Chenopodiaceæ, from which they chiefly differ in the indurated tube of the calyx, from the orifice of which the stamens proceed, and in the number of the latter often exceeding that of the divisions of the calyx.

Geography. Natives of barren fields in Europe, Asia, and North America, and in sterile places in countries of the southern hemisphere beyond the tropics. A single species is described from Peru.

Properties. Uninteresting weeds, of no known use.

GENERA.

Mniarum, Forst. — Scleranthus, L.
Ditoca, Banks. — Guilleminia, H. B. K.

Order CLXI. NYCTAGINACEÆ.

The Marvel of Peru Tribe.

Nyctagines, *Juss. Gen.* 90. (1789); *R. Brown Prodr.* 421. (1810); *Bartl. Ord. Nat.* 109. (1830).

Essential Character.—*Calyx* tubular, somewhat coloured, contracted in the middle; its limb entire or toothed, plaited in æstivation; becoming indurated at the base. *Stamens* definite, hypogynous; *anthers* 2-celled. *Ovary* superior, with a single erect ovule; *style* 1; *stigma* 1. *Fruit* a thin utricle, enclosed within the enlarged persistent base of the calyx. *Seed* without its proper integuments, its testa being coherent with the utricle; *embryo* with foliaceous cotyledons, wrapping round floury *albumen*; *radicle* inferior; *plumula* inconspicuous.—*Stem* either herbaceous, shrubby, or arborescent. *Leaves* opposite, and almost always unequal; sometimes alternate. *Flowers* axillary or terminal, clustered or solitary, having an involucre which is either common or proper, in one piece or in several pieces, sometimes minute.

Affinities. The tubular calyx, the limb of which is plaited in æstivation, and the base of which becomes hardened round the ovary, so that it resembles a woody pericarp, will, if taken with the curved embryo and farinaceous albumen, at all times distinguish Nyctaginaceæ; add to which, the articulations of the stem are tumid, as in Geraniaceæ. Its nearest affinity is perhaps with Polygonaceæ, from which it, however, differs so much that it need not be compared with them.

Geography. Natives of the warmer parts of the world in either hemisphere, scarcely extending far beyond the tropics, except in the case of the Abronias found in North-west America.

Properties. In consequence of the generally purgative quality of the roots of species of this family, one of them was supposed to have been the true

jalap plant, which is, however, now known to be a mistake. See Convolvulaceæ. The flowers of several species of Mirabilis are handsome, as are those also of some of the Abronias; but the greater part of the order is composed of obscure weeds. The genus Pisonia consists of trees or shrubby plants.

GENERA.

Mirabilis, L.
Nyctago, Juss.
Tricratus, L'Herit.
Abronia, Juss.
Trichya, Cav.
Oxybaphus, L'Herit.
Calyxhymenia, R.P.
Vitmannia, Turr.
Allionia, L.
Calymenia, Nutt.
Boldoa, Cav.
Salpianthus, H.B.K.
Reichenbachia, Spreng.
Boerhaavia, L.
Pisonia, L.
Calpidia, Pet. Thou.
Buginvillea, Commers.
Torreya, Spreng.
Oxia, Lour.
Nexea, R. P.?
Okenia, Schlecht.
Epilithes, Bl.
Mitscherlichia, Kth.

Alliance V. *COCCULALES.*

Essential Character.—*Albumen* present. *Flowers* formed upon a ternary plan, with the divisions of the calyx in two rows.

It is usual to refer the species of this alliance to Polypetalæ, because the calyx has its segments in two series; and it cannot be denied that, if paper-characters are alone to be consulted, this ought to be the proper course. But if we compare Cocculales with the orders with which they are thus associated, we cannot find one other important circumstance of agreement. It is usual to station them near Berberaceæ, or Anonaceæ; but what their affinity really is with such orders it is difficult to conceive, even if we admit their relationship to Schizandreæ. But if we look at them with an unprejudiced eye, we cannot fail to be struck with their general resemblance to Smilaceæ among Endogens, differing in little except their dicotyledonous, more highly developed, embryo, and exogenous stem. In the next place, their floral envelopes, although in two rows, and therefore technically composed of both calyx and corolla, agree altogether with the biseriate calyx of some Polygonaceæ, such as Rumex. Thirdly, the absence of zones from the wood assimilates them to Columnosæ. In short, look at these plants in what way we will, their relation seems to be in all important particulars with Imperfectæ. I, therefore, station them here at the peril of offending all the prejudices that have been gradually growing up since the appearance of the Genera plantarum of Jussieu in 1789.

Order CLXII. MENISPERMACEÆ. The Cocculus Tribe.

Menispermeæ, *Juss. Gen.* 284. (1789); *DC. Syst.* 1. 508. (1818).—Menispermaceæ, *DC. Prodr.* 1. 95. (1824); *Wight and Arnott. Prodr. Fl. Penins. Ind.* 1. 11. (1834).

Essential Character.—*Flowers* (by abortion?) unisexual, usually dicœcious and very small. *Sepals* in one or several rows, each of which is composed of either 3 or 4 parts, hypogynous, deciduous. *Stamens* monadelphous, or occasionally distinct, sometimes opposite the inner sepals and equal to them in number, sometimes 3 or 4 times as many. *Anthers* adnate, turned outwards or proceeding immediately from the point of the filament. *Ovaries* sometimes numerous, each with one style, cohering slightly at the base, sometimes completely soldered together into a many-celled body, which is occasionally in consequence of abortion 1-celled. *Drupes* usually berried, 1-seeded, oblique or lunate, compressed. *Seed* of the same shape as the fruit; *embryo* curved, or turned in the direction of the circumference; *cotyledons* flat, sometimes lying face to face, sometimes distant from each

other and lying in separate cells of the albumen, which is thin or fleshy, rarely none; *radicle* superior, but its position is sometimes obscured by the curvature of the seed.—*Shrubs*, with a flexible tough tissue, and sarmentaceous habit. *Leaves* alternate, entire or occasionally divided, mucronate. *Flowers* small, usually racemose.

Affinities. Having already explained my own views as to this order, I may here mention those of other Botanists. Some Anonaceæ agree with it in having a twining habit, and the whole resemble them in the ternary division of their flowers; De Candolle points out a resemblance with Sterculiaceæ, consisting in the monadelphous stamens and peltate leaves; according to Aug. de St. Hilaire, this order is related to Euphorbiaceæ through Phyllanthus, the male flowers of which are in certain species absolutely the same as those of Cissampelos. It is also thought to approach Malvaceæ by those genera which, like Caperonia, have stipulate leaves, and distinct caducous petals separated from the calyx by the gynophore. *Fl. Bras.* 59.

The position of the seed is altered materially from that of the ovule in the progress of the growth of the fruit. According to Aug. de St. Hilaire, the ovule of Cissampelos is attached to the middle of the side of a straight ovary, which after fecundation gradually incurves its apex until the style touches the base of the pericarp, when the two surfaces being thus brought into contact unite, and a drupe is formed, the seed of which is curved like a horse-shoe, and the cavity of which is divided by a spurious incomplete dissepiment, consisting of two plates: the attachment of the seed is at the top of the false dissepiment, on each side of which it extends equally. *Pl. Usuelles*, no. 35. The whole order requires careful revision by means of living plants, and is well worth the especial attention of some Indian botanist.

Geography. The whole of this order consists of fewer than a hundred species, which are common in the tropics of Asia and America, but uncommon out of those latitudes: all Africa contains but 5, North America 6, and Siberia 1. The species are universally found in woods, twining round other plants.

Properties. The root of several species is bitter and tonic, and the seeds of some of them narcotic. The root of Menispermum palmatum, *Lam.* or the Calumbo root, is esteemed highly on account of its powerful antiseptic, tonic, and astringent properties. See *Bot. Mag. fol.* 2970. Menispermum cordifolium of Willd. called *Gulancha* in Bengal, is used extensively in a variety of diseases by the native practitioners of India, especially in such as are attended by febrile symptoms not of a high inflammatory kind, and in fevers of debility: the parts used are the root, stems, and leaves, from which a decoction called *Páchana* is prepared. A sort of extract called *Pálo* is obtained from the stem, and is considered an excellent remedy in urinary affections and gonorrhœa. *Trans. M. & P. Soc. Calc.* 3. 298, Cocculus platyphylla is used by the Brazilians in intermittent fevers and liver complaints. Its properties, like those of Cocculus cinerascens, are highly esteemed, and appear to be due to the presence of a bitter and tonic principle. Similar qualities are found in Cocculus peltatus, crispus, and Fibraurea by the Malays. *Royle.* In the seed of Cocculus suberosus a bitter crystallisable poisonous principle has been detected, called picrotoxia. *Pl. Usuelles*, 42. The root of Cocculus Bakis is very bitter and diuretic; it is used in Senegal against intermittent fevers, &c. *Fl. Seneg.* 1. 13. The roots of the *Orelha de Onça* of Brazil, Cissampelos ovalifolia, are bitter, and their decoction is employed with success in intermittent fevers. *Pl. Usuelles*, no. 34. Cissampelos ebracteata, also called *Orelha de Onça*, is reputed an antidote to the bite of serpents. *Ibid.* no. 35. The root of Cissampelos pareira and Abuta amara is both diuretic and aperient, and known under the name of Pareira brava. *DC.* The Abuta candicans of Cayenne, where it is known by the name of Liane amère, is extremely bitter. *Ibid.* The

drug called in the shops Cocculus indicus is the seed of Menispermum Cocculus, and is well known for its narcotic properties, especially in poisoning fishes. Nevertheless, according to De Candolle, the berries of Menispermum edule, *Lam.* are eaten with impunity in Egypt; but they are acrid, and a very intoxicating liquor is obtained from them by distillation. Royle also states that the fruit of several is eatable. The bitter poisonous principle of Cocculus indicus is the above-mentioned vegetable alkali, *picrotoxia.* It has been supposed that a peculiar acid, called the *menispermic,* also existed in the same plant; but this is now known to have been merely a mixture of sulphuric and oxalic acids. *Turner,* 653. Forskahl states that from the berries of Cocculus cebatha, although acrid, a spirit is distilled in Arabia called *Khumr-ool-majnoon;* Royle adds that he found the root of Cissampelos obtecta used for the same purpose in Gurhwahl. *Illustrations,* 62.

GENERA.

Spirospermum, Pt.Th.
Braunea, Willd.
Anamirta, Colebr.
Clypea, W. et A.
Cocculus, DC.
Chondodendron, R.P.
Cebatha, Forsk.
Leæba, Forsk.
Fibraurea, Lour.
Limacia, Lour.
Androphylax, Wend.
Wendlandia, Willd.
Epibaterium, Forst.
Nephroia, Lour.
Bagalatta, Roxb.
Pselium, Lour.
Gynostemma, Blume.
Cissampelos, L.
Stephania, Lour.
Clypea, Blume.
Menispermum, L.
Abuta, Aubl.
Trichoa, Pers.
Batschia, Thunb.
Phytocrene, Wall.
Natsiatum, Roxb.

Iodes, Blume.
Coscinium, Colebr.
Tiliacora, Colebr.
Meniscosta, Blume.
Agdestis, Moç. Sess.
Meborea, Aubl.
Rhopium, Schreb.
Tephranthus, Neck.

Sub-Order ? LARDIZABALEÆ.

Lardizabaleæ, § of Menispermaceæ, *DC. Prodr.* 1. 95. (1824); *Bartl. Ord. Nat.* 343. (1830).

Many-seeded carpels and compound leaves are assigned to these plants by De Candolle; otherwise they are said to accord with Menispermaceæ. I am myself unacquainted with the genera; but I learn from Mr. Arnott that Dr. Brown, the highest of all authorities in these matters, considers them distinct from Menispermaceæ.

GENERA.

Lardizabala, R. et P. Stauntonia, DC. *Hollböllia,* Wall. Burasaia, Thouars.

Sub-Class II. MONOPETALÆ.

Essential Character.—*Petals* combined in a monopetalous corolla.

If it were not for the frequent occurrence of what are called gamopetalous plants among Polypetalæ, that is of plants whose petals cohere more or less into a tube, this sub-class would have very nearly definite limits; for such exceptions as Glaux in Primulaceæ, which is apetalous, and Elliottia, &c. in Ericaceæ, which are polypetalous, are unimportant. But with regard to the gamopetalous genera of polypetalous orders, as Correa in Rutaceæ, Stackhousiaceæ, Fouquieraceæ, and others without end, the only method of recognizing them is to see if the petals cannot be easily separated, or if they do not separate spontaneously by the base at least, or if the pistil is not apocarpous. As to the affinities of Monopetalæ, they are extremely various. Stellatæ touch

Umbelliferæ; Ericaceæ border closely upon Celastraceæ through Cyrilla; Aquifoliaceæ have a similar relation; Ebenaceæ almost touch Guttiferæ, &c. &c. They may also be said to approach Incompletæ by way of Solanaceæ and Nyctaginaceæ, while Salvadoraceæ join Chenopodiaceæ by way of Galenia.

Upon attentively considering the orders of which this sub-class consists, it is at once obvious that there is a cluster of plants with the ovary either originally split, or finally splitting into little nuts, as in Labiatæ in the first instance, and Verbenaceæ in the last. These naturally separate from the remainder and may be designated the *Nucamentaceous* group; all the orders belonging to this group have an ovary constructed upon a bicarpellary type. Agreeing with these in the latter circumstance, but disagreeing in their fruit being nucamentaceous; having, on the contrary, a capsular fruit with a manifest central placenta, some with regular, some with irregular, flowers, is another set of orders to which the name *Dicarposæ* may be applied. Thirdly, we have a very large number of plants, the fruit of which is usually inferior, belonging to orders, a part of which have the ovary constructed with one carpel, and another part with two or more carpels; these facts give us two more groups, the Epigynous and the Aggregose, the former usually having the flowers loosely arranged, the latter in dense round heads. Finally, the remainder of the orders of Monopetalous Dicotyledons form a fifth natural assemblage, essentially distinguished by having more carpels than two, symmetrical flowers, and a superior ovary. To these the name of Polycarpous may be conveniently applied. Hence the groups are—

1. **Polycarposæ.** Flowers hypogynous. Carpels more than 2.
2. **Epigynosæ.** Flowers epigynous. Carpels 2 or more.
3. **Aggregosæ.** Carpels single.
4. **Nucamentosæ.** Fruit consisting of several (usually 4) lobes, which are either originally distinct, or separate from each other when ripe, without any trace of a central placenta.
5. **Dicarposæ.** Fruit bicarpellary, capsular.

The two last groups might be arranged upon a different plan, making one of them comprehend all the regular, and the other the irregular, dicarpellary orders; but the arguments of Mr. Bentham have persuaded me to abandon the former in favour of that which is now proposed.

Group I. Polycarposæ.

Essential Character.—*Ovary* superior, consisting of several carpels, either combined or distinct; if inferior, then the anthers opening by pores.

The orders here combined are very much more closely allied to each other than to any others in the Monopetalous sub-class. The twining Volvales, indeed, seem at first sight to differ materially from the remainder; but they are plainly connected with the first three alliances by means of the shrubby species of themselves and of Nolanaceæ. Vaccinaceæ offer an exception to the usual character of the group, in consequence of their ovary being inferior; by that circumstance they are verbally referred to Epigynosæ; but all their affinities are here, and their anthers opening by pores will shew the student how to recognize them. Many Ericaceæ approach Rutaceæ, and some of them Celastraceæ. Myrsinaceæ are almost brought in contact with Rham-

naceæ through Choripetalum. Primulaceæ touch closely upon Solanaceæ, from which, however, they are known, independently of all other circumstances, by their stamens opposite the segments of the corolla.

Alliance I. *BREXIALES.*

Essential Character.—*Albumen* absent. *Carpels* 5. Sterile *stamens* between the fertile ones. *Seeds* indefinite.

Order CLXIII. BREXIACEÆ.

Brexiaceæ, *Ed. Prior. No.* 95. (1830); *Arnott in Edinb. Encycl.* 104 (1832); *Martius Conspectus, No.* 297. (1835).

Essential Character.—*Calyx* inferior, small, persistent, 5-parted; æstivation imbricated. *Petals* 5, hypogynous, imbricated in æstivation. *Stamens* 5, hypogynous, alternate with the petals, arising from a narrow cup, which is toothed between each stamen; *anthers* oval, innate, 2-celled, bursting longitudinally, fleshy at the apex; *pollen* triangular, cohering by means of fine threads. *Ovary* superior, 5-celled, with numerous ovules attached in two rows to placentæ in the axis; *style* 1, continuous; *stigma* simple. *Fruit* drupaceous, 5-celled, many-seeded. *Seeds* indefinite, attached to the axis, with a double integument, the inner of which is membranous; *albumen* 0; *cotyledons* ovate, obtuse; *radicle* cylindrical, centripetal.—*Trees*, with nearly simple trunks. *Leaves* coriaceous, alternate, simple, not dotted, with deciduous minute stipules. *Flowers* green, in axillary umbels, surrounded by bracts on the outside.

Affinities. The solitary genus upon which this order is founded does not exhibit any very obvious affinities, for which reason it is probable that other genera remain to be discovered which will establish the connexion that is at present wanting. Its habit is that of some Myrsinaceæ, especially of Theophrasta, from which it differs in being polypetalous, in the stamens being alternate with the petals, and in many other circumstances. With Rhamnaceæ and Celastraceæ its relation is no doubt strong, but its stamens are hypogynous, not perigynous, and its seeds indefinite. Some resemblance may be traced between it and Anacardiaceæ, especially in the resinous appearances visible upon the young shoots, and also in habit; but its fructification is entirely at variance with that order. With Pittosporaceæ it agrees in its hypogynous definite stamens, its polyspermous fruit, its alternate undivided leaves, and habit; but it disagrees in a number of important particulars. I once thought it approached more nearly to Celastraceæ than to any other order; but its relationship to Theophrasta seems so great that I am unwilling to remove it from the vicinity of Primulales, especially as it is so much a character of the Polycarpous group to separate the petals. The fruit is well described by Wallich in the *Flora Indica*.

Geography. Madagascar trees.

Properties. Unknown.

GENUS.

Brexia, Thouars.
Venana, Law.

Alliance II. *ERICALES.*

Essential Character.—*Anthers* opening by pores, hard and dry, often with appendages. *Carpels* from 4 to 5, or more.

The worst of this character is, that Monotropaceæ do not open their anthers by pores; their evident relationship to the other orders renders it, however, necessary to keep them here.

Order CLXIV. PYROLACEÆ. The Winter Green Tribe.

Pyroleæ, *Lindl. Coll. Bot.* t. 5. (1821); *Synops.* 175. (1829).

Essential Character.—*Calyx* 5-leaved, persistent, inferior. *Corolla* monopetalous, hypogynous, regular, deciduous, 4- or 5-toothed, with an imbricated æstivation. *Stamens* hypogynous, twice as numerous as the divisions of the corolla; *anthers* 2-celled, opening by pores. *Ovary* superior, 4- or 5-celled, many-seeded, with a hypogynous disk; *style* 1, declinate; *stigma* slightly indusiate. *Fruit* capsular, 4- or 5-celled, dehiscent, with central placentæ. *Seeds* indefinite, minute, winged; *embryo* minute, at the base of a fleshy albumen. —*Herbaceous* plants, rarely *under-shrubs*. *Stems* round, raked; in the frutescent species leafy. *Leaves* simple, entire or toothed. *Flowers* in terminal racemes, or solitary.

Affinities. The habit of these plants is so different from that of Ericaceæ that I cannot hesitate to separate them, especially as their winged seeds, with a minute embryo, and declinate styles, are real marks of difference. Pyrola (Cladothamnus?) fruticosa forms a passage to Ericaceæ, and P. aphylla to Monotropaceæ. A sort of approach to the indusiate stigma of Goodeniaceæ occurs in that of P. aphylla and others.

Geography. Natives of Europe, North America, and the northern parts of Asia, in fir woods, or in similar situations.

Properties. Chimaphila umbellata is a most active diuretic; it is also found to possess valuable tonic properties. The leaves, applied to the skin, act as slight vesicatories. It is remarkable enough that C. maculata, a very closely allied species, should be asserted by American practitioners to be wholly inert. See *Barton*, 1. 28.

GENUS.

Pyrola, L. Chimaphila, Ph. *Chimaza*, R. Br. Moneses, Salisb. Cladothamnus, Bong. Galax, L. *Blandfordia*, Andr.

Order CLXV. MONOTROPACEÆ.

Monotropeæ, *Nutt. Gen.* 1. 272. (1818); *DC. et Duby.* 319. (1828).

Essential Character.—In all things the same as Pyrolaceæ, except; *style* straight; *anthers* bursting longitudinally; *embryo* minute, at the apex of fleshy albumen; *stems* leafless, or nearly so, but covered with fleshy scales.—*Parasitical* plants.

Affinities. The dehiscence of the anthers separates these from Pyrolaceæ, as well as their leafless, scaly, and parasitical habit; besides which, it would appear that there is a difference in the position of the embryo, that organ being at the apex of the albumen in Monotropaceæ, and at its base in Pyrolaceæ. Tolmiea forms a transition from these to Pyrolaceæ, and P. aphylla back again.

Geography. Natives of Europe, Asia and North America, in cool places especially in fir woods.

Properties. Unknown.

GENERA.

Tolmiea, Hooker.
Hypopithys, Dill.
Monotropa, L.
Pterospora, Nutt.
Schweinitzia, Elliot.

Order CLXVI. ERICACEÆ. The Heath Tribe.

Ericæ, *Juss. Gen.* 159. (1789).—Ericeæ, *R. Brown Prodr.* 557. (1810); *Lindl. Synops.* 172. (1829).—Rhododendra, *Juss. Gen.* 158. (1789).—Ericineæ, *Desv. Journ. Bot.* 28. (1813); *Don in Edinb. Phil. Journal*, p. 150. (1834); *Klotzsch in Linnæa*, vol. 9. 67. *Litt.* (1835).—Rhodoraceæ *and* Ericaceæ, *DC. Fl. Fr.* 3. 671. *and* 675. (1815).

Essential Character.—*Calyx* 4- or 5-cleft, nearly equal, inferior, persistent. *Corolla* hypogynous, monopetalous, 4- or 5-cleft, occasionally separable into 4 or 5 pieces, regular or irregular, often withering, with an imbricated æstivation. *Stamens* definite, equal in number to the segments of the corolla, or twice as many, hypogynous, or scarcely inserted into the base of the corolla; *anthers* 2-celled, the cells hard and dry, separate either at the apex or base, where they are furnished with some kind of appendage, and dehiscing by a pore. *Ovary* surrounded at the base by a disk, or secreting scales, many-celled, many-seeded; *style* 1, straight; *stigma* 1, undivided or toothed, or 3-cleft. *Fruit* capsular, many-celled, with central placentæ; *dehiscence* various. *Seeds* indefinite, minute; *testa* firmly adhering to the nucleus; *embryo* cylindrical, in the axis of fleshy albumen; *radicle* opposite the hilum.—*Shrubs* or *under-shrubs*. *Leaves* evergreen, rigid, entire, whorled, or opposite, without stipules. *Inflorescence* variable, the pedicels generally bracteate.

Affinities. Formerly separated into two orders by Jussieu, who distinguished Ericeæ and Rhodoraceæ by the dehiscence of their capsule; a character which is not now esteemed of ordinal importance, and which is consequently abandoned. The order differs from Vaccinaceæ and Campanulaceæ in the superior ovary, from Epacridaceæ in the structure of the anthers, from Pyrolaceæ and Monotropaceæ in the structure of the seeds and in habit, and from all the orders of which Scrophulariaceæ and Gentianaceæ may be considered the representatives, in the number of cells of the ovary agreeing with the lobes of the calyx and corolla. An unexpected transition to Campanulaceæ is furnished by the curious genus Calysphyrum. The order has been remodelled by Don, but not upon satisfactory grounds, according to Klotzsch, who criticises the arrangement of the former Botanist with extreme severity. I do not pretend to judge between these two authors, but until the order has been carefully revised I prefer adopting the views of Klotzsch, who is evidently well acquainted with his subject.

Geography. Most abundant at the Cape of Good Hope, where immense tracts are covered with the species; common in Europe and North and South America, both within and without the tropics; less common in northern Asia and India, and almost unknown in Australasia, where their place is supplied by Epacridaceæ.

Properties. Their general qualities are, to be astringent and diuretic; Azalea procumbens, Rhododendron ferrugineum and chrysanthemum, and Ledum palustre, being examples of the former, and Arctostaphylos Uva Ursi of the latter. This, De Candolle observes, has been confounded with Vaccinium Vitis Idea by some practitioners, but most improperly, the chemical composition of the two plants being extremely different. See *Essai Méd.* 194. An infusion of the leaves of Uva Ursi has been employed with success in cases of gonorrhœa of long standing. *Ibid.* The berries of the succulent-fruited kinds are usually grateful, and sometimes used as food. Gaultheria procumbens and Shallon, Arctostaphylos alpina, and Brossæa coccinea, are examples

of this. In the island of Corsica an agreeable wine is said to be prepared from the berries of Arbutus Unedo. *Ed. P. J.* 2. 199. Gaultheria procumbens possesses stimulating and anodyne properties. In North America an infusion of it is used as tea. *Barton,* 1. 178. An infusion of the berries in brandy is taken in small quantities, in the same way as common bitters. *Ibid.* The fruit of Arbutus Unedo, taken in two great quantity, is said to be narcotic, and a similar quality no doubt exists in several other plants of the order; Ledum palustre renders beer heady, when used in the manufacture of that beverage; Rhododendron ponticum and maximum, Kalmia latifolia, and some others, are well known to be venomous. The honey which poisoned some of the soldiers in the retreat of the ten thousand through Pontus was gathered by bees from the flowers of Azalea pontica. The shoots of Andromeda ovalifolia poison goats in Nipal. *Don Prodr.* 149. It is stated by Dr. Horsfield that a very volatile heating oil, with a peculiar odour, used by the Javanese in rheumatic affections, is obtained from a species of Andromeda. *Ainslie,* 2. 107. The flowers of Rhododendron arboreum are eaten by the hill people of India; and are formed into a jelly by European visitors. The ferruginous leaves of Rhododendron campanulatum are used as snuff by the natives of India, as we are informed by De Candolle, is in the United States the brown dust that adheres to the petioles of Kalmias and Rhododendrons. *Royle's Illustr.* 259.

GENERA.*

§ 1. Ericeæ, D. Don.
Erica, L.
* Pachysa, Don.
* Ceramia, Don.
* Desmia, Don.
* Eurylepis, Don.
* Eurystegia, Don.
* Lophandra, Don.
* Dasyanthes, Don.
Thoracosperma, Klotz.
Gypsocallis, Salisb.
Lamprotis, Don.
Blæria, L.
Sympieza, Lichst.
Nabea, Lehm.
Callista, Don.
Euryloma, Don.
Chona, Don.
Syringodea, Don.
Ectasis, Don.
Octopera, Don.
Eremia, Don.
Salaxis, Salisb.
Philippia, Klotzch.
Salaxis, W.
Calluna, Salisb.

§ 2. Andromedeæ, Don.
Andromeda, L.
* Cassandra, Don.
* Zenobia, Don.
* Leucothoe, Don.
* Pieris, Don.
Cassiope, Don.
Lyonia, Nutt.
Bryanthus, Gmel.
Phyllodoce, Don.
Bruckenthalia, Rchb.
Menziesia, Sm.
Daboecia, Don.
Candollea, Baumg.
Enkianthus, Lour.
Melodora, Salisb.
Arbutus, L.
Arctostaphylos, Tourn.
Pernettya, Gaud.
Agarista, Don.
Diplecosia, Bl.
Gaultheria, L.
Epigæa, L.
Phalerocarpus, Don.
Clethra, L.
Elliottia, Nutt.

§ 3. Rhodoreæ, Don.
Rhodothamnus, Rchb.
Rhododendron, L.
Rhodora, L.
Anthodendron, Rchh.
Azalea, L.
Vireya, Bl.
Bejaria, Mutis.
Acunna, R. P.
Hymenanthus, Bl.
Kalmia, L.
Chamædedon, Lk.
Loiseleuria, Desv.
Leiophyllum, Pers.
Ammyrsine, Ph.
Fischera, Swz.
Ledum, L.

Pickeringia, Nutt.

Order CLXVII. VACCINACEÆ. The Bilberry Tribe.

Vaccinieæ, *DC. Théor. Elém.* 216. (1813); *DC. and Duby*, 315. (1818); *Lindl. Synops.* 134. (1829).

Essential Character. — *Calyx* superior, entire, or with from 4 to 6 lobes. *Corolla* monopetalous, lobed as often as the calyx. *Stamens* distinct, double the number of the lobes of the corolla, inserted into an epigynous disk; *anthers* with 2 horns and 2 cells, bursting by pores. *Ovary* inferior, 4- or 5-celled, 1 or many-seeded; *style* simple; *stigma* simple. *Berry* crowned by the persistent limb of the calyx, succulent, 4- or 5-celled; cells 1- or many-seeded. *Seeds* minute; *embryo* straight, in the axis of a fleshy albumen; *cotyledons* very short; *radicle* long, inferior.—*Shrubs*, with alternate coriaceous leaves.

* In this list the names with an asterisk are probably to be considered as mere sections of the genus which they follow.

Affinities. Formerly combined with Ericaceæ, from which the order differs in its inferior ovary and succulent fruit. It is confounded by Achille Richard with Escalloniaceæ, which are essentially distinguished by their flowers being polypetalous, the anthers bursting lengthwise, &c. &c. &c. Myrtaceæ are obviously separated by being polypetalous, by the leaves being opposite and marked with transparent dots, &c.

Geography. Natives of North America, where they are found in great abundance as far as high northern latitudes; sparingly in Europe; and not uncommonly on high land in the Sandwich Islands.

Properties. Much the same as those of Ericaceæ: their bark and leaves are astringent, slightly tonic, and stimulating. The berries of many are eaten, under the names of Cranberry, Bilberry, Whortleberry, &c. Several species are choice subjects of the gardener's care.

GENERA.

Vaccinium, L.
Oxycoccus, Pers.
Gaylussacia, H. B. K.
Lussacia, Spr.
Thibaudia, Pav.
Cavinium, Thouars.
Agapetes, Don.
Ceratostema, Juss.
Cavendishia, Lindl.
Symphysia, Presl.
Sphyrospermum, P. et Endl.

Order CLXVIII. EPACRIDACEÆ.

Epacrideæ, *R. Brown Prodr.* 535. (1810); *Link Handb.* 1. 601. (1829), *a* § *of* Ericeæ.

Essential Character.—*Calyx* 5-parted (very seldom 4-parted), often coloured, persistent. *Corolla* hypogynous, monopetalous, either deciduous or withering, sometimes capable of being separated into 5 pieces, its limb with 5 (rarely 4) equal divisions, sometimes, in consequence of the cohesion of the segments, bursting transversely; the æstivation valvular or imbricated. *Stamens* equal in number to the segments of the corolla, and alternate with them; very seldom fewer in number. *Filaments* arising from the corolla, or hypogynous. *Anthers* simple, with a single receptacle of pollen, which forms a complete partition sometimes having a border; undivided, opening longitudinally. *Pollen* either nearly round or formed of 3 connate grains. *Ovary* sessile, usually surrounded at the base with 5 distinct or connate scales; with several, rarely a single, cell; *ovules* solitary or indefinite; *style* 1; *stigma* simple, or occasionally toothed. *Fruit* drupaceous, baccate, or capsular. *Seeds* with albumen. *Embryo* taper, straight, in the axis, more than half as long as the albumen.—*Shrubs* or *small trees*, their hair, when present, being simple. *Leaves* alternate, very rarely opposite, entire or occasionally serrated, usually stalked; their bases sometimes dilated, cucullate, overlapping each other and half sheathing the stem. *Flowers* white or purple, seldom blue, either in spikes or terminal racemes, or solitary and axillary; the calyx or pedicels with 2 or several bracts, which are usually of the same texture as the calyx.

Affinities. This order differs from Ericaceæ solely in the structure of the anther; but that organ being one of the principal features of Ericaceæ, any material deviation from it acquires a peculiar degree of consequence. In Ericaceæ the anther consists of 2 cells, usually furnished with peculiar appendages; in Epacridaceæ is is simply 1-celled, with no appendages whatever. The order like both the last is remarkable for containing species with both definite and indefinite seeds.

Geography. All natives of the Indian archipelago, or Australasia, or Polynesia, where they abound as Heaths do at the Cape of Good Hope. It is remarkable that only 1 or 2 of the Heath tribe are found in the countries occupied by Epacridaceæ.

Properties. The fruit of Lissanthe sapida, called the Australian cranberry, is eatable. Chiefly remarkable for the great beauty of the flowers of many species.

GENERA.

§ 1. Styphelieæ, Bartl.
Styphelia, Sm.
Astroloma, R. Br.
Ventenatia, Cav.
Stenanthera, R. Br.
Melichrus, R. Br.
Cyathodes, La Bill.
Lissanthe, R. Br.
Perojoa, Cav.
Monotoca, R. Br.
Acrotriche, R. Br.
Trochocarpa, R. Br.
Decaspora, R. Br.

§ 2. Epacrideæ,
Epacris, Forst.
Lysinema, R. Br.
Prionotes, R. Br.
Cosmelia, R. Br.
Andersonia, R. Br.
Ponceletia, R. Br.
Sprengelia, Sm.
Poiretia, Cav.
Cystanthe, R. Br.
Pilitis, (31).
Richea, R. Br.
Dracophyllum, La Bill.
Sphenotoma, R. Br.

Alliance III. *PRIMULALES.*

Essential Character.—*Anthers* bursting longitudinally, without any kind of appendage. *Carpels* 4-5, very often with their dissepiments absorbed.

Order CLXIX. PRIMULACEÆ. The Primrose Tribe.

Lysimachiæ, *Juss. Gen.* 95. (1789).—Primulaceæ, *Vent. Tabl.* 2. 285. (1799); *R. Brown Prodr.* 427. (1810); *Lindl. Synops.* 182. (1829).

Essential Character.—*Calyx* divided, 5-cleft, seldom 4-cleft, inferior, regular, persistent. *Corolla* monopetalous, hypogynous, regular; the *limb* 5-cleft, seldom 4-cleft. *Stamens* inserted upon the corolla, equal in number to its segments, and opposite them! *Ovary* 1-celled; *style* 1; *stigma* capitate. *Capsule* opening with valves; *placenta* central, distinct. *Seeds* numerous, peltate; *embryo* included within fleshy albumen, and lying across the hilum; *radicle* with no determinate direction.—*Herbaceous* plants. *Leaves* usually opposite, either whorled or scattered. *R. Br.*

Anomalies. Samolus has the ovary half inferior, and 5 sterile stamens, in addition to the 5 fertile ones. Glaux is apetalous.

Affinities. Nearly allied to all the regular monopetalous orders with capsular superior fruit, especially to Solanaceæ and Ericaceæ, from both which, and all others, they are readily known by the stamens being placed opposite the segments of the corolla, and not alternate with them. In this respect they agree with Myrsinaceæ, which differ principally in their fleshy fruit and arborescent habit. Another character of Primulaceæ is to have the embryo lying across the hilum within the albumen, so that the radicle is presented neither to the umbilicus nor to one extremity, but to one side. Trientalis differs a little in its somewhat succulent fruit. Glaux, an apetalous genus is, and I think correctly, placed here; but, according to Don (*Jameson's Journal, Jan.* 1830, p. 166.), it should be referred to Plantaginaceæ, "where it will form the connecting link between that family and Primulaceæ."

Geography. Common in the northern and colder parts of the globe, growing in marshes, hedges, and groves, by fountains and rivulets, and even among the snow of cloud-capped mountains. The genus Douglasia was found by the traveller whose name it bears, blossoming while covered with snow, on the Rocky Mountains of America. They are uncommon within the tropics, where they usually occupy either the sea shore, or the summits of the most lofty hills.

Properties. As beautiful objects of culture, these rank among the most esteemed, both on account of their bright but modest-looking flowers, among the earliest harbingers of spring, and also for the sake of their fragrance. Their sensible properties are feeble. The Cowslip is slightly narcotic, and the root of Cyclamen is famous for its acridity; yet this is the principal food of the wild boars of Sicily, whence its common name of Sowbread. Anagallis ar-

vensis and cœrulea, the *Mouron* of the French, have enjoyed a great reputation as specifics in case of madness; but their use is discontinued. It appears, however, that An. arvensis does really possess highly energetic powers, for Orfila destroyed a dog by making him swallow 3 drachms of the extract. Upon examination it was found to have inflamed the mucous membrane of the stomach.

GENERA.

Cyclamen, L.
Dodecatheon, L.
Soldanella, L.
Cortusa, L.
Androsace, L.
Aretia, L.
Andraspis, Duby.
Gregoria, Duby.
Douglasia, Lindl.
Primula, L.
Trientalis, L.
Hottonia, L.
Lubinia, Venten.
Schwenckia, L.
Chætochilus, Vahl.
Asterolinon, Link.
Lysimachia, L.
Lerouxia, Merot.
Godinella, Lestib.
Ephemerum, Rchb.
Thyrsanthus, Schk.
Euparea, Banks.
Jirasekia, Schm.
Naumburgia, Mönch.
Anagallis, L.
Centunculus, L.
Bacopa, Aubl.
Coris, L.
Glaux, L.
Samolus, L.
Sheffieldia, Forst.

Order CLXX. MYRSINACEÆ.

Ophiosperma, *Vent. Jard. Cels.* 86. (1800).—Myrsineæ, *R. Brown Prodr.* 532. (1810.)—Ardisiaceæ, *Juss, Ann. Mus. XV.* 350. (1810); *Bartl. Ord. Nat.* 163. (1830); *Alph. DC. in Linn. Trans.* 17. 100. (1834).—Ægicereæ, *Blume in Ann. Sc. Nov. Ser. II.* 97. (1834).

Essential Character.—*Flowers* hermaphrodite or polygamous, rarely unisexual. *Calyx* 4- or 5-cleft, persistent. *Corolla* monopetalous, hypogynous, 4-5-cleft, equal. *Stamens* 4-5, opposite the segments of the corolla! into the bases of which they are inserted; *filaments* distinct, rarely connate, sometimes wanting, sometimes 5 sterile petaloid alternate ones; *anthers* attached by their emarginate base, with 2 cells, dehiscing longitudinally. *Ovary* 1, with a single cell and a free central placenta, in the midst of which is immersed a definite or indefinite number of peltate *ovules; style* 1, often very short; *stigma* lobed or undivided. *Fruit* fleshy, mostly 1-seeded, sometimes 2-4-seeded. *Seeds* peltate, with a hollow hilum and a simple integument; *albumen* horny, of the same shape as the seed; *embryo* lying across the hilum, taper, usually curved; *cotyledons* short; *radicle*, if several seeds ripen, inferior. *Plumula* inconspicuous.—*Trees* or *shrubs*. *Leaves* alternate, undivided, serrated or entire, coriaceous, smooth; *stipules* 0; sometimes *under-shrubs*, with opposite or ternate leaves. *Inflorescence* in umbels, corymbs, or panicles, axillary, seldom terminal. *Flowers* small, white or red, often marked with sunken dots or glandular lines.

Affinities. Scarcely different from Primulaceæ, except in their arborescent habit and fleshy fruit; the embryo always lies across the hilum, and the stamens are opposite the lobes of the corolla, as in that order; add to which, the connivence of the anthers in a cone, which is frequent in Primulaceæ, is common in Myrsinaceæ also. Brown remarks (l. c.), that the order is related to Sapotaceæ through Jacquinia, and to Primulaceæ through Bladhia. The immersion of the ovules in a fleshy placenta is a peculiar character of this tribe. Ægicereæ of Blume differ in nothing except their want of albumen, and, which is probably a consequence of that peculiarity, their embryo germinating in the pericarp, like the Mangroves among which the Ægicereæ grow. But it is to be supposed that in a situation among the mud of the sea shore, the dampest that can well exist, the nascent embryo of a plant has no occasion for that supply of food, which in the form of albumen is so often stored up for them under other circumstances. I therefore consider the presence of albumen in Ægiceras to be a special but not an ordinal character in this case, Mæsa is to other Myrsinaceæ what Samolus is to other Primulaceæ. Mr. Arnott remarks to me that in some genera he finds dots of different shapes mixed as in Samydaceæ.

Geography. Tropical plants without exception, and common both in India and America; but "no species has been met with in equinoctial Africa, though several exist both at the Cape of Good Hope and in the Canary Islands." *Brown in Congo*, 465.

Properties. Almost unknown. Generally handsome shrubs, with fine evergreen leaves. Bread is said to be prepared from the pounded seeds of Theophrasta Jussiæi in St. Domingo, where it is called Le Petit Coco. *Hamilt. Prodr.* p. 27. A slight degree of pungency exists in the berries of Embelia Ribes, and some others; Cathartic properties are ascribed to those of Embelia robusta, Myrsine bifaria. *Royle's Illustr.* 265.

GENERA.

§ 1. Ægicereæ, A. DC.
Ægiceras, Gærtn.
§ 2. Ardisieæ, A. DC.
Wallenia, Swz.
Weigeltia, A. DC.
Conomorpha, A. DC.
Cybianthus, Mart.
Myrsine, L.
Romeria, Thunb.
Samara, Swz.
Scleroxylum, W.
Rapanea, Aubl.
Caballeria, R. et P.
Manglilla, Juss.
Athurophyllum, Lour.
Badula, Juss.
Barthesia, Commers.
Oncostemum, Adr. J.
Ardisia, Swz.
Icacorea, Aubl.
Anguillaria, Gærtn.
Bladhia, Thunb.
Pyrgus, Lour.
Othera, Thunb.
Embelia, Juss.
Choripetalum, A. DC.
? Corynocarpus, Forst.
Samara, L.
§ 3. Mæseæ, A. DC.
Mæsa, Forsk.
Bæobotrys, Forst.
Sibouratia, Thouars.
§ 4. Theophrasteæ, Bartl.
Malaspinæa, Presl.
Oncinus, Lour.
Jacquinia, L.
Bonellia, Bert.
Theophrasta, L.
Eresia, Pl.
Leonia, R. P.
Clavija, R. P.

Order CLXXI. SAPOTACEÆ. The Sappodilla Tribe.

Sapotæ, *Juss. Gen.* 151. (1789).—Sapoteæ, *R. Brown Prodr.* 528. (1810).—Sapotaceæ, *Endl. Prodr. Norf.* 48. (1833).

Essential Character.—*Flowers* hermaphrodite. *Calyx* divided, regular, persistent. *Corolla* monopetalous, hypogynous, regular, deciduous, its segments usually equal in number to those of the calyx, seldom twice or thrice as many. *Stamens* arising from the corolla, definite, distinct, the *fertile* ones equal in number to the segments of the calyx, and opposite those segments of the corolla which alternate with the latter, seldom more. *Anthers* usually turned outwards; the *sterile* stamens as numerous as the fertile ones, with which they alternate, sometimes absent. *Ovary* with several cells, in each of which is 1 erect ovule. *Style* 1. *Stigma* undivided, occasionally lobed. *Fruit* baccate with several 1-seeded cells, or by abortion with only 1. *Seeds* nut-like, sometimes cohering into a several-celled putamen. *Testa* bony, shining, its inner face opaque and softer than the rest. *Embryo* erect, large, white, usually enclosed in fleshy albumen. *Cotyledons*, when albumen is present, foliaceous; when absent, fleshy and sometimes connate. *Radicle* short, straight, or a little curved, turned towards the hilum. *Plumule* inconspicuous.—*Trees* or *shrubs*, chiefly natives of the tropics, and abounding in milky juice. *Leaves* alternate, without stipules, entire, coriaceous. *Inflorescence* axillary.

Affinities. This order is certainly near Ebenaceæ, with which it agrees in habit, arborescent stem, alternate entire leaves, and axillary inflorescence; and moreover in its monopetalous regular hypogynous corolla, the absence of a hypogynous disk, an ovary with several cells, and definite ovules and stamens. The two orders, however, differ in several points. Sapotaceæ have usually a milky juice, and their wood is among the softer kinds; their flowers are always hermaphrodite, the segments of the calyx and corolla are often placed in a double row; their stamens are always in a single row, the fertile ones rarely more numerous than the segments of the calyx, and opposite the divisions of the corolla; their style is undivided; the cells of the ovary are always 1-seeded, with erect ovules; the testa is thick and bony; the embryo is large with respect to the fleshy albumen, which is sometimes deficient; the radicle

is very short, and inferior. In Ebenaceæ there is no milk, and the wood is very hard; the flowers are usually unisexual, the segments of the calyx and corolla are almost always in a single row: the stamens are usually doubled, and either twice or four times as numerous as the segments of the corolla, or, if equal to them, alternate with them; the style is generally divided, the cells of the ovary sometimes 2-seeded, the ovules always pendulous, the testa thin and soft, the embryo middle-sized or small in respect to the cartilaginous albumen, which is always present; the radicle is of middling length, or very long and superior. *R. Brown Prodr.* 529. It is worth remarking, that the woody shell of the seed of Sapotaceæ is certainly testa, and not putamen, as is proved by the presence of the micropyle upon it. If Acosta of the Fl. Peruviana really belongs here, Sapotaceæ will exhibit in that genus an approach to the irregularity of Labiosæ, and to the monadelphous structure of Meliaceæ.

Geography. Chiefly natives of the tropics of India, Africa, and America; a few are found in the southern parts of North America, and at the Cape of Good Hope.

Properties. The fruit of many is esteemed in their native countries as an article of the dessert: such are the Sappodilla Plum, the Star Apple, the Marmalade (Achras mammosa) the Medlar of Surinam, the Mimusops Elengi, and others; they are described as having generally a sweet taste, with a little acidity. The seeds of Achras Sapota are aperient and diuretic; those of some others are filled with a concrete oil, which is used for domestic purposes. Mimusops Kaki, like many trees with astringent bark, yields a gum, while its fruit is of a sweetish taste, and much eaten by the natives of India. *Royle.* A kind of thick oil, like butter, is obtained from the fruit of Bassia butyracea, the Mahva or Madhuca Tree. The flowers of the same tree are employed extensively in the distillation of a kind of arrack. *Ed. P. J.* 12. 192. The juice of the bark of Bassia longifolia is prescribed by the Indian doctors in rheumatic affections. *Ainslie,* 2. 100. The Butter Tree of Mungo Park was also a species of Bassia. See *Royle's Illustrations,* p. 263, for further information concerning these Bassias. The bark of 4 species of Achras is so astringent and febrifugal as to have been substituted for quinquina. The Cow Tree of Humboldt has been sometimes supposed to be referable to this order; but there seems no reason now to doubt its belonging to Artocarpeæ. The Tingi da Praya of Brazil, with which the Indians destroy fish, is the Jacquinia obovata. The branches are bruised and thrown into the water. It must not be confounded with another fish poison, called Tingi only, which is a species of Paullinia. *Pr. Max. Trav.* 166.

GENERA.

Achras, L.	Imbricaria, Commers.	Hornschuchia, Nees.	Argania, Schousb.
Lucuma, Juss.	Binectaria, Forst.	Hunteria, Roxb.	
Chrysophyllum, L.	Mimusops, L.	Sersalisia, R. Br.	Omphalocarpus, P. de B.
Nycterisition, R. P.	Bassia, Kön.	Sideroxylon, L.	? Acosta, R. P.
	Bumelia, Sw.		

Order CLXXII. EBENACEÆ. The Ebony Tribe.

Guaiacanæ, *Juss. Gen.* 155. (1789) *part of the first sect.*—Ebenaceæ, *Vent. Tabl.* 443. (1799); *Brown Prodr.* 524. (1810).—Ebenaceæ, § Diospyreæ, *DC. and Duby,* 320. (1829).

Essential Character.—*Flowers* polygamous or dicœcious, seldom hermaphrodite. *Calyx* in 3 or 6 divisions, nearly equal, persistent. *Corolla* monopetalous, hypogynous,

regular, deciduous, somewhat coriaceous, usually pubescent externally, and smooth internally; its *limb* with 3 or 6 divisions, imbricated in æstivation. *Stamens* definite, either arising from the corolla, or hypogynous; twice as many as the segments of the corolla, sometimes 4 times as many, or the same number, and then alternate with them; *filaments* simple in the hermaphrodite species, generally doubled in the polygamous and dicœcious ones, both their divisions bearing anthers, but the inner one generally smaller; *anthers* attached by their base, lanceolate, 2-celled, dehiscing lengthwise, sometimes bearded; *pollen* round, smooth. *Ovary* sessile, without any disk, several-celled, the cells each having 1 or 2 ovules pendulous from their apex; *style* divided, seldom simple; *stigmas* bifid, or simple. *Fruit* fleshy, round or oval, by abortion often few-seeded, its pericarp sometimes opening in a regular manner. *Seed* with a membranous testa of the same figure as the albumen, which is cartilaginous and white; *embryo* in the axis, or but little out of it, straight, white, generally more than half as long as the albumen; *cotyledons* foliaceous, somewhat veiny, lying close together, occasionally slightly separate; *radicle* taper, of middling length or long, turned towards the hilum; *plumule* inconspicuous.—*Trees* or *shrubs*, without milk, and a heavy wood. *Leaves* alternate, without stipules, obsoletely articulated with the stem, quite entire, coriaceous. *Inflorescence* axillary. *Peduncles* solitary, those of the males divided, of the females usually 1-flowered, with minute bracts. *R. Br.*

Affinities. Very near Oleaceæ, with which they agree in the placentation of the seeds and other points of structure; distinguished by their alternate leaves, constantly axillary and usually unisexual flowers, the stamens of which are at least double the number of the lobes of the corolla. *R. Br.* They are more closely allied to Aquifoliaceæ, from which they chiefly differ in the number of their stamens and their divided sexes. For their resemblance to Sapotaceæ, see that order.

Geography. Chiefly Indian and tropical; a very few are found northward as far as Switzerland in Europe, and the state of New York in North America.

Properties. Remarkable only for the hardness and blackness of the wood of such species as Diospyrus Ebenus, Ebenaster, melanoxylon, Mabolo, tomentosa and Roylei, and for the eatable quality of the fruit. The former is well known under the name of Ebony and Ironwood; the latter is occasionally introduced from China as a dry sweetmeat. It is noted for extreme acerbity before arriving at maturity. The bark of Diosp. virginiana is said to be a febrifuge. The fruit of Diospyrus Embryopteris is so glutinous as to be used in Bengal for paying boats. *Royle.*

GENERA.

Diospyros, L.
Ebenus, Commers.
Embryopteris, Gærtn.
Royena, L.
Cargillia, R. Br.
Maba, Forst.
Pisonia, Rottb.
Ferreola, Roxb.
Ebenoxylum, Lour.
Pouteria, Aubl.
Labatia, Sw.
Phelline, La Bill.
Goetzea, Wydl.

Sub-Order? STYRACEÆ.

Styraceæ, *Rich. Anal. du Fr.* (1808); *Von Martius, N. Gen. et Sp. Pl.* 2. 148. (1826).—Ebenaceæ, *a* § *of* Styraceæ, *DC. and Duby*, 320. (1828).—Symplocineæ, *Don Prodr. Nep.* 144. (1825).—Styracineæ, *Rich. in Humb. N. G. et Sp.* 3. 256. (1818); *Synops.* 2. 315. (1823).—Halesiaceæ, *Don in Jameson's Journ.* (*Dec.* 1828); *Link Handb.* 1. 667. (1829).

Essential Character.—*Calyx* inferior or superior, with 5 divisions, persistent. *Corolla* monopetalous, the number of its divisions frequently different from that of the calyx; with imbricated æstivation. *Stamens* definite or indefinite, arising from the tube of the corolla, of unequal length, cohering in various ways, but generally in a slight degree only; *anthers* innate, 2-celled, bursting inwardly. *Ovary* superior, or adhering to the calyx, with from 3 to 5 cells; *ovules* definite, the upper ascending, the lower pendulous, or *vice versâ*; *style* simple; *stigma* somewhat capitate. *Fruit* drupaceous, surmounted by or

enclosed in the calyx, with from 1 to 5 cells. *Seeds* ascending or suspended, solitary, with the *embryo* lying in the midst of the *albumen*; *radicle* long, directed towards the hilum; *cotyledons* flat, foliaceous.—*Trees* or *shrubs*. *Leaves* alternate, without stipules, usually toothed, turning yellow in drying. *Flowers* axillary, either solitary or clustered, with scale-like bracts. The *hairs* often stellate.

Affinities. The plants comprehended under this name require a careful examination and settlement. They have been at one time combined with Ebenaceæ, or divided into the two orders of Styraceæ and Symplocaceæ, from both which Halesiaceæ have been again separated by Don and Link. From Ericaceæ they differ in habit, in the definite number of their seeds, and their inferior ovary; from Ebenaceæ in the latter character, in the perigynous insertion of the stamens, in the peculiar circumstance of part of the ovules being erect and part inverted, and in the style being simple. Von Martius considers Styraceæ as gamopetalous rather than monopetalous: but what is the real difference in the meaning of these two words? Don says that Halesiaceæ are a group widely different from Styraceæ, and that they are principally known from Columelliaceæ by the indefinite stamens and simple stigma. *Jameson's Journ.* 1828. The genus Symplocos is different in habit from Styrax and Halesia, turning yellow in drying. Jussieu refers Styrax to Meliaceæ, with which family the order has no doubt much affinity. De Candolle considers them nearly akin to Ternströmiaceæ. *Essai Médic.* 204.

Geography. Found in North and South America within and without the tropics, and in tropical Asia and China.

Properties. Some of the genus Symplocos are used in dying yellow; others, as Alstonia theiformis, are employed as tea, on account of a slight astringency in their leaves. Storax and Benzoin, fragrant gum-resins, composed of resin, benzoic acid, and a peculiar aromatic principle, are the produce of two species of Styrax.

GENERA.

Symplocos, L.	Hopea, L.	Turaria, Molin.	Strigilia, Cav.
Alstonia, Mut.	Styrax, L.	Diclidanthera, Mart.	*Cypellium*, Desv.
Ciponima, Aubl.	Halesia, L.	? Morelosia, Llave.	Decadia, Lour.
	Paralea, Aubl.		

Order CLXXIII. AQUIFOLIACEÆ. The Holly Tribe.

Ilicineæ, *Ad. Brongniart Mémoire sur les Rhamnées*, p. 16. (1826); *Lindl. Synops.* p. 73. (1829).—Aquifoliaceæ, *DC. Théorie*, ed. 1. 217. (1813); *a* § *of* Celastrineæ, *Ib. Prodr.* 2. 11. (1825); *Martius H. R. Mon.* (1829).

Essential Character.—*Sepals* 4 to 6, imbricated in æstivation. *Corolla* 4- or 5-parted, hypogynous, imbricated in æstivation. *Stamens* inserted into the corolla, alternate with its segments; *filaments* erect; *anthers* adnate. *Disk* none. *Ovary* fleshy, superior, somewhat truncate, with from 2 to 6 cells; *ovules* solitary, pendulous from a cup-shaped funiculus; *stigma* subsessile, lobed. *Fruit* fleshy, indehiscent, with from 2 to 6 stones. *Seed* suspended, nearly sessile; *albumen* large, fleshy; *embryo* small, 2-lobed, lying next the hilum, with minute *cotyledons*, and a superior *radicle*.—*Trees* or *shrubs*. *Leaves* alternate or opposite, coriaceous. *Flowers* small, axillary, solitary or fascicled.

Affinities. Included in Rhamnaceæ by most botanists, but well distinguished by Ad. Brongniart, who remarks that the suggestion of Jussieu, in his *Genera Plantarum*, that Aquifoliaceæ ought probably to be placed among Monopetalæ, near Sapotaceæ or Ebenaceæ, will probably be adopted. From Celastraceæ, with which the order is combined in most modern works, it differs in the form of the calyx and corolla, in the disposition and insertion

of the stamens, and especially in the structure of the ovary and fruit. In these respects Aquifoliaceæ are found by Brongniart to agree so completely with Ebenaceæ, that that order does not, in fact, differ essentially from Aquifoliaceæ, except in characters of a secondary order, such as the calyx and corolla less deeply divided, the stamens often double the number of the segments of the corolla, the style being sometimes divided, the cells of the ovary usually containing 2 collateral ovula, and, finally, in the cells of the fruit not becoming bony, as in most Aquifoliaceæ. Von Martius places them near Polygalaceæ.

Geography. Found in various parts of the world, especially in the West Indies, South America, and the Cape of Good Hope. Several are found in North America; but 1, the common Holly, in Europe.

Properties. The bark and berries of Prinos verticillatus possess, in an eminent degree, the properties of vegetable, astringent, and tonic medicines, along with antiseptic powers which are highly spoken of by American practitioners. *Barton*, 1. 208. Prinos glaber and Ilex Paraguensis are used as tea: the latter yields the famous beverage called Maté in Brazil. Myginda Gongonha is diuretic. *DC.*

GENERA.

Cassine, L.
Maurocenia, Mill.
Hartogia, Thunb.
Schrebera, Thunb.
Curtisia, Ait.
Doratium, Soland.
Relhania, Gmel.
Junghousia, Gmel.
Myginda, Jacq.
Rhacoma, L.
Crossopetalum, P.Br.
Ilex, L.
Aquifolium, Tourn.
Botryceras, Willd.
Prinos, L.
Ageria, Adans.
Winterlia, Mœnch.
Macoucoua, Aubl.
Nemopanthes, Rafin
Nuttallia, DC.

Skimmia, Thunb.
Lepta, Lour.
? Monetia, L.
? Desfontainia, R.P.(32)

Alliance IV. *NOLANALES.*

Essential Character.—*Fruit* divided into distinct lobes.

Order CLXXIV. NOLANACEÆ.

Nolanaceæ, *Lindl. Nixus Pl.* 18. (1833); *Martius Conspectus, No.* 119. (1835).—Convolvulaceæ § Dichondreæ, *Choisy* (1834).

Essential Character.—*Calyx* 5-parted, regular or irregular. *Corolla* monopetalous, with a plaited æstivation, usually thickened in the tube. *Stamens* 5, equal, inserted into the tube, alternate with the segments of the corolla; *anthers* oblong, 2-celled, bursting longitudinally. *Pistil* composed of several carpels, either distinct with distinct styles, or distinct with a single style, or partially combined into several sets with a single style seated on a succulent *disk*. *Stigma* somewhat capitate. *Fruit* enclosed in the permanent calyx, constructed like the pistil; *pericarp* woody, and a little succulent or membranous. *Seeds* ascending, solitary; *embryo* curved, with either straight or doubled cotyledons, in the midst of a small quantity of *albumen*; *radicle* next the hilum.—Prostrate or erect, herbaceous or suffruticose plants. *Leaves* alternate, without stipules. *Flowers* usually showy.

Affinities. The genus Nolana, sometimes referred to Boraginaceæ, sometimes to Convolvulaceæ, has been erected into a distinct order, on account, on the one hand, of its regular plaited corolla, and, on the other, of its separate carpels. It appears to approach far more nearly to the latter than the former, differing, in reality, in nothing excepting its separate carpels, that is to say, much as Boraginaceæ from Tournefortiaceæ, or Labiatæ from Verbenaceæ, &c. The only difficulty in this character consists in knowing whether the genera Falkia or Dichondra belong to Convolvulaceæ or to

Nolanaceæ. With the latter they agree in their separate ovaries, with the former in the structure of their embryos; with both they disagree in the entirely apocarpous state of their carpels. If we attend to the embryo, they will stand among Convolvulaceæ; if to the carpels, among Nolanaceæ: upon the whole, the latter must be accounted of the most importance, and consequently it is with Nolanaceæ that I arrange them. Many more species of Nolana, than are described, are known, some of them shrubby ones; but I do not find any characters that can be depended upon to form them into genera: in some species (N. prostrata) the carpels are combined by fours into 5 nuculæ; in others they are all separate (N. paradoxa); in others they are two solitary and simple and six combined in threes; in others they are altogether irregular.

Geography. Chile, Peru, and the Cape of Good Hope, are the principal stations of the species. Dichondra is found in most hot latitudes.

Properties. Unknown.

GENERA.

Nolana, L.
Teganium, Schm.
Steripha, Gærtn.
Falkia, L.
Dichondra, Forst.

Alliance V. *VOLVALES.*

Essential Character.—*Carpels* from 2 to 4, combined. *Anthers* never opening by pores.

Order CLXXV. CUSCUTACEÆ.

Cuscuteæ, *J. S. Presl. Fl. Cech.* 1. 247. *Bartl. Ord. Nat.* 192. (1830); *Martius. Conspect. No.* 125. (1835).—Cuscutinæ, *Link Handb.* 1. 594. (1829); *Lindl. Nixus Pl.* 18. (1833).—Cuscutaceæ, *Lindl. Key*, 63. (1835).

Essential Character.—*Calyx* inferior, persistent, 4-5-parted, with an imbricate æstivation. *Corolla* persistent, cut round at the base; the limb regular, 4-5-cleft, imbricated in æstivation. *Scales* alternating with the segments of the corolla, and adhering to them, rarely wanting. *Stamens* equal to the segments of the corolla, and alternate with them: *anthers* 2-celled, opening longitudinally. *Ovary* 2-celled; *ovules* twin, collateral, erect; *styles* 2, simple, sometimes connate. *Capsule* 2-celled, cut round at the base; *cells* 1-2-seeded. *Seeds* with a central fleshy albumen, and a spiral acotyledonous embryo.—Leafless, twining, parasitical *herbs*, with clustered *flowers*.

Affinities. Similar motives which induced me to separate Cassythaceæ from Lauraceæ have led me to divide this order from Convolvulaceæ, with which its peculiar habits forbid us to confound it, and from which its technical characters seem sufficient to separate it.

Geography. Found all over the world, occasionally, in cool, temperate, sub-humid climates.

Properties. Unknown.

GENUS.

Cuscuta, L.
Grammica, Lour.

Order CLXXVI. CONVOLVULACEÆ. The Bindweed Tribe.

Convolvuli, *Juss. Gen.* 133. (1789).—Convolvulaceæ, *R. Brown Prodr.* 481. (1810); *Lindl. Synops.* 167. (1829); *Choisy in Mem. Soc. Phys. Genév.* (1834).

Essential Character.—*Calyx* persistent, in 5 divisions, remarkably imbricated, as if in more whorls than one, often very unequal. *Corolla* monopetalous, hypogynous, regular, deciduous; the limb 5-lobed, plaited. *Stamens* 5, inserted into the base of the corolla, and alternate with its segments. *Ovary* simple, with 2 or 4 cells, seldom with 1; sometimes in 2 or 4 divisions; few-seeded; the ovules definite and erect, when more than 1 collateral; *style* 1, usually divided at the top; *stigmas* obtuse or acute. *Disk* annular, hypogynous. *Capsule* with from 1 to 4 cells; the valves fitting, at their edges, to the angles of a loose dissepiment, bearing the seeds at its base. *Seeds* with a small quantity of mucilaginous albumen; *embryo* curved; *cotyledons* shrivelled; *radicle* inferior.—*Herbaceous* plants or *shrubs*, usually twining and milky, smooth, or with a simple pubescence. *Leaves* alternate, undivided, or lobed, seldom pinnatifid, with no stipules. *Inflorescence* axillary or terminal; *peduncles* 1- or many-flowered, the partial ones generally with 2 bracts.

Affinities. The plaited corolla, imbricated calyx (as in calycose polypetalæ) and climbing habit, are the *primâ facie* marks of this order, which approaches Cordiaceæ in its shrivelled cotyledons, and through that tribe Boraginaceæ. Nolanaceæ would seem to establish a more direct relationship between Convolvulaceæ and that order. Polemoniaceæ are known by their loculicidal dehiscence, which in Convolvulaceæ is always opposite the dissepiments. Hydroleaceæ are characterised by their indefinite seeds, and taper embryo lying in the midst of fleshy albumen. Solanaceæ have a dicarpellary fruit and numerous seeds; otherwise, they are very like the shrubby erect species of Convolvulaceæ.

Geography. Very abundant in all parts of the tropics, but rare in cold climates, where a few only are found: they twine round other shrubs, or creep among the weeds of the sea-shore.

Properties. Their roots abound in an acrid milky juice, which is strongly purgative; this quality depends upon a peculiar resin, which is the active principle of the Jalap, the Scammony, and the others whose roots possess similar qualities. Conv. Jalapa produces the real jalap, and C. Scammonia the scammony; besides which, C. Turpethum, C. Mechoacanus, sepium, arvensis, Soldanella, macrorhizus, maritimus, macrocarpus, and probably many others, may be used with nearly equal advantage. The root of Convolvulus panduratus is used in the United States as jalap; its operation is like that of rhubarb; it is supposed to be also diuretic. *Barton*, 1. 252. The roots of Conv. floridus and scoparius, and Ipomœa Quamoclit, are used as sternutatories; those of C. Batatas and edulis are useful articles of food: the former is the common sweet Potato of European gardens. Convolvulus dissectus abounds in prussic acid, and is one of the plants from which the liqueur *Noyau* is prepared. *Bot. Mag.* 3141. The Ipomæa sensitiva of Turpin is remarkable for the extreme irritability of its corolla.

GENERA.

§ 1. Argyreieæ, Chois.
Rivea, Ch.
Maripa, Aubl.
Argyreia, Lour.
Lettsomia, Roxb.
Blinkworthia, Ch.
Humbertia, Lam.
Endrachium, Gmel.
Thouinia, Sm.
Smithia, Gmel.
Moorcroftia, Ch.

§ 2. Convolvuleæ, Ch.
Quamoclit, Tourn.
Calbœa, Cav.
Macrostemma, Pers.
Mina, Lex.
Morenoa, Lex.
Batatas, Ch.
Pharbitis, Ch.
Calonyction, Ch.
Exogonium, Ch.
Lepistemon, Bl.
Ipomœa, Ch.

Convolvulus, Ch.	Porana, L.	*Dethardingia*, Nees.	Evolvulus, L.
Aniseia, Ch.	*Dinetus*, Sweet.	*Reinwardtia*, Spr.	? Wilsonia, R. Br.
Polymeria, R. Br.	Neuropeltis, Wall.	Breweria, R. Br.	———
Calystegia, R. Br.	Prevostea, Ch.	Bonamia, Thouars.	Mouroucoua, Aubl.
Shuteria, Ch.	*Calycobolus*, W.	Cressa, L.	
Skinneria, Ch.	*Dufourea*, H. B. K.		

Order CLXXVII. POLEMONIACEÆ.

The Greek Valerian Tribe.

Polemonia, *Juss. Gen.* 136. (1789).—Polemonideæ, *DC. and Duby*, 329. (1828).—Polemoniaceæ, *Lindl. Synops.* 168. (1829); *Bentham in Bot. Reg.* 1622. (*Oct.* 1833).

Essential Character.—*Calyx* inferior, monosepalous, 5-parted, persistent, sometimes irregular. *Corolla* regular, 5-lobed. *Stamens* 5, inserted into the middle of the tube of the corolla, and alternate with its segments. *Ovary* superior, 3 celled, with a few or many ovules; *style* simple; *stigma* trifid; *ovules* ascending or peltate. *Capsule* 3-celled, 3-valved, few- or many-seeded, with a loculicidal or septicidal dehiscence; the valves separating from the axis. *Seeds* angular or oval, or winged, often enveloped in mucus, ascending; *embryo* straight in the axis of horny albumen; *radicle* inferior; *cotyledons* elliptical, foliaceous.—*Herbaceous* plants, with opposite, or occasionally alternate, compound, or simple *leaves; stem* occasionally climbing.

Affinities. The ternary division of the ovary connected with the pentandrous corolla and 5-lobed calyx bring this order near Convolvulaceæ, from which the habit, embryo, and corolla, distinguish it; from Gentianaceæ, to which it also approaches, the 3-celled ovary divides it. It is remarkable for the blue colour of the pollen, which is usually of that hue, whatever may be the colour of the corolla. In Collomia linearis I have noticed (in *Botanical Register*, folio 1166) that the dilatation of the mucous matter in which the seeds are enveloped, and which, when they are thrown into water, forms around them like a cloud, depends upon the presence of an infinite multitude of exceedingly delicate and minute spiral vessels, lying coiled up, spire within spire, on the outside of the testa; when dry, these vessels are confined upon the surface of the seed by its mucus, without being able to manifest themselves; but the instant water is applied, the mucus dissolves and ceases to counteract the elasticity of the spiral vessels, which then dart forward at right angles with the testa, each carrying with it a sheath of mucus, in which it for a long time remains enveloped as if in a membranous case. The order has been remodelled by Bentham in the place above quoted. Bartling refers Retziaceæ to Convolvulaceæ, from which he distinguishes them by their polyspermous cells and straight embryo. *Ord. Nat.* 192.

Geography. Very abundant in both North and South America, in temperate latitudes, particularly on the north-west side. It is stated by Richardson, that the most northern limit in North America is 54°. *Edin. Phil. Journ.* 12. 209. In Europe and Asia they are much more uncommon. They are unknown in tropical countries.

Properties. None, or unknown.

GENERA.*

Polemonium, L.	Hugelia, Benth.	Leptosiphon, Benth.	Dactylophyllum, Bent.
Phlox, L.	Linanthus, Benth.	Fenzlia, Benth.	

* For this list I am indebted to Mr. Bentham.

Gilia, Cav.	Collomia, Nutt.	Cantua, Juss. (33)
Ipomopsis, Sm.	Caldasia, Willd.	*Periphragmos*, R. et P.
Ipomeria, Nutt.	*Bonplandia*, Cav.	? Cyananthus, Wall. (34)
Navarretia, R. et P.	Hoitzia, Juss.	
Œgochloa, Benth.	Loeselia, L.	Heteryta, Raf.

Don distinguishes Cobæaceæ from this order; but the only differences of importance between the one and the other appear to consist in the former having an unusually large lobed disk, a septicidal dehiscence and climbing habit; distinctions, I fear, of too little moment to be admitted as of ordinal value. The characters of Cobæaceæ, as understood by Don, are these:—

Cobæaceæ, *Don in Edinb. Phil. Journ.* 10. 111. (1824); *Link Handb.* 1. 822. (1829).

Essential Character.—*Calyx* leafy, 5-cleft, equal. *Corolla* inferior, campanulate, regular, 5-lobed, with an imbricate æstivation. *Stamens* 5, equal, arising from the base of the corolla; *anthers* 2-celled, compressed. *Ovary* superior, 3-celled, surrounded with a fleshy secreting annular disk; *ovules* several, ascending; *style* simple; *stigma* trifid. *Fruit* capsular, 3-celled, 3-valved, with a septicidal dehiscence; *placenta* very large, 3-cornered, in the axis, its angles touching the line of dehiscence of the pericarpium. *Seeds* flat, winged, imbricated in a double row; their integument mucilaginous; *albumen* fleshy; *embryo* straight; *cotyledons* leafy; *radicle* inferior.—Climbing *shrubs*. *Leaves* alternate, pinnated, their petiole lengthened into a tendril. *Flowers* axillary, solitary. *Don.*

Bartling (p. 186) remarks that the type of this order ought, in fact, to be referred to Bignoniaceæ; but all the arguments he adduces prove exactly the contrary.

GENUS.

Cobæa, Cav.

Order CLXXVII.* DIAPENSIACEÆ.

Diapensiaceæ, *Link Handb.* 1. 595. (1829); *a* § *of* Convolvulaceæ.

Essential Character.—*Calyx* composed of 5 sepals which form a broken whorl, are rather unequal, and much imbricated; scarcely distinguishable from the bracts which are closely imbricated round it. *Corolla* monopetalous, regular, with an imbricated æstivation. *Stamens* 5, equal; the *filaments* petaloid and arising from the margin of the sinus of the corolla; *anthers* 2-celled, with a broad connective, bursting transversely; in Pyxidanthera awned on the lower valve. *Disk* 0. *Ovary* superior, 3-celled; each placenta with 7 ovules in Pyxidanthera, with an indefinite number in Diapensia; *style* single, continuous with the ovary; *stigma* sessile with 3 very short decurrent lobes. *Capsule* membranous or papery, surrounded with the permanent sepals, terminated by the rigid style or its base. *Seeds* with a brittle deeply pitted skin, peltate. *Embryo* filiform, with a long slender *radicle* and two very short *cotyledons;* lying across the hilum in a mass of fleshy albumen.—Prostrate *undershrubs*, with small densely imbricated leaves which have scarcely any visible veins. *Flowers* solitary terminal.

Affinities. From the manner in which Diapensia was associated by Brown (*Prodromus* 482.), when he separated it along with Hydroleaceæ from Convolvulaceæ, it has been generally supposed that this profound Botanist intended to refer Diapensia to the former of those orders. But upon looking again at the passage in question I perceive that it does not necessarily bear the interpretation that is usually put upon it, and this has led me to reconsider the subject. The result has been a persuasion that Diapensia is in reality nearer Polemoniaceæ than Hydroleaceæ, and essentially distinct from both. The more immediate points of resemblance with Hydroleaceæ consist, firstly, in Diapensia having the filaments petaloid, and originating not from within the

corolla but from the margin of the sinuses, so that the corolla might be described as 10-cleft, five of the divisions being broad and coloured, and the other five much narrower, and shorter, colourless, and having anthers; and secondly, in the embryo being a filiform body, slightly 2-lobed at one end. But both Diapensia and Pyxidanthera disagree with Hydroleaceæ in having a calyx consisting of five unequal sepals forming a broken whorl as in the calycose group of Polypetalous Dicotyledons; secondly, in having the anthers bursting transversely, and with a very broad connective; thirdly, in having only one style instead of two; fourthly, in being destitute of an hypogynous disk; and finally, in the embryo lying in the midst of fleshy albumen across the hilum, so as to be what modern Botanists call heterotropous. At least this is certainly the case in Pyxidanthera, and I have no reason to doubt its being equally the case with Diapensia. In Hydrolea certainly, and I believe in Wigandia also, the embryo is orthotropous, and the quantity of albumen so inconsiderable as to be of no moment. It is plain, therefore, that Diapensia and Pyxidanthera must be separated from Hydroleaceæ. With Polemoniaceæ I have already stated that their affinity appears to me to be much greater. In the first place they are not very different in habit; compare Pyxidanthera barbulata with Phlox setacea. Secondly, they agree in the trimerous structure of the ovary, and in the single style. But on the other hand Diapensiaceæ have a totally different calyx and embryo, their corolla is not the corolla of Polemoniaceæ, and they have no trace of an hypogynous disk. I therefore think it absolutely necessary to give them a distinct station. The characters of the two genera, usually, but incorrectly, combined, will be found in the Appendix.

Let me add, that although the name of Diapensiaceæ originated with Link, yet that author in placing it in Convolvulaceæ was obviously unacquainted with its real structure, and in assigning it for a character "semina membrana inclusa," seems to have assumed that in this respect it agrees with Hydroleaceæ, which is not the fact.

Geography. Mountain plants of the North of Europe and North America.

Properties. Unknown.

GENERA.

Diapensia, L. (35)
Pyxidanthera, Michx. (36)

Order CXXVIII. HYDROLEACEÆ.

R. Brown Prodr. 482. (1810) *without a name; Id. in Congo* (1818).—Hydroleaceæ, *Kunth in Humb. N. G. et Sp.* 3. 125. (1818); *Synops.* 2. 234. (1823); *Bartl. Ord. Nat.* 189. (1830); *Choisy Descr. des Hydroleacées (no date).*

Essential Character.—*Calyx* 5-parted, inferior, persistent, with slightly imbricated æstivation. *Corolla* hypogynous, monopetalous, regular, not always agreeing with the calyx in the number of its divisions. *Stamens* arising from between the lobes of the corolla, regular, agreeing in number with the segments of the calyx; *anthers* deeply lobed at the base, opening longitudinally, with a very narrow *connective; filaments* petaloid at the base. *Ovary* superior, surrounded by a short annular disk, 2- or 3-celled; *styles* 2 or 3; *stigmas* thickened. *Fruit* capsular, papery, enclosed in the calyx, 2- rarely 3-celled, sometimes splitting through the middle of the cells; *placentæ* either single and fungous, or double and thin, sometimes central and loose. *Seeds* indefinite, very small, with a testa more or less loose; *albumen* fleshy, in the axis of which lies a taper, straight *embryo*, which is orthotropous and slightly 2-lobed at one end.—*Herbaceous* plants or *under-shrubs*, some-

times spiny. *Leaves* alternate, entire, or lobed, without stipules, often covered with glandular or stinging hairs. *Flowers* numerous, axillary and terminal. *Inflorescence* gyrate.

Affinities. Separated from Convolvulaceæ by Brown, on account of the indefinite seeds, and taper embryo with small flat cotyledons in the midst of fleshy albumen. To me the order appears equally related to Boraginaceæ, with some of which Wigandia agrees in habit. Also allied to Hydrophyllaceæ, the membranous plates lining the tube of the corolla of that order being, according to Von Martius (*N. G.* 2. 138.), analogous to the dilated base of the filaments of Hydroleaceæ.

Geography. No particular geographical limits can be assigned to this order. Wigandia is found in the Caraccas, Hydrolea in the West Indies, and Nama in both the East and West Indies.

Properties. Unknown, except that a bitter principle exists in Hydrolea.

GENERA.

Hydrolea, L.	Hydrolia, Pet. Th.	? Romanzovia, Cham.
Steris, L.	Nama, L.	
Sagonea, Aubl.	Wigandia, H. B. K.	Cervia, Lga.
Reichelia, Schreb.		Codon, L.

Group II. Epigynosæ.

Essential Character.—*Ovary* inferior, usually with an epigynous disk, composed of two or more carpels. *Anthers* never bursting by pores. *Stamens* always inserted into the corolla.

If attention is paid to the constant absence of a porous dehiscence in the anthers, this group can never be confounded with the last, notwithstanding that some Polycarpous genera have an inferior ovary. It is here that we have one of the most evident transitions from Monopetalous to Polypetalous Exogens by way of Galium and other Stellatæ to Umbelliferous plants, and by way of Caprifoliaceæ to Cornales.

Alliance I. *CAMPANALES.*

Essential Character.—*Stipules* absent. *Seeds* indefinite in number.

Of this alliance Lobeliaceæ pass into Goodenales and Columelliaceæ seem to have much analogy with Onagraceæ. Campanulaceæ may be considered to pass into Caprifoliaceæ by way of Linnæa and into Ericaceæ by way of Calysphyrum.

Order CLXXIX. LOBELIACEÆ.

Campanulaceæ, § 2. *R. Brown Prodr.* 562. (1810).—Lobeliaceæ, *Juss. Ann. Mus.* 18. 1. (1811); *DC. and Duby*, 310. (1828); *Lindl. Synops.* 137. (1829).

Essential Character.—*Calyx* superior, 5-lobed, or entire. *Corolla* monopetalous, irregular, inserted in the calyx, 5-lobed, or deeply 5-cleft. *Stamens* 5, inserted into the calyx alternately with the lobes of the corolla; *anthers* cohering; *pollen* oval. *Ovary* inferior, with from 1 to 3 cells; *ovules* very numerous, attached either to the axis or to the

lining; *style* simple; *stigma* surrounded by a cup-like fringe. *Fruit* capsular, 1- or more-celled, many-seeded, dehiscing at the apex. *Seeds* attached either to the lining or the axis of the pericarp; *embryo* straight, in the axis of fleshy albumen; *radicle* pointing to the hilum.—*Herbaceous* plants or *shrubs*. *Leaves* alternate, without stipules. *Flowers* axillary or terminal.

Anomalies. Clintonia has a triangular 1-celled ovary, with 2 parietal placentæ. Some have 5 petals. One species of Lobelia is dicœcious.

Affinities. Different as the plants of this order at first sight appear from Compositæ, they in fact participate in all the analogies of Campanulaceæ with that alliance, and perhaps are yet more nearly related to Compositæ even than Campanulaceæ, especially in their cohering anthers and in the irregularity of their corolla, which is split so that the segments cohere towards one side just like the 5 segments that make up the ligulate floret of a Composita. The stigma is surrounded by hairs, which are probably analogous to the indusium of Goodeniaceæ, to which order Lobeliaceæ approach closely. Of course they participate in any and all the affinities of Campanulaceæ. Alphonse De Candolle criticises, with much justice, the character assigned to Lobeliaceæ in my *Synopsis* of the British Flora, particularly in regard to the *cup or* fringe assigned to their stigma: this was a misprint for cup-like. He also considers Jasione more properly a Campanulaceous than a Lobeliaceous plant; this genus, however, seems to me to stand upon the limit between the two orders.

Geography. Unlike Campanulaceæ, these seem to prefer countries within or upon the border of the tropics to such as have a colder character. We find them abounding in the West Indies, Brazil, the Cape of Good Hope, and the Sandwich Islands; they are not uncommon in Chile, and New Holland.

Properties. All dangerous or suspicious, in consequence of the excessive acridity of their milk. L. Caoutchouc is so named by the inhabitants of Popayan from the tenacity of its juice. *Royle.* Lobelia tupa yields a dangerous poison in Chile. The most active article of the North American Materia Medica is said to be the Lobelia inflata: it is possessed of an emetic, sudorific, and powerful expectorant effect, especially the first. When given with a view to empty the stomach, it operates vehemently and speedily; producing, however, great relaxation, debility, and perspiration, and even death, if given in over-doses. *Barton*, 1. 189. The anti-syphilitic virtues ascribed to Lobelia syphilitica are supposed to have resided in its diuretic property; they are, however, generally discredited altogether. *Ibid.* 2. 211. Lobelia longiflora, a native of some of the West India Islands, is one of the most venomous of plants. The Spanish Americans call it Rebenta Cavallos, because it proves fatal to horses that eat it, swelling them until they burst. Taken internally, it acts as a violent cathartic, the effects of which no remedy can assuage, and which end in death. The leaves are an active vesicatory. Lobelia cardinalis is an acrid plant which is reckoned an anthelmintic. *Ibid.* 2. 180.

GENERA.

Clermontia, Gaud.	Tupa, D. Don.	Isotoma, R. Br.	Hippobroma, Don.
Moquinia, Spr.	Siphocampylus, Pohl.	Holostigma, Don.	Canonanthus, Don.
Rollandia, Gaud.	Lobelia, L.	Lysipoma, H. B. K.	Strumpfia, L.
Cyanea, Gaud.	Dortmanna, Don.	Monopsis, Salisb.	Heterotoma, Zucc.
Delissea, Gaud.	Parastranthus, Don.	Clintonia, Dougl.	Jasione, L.
Pratia, Gaud.			

Order CLXXX. CAMPANULACEÆ. The Campanula Tribe.

Campanulæ, *Juss. Gen.* 163. (1789) *in part.*—Campanulaceæ, *R. Brown Prodr.* 559. (1810); *Lindl. Synops.* 135. (1829).—Campanuleæ, *Alph. DC. Monogr.* (1830).

Essential Character.—*Calyx* superior, usually 5-lobed (3-8), persistent. *Corolla* monopetalous, inserted into the top of the calyx, usually 5-lobed (3-8), withering on the fruit, regular. *Æstivation* valvate. *Stamens* inserted into the calyx alternately with the lobes of the corolla, to which they are equal in number. *Anthers* 2-celled, distinct. *Pollen* spherical. *Ovary* inferior, with 2 or more polyspermous cells opposite the stamens, or alternate with them; *style* simple, covered with collecting hairs; *stigma* naked, simple, or with as many lobes as there are cells. *Fruit* dry, crowned by the withered calyx and corolla, dehiscing by lateral irregular apertures or by valves at the apex, always loculicidal. *Seeds* numerous, attached to a placenta in the axis; *embryo* straight, in the axis of fleshy albumen; *radicle* inferior.—*Herbaceous* plants or *under-shrubs*, yielding a white milk. *Leaves* almost always alternate, simple, or deeply divided, without stipules. *Flowers* single, in racemes, spikes, or panicles, or in heads, usually blue or white, very rarely yellow.

Affinities. I gladly avail myself of the valuable remarks of Alphonse De Candolle in explaining the affinities of Campanulaceæ. He considers that they differ from Lobeliaceæ chiefly in their regular corolla, their stamens being almost always distinct, their pollen spherical (not oval), their stigmas generally long and velvety externally, in the abundance of collecting hairs on the style, and finally in their capsule usually opening laterally. "It is not only in the form," he proceeds, "but also in the number of the parts, that the flower of Campanulaceæ is more regular than that of Lobeliaceæ. Thus, in several Campanulas the cells of the ovary are equal in number to the stamens and the divisions of the corolla and calyx, which points out the natural symmetry of the flower. In Lobelias abortion is more frequent. In both groups the innermost organs are abortive more frequently than the outermost. Thus, the number of cells is often smaller (never greater) than that of the stamens; the number of stamens is sometimes smaller (but never larger) than that of the lobes of the corolla; and the same is true of the lobes of the corolla with respect to the calyx. Finally, Lobeliaceæ have sometimes a corolla of a fine bright red, a colour unknown among Campanulas; nine-tenths of the species of the latter have blue flowers; and those in which the colour varies, and into which a little red enters (as Canarina), are far from having the brilliancy of Lobelia cardinalis for instance. After Lobeliaceæ, the natural groups with which Campanulaceæ have the most relation are, no doubt, Goodeniaceæ and Stylidiaceæ, which formed part of the Campanulaceæ of Jussieu. The regular corolla of Campanulaceæ distinguishes them, at first sight, from both those orders, as well as from Lobeliaceæ. Besides, Campanulas have not the fringed indusium which terminates the style of Goodeniaceæ, and surrounds their stigma. Although this organisation approaches that of Lobeliaceæ, and so Campanulaceæ, it is not less true that it affords an important mark of distinction, and that it is connected with essential differences in the mode of fecundation. Brown has also remarked, that the corolla of Goodeniaceæ is sometimes polypetalous, which it never is in Campanulaceæ or Lobeliaceæ; that the æstivation of their corolla is induplicate, not valvate; that its principal veins are lateral, or alternate with the lobes, as in Compositæ; that in the species of Goodeniaceæ with dehiscent fruit, the dehiscence is usually septicidal, while in the two other groups it is always loculicidal; finally, that Goodeniaceæ have not the milky juice that characterises Campanulaceæ and Lobeliaceæ." Notwithstanding the polyspermous fruit and different inflorescence, this order approaches very closely to Compositæ; the milky juice is the same as that of Cichoraceæ; the species have, in many cases, the flowers crowded in heads;

the stigma is similar to that of many Compositæ; there are the same collecting hairs on the style, in both cases intended to clear out the pollen from the cells of the anthers; and, finally, the habit is very like. The curious genus Calysphyrum offers a direct transition to Ericaceæ.

Geography. Chiefly natives of the north of Asia, Europe, and North America, and scarcely known in the hot regions of the world. In the meadows, fields, and forests of the countries they inhabit, they constitute the most striking ornament. Some curious species are found in the Canaries, St. Helena, and Juan Fernandez. Alphonse De Candolle remarks, that "it is within the 36° and 47° N. lat. that in our hemisphere the greatest number of species is found; the chain of the Alps, Italy, Greece, Caucasus, the Altai range, are their true country. In whatever direction we leave these limits, the number of species rapidly decreases. In the southern hemisphere, the Cape of Good Hope (lat. 34° S.) is another centre of habitation, containing not fewer than 63 species. This locality has a climate so different from that of our mountains, that it may be easily imagined that the species capable of living there differ materially from those of our own hemisphere: in fact, they belong to other genera." Of 300 species, only 19 are found within the tropics. The same botanist remarks that, with only a single exception, all the species belonging to genera that open their capsule by lateral pores are found in the northern hemisphere; while those whose capsules dehisce at the apex chiefly inhabit the southern hemisphere.

Properties. The milky juice is rather acrid, but nevertheless the roots and young shoots of some, particularly of Campanula Rapunculus, or Rampion, of Phyteuma spicatum, of Canarina Campanula, &c. are an occasional article of food. The chief value of the order, however, is its beauty.

GENERA.

Lightfootia, L'Herit.
Cephalostigma, A. DC.
Campanomæa, Bl.
Codonopsis, Wall.
Glossocomia, Don.
Canarina, L.
Pernettia, Scop.
Platycodon, A. DC.
Microcodon, A. DC.
Wahlenbergia, Schrad.
Cervicina, Del.
Schultesia, Roth.
Prismatocarpus, L'Her.
Roella, L.
Phyteuma, L.
Petromarula. A. DC.
Michauxia, L'Her.
Mindium, Rhazes.
Campanula, L.
Roucela, Dumort.
Medium, Fisch.
Marianthemum, Schrank.
Specularia, Heist.
Legouzia, Durand.
Apenula, Neck.
Trachelium, L.
Adenophora, Fisch.
Flærkea, Spr.
Symphiandra, Ad. J.
Musschia, Dumort.
Merciera, A. DC.
Calysphyrum, Bge.

Sub-Order? SPHENOCLEACEÆ.

Sphenocleaceæ, *Martius Conspectus, No.* 162. (1835).

Essential Character.—*Calyx* superior, 5-parted, with inflexed segments. *Corolla* monopetalous, 5-parted, with the segments inflexed and somewhat auricled at the base. *Stamens* 5, sessile in the recesses of the corolla; *anthers* roundish two-celled, opening longitudinally. *Ovary* inferior, 2-celled, many-seeded; *style* very short, and 2-lobed; *stigma* hairless. *Capsule* membranous, 2-celled, many-seeded, with a central fungous placenta, circumscissile; *seeds* minute; *embryo* without albumen, straight, with the *radicle* next the hilum.—*Herbaceous* plants. *Leaves* alternate, soft, smooth, undivided, without *stipules*. *Flowers* minute, herbaceous, sessile in a dense subcylindrical head.

Affinities. This remarkable plant is very much like a Campanulaceous genus in structure; but its exalbuminous seeds, the absence of collecting hairs from its styles, and the round sub-sessile anthers, seem to indicate the type of a different order; and the peculiar habit of the only known species seems to confirm the propriety of the separation.

GEOGRAPHY. An Indian marshy annual.
PROPERTIES. Unknown.

GENUS.

Pongatium, Juss.
Sphenoclea, Gærtn.
Gærtnera, Retz.
Rapinia, Lour.

ORDER CLXXXI.? BELVISIACEÆ.

BELVISIEÆ, *R. Brown in Linn. Trans.* 13. 222. (1820).

ESSENTIAL CHARACTER.—*Calyx* of 1 piece, persistent, with a divided limb. *Corolla?* monopetalous, plaited (many-lobed or undivided, simple or double), deciduous. *Stamens* either definite or indefinite, arising from the base of the corolla. *Ovary* inferior; *style* 1; *stigma* lobed or angular. *Fruit* berried, many-seeded.—*Shrubs*. *Leaves* alternate, entire, without stipules. *Flowers* axillary or lateral, solitary. *R. Br.*

AFFINITIES. Little is known of this obscure family, except that it is not referable to any order at present established.
GEOGRAPHY. African shrubs or trees.
PROPERTIES. Unknown.

GENERA.

Belvisia, Desv.
Napoleona, P. de B.
Asteranthus, Desf.

ORDER CLXXXII. COLUMELLIACEÆ.

COLUMELLIEÆ, *Don in Edinb. New Phil. Journ.* (*Dec.* 1828).

ESSENTIAL CHARACTER.—*Calyx* superior, 5-parted. *Corolla* rotate, 5-8-parted, with an imbricated æstivation. *Stamens* 2, inserted in the throat, alternate with the segments of the corolla; *anthers* roundish, 3-lobed, bursting externally, each consisting of three pair of narrow somewhat sinuous cells which open longitudinally, and which are placed upon a solid fleshy *connective*. *Ovary* inferior, 2-celled, with an indefinite number of ovules; *style* simple, smooth; *stigma* capitate, 2-lobed. *Disk* epigynous, fleshy. *Fruit* capsular, 2-celled, many-seeded, with a septicidal dehiscence.—[*Seeds* ascending; *testa* polished; *embryo* taper, erect, in the axis of fleshy albumen. *Don.*]—*Shrubs*, or *trees*. *Leaves* opposite, without stipules, entire or serrated. *Flowers* yellow.

AFFINITIES. This character has been prepared from excellent specimens of Columellia oblonga sent home by Mathews; C. obovata does not appear to differ in any essential circumstance, so far as I can judge, from a bud given me by Mr. Don. This gentleman, who first noticed the order, thinks it near Jasminaceæ, with which it corresponds "in the structure and æstivation of the corolla, in the bilocular ovary, and erect (?) ovules: and it agrees both with them and Syringa in the structure and dehiscence of the capsule. The order differs, however, essentially from Jasminaceæ, by having an adherent ovary, by the presence of a perigynous (?) disk, by the undivided stigma, and, lastly, by having an inferior capsule with polyspermous cells." It appears to me, however, that there are objections to this view of the affinities of the order, especially as Menodora which Don included in his Columelliaceæ is

the same as Bolivaria which is a genuine Jasminaceous plant. The first thing that strikes one in looking at Columellia oblonga, is its resemblance to Onagraceæ, from which, however, the proportions of the flower, the monopetalous corolla, &c. clearly divide it. The next point is its stamens; these curious bodies, rudely represented in the Flora Peruviana, are apparently composed each of three stamens firmly consolidated; for each anther has six cells arranged in 3 pairs upon a three-lobed fleshy connective, and turned towards the corolla. Now this indicates an irregularity of structure of a most unusual kind, and to which I find no parallel; in order to reduce such a structure to regularity, we must either suppose that 3 more such triple stamens are abortive, and that consequently the typical number of parts in the androœceum is twenty-five, or we must imagine that the typical number is 10, and that each of the stamens actually developed is composed of two stamens opposite the segments of the corolla and one alternate with them; in that case three of the stamens alternating with the lobes of the corolla, and two of those opposite the lobes will have to be supposed undeveloped. This would give us a pentamerous monopetalous flower, with twice as many stamens as parts of the corolla. Among monopetalous orders with an inferior ovary we have no such structure; among the regular dicarpous orders with a superior ovary we have only Potaliaceæ with a similar organization, but the plants which constitute that order are so very different in habit that it is not probable that it is they with which Columelliaceæ are to be considered allied. Perhaps Don's idea of a connection between Columellia and Halesia may have some foundation: but there is as yet too little evidence to enable Botanists to form any decided opinion upon the subject.

Geography. Mexican and Peruvian plants.

Properties. Unknown.

GENUS.

Columellia, R. et P.
Uluxia, Juss.

Order CLXXXIII. STYLIDIACEÆ.

Stylideæ, *R. Brown Prodr.* 565. (1810).

Essential Character.—*Calyx* superior, with from 2 to 6 divisions, bilabiate or regular, persistent. *Corolla* monopetalous, falling off late; its limb irregular, rarely regular, with from 5 to 6 divisions, imbricated in æstivation. *Stamens* 2; *filaments* connate with the style into a longitudinal column; *anthers* twin, sometimes simple, lying over the stigma; *pollen* globose, simple, sometimes angular. *Ovary* 2-celled, many-seeded, sometimes 1-celled, in consequence of the contraction of the dissepiment, often surmounted with a single gland in front, or two opposite ones: *style* 1; *stigma* entire or bifid. *Capsule* with 2 valves and 2 cells, the dissepiment between which being sometimes either contracted or separable from the inflexed margins of the valves, the capsule becomes as it were 1-celled. *Seeds* small, erect, sometimes stalked, attached to the axis of the dissepiment; *embryo* minute, enclosed within a fleshy somewhat oily albumen.—*Herbaceous* plants or *undershrubs*, without milk, having a stem or scape, their hair, when they have any, simple, acute, or headed with a gland. *Leaves* scattered, sometimes whorled, entire, their margins naked or ciliated, the radical ones clustered in the species with scapes. *Flowers* in spikes, racemes, or corymbs, or solitary; terminal, rarely axillary, the pedicels usually with three bracts.

Affinities. Nearly allied both to Campanulaceæ and Goodeniaceæ, from both which they are distinguished by their gynandrous stamens, and from the latter by the want of an indusium to the stigma. The structure of the sexual

organs is highly curious; the stamens and style are closely combined in a solid irritable column, at the top of which is a cavity, including the stigma, and bounded by the anthers. A singular blunder was committed by Labillardiére, who mistook the epigynous gland for the stigma; and another by L. C. Richard, who considered the labellum to be the female organ.

Geography. Chiefly found in New Holland. Species have been discovered both in Ceylon and the South Sea Islands.

Properties. Unknown.

GENERA.

Stylidium, Sw.	Leuwenhoekia, R. Br.
Ventenatia, Sm.	Forstera, Linn. fil.
Candollea, La Bill.	*Phyllachne*, Forst.

Alliance II. *GOODENIALES.*

Essential Character.—*Stigma* with a cup-like indusium.

In habit the plants of this alliance are similar to Lobeliaceæ; their peculiar stigma, however, sufficiently distinguishes them.

Order CLXXXIV. GOODENIACEÆ.

Campanulæ, *Juss. Gen.* 163. (1789) *in part.*—Goodenoviæ, *R. Brown Prodr.* 573. (1810). *Bartl. Ord. Nat.* 148. (1830).

Essential Character.—*Calyx* usually superior, rarely inferior, equal or unequal, in from 3 to 5 divisions. *Corolla* always more or less superior, monopetalous, more or less irregular, withering; its *tube* split at the back, and sometimes capable of being separated into 5 pieces, when the calyx only coheres with the base of the ovary; its *limb* 5-parted, with 1 or 2 lips, the edges of the segments being thinner than the middle, and folded inwards in æstivation. *Stamens* 5, distinct, alternate with the segments of the corolla; *anthers* distinct or cohering, 2-celled, bursting longitudinally. *Pollen* simple or compound. *Ovary* 2-celled, rarely 4-celled, with indefinite ovules, having sometimes a gland at its base between the 2 anterior filaments; *style* 1, simple, very rarely divided; *stigma* fleshy, undivided, or 2-lobed, surrounded by a membranous cup. *Fruit* a 2- or 4-celled capsule with many seeds, attached to the axis of the dissepiment, which is usually parallel with the valves, rarely opposite to them. *Seeds* usually with a thickened testa, which is sometimes nut-like; *albumen* fleshy, enclosing an erect *embryo*; *cotyledons* foliaceous; *plumule* inconspicuous.—*Herbaceous* plants, rarely *shrubs*, without milk, with simple or glandular hairs, if any are present. *Leaves* scattered, often lobed, without stipules. *Inflorescence* terminal, variable. *Flowers* distinct, never capitate, usually yellow, or blue, or pink.

Anomalies. This order offers the singular anomaly of genera having, at the same time, an inferior calyx and a superior corolla; a circumstance which, it has been well observed by Brown, points out the real origin of both organs.

Affinities. We cannot doubt the strict relation of these to Campanulaceæ and Lobeliaceæ, from which they differ in the æstivation of the flower, and in the peculiar indusium of the stigma, a trace of which is to be found in Lobeliaceæ, and which exists in a remarkable degree in the order Brunoniaceæ of the Aggregose group. Scævolaceæ differ only in their definite seeds. Upon the nature of the indusium of the stigma Brown makes the following observations.

"Is this remarkable covering of the stigma in these families merely a process of the apex of the style? or is it a part of distinct origin, though inti-

mately cohering with the pistillum? On the latter supposition, may it not be considered as analogous to the glandular disk surrounding or crowning the ovarium in many other families? And, in adopting the hypothesis I have formerly advanced respecting the nature of this disk in certain families,—namely, that it is composed of a series of modified stamina,—has not the part in question a considerable resemblance, in apparent origin and division, to the stamina of the nearly-related family Stylidiaceæ? To render this supposition somewhat less paradoxical, let the comparison be made especially between the indusium of Brunonia and the imperfect antheræ in the female flowers of Forstera. Lastly, connected with this view, it becomes of importance to ascertain whether the stamina of Stylidiaceæ are opposite to the segments of calyx or of corolla. The latter disposition would be in favour of the hypothesis. This, however, is a point which will not be very easily determined, the stamina being lateral. In the mean time, the existence and division of the corona faucis in Stylidium render it not altogether improbable that they are opposite to the segments of the corolla." *R. Brown in Linn. Trans.* 12. 134. I am rather inclined to consider the indusium analogous to the collecting hairs of Campanulaceæ. In these they occupy the surface of the greater part of the style; in Lobelia they are sometimes arranged in a whorl, forming a cup-like fringe; and in Goodeniaceæ the hairs, being still whorled, are consolidated into a uniform substance by their mutual cohesion.

Geography. Natives of New Holland, and other islands of the South Pacific Ocean.

Properties. Unknown.

GENERA.

Goodenia, Sm.	Calogyne, R. Br.	Distylis, Gaudich.	Cyphia, Berg.
Selliera, Cav.	Euthales, R. Br.	Lechenaultia, R. Br.	Pentaphragma, Wall.
	Velleja, Sm.	Anthotium, R. Br.	

Order CLXXXV. SCÆVOLACEÆ.

Goodenoviæ, § Scævoleæ, *R. Brown Prodr.* 582. (1810).—Scævoleæ, *Ed. Pr. No.* 178. (1830); *Martius Conspectus, No.* 167. (1835).

Essential Character.—*Calyx* superior, equal or unequal, in 5 divisions, sometimes obsolete. *Corolla* superior, monopetalous, more or less irregular, withering, or deciduous; its *tube* split at the back; its *limb* 5-parted, with 1 or 2 lips, the edges of the segments being thinner than the middle, and folded inwards in æstivation. *Stamens* 5, distinct, alternate with the segments of the corolla; *anthers* distinct or cohering, 2-celled, bursting longitudinally; *pollen* simple. *Ovary* 1- 2- or 4-celled, with 1, seldom 2, erect ovules in each cell; *style* 1, simple; *stigma* fleshy, surrounded by a membranous cup. *Fruit* inferior, indehiscent, drupaceous, or nut-like. *Seeds* with a thickened testa; *albumen* fleshy, enclosing an erect embryo; *cotyledons* foliaceous; *plumule* inconspicuous.—*Herbaceous* plants or *shrubs*, without milk, with simple or stellate hairs, if any are present. *Leaves* scattered, undivided, without stipules. *Inflorescence* axillary or terminal. *Flowers* distinct, never capitate, white, blue, or yellowish.

Anomalies. A Molucca species of Scævola exists, with opposite leaves. *R. Br.*

Affinities. Combined, on account of their indusiate stigmas, by Brown, with Goodeniaceæ and Brunoniaceæ, from the former of which they differ in habit, indehiscent fruit, and definite seeds; from the latter, in their compound inferior ovary and habit.

Geography. Natives of the South Seas and the islands of the Indian archipelago. The species are abundant in New Holland.

Properties. Unknown.

GENERA.

Scævola, L.
Gerbera, Lour.
Pogonetes, (37)
Diaspasis, R. Br.
Dampiera, R. Br.

Alliance III. *CINCHONALES.*

Essential Character.—*Stipules* between the leaves.

I know of no other good character by which the genera belonging to this alliance are to be known from Capriales; and yet the order that they consist of is, in the opinion of all botanists, distinct. The same character then cuts off Stellales, which is not generally admitted. The principal anomaly in the alliance is in the case of Opercularineæ, which have a 1-celled ovary, and which ought, perhaps, rather to form a distinct order among Aggregosæ.

Order CLXXXVI. CINCHONACEÆ. The Coffee Tribe.

Rubiaceæ, *Juss. Gen.* 196. (1789) *for the most part; Ann. Mus.* 10. 313. (1807); *Mém. Mus.* 6. 365. (1820); *Dict. des Sciences*, 46. 385. (1827); *Schlect. et Chamisso in Linnæa*, 3. 309. (1828); *Ach. Rich. Dissert. in Mém. Soc. h. n. Par.* 5. 81. (1830); *DC. Prodr.* 4. 341. (1830); *Royle's Illustration, p.* 287. (1835).

Essential Character.—*Calyx* superior, simple, with a definite number of divisions or none. *Corolla* superior, tubular, regular, with a definite number of divisions, which are valvate or imbricated in æstivation and equal to the segments of the calyx. *Stamens* arising from the corolla, all on the same line, and alternate with its segments; *pollen* elliptical. *Ovary* inferior, surmounted by a disk, usually 2-celled, occasionally with several cells; *ovules* numerous and attached to a central placenta, or few and erect or ascending; *style* single, inserted, sometimes partly divided; *stigma* usually simple, sometimes divided into a definite number of parts. *Fruit* inferior, either splitting into 2 cocci, or indehiscent and dry or succulent, occasionally many-celled. *Seeds* definite or indefinite; in the former case erect or ascending, in the latter attached to a central axis; *embryo* small, oblong, surrounded by horny albumen; *cotyledons* thin; *radicle* longer, turned, to the hilum.—*Trees, shrubs*, or *herbs*. *Leaves* simple, quite entire, opposite or verticillate, with interpetiolary stipules. *Flowers* arranged variously, usually in panicles or corymbs.

Anomalies.—Opercularia has but 1 cell and 1 seed, and the number of stamens is incongruous with the lobes of the corolla.

Affinities. This well-marked and strictly limited order is nearly allied to Compositæ, from which its distinct stamens, bilocular or plurilocular ovary, and inflorescence, distinguish it; and consequently it participates in all the relationship of that extensive group. From Apocynaceæ the æstivation of the corolla, the presence of stipules, and the inferior ovary, distinctly divide it; yet, according to Brown, there exists a genus in equinoctial Africa which has the interpetiolary stipules and seeds of Cinchonaceæ, and the superior ovary of Apocynaceæ, thus connecting these two orders. *Congo*, 448. The close proximity of Caprifoliaceæ will be adverted to in speaking of that order. A tribe called Opercularineæ, referred here by Brown (*Ibid.* 447) and others (*A. Rich. Elém. ed.* 4. 483), is remarkable for having but 1 seed, and the number of stamens unequal to the lobes of the corolla; it occupies an intermediate position between genuine Cinchonaceæ and Dipsaceæ. The order has been recently illustrated by Chamisso and Schlechtendahl, Achille Richard, and by De Candolle in his invaluable Prodromus. It is, I think, much to be regretted that all these authors should have retained the name Rubiaceæ;

for surely Stellatæ, to which the genus Rubia belongs, must be admitted to be fully as distinct from Cinchonaceæ as is the universally recognized order Caprifoliaceæ.

Geography. Almost exclusively found in the hotter parts of the world, especially within the tropics, where they are said to constitute about 1-29th of the whole number of flowering plants. In America the most northern species is Pinckneya pubens, a shrub inhabiting the southern states of North America; the most southern is Nerteria depressa, a small herb found in the Straits of Magellan. The order is represented in northern regions by Stellatæ.

Properties. Powerful febrifugal properties in the bark, or emetic in the root, are the grand features of this order, the most efficient products of which, in these two respects, are Quinquina and Ipecacuanha. The febrifugal properties depend upon the presence of a bitter, tonic, astringent principle, which exists in great abundance in the bark; those of Cinchona are known to depend upon the presence of two alkalies, called cinchonia and quina, both of which are combined with kinic acid: two principles which, though very analogous, are distinctly different, standing in the same relation to each other as potassa and soda. *Turner*, 648. Sertürner has obtained some other vegeto-alkalies from Cinchona, one of which he calls chinioidia. *Brande*, 12. 417. *N. S.* But the existence of this is denied by Henry and Delondre. *Ibid. July*, 1830, p. 422. A detailed account of the qualities, synonymes, and commercial names of the species of Cinchona is given in Lambert's *Illustration of the Genera Cinchona*, 4to. London, 1821. In the same work is a translation of Humboldt's account of the Cinchona forests of South America; but the most satisfactory information is to be found in a Memoir upon the officinal Jesuit's Barks, published in the *Bibl. Univ. de Genève, June*, 1829-1830, quoted in *Ferussac's Bulletin, June*, 1830, p. 437. Buena hexandra bark is an indifferent febrifuge, known in Brazil under the name of *China*. *Ibid.* Three species of Remija, the R. ferruginea, Vellozii, and another, are found in Brazil, where they are used for the same purposes as the Peruvian bark, to which, however, they are altogether inferior. *Pl. Usuelles*, no. 2. The bark of French Guiana, possessing properties analogous to those of Cinchona, is obtained from Portlandia hexandra, the Coutarea speciosa of Aublet. *Humb. Cinch. For.* 43. *Eng. ed.* The Quinquina Piton and Quinquina des Antilles are produced by species of the genus Exostema, and are remarkable for possessing properties similar to those of true Quinquina, but without any trace of either cinchonine or quinine. *Pl. Usuelles*, no. 3. A kind of fever bark is obtained at Sierra Leone from Rondeletia febrifuga. Besides these, a great number of other species possess barks more or less valuable: Pinckneya pubens is the fever bark of Carolina; Macrocnemum corymbosum, Guettarda coccinea, Antirhea, and Morinda Royoc, are all of the same description. Chiococca anguifuga and densifolia are most active remedies in cases of snake-poisons. Their action is violently emetic and purgative. See *Martius, Mat. Med. Bras.* p. 18. They are recommended by this writer to be used in hydrophobia. Manettia cordifolia, another Brazilian plant, acts in a similar way. The last is also used in dropsy and dysentery. A lightish brown, bitter, and powerfully astringent extract, called Gambeer, is obtained at Malacca by boiling the leaves of Nauclea Gambeer; it is sometimes substituted for Gum Kino. *Ainslie*, 2. 106. A decoction of the leaves as well as root of Webera tetrandra is prescribed in India in certain stages of flux, and the last is supposed to have anthelmintic qualities, though neither have much sensible taste or smell. The bark and young shoots are also used in dysentery. *Ibid.* 2. 63. Among the emetics, Ipecacuanha holds the first rank; it is the root of Cephaelis Ipecacuanha, a little creeping-rooted, half-herbaceous plant, found in damp shady forests in Brazil. Similar properties are found in the roots of other

Cinchonaceæ of the same country, as in Richardsonia rosea and scabra, Spermacoce ferruginea and Poaya, &c. A peculiar alkaline principle, called Emetia, is found in Ipecacuanha, which contains 16 per cent. of it. *Turner*, 653. The Raiz Preta, which is celebrated for its power in curing dropsy, and in destroying the dangerous consequences of bites of serpents, is said to be related to Ipecacuanha. *Ed. P. J.* 1. 218. Several species of Psychotria, as emetica and herbacea, are substitutes for Ipecacuanha. The spurious barks called Quinquina Piton are capable of exciting vomiting. The powdered fruit of Randia dumetorum is a powerful emetic. An infusion of the bark of the root is administered to nauseate in bowel complaints. *Ainslie*, 2. 186. According to Roxburgh, the root bruised and thrown into ponds where there are fish intoxicates them as Cocculus indicus. *Ibid.* Psychotria noxa and Palicourea Marcgraavii, both called Erva de rata, are accounted poisonous in Brazil; but nothing very certain seems to be known of their properties. *Ed. P. J.* 14. 267. The leaves of Oldenlandia umbellata are considered by the native doctors of India as expectorant. *Ainslie*, 2. 101. Coffee is the roasted seeds of a plant of this order, Coffea arabica, and is supposed to owe its characters to a peculiar chemical principle called Caffein. *Turner*, 699. The part roasted is the albumen, which is of a hard horny consistence; and it is probable that the seed of all Cinchonaceæ or Stellatæ whose albumen is of the same texture would serve as a substitute. This would not be the case with those with fleshy albumen. The fruit of some species of Gardenia, Genipa, and of Vangueria, the Voa Vanga of Madagascar, are succulent and eatable. Various species of Morinda, Hydrophylax maritima, &c. afford a colouring matter analogous to the dye of Madder.

GENERA.

§ 1. CINCHONEÆ, A.R.
Nauclea, L.
Uncaria, Schreb.
Ourouparia, Aubl.
Agylophora, Neck.
Adina, Salisb.
Stevensia, Poit.
Coutarea, Aubl.
Hillia, Jacq.
Fereiria, Vand.
Hymenopogon, Wall.
Lasionema, D. Don.
Endlichera, Presl.
Cinchona, DC.
Kinkina, Adans.
Buena, Pohl.
Cosmibuena, R. P.
Remija, DC.
Macrocnemum, Vellz.
Luculia, Sweet.
Hymenodictyon, Wall.
Exostemma, DC.
Danais, Comm.
Manettia, Mutis.
Nacibea, Aubl.
Bouvardia, Salisb.
Ægenetia, Cav.
Chistimia, Rafin.
Pinckneya, Michx.
Calycophyllum, DC.
Macrocnemum, Vahl.

§ 2. GARDENIEÆ, Ch. et S.
COCCOCYPSELEÆ, Ch. et S.
Sarcocephalus, Afzel.
Cephalina, Thonn.
Zuccarinia, Blum.
Lucinæa, DC.
Burchellia, R. Br.
Bubalina, Rafin.
Amaioua, Aubl.
Hexactina, Willd.
Mussænda, Linn.
Belilla, Rheed.
Kutchubæa, Fisch.
Cassupa, H. B.
Gynopachys, Blum.
Tocoyena, Aubl.
Ucriana, Willd.
Posoqueria, Aubl.
Kyrtanthus, Gmel.
Cyrtanthus, Schreb.
Solena, Willd.
Posoria, Rafin.
Oxyanthus, DC.
Stylocoryna, Cav.
Wahlenbergia, Blum.
Ceriscus, Nees.
Genipa, Plum.
Duroia, L.
Gardenia, Ellis.
Rothmannia, Thunb.
Piringa, Juss.
Sahlbergia, Neck.
Randia, Houst.
Oxyceros, Lour.
Griffithia, W. et A.
Scepseothamnus, Cham.
Thieleodoxa, Cham.
Hyptianthera, W. et A.
Chapelieria, A. Rich.
Heinsia, DC.
Menestoria, DC.
Helospora, Jack.
Hippotis, R. P.
Pomatium, Gærtn.
Bertiera, Aubl.
Pouchetia, A. Rich.
Cupia, DC.
Cupi, Rheed.
Chomelia, L.
Webera, Schreb.
Zamaria, Rafin.
Tarenna, Gærtn.
Petesia, P. Brown.
Coccocypselum, Swtz.
Sicelium, P. Brown.
Tontanea, Juss.
Bellardia, Schreb.
Condalia, R. et P.
Fernelia, Comm.
Petunga, DC.
Higginsia, Pers.
O-Higginsia, R. et P.
Hoffmannia, Swartz.
Catesbæa, L.

§ 3. HEDYOTIDEÆ, Ch. et S.
Condaminea, DC.
Macrocnemum, P. Br.
Chimarrhis, Jacq.
Augustea, DC.
Augusta, Pohl.
Portlandia, P. Browne.
Bikkia, Reinw.
Cormigonus, Raf.
Isidorea, A. Rich.
Spallanzania, DC.
Rondeletia, Plum.
Petesia, P. Brown.
Arachnimorpha, Desv.
Lightfootia, Schreb.
Willdenovia, Gmel.
Greenea, W. et A.
Wendlandia, Bartl.
Adenosacme, Wall.
Xanthophyllum, Blum
Carphalea, Juss.
Sipanea, Aubl.
Virecta, DC.
Ophiorhiza, L.
Argostemma, Wall.
Pomangium, Reinw
Spiradiclis, Blum.
Tula, Adans.
Dentella, Forst. gen.
Hedyotis, Roxb.

Oldenlandia, Linn.
Gerontogea, Cham.
Listeria, Neck.
Gonotheca, Blum.
Kohautia, Cham.
Kadua, Cham.
Anotis, DC.
Rachicallis, DC.
Lucya, DC.
Dunalia, Spreng.
? Polypremum, L.

§ 4. Hamelieæ. A. R.
Metabolos, Blum.
Sclerococcus, Bartl.
Gonzalea, Pers.
Gonzalagunia, R. et P.
Isertia, Schreb.
Phosanthus, Rafin.

§ 5. Hamelieæ. A. R.
Tepesia, Gærtn.
Evosmia, H. B.
Sabicea, Aubl.
Olostyla, DC.
Stylocoryna, La B.
Axanthes, Blume.
Wallichia, Reinw.
Maschalanthe, Blum.
Urophyllum, Jack.
Wallichia, Roxb.
Hamelia, Jacq.
Duhamelia, Pers.
Tangarasca, Adans.
Alibertia, A. Rich.
Genipella, Rich.
Melanopsidium, Poit.
Schradera, Vahl.
Urceolaria, Willd.
Brignolia, DC.
Patima, Aubl.
Polyphragmon, Desf.

§ 6. Cordiereæ, A.R.
Cordiera, A. Rich.
Tricalysia, A. Rich.

§ 7. Guettardeæ, Kunth.
Morinda, Vaill.
Royoc, Plum.
Myrmecodia, Jack.
Hydnophytum, Jack.
Hypobathrum, Blum.
Nertera, Banks.
Nerteria, Smith.
Gomozia, Mutis.
Erythrodanum, Pet. Thou.
Mitchella, Linn.
Chamædaphne, Mitch. gen.
Baumannia, DC.
Mephitidia, Reinw.
Lasianthus, Jack.
Vangueria, Comm.
Voacanga, Rohr.
Meynia, Link.
Guettarda, Vent.
Mathiola, Linn.
Laugeria, Jack.
Halesia, P. Brown.
Viviania, Rafin.
Malanea, Aubl.
Antirhœa, Comm.
Cunninghamia, Schreb.
Stenostomum, Gærtn.
Chione, DC.
Crusea, A. Rich.
Timonius, Rumph.
Bobea, Gaudich.
Bobœa, A. Rich.
Burneya, Cham.
Hamiltonia, Roxb.
Spermadictyon, Roxb.
Leptodermis, Wall.
Psathura, Comm.
Chicoinœa, Comm.
Psatura, Poir.
Psathyra, Spreng.
Myonima, Comm.
Pyrostria, Comm.
Octavia, DC.
Litosanthes, Blume.
Lithosanthes, A.Rich.
Erithalis, P. Brown.
Herrera, Adans.
Retiniphyllum, H. B.
Nonatelia, Aubl.
Oribasia, Schreb.
Gynochtodes, Blum.
Cœlospermum, Blum.
Ancylanthus, Desf.
Cuviera, DC.
Dondisia, DC.
Stigmanthus, Lour.
Stigmatanthus, Rœm. et S.
Strumpfia, Jacq.

§ 8. Pæderieæ, DC.
Lecontea, A. Rich.
Pœderia, Linn.

§ 9. Coffeæ, DC. Psychotriaceæ, Ch. et S.
Amaracarpus, Blum.
Damnacanthus, Gærtn.
Canthium, Lam.
Plectronia, Linn.
Psydrax, Gærtn.
Marquisia, A. Rich.
Nescidia, A. Rich.
Diplospora, DC.
Epithinia, Jack.
Siderodendron, Schrb.
Sideroxyloides, Jacq.
Eumachia, DC.
Petesia, Gærtn.
Declieuxia, H. B. K.
Psyllocarpus, Pohl.
Tertrea, DC.
Schiedea, A. Rich.
Chiococca, P. Brown.
Margaris, DC.
Deseliœa, fl. mex.
Saldinia, A. Rich.
Scolosanthus, Vahl.
Antacanthus, Rich.
Chomelia, Jacq.
Baconia, DC.
Verulamia, DC.
Ixora, Linn.
Pavetta, Linn.
Pavate, Ray.
Saprosma, Blum.
Coussarea, Aubl.
Frælichia, Juss.
Billardiera, Vahl.
Pecheya, Scop.
Polyozus, Lour.
Grumilea, Gærtn.
Rutidea, DC.
Rytidea, Spreng.
Faramea, A. Rich.
Tetramerium, Juss.
Strempelia, A. Rich.
Coffea, Linn.
Rudgea, Salisb.
Antherula, Lour.
Ronabea, Aubl.
Antonia, P
Psychotria, L.
Simiria, Aubl.
Mapouria, Aubl.
Palicourea, Aubl.
Galvania, Vell.
Stephanium, Schreb.
Colladonia, Spreng.
Chasalia, Comm.

10. § Cephaelideæ, Ch. et Sch.
Cephaëlis, Swartz.
Tapogomea, Aubl.
Evea, Aubl.
Callicocca Schreb.
Cephaleis, Vahl.
Carapichea, Aubl.
Eurothia, Neck.
Suteria, DC.
Geophila, Don. Prod.
Patabea, Aubl.

§ 11. Spermacoceæ, Ch. et S.
Cephalanthus, L.
Anthocephalus, A. Rich.
Democritea, DC.
Octodon, Thonn.
Borreria, Meyer.
Bigelowia, Spreng.
Chlorophytum, Pohl.
Grulhmannia, Neck.
Santia, W. et A.
Eupyrena, W. et A.
Pyrostria, Roxb.
Spermacoce, Meyer.
Covelia, Neck.
Chenocarpus, Neck.
Otiophora, Zucc.
Hexasepalum, Bartl.
Diodia, L.
Triodon, DC.
Crusea, Cham.
Richardsonia, Kunth.
Richardia, L.
Schiedea, Bartl.
Knoxia, L.
Cruckshanksia, H. et A.
Psyllocarpus, Mart.
Mitracarpum, Zucc.
Schizangium, Bartl.
Staurospermum, Thonn.
Stælia, Cham.
Tessiera, DC.
Gaillonia, A. Rich.
Machaonia, H. B.
Serissa, Comm.
Dysoda, Lour.
Buchozia, L'Her.
Ernodea, Swartz.
Cuncea, Ham.
Hydrophylax, Linn. f.
Sarissus, Gærtn.
Scyphiphora, Gærtn.
Plocama, Ait.
Placoma, Pers.
Bartlingia, Reichenb.
Putoria, Pers.

§ 12. Anthospermeæ, Ch. et S.
Coprosma, Forst.
Phyllis, L.
Nobla, Adans.
Galopina, Thunb.
Anthospermum, L.
Tournefortia, Ponted.
Ambraria, Cruse.

§ 13. Opercularineæ, Juss.
Pomax, Soland.
Opercularia, A. Rich.
Cryptospermum, Pers.
Lipostoma, Don.

Canephora, Juss.
Morelia, A. Rich.
Salzmannia, DC.
Deppea, Cham.
Billiottia, DC.
Viviania, Colla.
Melanospidium, Cels. hort.
Psilobium, Jack.
Platymerium, Bartl.
Stipularia, Beauv.
Hylacium, Beauv.
Phallaria, Schum.
Benzonia, Schum.
Alseis, Schott.
Breonia, A. Rich.
Lecananthus, Jack.
Jackia, Wall.
Himatanthus, Willd.
Sickingia, Willd.
Lippaya, Endl.
Sommera, Schlecht.
Myrioneuron, Wall.
Pleotheca, Wall.
Monodynamus, Pohl.

Order CLXXXVII. LYGODYSODEACEÆ.

Lygodysodeaceæ, *Bartl. Ord. Nat.* 207. (1830); *Martius Conspectus, No.* 161. (1835). —Rubiaceæ § Pæderieæ, *DC. Prodr.* 4. 470. (1830).

Differential Character.—In all things Cinchonaceous except; *Ovary* composed of two confluent carpels, 1-celled, with 2-ovules; *style* single. *Pericarp* brittle, burst in four directions from the base, not adhering to the seeds, 1-celled. *Placentæ* 2, free, rising up between the pericarp and the back of the seeds. *Seeds* 2, pendulous from the apex of the placentæ. *Albumen* 0. *Embryo* straight, foliaceous, compressed; *radicle* short, inferior.—*Twining shrubs. Stipules* single between the petioles.

Affinities. According to Bartling, from whom the foregoing *differential* character has been taken, an order intermediate between Apocynaceæ and Cinchonaceæ; differing from the latter in the remarkable structure of the fruit and seed. If the latter is rightly described, the order must indeed be recognized; but De Candolle, who seems to have examined the same materials as Bartling, gives quite another account of the structure, and reduces the supposed order to the § Pæderieæ of Cinchonaceæ. According to De Candolle, what Bartling calls pericarp is calyx, and his seeds are carpels, and consequently all the most remarkable features of the order disappear, with the exception of the absence of albumen. If Bartling is right, the radicle must be at the end of the seed most remote from the hilum; if De Candolle's views are correct, the radicle will probably be in its usual place. This question deserves attention from those who have access to the necessary materials.

Geography. Natives of South America.

Properties. Unknown.

GENUS.

Lygodysodea, R. et P.
Disodea, Pers.

Alliance IV. *CAPRIALES.*

Essential Character.—*Stipules* wanting. *Leaves* opposite. *Seeds* always definite in number.

Order CLXXXVIII. CAPRIFOLIACEÆ.

The Honeysuckle Tribe.

Caprifolia, *Juss. Gen.* 210. (1789) *in part.*—Caprifoliaceæ, *Rich. Dict. Class*, 3. 172. ( ); *Lindl. Synops.* 131. (1829); *DC. Prodr.* 4. 321. (1830); *Bartl. Ord. Nat.* 213. (1830).

Essential Character.—*Calyx* superior, 4-5-cleft, usually with 2 or more bracts at its base. *Corolla* superior, monopetalous or polypetalous, rotate or tubular, regular or irregular. *Stamens* epipetalous, equal in number to the lobes of the corolla, and alternate with them. *Ovary* with from 1 to 3 or 4 cells, 1 of which is often monospermous, the others polyspermous; in the former the ovule is pendulous; *style* 1; *stigmas* 1, or 3-4. *Fruit* indehiscent, 1- or more celled, either dry, fleshy, or succulent, crowned by the persistent lobes of the calyx. *Seeds* either solitary and pendulous, or numerous and attached to the axis; *testa* often bony; *embryo* straight, in fleshy albumen; *radicle* next the hilum.—*Shrubs* or *herbaceous* plants, with opposite *leaves*, destitute of *stipules*. *Flowers* usually corymbose, and often sweet-scented.

Affinities. As left by Jussieu this order was a heterogeneous assemblage; as altered and better limited by De Candolle and others it seems to be in all

respects unobjectionable. It possesses a striking affinity with Cinchonaceæ, in the monopetalous tubular corolla, definite stamens, inferior ovary, and opposite leaves; an affinity which is confirmed by the corolla of the latter being occasionally regular or irregular. In fact the resemblance between them in habit, structure, inflorescence, and sensible properties is so great that there seems to be no certain character to distinguish them except the stipules of Cinchonaceæ. With Apocynaceæ they will have, for the same reasons, an intimate alliance, differing chiefly in their qualities, in the non-connivence of their anthers, the æstivation of the corolla, and the structure of the inferior ovary. To Loranthaceæ they also approach, but differ in the relation of the anthers to the lobes of the corolla, and in other points. But if we consider the tribe called Sambuceæ, our view of the affinities of the order will take a different turn, and we shall find an approach to an order the relationship of which would hardly have been suspected, viz. Saxifragaceæ: this is established through the intervention of Hydrangea, which is undistinguishable in habit from Viburnum, with which it accords in inflorescence and in the constant disposition of its flowers to become radiant, but which differs in being polypetalous and polyspermous. Besides these points of affinity, Caprifoliaceæ probably tend towards Umbelliferæ through Sambuceæ.

Geography. Natives of the northern parts of Europe, Asia, and America, passing downwards within the limits of the tropics; found very sparingly in northern Africa, and almost unknown in the southern hemisphere.

Properties. The fragrance and beauty of plants of the Honeysuckle tribe have been the theme of many a poet's song; but independently of such recommendations, they possess properties of considerable interest. Their bark is generally astringent; that of Lonicera corymbosa is used for dyeing black in Chile. The flowers of the Elder are fragrant and sudorific, its leaves fœtid, emetic, and a drastic purgative; qualities which are also possessed by the Honeysuckle itself. The fruit of Viburnum is destitute of these properties, but has, instead, an austere astringent pulp, which becomes eatable after fermentation, and is made into a sort of cake by the North American Indians. Triosteum perfoliatum is a mild cathartic; in large doses it produces vomiting. Its dried and roasted berries have been used as a substitute for Coffee. *Ibid.* 1. 63. The berries of Lonicera cœrulea are a favourite food of the Kamtchadales. *Linnæa*, 6. 591.

GENERA.

§ 1. Lonicereæ, R. Br.
Triosteum, Linn. gen.
Diervilla, Tourn.
Weigelia, Thunb.
Karpaton, Raf.
Lonicera, L.
Isika, Adans.
Chamæcerasus, Tourn.
Cobæa, Neck.
Xylosteum, Tourn.
Caprifolium, Juss.
Leycesteria, Wall.
Symphoria, Pers.
Anisanthus, W.
Symphoricarpos, Dill.
Abelia, R. Brown.
Linnæa. Gron.
Obolaria, Sieg.
———
Aidia, Lour.
Valentiana, Rafin.
Mastyxia, Bl.
? Diacicarpium, Bl.
Polyosma, Bl.
§ 2. Sambuceæ, H.B.K.
Sambucus, Tourn.
Phyteuma, Lour.
Viburnum, L.
Opulus, Tourn.
Tinus, Tourn.

Alliance V. *STELLALES.*

Essential Character.—*Fruit* double. *Leaves* whorled without stipules. *Stem* usually angular, always herbaceous.

Order CXXXIX. STELLATÆ, or GALIACEÆ. } The Madder Tribe.

Rubiaceæ, Sect. I. *Juss. Gen.* 196. (1789).—Stellatæ, *Ray Synops.* 223. (1690); *R. Brown in Congo,* (1818); *Lindl. Synops.* 128. (1829).—Galieæ, *Turp. in Atlas du Nouv. Dict. des Sc.* (?)—Rubiaceæ, § Stellatæ *Cham. et Schlect. in Linnæa,* 3. 220. (1828); *DC. Prodr.* 4. 580. (1830); *Bartl. Ord. Nat.* 209. (1830).—Rubiaceæ, § Galieæ, *N. ab Es. et Fuhlrott. Nat. Pflanz. Syst.* 165. (1829).—Stellaceæ, *Lindl. Key. No.* 189. (1835).

Essential Character.—*Calyx* superior, 4- 5- or 6-lobed. *Corolla* monopetalous, rotate or tubular, regular, inserted into the calyx; the number of its divisions equal to those of the calyx. *Stamens* equal in number to the lobes of the corolla, and alternate with them. *Ovary* simple, 2-celled; *ovules* solitary, erect; *style* simple; *stigmas* 2. *Fruit* a didymous, indehiscent pericarp, with 2 cells and 2 seeds. *Seeds* erect, solitary; *embryo* straight in the axis of horny albumen; *radicle* inferior; *cotyledons* leafy.—*Herbaceous* plants, with whorled *leaves,* destitute of *stipules;* angular *stems; flowers* minute.

Affinities. There can be little doubt that the inconspicuous weeds of which this order is composed have as strong claims to be separated from Cinchonaceæ as that order from Caprifoliaceæ. It is true that no very positive characters are to be obtained from the fructification, but the want is abundantly supplied by the square stems and verticillate leaves without stipules, forming a kind of star, from which circumstance the name Stellatæ is derived. Nevertheless, Botanists with one consent appear to be against this opinion: I confess I cannot conceive upon what grounds. Usually a material dissimilarity in habit, if accompanied by any clear character whether of vegetation or fructification, is considered sufficient ground for the separation of a group of plants into two orders; in this case the weak angular stems cause a peculiarity of habit that cannot be mistaken, and the total absence of stipules, to say nothing of the didymous fruit, afford a certain mark of recognition. Surely there is some inconsistency in separating, by the absence of stipules, Caprifoliaceæ which are undistinguishable in habit, while the very same character is rejected when applied to the separation of an assemblage of genera, all distinctly combined by their habit. The only ground upon which this is intelligible is that taken by De Candolle and others who consider the apparent leaves of Stellatæ to be in part true leaves and in part leaf-like stipules. To this verbal but not real distinction there is this objection which I conceive quite fatal to it. If a part of the leaves of each whorl of Galium were stipules they must bear a certain proportion to the true leaves; suppose the whorl to consist of two leaves, each will have two stipules, and consequently the whole number of parts in the whorl must be six, and in all cases the number must be some power of 3. But of the first *forty* species of Galium in De Candolle's Prodromus only *thirteen* conform to this rule; and the frequent tendency in the whorls to vary from 4 to 6 or from 5 to 6, or from 6 to 8, seems to me an incontrovertible proof that the apparent leaves of Stellatæ are true leaves and not a modification of stipules. To be consistent then we must either combine Caprifoliaceæ with Cinchonaceæ, or we must preserve Stellatæ separate. Properly speaking, the appellation Rubiaceæ should be confined to this group, as it comprehends the genus Rubia; but that name has been so generally applied to the larger mass here comprehended under the name of Cinchonaceæ, that I find it better to abolish that of Rubiaceæ altogether.

Geography. Natives of the northern parts of the northern hemisphere, where they are extremely common weeds.

Properties. First among them stands Madder, the root of Rubia tinc-

toria, one of the most important dyes with which we are acquainted; a quality in which many other species of Stellatæ participate in a greater or less degree. The roots of Rubia cordifolia (Munjista Roxb.) yield the Madder of Bengal. (*Ainslie*, 1. 203.), and form even an article of the export commerce to Europe under the name of *Munjeeth*. Rubia angustissima from Tong Dong, has also highly coloured roots. *Royle's Illustrations*, 237. The torrified grains of Galium are said to be a good substitute for coffee. The flowers of Galium verum are used to curdle milk. An infusion of Asperula cynanchica has a little astringency, and has been used as a gargle. Asperula odorata, or Woodruff is remarkable for its fragrance when dried; it passes for a diuretic. Rubia noxa is said to be poisonous. *Ed. Phil. Journ.* 14. 207.

GENERA.

Sherardia, Dill.	Asperula, L.	Galium, Scop.	Callipeltis, Stev.
Dillenia, Heist.	Crucianella, L.	*Aspera*, Mœnch.	*Cucullaria*, Buxb.
Aparine, Tourn.	Rubia, Tourn.	*Eyselia*, Neck.	Vaillantia, DC.
			Valantia, Tourn.

Group III. Aggregosæ.

Essential Character.—*Ovary* consisting of but one perfect carpel.

This simple character groups a very large number of plants which, whatever their relation may be to other parts of the system, are manifestly allied most strictly to each other. They differ in regard to the cohesion of their anthers with each other, of the calyx with the ovary, and some other points which serve to form five natural alliances. The principal part of the orders have the flowers in close heads; but in some of them they are arranged in loose masses.

Alliance I. *COMPOSITÆ* or *ASTERALES.*

Essential Character—*Anthers* syngenesious.

These are the Polygamous Syngenesious plants of Linnæus. Until the appearance of De Candolle's next volume of his Prodromus all that relates to the systematic arrangement of the genera and species must remain in much confusion, notwithstanding the recent excellent work of Lessing. I therefore leave all that relates to them in nearly the same state as in the first edition of this work; observing only that it appears to me that independently of Calyceraceæ there are at least four distinct orders comprehended under the common name of Compositæ; of these some have a bilabiate corolla (Mutisiaceæ); others only a unilabiate one (Cichoraceæ); others a unilabiate and regular one mixed (Asteraceæ or Corymbiferæ); and a fourth set, rigid or spiny involucres with all the flowers regular (Cynaraceæ); see order 194. All this, however, I waive for the present, until the views of De Candolle shall have been explained as they soon will be. It may, however, be useful to repeat very briefly the characters of the orders just adverted to adding their synonyms.

Order 190. Calyceraceæ, R. Br. (Boopideæ, *Cassini.*)

Albumen present; *seed* pendulous.

Order 191. MUTISIACEÆ, (Compositæ, *series* 2. Labiatifloræ, *DC.*)

Albumen absent: *seed* erect. *Corolla* bilabiate.

Order 192. CICHORACEÆ, Juss. (Compositæ, *series* 3. Liguliflorae, *DC.*)

Albumen absent; *seed* erect. *Corollas* ligulate, or 1-lipped. *Juice* milky.

Order 193. ASTERACEÆ, (Corymbiferæ, *Juss.*—Compositæ, *series* 1. Tubuliflorae, *DC.* chiefly.)

Albumen absent; *seed* erect. *Involucre* hemispherical. *Florets* of the ray ligulate if present.

Order 194. CYNARACEÆ, (Cynarocephalæ, *Juss.*—Compositæ, *series* 1, Tubuliflorae, *DC.* Trib. V., Cynareæ; sub-trib. 3. 4. 6. 7. 8. 9. 10. 11.)

Albumen absent; *seed* erect. *Involucre* rigid or spiny, conical. *Flowers* of ray tubular, inflated, regular.

ORDER CXC. CALYCERACEÆ.

CALYCEREÆ, *R. Brown in Linn. Trans.* 12. 132. (1816); *Rich. in Mém. Mus.* 6. 76. (1820). BOOPIDEÆ, *Cassini in Dict. des Sc.* 5. 26. *Supp.* (1817).

ESSENTIAL CHARACTER.—*Calyx* superior, of 5 unequal pieces. *Corolla* regular, funnel-shaped, with a long slender tube and 5 segments, each of which has 3 principal veins; glandular spaces below the stamens and alternate with them. *Stamens* 5, monadelphous; *anthers* combined by their lower half in a cylinder. *Ovary* inferior, 1-celled; *ovule* solitary, pendulous; *style* simple, smooth; *stigma* capitate. *Fruit* an indehiscent pericarp crowned by the rigid spiny segments of the calyx. *Seed* solitary, pendulous, sessile; *embryo* in the axis of fleshy albumen; *radicle* superior. *Herbaceous* plants. *Leaves* alternate, without stipules. *Flowers* collected in heads, which are either terminal or opposite the leaves, surrounded by an involucre. *Florets* sessile, hermaphrodite, or neuter.

AFFINITIES. A very small and curious tribe, differing from Compositæ in nothing but their albumen, pendulous ovule, and half distinct anthers, and from Dipsaceæ in their filaments being monadelphous and their anthers partly connate. They may therefore be considered to hold a middle station between these two families. Richard's monograph, in the work above quoted, is worthy of the high reputation of that distinguished botanist.

GEOGRAPHY. All natives of South America.

PROPERTIES. Unknown.

GENERA.

Calycera, Cav.	Acicarpha, Juss.
Boopis, Juss.	*Cryptocarpha*, Cass.

ORDERS CXCI. MUTISIACEÆ, CXCII. CICHORACEÆ, CXCIII. ASTERACEÆ, CXCIV. CYNARACEÆ, or COMPOSITÆ.

COMPOSITÆ, *Adans. Fam.* 2. 103. (1763); *Kunth in Humb. N. G. et Sp.* vol. 4. (1820); *Lindl. Synops.* 140. (1829); *Lessing, Synops. Compos.* (1832); *Royle's Illustr.* 245. (1835); *DC. Prodr. vol.* 5. (*ined*).—SYNANTHEREÆ, *Rich. Anal.* (1808); *Cassini Dict. Sc. N.* 10. 131. (1818); *ibid.* 60. 563. (1830).—CORYMBIFERÆ, CYNAROCEPHALÆ, and CICHORACEÆ, *Juss. Gen.* (1789).

ESSENTIAL CHARACTER.—*Calyx* superior, closely adhering to the ovary, and undis-

tinguishable from it; its *limb* either wanting, or membranous, divided into bristles, paleæ, hairs, or feathers, and called *pappus*. *Corolla* monopetalous, superior, usually deciduous, either ligulate or funnel-shaped; in the latter case, 4- or 5-toothed, with a valvate æstivation. *Stamens* equal in number to the teeth of the corolla, and alternate with them; the *anthers* cohering into a cylinder. *Ovary* inferior, 1-celled, with a single erect ovule; *style* simple; *stigmas* 2, either distinct or united. *Fruit* a small, indehiscent, dry pericarp, crowned with the limb of the calyx. *Seed* solitary, erect; *embryo* with a taper, inferior radicle; *albumen* none.—*Herbaceous* plants or *shrubs*. *Leaves* alternate or opposite, without stipules, usually simple. *Flowers* (called *florets*) unisexual or hermaphrodite, collected in dense *heads* upon a common *receptacle*, surrounded by an *involucre*. *Bracts* either present or absent; when present, stationed at the base of the florets, and called *paleæ of the receptacle*.

Affinities. One of the most natural and extensive families of the vegetable kingdom, at all times recognised by its syngenesious stamens and capitate flowers. Calyceraceæ and Dipsaceæ, neighbouring orders, are readily distinguished by their pendulous ovule, and the anthers being either wholly or partially distinct. In proportion to its strict natural limits, depending upon the uniformity of its characters, is the difficulty of separating it into sections or subordinate divisions, a measure absolutely necessary, on account of the vast number of species referable to the order. Jussieu has three; Corymbiferæ, the florets of which are flosculous in the middle, and ligulate at the circumference; Cichoraceæ, the florets of which are all ligulate; and Cynarocephalæ, all whose florets are flosculous; to which has since been added a tribe called *bilabiate*. Linnæus divided them according to the sexes of the florets of different parts of the same head. The former has been found unexceptionable, as far as it goes; the latter wholly unmanageable. Neither, however, have satisfied the views of modern botanists, who have divided the order into a considerable number of sections, to which many names have been given; so that this order has become a perfect chaos to all who have not devoted years to its exclusive study. The most important of those who have undertaken to remodel Compositæ, are Cassini, who has written much upon them in the *Dictionnaire des Sciences Naturelles*, and elsewhere; Kunth, whose arrangement will be found in Humboldt's *Nova Genera et Species Plantarum:* Don who has written several detached papers upon them; and Link, who has an arrangement of his own in his *Handbuch*, vol. 1. p. 685. The most profound writers upon their general structure are Cassini, and Brown, whose paper in the 12th volume of the *Transactions of the Linnean Society* is a masterpiece of careful investigation and acute reasoning. More recently the order has been revised in a most useful Synopsis by Lessing; and it is now under the hands of the learned De Candolle, from whom, if it is in human power to disembroil the confused synonymy and unintelligible classifications of some of the Botanists who have meddled with this most difficult order, every thing is to be expected. I am infinitely indebted to this most excellent man for a classified catalogue expressly drawn up for this work, of the genera and their synonyms as they stood in his manuscripts in the beginning of December, 1835. I am sure this will be hailed by all Botanists as a valuable forerunner of the great work upon which the author has now been engaged for so many years. I have not presumed to add a letter or a name to the list, but I have inserted in a supplement the genera whose names I do not find in it.

Geography. All parts of the world abound in Compositæ, but in very different proportions. According to the calculations of Humboldt, they constitute $\frac{1}{7}$ of the phænogamous plants of France, $\frac{1}{8}$ of Germany, $\frac{1}{15}$ of Lapland, in North America $\frac{1}{6}$, within the tropics of America $\frac{1}{2}$; upon the authority of Brown, they only form $\frac{1}{16}$ of the Flora of the north of New Holland, and did not exceed $\frac{1}{23}$ in the collection of plants formed by Smith upon the western coast of Africa in Congo. *Congo*, 445. In Sicily they constitute ra-

ther more than $\frac{1}{2}$ (*Presl.*); the same proportion exists in the Balearic Islands (*Cambessédes*); but in Melville Island they are rather more than $\frac{1}{16}$ (*Brown*), a proportion nearly the same as that of the tropical parts of New Holland. It does not, therefore, appear that Compositæ, as an order, are subject to any very fixed ratio of increase or decrease corresponding with latitude. But much remains to be learned upon this subject. It is certain that Cichoraceæ are most abundant in cold regions, and Corymbiferæ in hot ones; and that while in the northern parts of the world Compositæ are universally herbaceous plants, they become gradually frutescent, or even arborescent, as we approach the equator; most of those of Chile are bushes, and the Compositæ of St. Helena are chiefly trees.

Properties. I shall extract the substance of De Candolle's excellent remarks upon the properties of this family, with some additions. See *Essai sur les Propriétés, &c.* 177.

They are best considered under the three principal heads of classification.

Corymbiferæ or Asteraceæ.

There is a bitterness peculiar to all Compositæ, which in this section assumes a particular character, being combined with a resinous principle. If this latter exists in an inconsiderable quantity, and mixed with a bitter or astringent mucilage, we find tonic, stomachic, and febrifugal qualities, as in Tussilago Farfara, Camomile, Elecampane, Golden Rod, Matricaria Parthenium, the Stevia febrifuga of Mexico, and Eupatorium perfoliatum. The Inula Helenium, or Elecampane, has a root which is aromatic and slightly fœtid. It is said to be of little value as a stomachic; the French prepare from it a medicinal wine they call Vin d'Aulnée. *Ainslie*, 1. 120. Eupatorium perfoliatum is known in North America under the name of Boneset. It possesses very important tonic and diaphoretic properties; it is also slightly stimulant. See *Barton*, 2. 133. upon this subject. In proportion as this resinous principle increases, the stimulating properties are augmented. Some become anthelmintics, as Artemisia, Tansy, and Santolina; others emmenagogues, as Matricaria, Achillea and Artemisia. The seeds of Vernonia anthelmintica are accounted, in India, a very powerful anthelmintic. *Ainslie*, 2. 54. Artemisia chinensis and other species yield the Moxa of China, a substance which is used as a cautery, by burning it upon parts affected with gout and rheumatism. The leaves of A. maderaspatana are esteemed by the Indian doctors a valuable stomachic medicine; they are also sometimes used in antiseptic and anodyne fomentations. *Ibid.* 1. 482. Artemisia indica is considered in India a powerful deobstruent and antispasmodic. *Ibid.* 2. 194. Some are sudorifics, like Eupatorium, Achillea, Artemisia, and Calendula; others diuretic; and some possess both these qualities. A species of Conyza is highly esteemed in Mendoza as a diuretic. Erigeron philadelphicum and heterophyllum are both used in the United States as diuretics. They are commonly sold under the name of Scabious. *Barton*, 1. 234. The roots of several species of Liatris are active diuretics. *Ibid.* 2. 225. A decoction of the leaves and roots of Elephantopus scaber is given on the Malabar coast in cases of dysuria. *Ainslie*, 2, 17. A decoction of Cacalia sonchifolia is antifebrile. *Ibid.* 2. 213. The leaves of Cacalia alpina and sarracenica are recommended in coughs. *Ibid.* Many are sternutatories, as Ptarmica and Arnica; others excite salivation powerfully, as Spilanthus, Siegesbeckia orientalis, Anthemis Pyrethrum, Coreopsis bidens, and Bidens tripartita: some are emetic. A decoction of Anthemis cotula is a strong and active bitter: in the dose of a teacupful it produces copious vomiting and sweating. *Barton*, 1. 169. Others are tonic and antispasmodic, such as Achillea, Camomile, Wormwood, Tansy, Eupatorium, &c. Many have been celebrated for their power of curing the

bites of serpents, especially Eupatorium Ayapana, the leaves of which also form, in infusion excellent diet drink: when fresh bruised, they are said to be a most useful application for cleaning the face of a foul ulcer. *Ainslie*, 2. 35. An infusion of another species is used by the Javanese in fevers. *Ibid.* A valuable antidote against the bite of serpents, Vijuco del guaco, much esteemed in Spanish America, is produced by Mikania guaco. *Humboldt Cinch. Forests*, p. 21. *Eng. ed.* But the power of this Mikania is denied in the most positive terms by Hancock (*Quarterly Journ. July* 1830, p. 334.), who suspects that the real Guaco antidote is some kind of Aristolochia. The peculiar and agreeable flavour of Tarragon (Artemisia dracunculus) is well known. A vinegar, not distinguishable in flavour from it, is prepared in the Alps from Achillea nana, as well as from several dwarf species of Artemisia. The seeds usually abound in a fixed oil, which, in some cases, has the reputation of being anthelmintic: it is extracted in abundance from Madia sativa, Verbesina sativa, and even Helianthus, the grains of which are made into cakes by the North American Indians. The genus Helianthus contains a species remarkable for its eatable, wholesome tubers (H. tuberosus, or Jerusalem Artichoke), while the roots of the Dahlia are extremely disagreeable. It is stated by Payen, that benzoic acid exists in the Dahlia. *Brewster*, 1.376. A principle called Inulin is obtained from the roots of Inula Helenium. *Turner*, 700. The pith of the Sunflower has been stated by John to be a peculiar chemical principle, which he calls Medullin.

Cynaraceæ.

Characterised by intense bitterness, which depends upon the mixture of extractive with a gum which is sometimes yielded in great abundance. On this account some have been accounted stomachics, as Carduus marianus, Centaurea calcitrapa: the Artichoke and others sudorific and diaphoretic, as Carduus benedictus and Arctium Bardana. The modern Arabians consider the root of the Artichoke (Cynara scolymus) an aperient: they call the gum of it Kunkirzeed, and place it among their emetics. *Ainslie*, 1. 22. This bitterness is not, however, found in the unexpanded leaves or receptacles, on which account they are, in many cases, used as wholesome articles of food; as the leaves of the Cardoon, and the receptacle of the unexpanded flower of the Artichoke, the Carlina acanthifolia, and others. The flower of Echinops strigosus is used in Spain for tinder; the corollas of the Artichoke, the Cardoon, and of several thistles, are employed in the South of Europe for curdling milk; and those of Carthamus tinctorius yield a deep yellow dye, resembling Saffron. Their seeds are all oily and slightly bitter; some are purgative, as those of Carthamus; others diaphoretic, as Carduus benedictus; and, finally, some partake of all these qualities, as Arctium Bardana, whose seeds pass for diuretic, diaphoretic, and slightly purgative.

Cichoraceæ.

These are very like Campanulaceæ in their medical and chemical properties, as might have been expected from the close affinity they bear that order botanically. Their juice is usually milky, bitter, astringent, and narcotic, as is well known to be the case in Succory, Endive, and even the common Lettuce, but more especially in Lactuca virosa and sylvestris, both of which yield an extract resembling Opium in its qualities, but less likely to produce the inconvenient consequences that often attend upon the use of that drug. Before this narcotic bitter secretion is formed, many of the species are useful articles of food: the Succory and Endive, for instance, when blanched, and the roots of Scorzonera and Tragopogon, or Salsafy.

GENERA.

ORDO.—Compositæ, Vaill. L. Ad. DC.
Syngenesia polygamia, Lin.
Synantherеæ, Rich. Cass.
Compositifloræ, Gærtn.

SERIES 1ª.

Tubulifloræ, DC. Pr.
Trib. 1. Vernoniaceæ, Less.
Vernonieæ, Cass. excl. § 2 et 3.
Sub-Trib. 1. Vernonieæ, Cass. DC. Pr.
Div. 1. Euvernonieæ, DC. Pr.
Vernonieæ prototypæ, Cass.
Adenocyclus, Less.
Odontoloma, H. B. K.
Oiospermum, Less.
Sparganophorus, Vaill. Gært.
Struchium, P. Browne.
Athenæa Adans. non Schreb.
Ethulia, Cass. non Gærtn.
Kahiria, Forsk.
Pirardia, Ad. non Cass.
Leighia, Scop. non Cass.
Vanhelmontia, DC. Pr.
Pacourina, Aubl.
Pacourinopsis, Cass.
Meisteria, Scop. non Gmel.
Haynea, Willd. non Schum.
Heterocoma, DC.
Vernonia, Schreb.
Ascaricida, Cass.
Oliganthes, Cass.
Lepidaploa, Cass.
Achyrocoma, Cass.
Centrapalus, Cass.
Pollalesta, H. B. K.
Acilepis, Don.
Hololepis, DC.
Vanillosma, Mart.
Decaneurum, DC. Pr.
Phyllocephalum, Blum.
Gymnanthemum, Cass.
Cyanopis, Blum. in DC. Pr.
Cyanthillium, Blum.
Isonema, Cass. non Br.
Centratherum, Cass. 1817.
Amplerephis, Kunth 1818.
Spixia, Schranck. non Leand.
Bechium, DC. Pr.
Stokesia, Lhér.
Cartesia, Cass.
Platycarpha, Less.
Cynara, Thunb. Fl. cap. non L.
Odontocarpha, DC. Pr.
Webbia, DC. Pr.
Hoplophyllum, DC. Pr.
Piptocoma, Cass.
Distephanus, Cass.
Strophopappus, DC. Pr.
Blanchetia, DC. Pr.
Stilpnopappus, Mart. in DC. Pr.
Dialesta, H. B. K.
Monosis, DC.
Shawia, Forst.
Haplostephium, Mart. in DC. Pr.
Lychnophora, Mart.
Albertinia Spreng.
Eremanthis, Less. non Cass.
Pycnocephalum, DC. Pr.
Lychnocephalus, Mart. in DC. Pr.
Chronopappus, DC. Pr.
Pithecoseris, Mart. in DC. Pr.
Stachyanthus, DC. Pr.
Chresta, Arrab.
Div. 2. Elephantopeæ, Cass.
Elephantopodeæ, Less.
Elephantopus, Lin.
Elephantopus, Cass.
Elephantosis, Less.
Distreptus, Cass.
Pseudo elephantopus, Rohr.
Matamoria, Lallav. et Lex.
Div. 3. Rolandreæ, Cass. excl. gen.
Gundelia, Tourn.
Hacub, Vaill.
Gundelsheimera, Cass.
Corymbium, Lin.
Contarena, Adans.
Rolandra, Rottb.
Spiracantha, H. B. K.
Trichospira, H. B. K.
Lagascea, Cav.
Noccæa, Jacq. non Mnch.
Div. 4. Bojerieæ, DC. Pr.
Synchodendron, Boj. in DC. Pr.
Centauropsis, Boj. in DC. Pr.
Tecmarsis, DC. Pr.
Bojeria, DC. Pr.
Sub-Trib. II. Pectideæ, Less.
Div. 1. Liabeæ, Cass.
Xanthisma, DC. Pr.
Hectorea, DC. Pr.
Andromachia, H. et B.
Oligactis, Cass.
Liabum, Adans.
Andromachia, Cass. non Bonpl.
Starkea, Willd.
Chrysactinium, H. B. K.
Alibum, Less.
Cacosmia, H. B. K.
Div. 2. Eupectideæ, DC. Pr.
Pectideæ, Less.
Pectis, Lin.
Pectidopsis, DC. Pr.
Pectidium, Less.
Pectis, Cass. non Less.
Pectis, Less. non Cass.
Chthonia, Cass.
Lorentea, Less. non Ort. nec Lag.
Cryptopetalum, Cass. non Hook.
Stammarium, Willd. herb.
Trib. II. Eupatoriaceæ, Less.
Sub-Trib. I. Eupatorieæ, DC. Pr.
Div. 1. Alomieæ, Less.
Orsinia Bertol. in DC. Pr. non in Ann. Sc. Nat.
Piqueria, Cav.
Alomia H. B. K.
Phalacræa, DC. Pr.
Gymnocoronis, DC. Pr.
Isocarpha, R. Br.
Div. 2. Agerateæ, Less.
Cœlestina, Cass.
Ageratum, Lin.
Carelia, Adans. non Less.
Adenostemma, Forst.
Lavenia, Swartz.
Sclerolepis Cass. non Monn.
Sparganophorus, Michx non Gærtn.
Phania, DC. Pr.
Stevia, Cav.
Palafoxia, Lag.
Paleolaria, Cass.
Polypteris, Nutt. non Less.
Carelia, Less. non Ponted. nec Rieux.
Div. 3. Adenostyleæ, Cass.
Eupatorieæ, Less.
Kuhnia, Lin.
Critonia, Gærtn. non P. Br.
Liatris, Schreb. non Don.
Suprago, Gærtn.
Trilisa, Cass.
Carphephorus, Cass.
Decachæta, DC. Pr.
Chromolæna, DC. Pr.
Ooclinium, DC. Pr.
Praxelis, Cass?
Conoclinium, DC. Pr.

Hebeclinium, DC. Pr.
Coleosanthi, sp. Cass.
Campuloclinium, DC.
Bulbostylis, DC. Pr.
Coleosanthi, sp. Cass.
Critonia, P. Browne non Gærtn. nec Cass.
Dalea, P. Br. non Lin.
Wikstrœmia, Spreng. non Schrad. nec Endl.
Eupatorium, Tourn. Lin.
Traganthes, Wallr.
Nothites, Cass.
Mikania, Willd.
Adenostyles, Cass. non Blum.
Cacalia, Tourn. non Cass.
Sub-Trib. II. TUSSILAGINEÆ, Cass. Less.
Tussilago, Lin.
Div. 1. PETASITEÆ, DC. Pr.
Homogyne, Cass.
Nardosmia, Cass.
Petasites, Tourn.
Adenocaulon, Hook.
Div. 2. EUTUSSILAGINEÆ, DC. Pr.
Tussilago, Tourn.
Celmisia, Cass. Dict v. 37.
Alciope, DC. Pr.
Celmisia, Cass. Dict. v. 7.
Brachyglottis, Forst.
Trib. III. ASTEROIDEÆ, Less.
Sub-Trib. I. ASTERINEÆ, Nees (excl. gen.)
Astereæ, Less. p. 161. non 167.
Div. 1. AMELLEÆ, DC. Pr.
Sub-Div. 1. EUAMELLEÆ, DC. Pr.
Amelloideæ, Less.
Amellus, Lin.
Chorethrogyne, DC. Pr.
Chiliotrichium, Cass.
Tropidolepis, Tausch.
Sub-Div. 2. HETEROTHALAMEÆ DC.
Heterothalamus, Less.
Div. 2. ASTEREÆ, DC. Pr.
Sub-Div. 1. EUASTEREÆ, DC. Pr.
Mairia, Nees.
Zyrphelis, Nees.
Pteropappus, Less.
Felicia, Cass. non Less.
Polyarrhena, Cass.
Polylepis, Less. non Cass. nec R. et Pav.
Munychia, Cass.
Felicia, Less. non Cass.
Agathæa, Cass.
Detris, Adans.
Detridium, Nees.
Detrioides, Less.
Bellidiastrum, Mich. Cass. non Vaill. Less.
Margarita, Gaud.
Aster, Lin. excl. Sp. Nees, Lindl.
Amellus, Adans. non Lin.
Tripolium, Nees, Lindl.
Aster, Adans.
Galatella, Cass. Nees, Lindl.
Galatea, Cass.
Turczaninovia, DC. Pr.
Calimeris, Cass.
Kalimeris, Cass.
Eurybiopsis, DC. Pr.
Podocoma, Cass.
Asteropsis, Less.
Arctogeron, DC. Pr.
Sericocarpus, Nees.
Machœranthera, Nees.
Tetramolopium, Nees.
Henricia, Cass.
Dœllingeria, Nees, excl. sp.
Heleastrum, DC. Pr.
Biotia, DC. Pr. non Cass.
Eurybiæ genuinæ, Nees.
Eurybia, Cass.
Spongotrichum, Nees.
Sub-Div. 2. DIPLOPAPPEÆ, DC. Pr.
Olearia, Mœnch.
Diplostephium, H. B. K.
Diplostephia eurybioidea, Nees.
Callistephus, Cass.
Callistemma, Cass.
Poloa, DC.
Diplopappus, Cass. excl. sp.
Rhinactina, Less. non Willd.
Noticastrum, DC. Pr.
Distasis, DC. Pr.
Sub-Div. 3. ERIGEREÆ, DC. Pr.
Melanodendron, DC. Pr.
Leptocoma, Less.
Vittadinia, A. Rich. et Less.
Brachycoma, Gaud. non Cass.
Fullartonia, DC. Pr.
Polyactidium, DC. Pr.
Polyactis, Less. non Link.
Stenactidis sp. Cass.
Heterogeron, DC. Pr.
Therogeron, DC. Pr.
Erigeron, Lin. excl. sp. Less.
Rhynchospermum, Reinw. in Blum.
Microgyne, Less. non Cass.
Sub-div. 4. HETEROPAPPEÆ, DC.
Simblocline, DC. Pr.
Heteropappus, Less.
Phalacroloma, Cass.
Minuria, DC. Pr.
Stenactis, Nees.
Gymnostephium, Less.
Charieis, Cass.
Kaulfussia, Nees non Blum.
Chætopappa, DC. Pr.
Chætophora, Nutt. non. Schr. nec Brid. nec Horns.
Boltonia, Lher.
Madea, Sol. Mss.
Sommerfeldtia, Less. non Schum.
Sub-Div. 5. BELLIEÆ, DC. Pr.
Calotis, R. Br.
Asteromœa, Blum.
Bellium, Lin.
Sub-Div. 6. BELLIDEÆ, DC. Pr.
Bellis, Lin.
Kyberia, Neck.
Brachycome, Cass.
Paquerina, Cass.
Lagenophora, Cass.
Lagenifera, Cass.
Ixauchenus, Cass.
Myriactis, Less.
Garuleum, Nees.
Keerlia, DC. Pr.
Aphanostephus, DC. Pr.
Div. 3. CHRYSOCOMEÆ, DC. Pr.
Sub-Div. 1. GYMNOSPERMEÆ, DC. Pr.
Xanthocoma, H. B. K.
Xerothamnus, DC. Pr.
Anaglypha, DC. Pr.
Gymnosperma, Less.
Sub-Div. 2. ACHYRIDEÆ, DC. Pr.
Brachyris, Nutt.
Brachyachyris, Spreng.
Lepidophyllum, Cass.
Grindelia, Willd.
Demetria, Lag.
Aurelia, Cass.
Donia, Desf. non Br. nec Don.
Sub-Div. 3. HETEROTHECEÆ, DC. Pr.
Heterotheca, Cass.
Diplocoma, Don.
Calycium, Ell. non Pers.
Sub-Div. 4. PSIADIEÆ, DC.
Woodvillea, DC. Pr.
Psiadia, Jacq.
Elphegea, Cass. non Less.
Microglossa, DC. Pr.
Nidorella, Cass.
Homochroma, DC. Pr.
Sub-Div. 5. CHRYSOPSIDEÆ, DC. Pr.
Neja, Don.
Chrysopsis, Nutt.
Diplogon, (?) non Br.
Fresenia, DC. Pr.
Sub-Div. 6. SOLIDAGINEÆ, DC. Pr.
Bigelowia, DC. Pr. non Spreng. nec Sm. nec Raf.
Chrysocoma, Nutt. non alior.
Solidago, Lin.
Virga-aurea, Tourn.
Doria, Adans. non Thunb.
Euthamia, Nutt.
Commidendron, DC.

Steiractis, DC. Pr.
Rochonia, DC. Pr.
Aplopappus, Cass.
Diplopappus, Less.
Hoorebeckia, Mussch.
Pyrrocoma, Hook.
Lessingia, Cham.
Linosyris, Lob. Cass.
Crinitaria, Cass. Less.
Crinita, Houtt. non Mœnch.
Chrysocoma, Cass.
Pteronia, Lin.
Pterophorus, Vaill.
Henanthus, Less.
Pachideris, Cass.
Div. 4. SOLENOGYNEÆ, DC. Pr.
Microtrichia, DC. Pr.
Nolletia, Cass.
Sarcanthemum, Cass.
Leptothamnus, DC. Pr.
Solenogyne, Cass.
Sub-Trib. II. BACCHARIDEÆ, Less. p. 200. non 204.
Div. 1. CONYZEÆ, Less.
Sub-Div. 1. SPHÆRANTHEÆ, DC. Pr.
Blepharispermum, Wight.
Athroisma, DC.
Sphæranthus, Lin.
Polycephalos, Forsk.
Sub-Div. 2. GRANGEINEÆ, DC. Pr.
Dichrocephala, Lher. Mss.
Centipeda, Less. non Lour.
Grangea, Adans. Cass.
Pyrarda, Cass. non Adans.
Cyathocline, Cass.
Læstadia, Kunth.
Gymnarrhena, Desf.
Sub-Div. 3. EUCONYZEÆ, DC. Pr.
Thespis, DC.
Karelinia, Less. Mss.
Berthelotia, DC. Pr.
Laennecia, Cass.
Conyza, Lin. (excl. sp.) Less.
Eschenbachia, Mœnch.
Dimorphanthes, Cass.
Fimbrillaria, Cass.
Phagnalon, Cass.
Chionolæna, DC. Pr.
Elachothamnos, DC. Pr.
Div. 2. BACCHAREÆ, DC. Pr.
Baccharideæ, Less. p. 204.
Baccharideæ veræ, Cass.
Polypappus, Less.
Baccharis, Lin.
Molina, R. et Pav.
Sergilus, Gærtn.
Pingræa, Cass.
Tursenia, Cass.
Arrhenachne, Cass.
Stephananthus, Lehm.
Sub-Trib. III. TARCHONANTHEÆ, Less. p. 205. non 208.

Div. 1. EUTARCHONANTHEÆ, DC. Pr.
Tarchonantheæ, Less. p. 208.
Brachylæna, R. Br.
Oligocarpha, Cass.
Tarchonanthus, Lin.
Div. 2. PLUCHEINEÆ, Cass.
Epaltideæ, Less.
Blumea, DC. non Spr. nec Nees.
Erigeron, Don. non. Lin.
Pluchea, Cass. non Arrab.
Chlænobolus, Cass. Dict. v. 42.
Stylimnus, Raf.
Gynema, Raf.
Leptogyne, Ell. non Less.
Pterocaulon, Ell.
Chlænobolus, Cass. Dict. v. 49.
Monenteles, Labill.
Tessaria, R. et Pav.
Gyneheteria, Willd.
Monarrhenus, Cass.
Cylindrocline, Cass.
Lepidopogon, Tausch.
Evax, Gærtn.
Filago, Willd. non Lin.
Gnaphalium, Vaill. non L.
Micropus, Lin.
Gnaphalodes, Tourn.
Epaltes, Cass.
Ethulia, Gærtn. non Lin.
Denekia, Thunb.
Sub-Trib. IV. INULEÆ, Cass. Less.
Div. 1. EUINULEÆ, DC. Pr.
Rhantherium, Desf.
Inula, Lin. (excl. sp.) Gærtn.
Limbarda, Cass.
Corvisartia, Merat.
Conyza, Cass. non Lin.
Schizogyne, Cass.
Varthemia, DC. Pr.
Vicoa, Cass.
Pentanema, Cass.
Francœuria, Cass.
Duchesnea, Cass. non Sm.
Iphiona, Cass.
Jasonia, Cass.
Chiliadenus, Cass.
Allagopappus, Cass.
Orsina, Bertol. ann. sc. n.
Pulicaria, Gærtn.
Tubilium, Cass.
Strabonia, DC. Pr.
Pegolottia, Cass.
Zeyhera, Spreng. non Mart.
Geigera, Griss.
Dizonium, Willd.
Div. 2. CÆSULIEÆ, DC. Pr.
Cæsulia, Roxb.
Sub-Trib. V. BUPHTHALMEÆ, Cass. Less.
Buphthalmum, Lin.
Buphthalmum, Beck. Cass. Less.

Telekia, Baumg. Less.
Molpadia, Cass.
Asteriscus, Mœnch. Less.
Nauplius, Cass.
Odontosperma, Neck.?
Pallenis, Cass. Less.
Athamum, Neck.
Anvillea, DC. Pr.
Ceruana, Forsk.
Sub-Trib. VI. ECLIPTEÆ, Less.
Borrichia, Adans.
Diomedea, Cass. non Zool.
Eclipta, Lin.
Micrelium, Forsk.
Eupatoriophalacron, Vaill.
Blainvillea, Cass.
Ucacoa, Cass.
Salmea, DC. Br. non Cav. nec Willd.
Hopkirkia, Spreng.
Dahlia, Cav. (1791.) non Thunb. (1792.)
Georgina, Willd.
Georgia, Spreng.
Leptocarpha, DC. Pr.
Siegesbeckia, Lin.
Trimerantha, Cass.
Sabazia, Cass.
Cryphiospermum, Beauv.
Wahlenbergia, Schum. non Schrad.
Trib. IV. SENECIONIDEÆ, Less.
Sub-Trib. I. MELAMPODINEÆ, DC. Pr.
Div. 1. EUXENIEÆ, Less.
Euxenia, Cham.
Ogiera, Spreng. non Cass.
Podanthus, Lag. non Haw.
Petrobium, R. Br.
Laxmannia, Forst. non Sm. nec Br.
Astemma, Less.
Div. 2. MILLERIEÆ, DC. Pr.
Elvira, Cass.
Meratia, Cass. non Lois.
Milleria, Lin. (excl. sp.) Cass.
Riencourtia, Cass.
Latreillea, DC. Pr.
Ichthyothere, Mart.
Clibadium, Lin. non Neck.
Baillieria, Aubl.
Oswalda, Cass.
Trixis, Swartz. non P. Br.
Unxia, Lin. F. non Kunth.
Apalus, DC. Pr.
Pronacron, Cass.
Aiolotheca, DC. Pr.
Trigonospermum, Less.
Xenismia, DC. Pr.
Scolospermum, Less.
Fougerouxia, DC. Pr.
Baltimora, Lin.
Fougeria, Mœnch.
Niebuhria, Scop. non DC.
Chrysogonum, Lin.
Diotostephus, Cass.

Div 3. SILPHIEÆ, Less.
Guardiola, H. B. K.
Hidalgoa, Less. non Lallav.
Silphium, Lin.
Polymnia, Lin.
Alymnia, Neck.
Polymniastrum, Lam.
Berlandiera, DC. Pr.
Div. 4. MELAMPODIEÆ, Less.
Melampodium, Lin.
Disodium, Pers. non Cav.
Alcina, Cav.
Zarabellia, Cass. non Neck.
Acanthospermum, Schrank (1819).
Centrospermum, H. B. K. (1820) non Spreng.
Div.5. AMBROSIEÆ, Cass. Less.
Xanthium, Tourn. Lin.
Franseria, Cav.
Ambrosia, Lin.
Div. 6. IVEÆ, Cass.
Pinillosia, Ossa in DC. Pr.
Tetranthus, Swartz.
Iva, Lin.
Denira, Adans.
Euphrosine, DC. Pr.
Div. 7. PARTHENIEÆ, Less.
Coniothele, DC. Pr.
Leptogyne, DC. Pr.
Parthenium, Lin.
Partheniastrum, Niss.
Hysterophorus, Vaill.
Argyrochæta, Cav.
Mendezia, DC. Pr.
Tragoceras, H. B. K. Less.
Sub-Trib. II. HELIANTHEÆ, Less.
Div. 1. HELIOPSIDEÆ, DC. Pr.
Philactis, Schrad.
Zinnia, Lin.
Lejica, Hill.
Helicta, Cass. non Less.
Alarçonia, DC. Pr.
Wedelia, Jacq. non Adans.
Stemmodontia, Cass.
Trichostemma, Cass.? non Lin.
Jægeria, H.B.K non Raeusch.
Lipotriche, R. Br. non Less.
Melanthera, Rohr.
Melananthera, Rich.
Amellus, P. Br. non Lin.
Monactis, H. B. K.
Wollastonia, DC.
Tilesia, Mey.
Pascalia, Ort.
Rumfordia, DC. Pr.
Heliopsis, Pers. Dun.
Kallias, Cass.
Balsamophora, Hook.?
Guizotia, Cass.
Ramtilla, DC.
Tetragonotheca, Dill. Lin.
Ferdinanda, Lag.
Chrysophania, Kunth.
Zaluzania, Pers. non Neck.
Chiliophyllum, DC. Pr.
Hybridella, Cass.
Div. 2. RUDBECKIEÆ, Less.
Echinacea, Mœnch.
Brauneria, Neck.
Helichroa, Raf.
Bobartia, Pet. non Lin.
Rudbeckia, Lin. (excl. sp.) Cass.
Centrocarpha, Don.
Obeliscaria, Vaill.
Heliophthalmum, Raf.?
Dracopis, Cass.
Obeliscaria, Cass.
Lepachys, Raf. Less.
Ratibida, Raf.
Andrieuxia, DC. Pr.
Anomostephium, DC. Pr.
Aspilia, Pet. th.
Gymnopsis, DC. Pr.
Gymnoloma, H. B. K. non Ker.
Aldama, Lallav.? Less.
Wulfia, Neck. Cass.
Chakietella, Cass.
Chylodia, Rich. in Cass. non Br.
Gymnoloma, Ker. non H.B.K.
Montagnæa, DC. Pr.
Eriocoma, H. B. K. non Nutt.
Montanoa, Lallav. et Lex.
Eriocarpha, Cass.
Sclerocarpus, Jacq.
Encelia, Adans.
Pallasia, Lher. non Lin.
Philoglossa, DC. Pr.
Chrysostemma, Less.
Calliopsis, Reichenb.
Diplosastera, Tausch.
Div. 3. COREOPSIDEÆ, Less.
Agarista, DC. Pr.
Coreopsis, Lin. (excl. sp.)
Coreopsoides, Mœnch.
Leachea, Cass.
Chrysomelea, Tausch.
Acispermum, Neck.
Actinomeris, Nutt.
Ridan, Adans.
Pterophyton, Cass.
Armania, Berter. in DC. Pr.
Oyedæa, DC. Pr.
Simsia, Pers. (1807) Cass. non R. Br. (1810).
Viguiera, H. B. K. Less.
Leighia, Cass. non Scop.
Harpalium, Cass.
Tithonia, Desf. non Raeusch.
Helianthus, Lin.
Corona-solis, Tourn.
Vosacar, Adans.
Flourensia, DC. Pr.
Div. 4. BIDENTIDEÆ, Less.
Bidens, Lin.
Kerneria, Mœnch. non Med. nec Willd.
Pluridens, Neck.
Edwardsia, Neck. non Salisb.
Ceratocephalus, Vaill. non Mœnch.
Cosmos, Cav.
Cosmea, Willd.
Adenolepis, Less.
Div. 5. VERBESINEÆ, Less.
Lasianthæa, DC. Pr.
Lasianthus, Zucc. non DC. nec Jack.
Perymenium, Schrad. (1830)
Schistocarpha, Less. (1831)
Psathurochæta, DC. Pr.
Lipochæta, DC. Pr.
Lipotriche, Less. non Br.
Zexmenia, Lallav.?
Diplothrix, DC.
Selloa, H. B. K. non Spreng.
Tecæa, Spreng. non Bory.
Verbesina, Lin. (excl. sp.) Less.
Platypteris, H. B. K.
Hamulium, Cass.
Phaethusa, Gærtn.
Ditrichum, Cass.
Micractis, DC. Pr.
Spilanthes, Jacq.
Pyrethrum, Med. non Willd.
Cerachis, Gærtn.
Acmella, Rich.
Athronia, Neck.
Ximenesia, Cav.
Sanvitalia, Gualt.
Lorentea, Ort. non Less.
Oligogyne, DC. Pr.
Synedrella, Gærtn.
Ucacou, Adans.
Calyptocarpus, Less.
Electra, DC. non Panz.
Chrysanthellum, Rich. in Pers. 1807.
Chrysanthellina, Cass. 1822.
Sebastiania, Bertol. 1822. non Spr.
Collæa, Spreng. 1826. non. DC.
Neuractis, Cass.
Glossocardia, Cass.
Heterospermum, Willd.
Heterosperma, Cav.
Glossogyne, Cass. non Less.
Delucia, DC. Pr.
Narvalina, Cass.
Needhamia, Cass, non Scop. nec Br.
Thelesperma, Less.
Isostigma, Less.
Sub-Trib. III. FLAVERIEÆ, Less.
Flaveria, Juss.
Vermifuga, R. et Pav.
Broteroa, DC. Pr.
Brotera, Spreng. non Cav. Willd. Spreng.

Nauemburgia, Willd. non Mœnch.
Clairvillea, DC. Pr.
Enhydra, DC. Pr.
Enydra, Lour. 1790.
Meyera, Schreb. 1791.
Sobrayra, R. et. P. 1794.
Hingstha, Roxb.
Tetraotis, Reinw.
Sub-Trib. IV. TAGETINEÆ, Cass.
Div. 1. TAGETEÆ, DC. Pr.
Adenophyllum, Pers.
Wildenowa, Cav. non Thunb.
Schlectendalia, Willd. non Less. Spr.
Lebetina, Cass.
Bœbera, Less. non Willd.
Dyssodia, Willd. non Cav.
Dysodia, DC. non Lour.
Dyssodia, Cav. non Willd.
Bœbera, Willd.
Clomenocoma, Cass.
Bartolina, Adans. non Br.
Hymenatherum, Cass.
Tagetes, Tourn. Lin.
Thymophylla, Lag.
Div. 2 POROPHYLLEÆ, DC. Pr.
Porophyllum, Vail. Lin. Cass.
Kleinia, Jacq. non Juss. nec Haw.
Sub-trib. v. HELENIEÆ, Cass. Less.
Div. 1. GAILLARDIEÆ, Nutt.
Sub-Div. 1. EUGAILLARDIEÆ, DC. Pr.
Gaillardia, Foug.
Galardia, Lam.
Calonnea, Buchoz.
Virgilia, Lher. non Lam.
Balduina, Nutt.
Actinospermum, Ell.
Leptopoda, Nutt.
Sub-Div. 2. EUHELENIEÆ, DC. Pr.
Guttierezia, Lag.
Achyropappus, H. B. K.
Chamæstephanum, Willd.
Schkuhria, Roth.
Tetracarpum, Mœnch.
Mieria, Lallav.
Florestina, Cass.
Actinolepis, DC. Pr.
Bahia, Lag.
Eriophyllum, Lag.
Trichophyllum, Nutt.
Phialis, Spreng.
Hymenopappus, Lher.
Rothia, Lam. non Schreb.
Chœnactis, DC. Pr.
Polypteris, Nutt. non Less.
Espejoa, DC. Pr.
Cercostylos, Less.
Polypteris, Less. non Nutt.
Hymenoxys, Cass.
Cephalophora, Cav.
Graemia, Hook.
Actinella, Pers.
Actinea, Juss.
Dugaldea, Cass.
Burrielia, DC. Pr.
Lasthenia, Cass.
Picradenia, Hook.
Hecubæa, DC. Pr.
Helenium, Lin.
Tetrodus, Cass.
Helenia, Lin.
Amblyolepis, DC. Pr.
Argyroxiphium, DC. Pr.
Rosilla, Less.
Div. 2. GALINSOGEÆ, DC. Pr.
Sub-Div. 1. EUGALINSOGEÆ, DC. Pr.
Lemmatium, DC. Pr.
Calydermos, Lag.
Calebrachys, Cass.
Meyeria, DC. Pr. non Schreb.
Callilepis, DC. Pr.
Calea, Lin. (excl. sp.) R. Br.
Mocinna, Lag. non Spr. nec Ort.
Caleacte, Br. Cass. non Less.
Leontophthalmum, Willd.
Allocarpus, H. B. K.
Alloispermum, Willd.
Vargasia, DC. Pr.
Galinsoga, R. et Pav.
Wiborgia, Roth. non Spr. Th. Mœnch.
Sogalgina, Cass.
Galinsoga, H. B. K. non R. et Pav.
Ptilostephium, H. B. K.
Carphostephium, Cass.
Tridax, Lin.
Bartolina, Adans? non Br.
Balbisia, Willd. non DC.
Blepharipappus, Hook.
Marshallia, Schreb.
Persoonia, Michx. non Sm.
Phyteumopsis, Michx. ic.
Trattenickia, Pers. non Willd.
Athanasia, Walt. non L.
Dubautia, Gaudich.
Sub-Div. 2. SPHENOGYNEÆ, DC. Pr.
Sphenogyne, R. Br.
Oligærium, Cass.
Thelythamnos, Spreng.
Spermophylla, Neck.
Ursinia, Gærtn.
Div. 3. MADIEÆ, DC. Pr.
Madaroglossa, DC. Pr.
Hartmannia, DC. Pr.
Oxyura, DC. Pr.
Hemizonia, DC. Pr.
Madaria, DC. Pr.
Madia, Don. non Cav.
Madia, Mol. Cav.
Biotia, Cass. non DC.
Sub-Trib. VI. ANTHEMIDEÆ, Cass.
Div. 1. EUANTHEMIDEÆ, DC. Pr.
Anthemideæ Prototypæ, Cass.
Œderia, Lin.
Eumorphia, DC. Pr.
Epallage, DC. Pr.
Helicta, Less. non Cass.
Anthemis, Lin. (excl. sp.) DC.
Marcelia, Cass.
Chamæmelum, Cass.
Maruta, Cass.
Verræa, DC. Pr.
Lyonnetia, Cass.
Anacyclus, Pers. DC.
Hiorthia, Neck.
Cyrtolepis, Less.
Ormenis, Cass.
Cladanthus, Cass.
Lepidophorum, Neck.
Ptarmica, Tourn. Neck.
Achillea, Lin. (excl. sp.) Neck.
Diotis, Desf. non Schreb.
Gnaphalium, Tourn. non L.
Otanthus, Link.
Santolina, Tourn. Lin.
Nablonium, Cass.
Lasiospermum, Lag.
Lanipila, Burch.
Mataxa, Spreng.
Div. 2. CHRYSANTHEMEÆ, Less. p. 250.
Lidbeckia, Berg.
Lancisia, Pers. non Adans. nec Gærtn.
Steirodiscus, Less.
Schistostephium, Krebs. Less.
Gamolepis, Less.
Coinogyne, Less.
Sphæroclinium, DC. Pr.
Eglotes, Cass. Less.
Xerobius, Cass.
Eyselia, Reichenb. non Neck.
Venegazia, DC. Pr.
Leucopsidium, DC. Pr.
Xanthocephalum, Willd.
Phymaspermum, Less.
Hisutsua, DC. Pr.
Brachanthemum, DC. Pr.
Leucanthemum, Tourn. DC. Pr.
Phalacrodiscus, Less.
Chrysanthemum, Less.
Matricaria, Lin.
Pyrethrum, Gærtn. Sm.
Gymnocline, Cass.
Chrysanthemum, Lin. (excl. sp.) DC. Pr.
Centrachæna, Schott.
Heteranthemis, Schott.
Pinardia, Cass.
Glebionis, Cass.
Ismelia, Cass.
Centrospermum, Spr. non Kunth.

Dimorphotheca, Vaill. Mœnch. Less.
Cardiopermum, Traut.
Lestibodea, Neck.
Gattenhofia, Neck.
Meteorina, Cass.
Blaxium, Cass.
Arnoldia, Cass. non Blum.
Castalis, Cass.
Chlamysperma, Less.
Villanova, Lag. non Ort.
Unxia, H. B. K. non Lin.
Div. 3. COTULEÆ, Less.
Peyrousea, DC. Pr.
Lapeyrousia, Thunb. non Pourr.
Cotula, Lin. (excl. sp.) Gærtn.
Ananthocyclus, Vaill.
Lancisia, Adans. non Pers.
Strongylosperma, Less.
Cenia, Comm. in Juss.
Lancisia, Gærtn. non Pers. nec Adans.
Omalotes, DC. Pr.
Omalanthus, Less. non A. Juss.
Div. 4. ATHANASIEÆ, Less.
Athanasia, Lin.
Lonas, Adans. Gærtn.
Gonospermum, Less.
Hymenolepis, Cass. non Kaulf.
Holophyllum, Less.
Athanasia, Cass.
Morisia, Cass. non Gay. nec Nees.
Div. 5. ARTEMISIEÆ, Less.
Stilpnophytum, Less.
Artemisia, Lin.
Oligosporus, Cass.
Abrotanum, Tourn.
Absinthium, Gærtn.
Tanacetum, Lin. (excl. sp.) Less.
Psanacetum, Neck.
Plagius, Lher. Mss.
Balsamita, Desf. (excl. sp.)
Pentzia, Thunb.
Chlamysperma, Ehr. in Less.
Myriogyne, Less.
Sphæropsis, DC. Pr.
Centipeda, Lour. non Less.
Machlys, DC. Pr.
Crossostephium, Less.
Div. 6. HIPPIEÆ, Less.
Abrotanella, Cass.
Blennosperma, Less.
Leptinella, Cass.
Hippia, Kunth. non Lin.
Soliva, R. et Pav.
Gymnostyles, Juss.
Solivæa, Cass.
Hippia, Lin.
Div. 7. ERIOCEPHALEÆ, Less.
Eriocephalus, Lin.
Cryptogyne, Cass.
Molochlæna, Cass.

Sub-Trib. VII. GNAPHALIEÆ, Less.
Div. 1. ANGIANTHEÆ, DC. Pr.
Styloncerus, Spreng.
Siloxerus, Labill.
Ogcereostylus, Cass.
Hyalolepis, DC. Pr.
Angianthus, Wendl.
Cassinia, Br. h. Kew, non tr. Lin.
Hirnellia, Cass.
Skirrhophorus, DC. Pr.
Gnephosis, Cass.
Calocephalus, R. Br.
Leucophyta, R. Br.
Div. 2. CASSINIEÆ, Less.
Craspedia, Forst.
Cartodium, Sol.
Richea, Labill. non Pet. Th. nec Br.
Ammobium, Br.
Ixodia, Br. non Sol.
Rhynea, DC. Pr.
Cassinia, Br. tr. Lin. non. H. K.
Chromochiton, Cass.
Achromolæna, Cass.
Apalochlamys, Cass.
Div. 3. HELICHRYSEÆ, Less.
Humea, Smith.
Calomeria, Vent.
Agathomeris, Delaun.
Oxyphæria, hortul.
Razumowia, Spreng.
Crossolepis, Less.
Quinetia, Cass.
Rutidosis, DC. Pr.
Podotheca, Cass.
Podosperma, Labill. non DC.
Phænopoda, Cass.
Leptorhynchos, Less.
Viraya, Gaud. non Blum. nec Raf. nec Adans.
Millotia, Cass.
Panætia, Cass.
Podolepis, Labill.
Scalia, Sims.
Stylolepis, Lehm.
Ozothamnus, Brown.
Faustula, Cass.
Petalolepis, Cass.
Eriosphæra, Less.
Leontonyx, Cass.
Spiralepis, Don.
Helichrysum, Less. (excl. sp.) DC.
Lepicline, Cass.
Plocamophyllum, Less.
Pentataxis, Don.
Euchloris, Don.
Leucostemma, Don.
Helipterum, DC. Pr.
Argyrocome, Gærtn.
Damironia, Cass.
Syncarpha, DC.
Roccardia, Neck.
Edmondia, Cass.
Aphelexis, Don.
Aphelexis, Boj. in DC. Pr. non Don.
Stenocline, DC. Pr.
Achyrocline, DC. Pr.
Gnaphalium, Lin. (excl. sp.) Cass.
Euchiton, Cass.
Omalotheca, Cass.
Cladochæta, DC. Pr.
Pteropogon, DC. Pr.
Lasiopogon, Cass.
Amphidoxa, DC. Pr.
Filago, Tourn. Lin. (excl. sp.)
Impia, Bluf. et Fing.
Achæritherium, Bl. et Fing.
Herotium, Bl. et Fing.
Gifola, Cass.
Oglifa, Cass.
Logfia, Cass.
Metalasia, R. Br.
Endoleuca, Cass.
Erythropogon, DC. Pr.
Lachnospermum, Willd.
Carpholoma, Don.
Elytropappus, Cass.
Disparago, Gærtn.
Wigandia, Neck.
Amphiglossa, DC. Pr.
Div. 4. SERIPHIEÆ, DC. Pr.
Stœbe, Less.
Seriphium, Less.
Eremanthis, Cass.
Perotriche, Cass.
Gymnachæna, Reichenb.
Div. 5. ANTENNARIEÆ, Less.
Trichogyne, Less.
Ifloga, Cass.
Phœnocoma, Don.
Petalacta, Don.
Petalolepis, Less. non Cass.
Anaxeton, Cass. non Schrank.
Argyranthus, Neck.
Antennaria, R. Br.
Disynanthus, Raf.
Leontopodium, R. Br.
Div. 6. LEYSSEREÆ, Less.
Athrixia, Ker.
Antithrixia, DC. Pr.
Leyssera, Lin.
Asteropterus, Vaill.
Leptophytus, Cass.
Longchampia, Willd.
Callicornia, Burm.
Pterothrix, DC. Pr.
Rosenia, Thunb.
Div. 7. RELHANIEÆ, Less.
Carpesium, Lin.
Conyzoides, Tourn.
Syncephalum, DC. Pr.
Oligodora, DC. Pr.
Nestlera, Spreng.
Columellea, Jacq. non Lour. nec R. et P.
Stephanopappus, Less.

Polychætia, Less.
Relhania, Lher. (excl. sp.) Less.
Eclopes, Gærtn.
Nanophytum, DC. Pr. Less. syn. non in Linn.
Osmites, Cass. Lin. (excl. sp.)
Bellidiastrum, Vaill. non Mich.
Osmitopsis, Cass.
Sub-Trib. VIII. SENECIONEÆ, Less. p. 387.
Div. 1. NEUROLÆNEÆ, Less.
Neurolæna, R. Br.
Calea, Gærtn.
Div. 2. ERECHTHITEÆ, DC.
Cacalieæ, Less. excl. gen.
Faujasia, Cass.
Eriothrix, Cass.
Stilpnogyne, DC. Pr.
Erechthites, Raf. Less.
Neoceis, Cass.
Cremocephalum, Cass.
Crassocephalum, Mœnch.
Div. 3. EUSENECIONEÆ, DC. Pr.
Senecioneæ, Less. p. 388.
Gynura, Cass.
Emilia, Cass.
Brachystephium, Less.
Oligothrix, DC. Pr.
Mesogramma, DC. Pr.
Cineraria, Lin. (excl. sp.) Less.
Xenocarpus, Cass.
Senecillis, Gærtn.
Ligularia, Cass. Less. non Haw.
Hoppea, Reich. non Lher.
Arnica, Lin. (excl. sp.) Cass.
Aronicum, Neck.
Grammarthron, Cass.
Doronicum, Lin.
Werneria, H. B. K.
Oresigonia, Willd.
Culcitium, H. et Bonpl.
Oresigonia, Schlect.
Gynoxys, Cass.
Cacalia, Lin. (excl. sp.) DC. Pr. non. Less.
Psacalium, Cass. DC. Pr.
Pentacalia, Cass.
Lopholœna, DC. Pr.
Kleinia, Lin. h. Clif. non Jacq. nec Pers.
Cacalia, Cass. non Tourn. nec DC.
Cacalianthemum, Dill.
Senecio, Linn. Less.
Anecio, Neck.
Jacobœa, Tourn.
Obajaca, Cass.
Eudorus, Cass.
Ætheolæna, Cass.
Carderina, Cass.
Cineraria, Cass. non. Less.
Scrobicaria, Cass.
Brachyrhynchos, Less.
Madaractis, DC. Pr.
Raillardia, Gaudich.
Bedfordia, DC.
Notonia, DC. non Wight. et Arn.
Lachanodes, DC.
Euryops, Cass.
Div. 4. BALBISIEÆ, DC. Pr.
Balbisia, DC. non Willd. nec Cav.
Ingenhouzia, Bert. non DC.
Robinsonia, DC. non Schreb.
Trib. v. CYNAREÆ, Less.
Sub-Trib. I. CALENDULACEÆ, DC. Pr.
Div. 1. CALENDULEÆ, Less.
Calendula, Lin. (excl.sp.) Cass.
Caltha, Vaill. Mœnch. non Lin.
Oligocarpus, Less.
Tripteris, Less.
Div. 2. OSTEOSPERMEÆ, DC. Pr.
Osteospermum, Lin.
Chrysanthemoides, Tourn.
Eriocline, Cass.
Div. 3. OTHONNEÆ, Less.
Heteractis, DC. Pr.
Gymnodiscus, Less.
Doria, Thunb. (excl. sp.) Less.
Othonna, Lin. (excl. sp.) Cass.
Aristotela, Adans. non Lher.
Hertia, Less. non Neck.
Ruckeria, DC. Pr.
Sub-Trib. II. ARCTOTIDEÆ, Cass. Less.
Div. 1. ARCTOTEÆ, DC. Pr.
Arctotideæ prototypæ, Cass.
Arctotis, Lin. (excl. sp.) Gærtn.
Cymbonotus, Cass.
Venidium, Less.
Haplocarpha, Less.
Landtia, Less.
Arctotheca, Wendl.
Cryptostemma, R. Br.
Cynotis, Hoffmans.
Microstephium, Less.
Div. 2. GORTERIEÆ, Cass.
Stephanocoma, Less.
Cullumia, R. Br.
Gorteria, Lin. (excl. sp.) Gærtn. non Lam.
Personaria, Lam.
Hirpicium, Cass.
Heterolepis, Cass.
Heteromorpha, Cass. non Cham.
Didelta, Lher. Less.
Favonium, Gærtn.
Cuspidia, Gærtn.
Choristeu, Thunb.
Breteuillia, Buchoz.
Aspidalis, Gærtn.
Berckheya, Ehr. Willd. Less.
Evopis, Cass.
Crocodilodes, Adans. non Vaill.
Basteria, Houtt.
Agriphyllum, Juss.
Rohria, Vahl.
Gorteria, Lam.
Zarabellia, Neck. non Cass.
Gazania, Gærtn.
Mussinia, Willd.
Melanchrysum, Cass.
Mœhnia, Neck.
Stobœa, Thunb.
Apuleia, Gærtn.
Arelina, Neck.
Sub-Trib. III. ECHINOPSIDEÆ, Less.
Echinopodeæ, Cass.
Echinops, Lin.
Echinopus, Tourn.
Echinanthus, Neck.
Acantholepis, Less.
Sub-Trib. IV. CARDOPATEÆ, Less.
Cardopatum, Juss.
Brotera, Willd. non Cav. nec Spr.
Sub-Trib. V. XERANTHEMEÆ, Less.
Xeranthemum, Tourn.
Harrisonia, Neck. non Br. nec Sims.
Chardinia, Desf.
Siebera, Gay. non Spr. nec Mohr. nec Reich. nec Schrad. nec Hopp.
Sub-Trib. VI. CARLINEÆ, Cass.
Saussurea, DC. non Mœnch.
Heterotrichum, Bieb. non DC.
Lagurostemon, Cass. Less.
Theodorea, Cass. non Med. nec Neck.
Aplotaxis, DC.
Eriostemon, Less. non Sm. nec Colla.
Dolomiæa, DC.
Arctium, Dalech. Lam. Juss. non Lin.
Arctio, Lam.
Villaria, Guett.
Berardia, Vill. non Brongn.
Stæhelina, Lin. (excl. sp.) Less
Barbellina, Cass.
Hirtellina, Cass.
Carlina, Lin.
Carlowizia, Mœnch.
Chamæleon, Cass.
Mitina, Cass.
Heracantha, Besl. non Linn
Athamus, Neck.
Atractylis, Lin. non Vaill.
Crocodilodes, Vaill. non Adans.
Acarna, Willd.
Spadactis, Less.
Cirsellium, Cass.
Anactis, Cass.

Thevenotia, DC. non Lin.
Cousinia, Cass.
Ancathia, DC.
Sub-Trib. VII. CENTAURIEÆ, DC. Cass. Less.
Amberboa, DC. Pr.
Chryseis, Cass. Less.
Amberboi, Isn.
Goniocaulon, Cass.
Cyanopsis, Cass.
Volutarella, Cass.
Lacellia, Viv.
Volutaria, Cass.
Amblyopogon, Fisch. et Mey.
Zœgea, Lin.
Microlonchus, Cass.
Mantisalca, Cass.
Crupina, Cass.
Centaurea, Lin. (excl. sp.) Less.
Centaurium, Cass.
Microlophus, Cass.
Piptoceras, Cass.
Chartolepis, Cass.
Phalolepis, Cass.
Jacea, Cass.
Platylophus, Cass.
Pterolophus, Cass.
Stenolophus, Cass.
Ætheopappus, Cass.
Stizolophus, Cass.
Psephellus, Cass.
Heterolophus, Cass.
Melanoloma, Cass.
Lopholoma, Cass.
Spilacron, Cass.
Acrolophus, Cass.
Acrocentron, Cass.
Hymenocentron, Cass.
Verutina, Cass.
Mesocentron, Cass.
Triplocentron, Cass.
Philostizus, Cass.
Seridia, Cass.
Pectinastrum, Cass.
Lepteranthus, Neck.
Cyanus, Desp. Baumg.
Crocodylium, Vaill.
Calcitrapa, Vaill.
Podia, Neck.
Calcitrapoides, Vaill.
Plectocephalus, Don.
Cnicus, Vaill. DC. Cass. non Lin.
Carbeni, Adans.
Tetramorphæa, DC.
Sub-Trib. VIII. CARTHAMEÆ, DC. Pr.
Carthamus, Lin.
Kentrophyllum, Neck. DC.
Atractylis, Vaill. non Lin.
Carthamus, Berck.
Hohenwartha, Vest.
Heracantha, Link.
Carthamus, Tourn. Cass.
Onobroma, DC. Pr. non Gærtn.
Carduncellus, Adans. DC.
Onobroma, Gærtn.
Sub-Trib. IX. SILYBEÆ, Less. non Cass.
Silybum, Vaill. Gærtn.
Galactites, Mœnch. DC.
Tyrimnus, Cass.
Sub-Trib. X. CARDUINEÆ, Less. p. 8.
Onopordon, Vaill. Lin.
Acanos, Adans.
Cynara, Vaill. Lin.
Spanioptilon, Less.
Carduus, Gærtn.
Clomium, Adans.
Clavena, DC. Pr.
Picnomon, Lob. Adans. Cass.
Acarna, Vaill. non Willd.
Picnocomon, Mey. non Link.
Cirsium, Tourn. Gærtn. DC. non Less.
Cnicus, Schreb. non Vaill.
Lophiolepis, Cass.
Eriolepis, Cass.
Onotrophe, Cass.
Orthocentron, Cass.
Breea, Less.
Cephalonoplos, Neck.
Erythrolæna, Sweet.
Chamæpeuce, P. Alp. DC. Pr.
Ptilostemon, Cass.
Lamyra, Cass.
Platyraphium, Cass.
Cirsium, Less.
Philostemon, Less.
Notobasis, Cass.
Echenais, Cass.
Lappa, Tourn. Juss. DC.
Arctium, Lin. (excl. sp.)
Sub-Trib. XI. SERRATULEÆ, Less.
Acroptilon, Cass.
Rhaponticum, DC.
Stemmacantha, Cass.
Cesirinus, Cass.
Centaurium, Hall.
Hookia, Neck.
Leuzea, DC.
Fornicium, Cass.
Rhacoma, Adans. (excl. sp.)
Alfredia, Cass.
Tricholepis, DC. Pr.
Achyropappus, Bieb. non Kunth.
Serratula, Lin. (excl. sp.) DC.
Klasea, Cass.
Mastrucium, Cass.
Jurinea, Cass.

SERIES 2ª.

LABIATIFLORÆ, DC.
Chænanthophoræ, Lag.
Perdicieæ, Spreng.
Trib. VI. MUTISIACEÆ, Less.
Mutisieæ et pars Cynar. Cass.
Sub-Trib. I. MUTISIEÆ, Less.
Div. 1. GERBERIEÆ, DC. Pr.
Schlechtendalia, Less. non Willd. nec Spr.
Barnadesia, Lin. f.
Diacantha, Lag.
Penthea, Don.?
Dasyphyllum, H. B. K.
Fulcaldea, Poir. 1827.
Turpinia, H. B. K. non Vent.
Voigtia, Spr. non Roth. nec Hores.
Dolichostylis, Cass. 1828.
Arrowsmithia, DC. Pr.
Gerbera, Gron. in Lin.
Aphyllocaulon, Lag.
Oreoseris, DC. Pr.
Berniera, DC. Pr.
Isanthus, Less. non Michx.
Lasiopus, Cass.
Div. 2. EUMUTISIEÆ, DC. Pr.
Frotovia, Spr.
Erinesa, Don.?
Seris, Less. non Willd.
Lycoseris, Cass.
Diazeuxis, Don.?
Centroclinium, Don.
Chætachlæna, Don.
Euthrixia, Don.
Chuquiraga, Juss.
Johannia, Willd.
Spadonia, Less.
Gochnatia, H. B. K.
Anastraphia, Don.
Stifftia, Mik.
Augusta, Leand. non Pohl.
Sanhilaria, Leand.
Mutisia, Lin.
Guariruma, Cass.
Aplophyllum, Cass.
Proustia, Lag.
Harmodia, Don.
Chætanthera, R. et Pav. non Bonpl.
Cherina, Cass.
Proselia, Don.
Bichenia, Don.
Tylloma, Don.
Trichocline, Cass.
Onoseris, DC. non Don.
Hipposeris, Cass.
Isotypus, H. B. K.
Seris, Willd. non Less.
Oldenburgia, Less.
Leucomeris, Don.
Ainsliæa, DC. Pr.
Liatris, Don. non Schr.
Myripnois, Bung.

Dicoma, Less.
Macledium, Cass.
Nitelium, Cass.
Printzia, Cass.
Perdicium, Lin. (excl. sp.) Lag.
Pardisium, Burm.
Anandria, Sieg. Lin. Less.
Leibnitzia, Cass.
Sub-Trib. II. LERIEÆ, Less.
Chaptalia, Vent.
Leria, DC.
Lieberkuhnia, Cass.
Oxydon, Less.
Loxodon, Cass.
Chevreulia, Cass.
Sub-Trib. III. FACELIDEÆ, Less.
Lucilia, Cass.
Oligandra, Less.
Facelis, Cass.
Trib. VII. NASSAUVIACEÆ, Less.
Nassauvieæ, Cass.
Sub-Trib. I. NASSAUVIEÆ, Less.
Nassauvieæ prototypæ, Cass.
Nassauvia, Comm. in Juss. non Arrab.
Mastigophorus, Cass.
Triachne, Cass.
Triptilion, R. et Pav.
Pentanthus, Less.
Caloptilium, Lag.
Sphærocephalus, Lag. in DC. non alior.
Panargyrus, Lag.
Polyachyrus, Lag.
Bridgesia, Hook.
Sub-Trib. II. TRIXIDEÆ, Cass.
Cadiscus, E. Mey.?
Pamphalea, Lag.
Cephalopappus, Nees. et Mart.
Pleocarphus, Don.
Jungia, Lin. f. non Lœfl. nec Gærtn. nec Heist.
Rhinactina, Willd. non Less.
Trinacte, Gærtn.
Dumerilia, Lag. DC. non Less.
Martrasia, Cass.
Gastrocarpha, Don.
Moscharia, R. et Pav. non Heist. nec Forsk.
Moschifera, Mol.
Mosigia, Spreng.
Leuceria, Lag. in DC.
Cassiopea, Don.
Chabræa, DC.
Lasiorhiza, Lag. excl. sp.
Ptilurus, Don.
Dumerilia, Less. non Lag.
Trixis, P. Brown non Mitch. nec Sw.
Alcithoe, Don.
Cleanthes, Don.
Clarionea, DC.
Perezia, Less.
Drozia, Cass.
Homoianthus, DC.
Clarionea, Cass. non DC.
Perezia, Lallav. non Cass.
Acourtia, Don.
Pogonura, DC. Pr.

SERIES 3ª.

LIGULIFLORÆ, DC.
Trib. VIII. CICHORACEÆ, Vaill. Juss. Less.
Lactuceæ, Cass.
Sub-Trib. I. SCOLYMEÆ, Less.
Scolymus, Lin.
Scolymus, Cass.
Miscolus, Cass.
Sub-Trib. II. LAMPSANEÆ, Less.
Lampsana, Vaill. Juss.
Lapsana, Lin.
Rhagadiolus, Tourn. Gærtn.
Kœlpinia, Pall.
Soldevilla, Lag.?
Sub-Trib. III. HYOSERIDEÆ, Less.
Arnoseris, Gærtn.
Hyoseris, Lin. (excl. sp.) Gærtn.
Hedypnois, Tourn. Gærtn.
Achyrastrum, Neck.
Aposeris, Neck. Cass.
Catananche, Lin.
Acanthophyton, Less.
Cichorium, Lin.
Tolpis, Adans. Gærtn.
Drepania, Juss.
Swertia, Ludw. non Lin.
Chatelania, Neck.
Schmidtia, Mœnch.
Æthionia, Don.
Polychætia, Tausch.
Krigia, Schreb.
Cynthia, Don.
Adopogon, Neck.
Sub-Trib. IV. HYPOCHÆRIDEÆ, Less.
Hypochæris, Lin. (excl. sp.)
Achyrophorus, Scop. Gærtn.
Seriola, Lin.
Porcellitis, Sp. Cass.
Piptopogon, Cass.
Agenora, Don.
Rodigia, Spr.
Robertia, DC.
Sub-Trib. V. SCORZONEREÆ, Less.
Thrincia, Roth.
Colobium, Roth.
Leontodon, Lin. (excl. sp.) DC.
Virea, Adans.
Apargia, Willd. excl. sp.
Antodon, Neck.
Apargia, Less. non Scop.
Oporina, Don.
Scorzoneroides, Mœnch.
Millina, Cass.
Geropogon, Lin.
Podospermum, DC.
Reichardia, Roth. cat. non Roth. nov. sp.
Podosperma, Less. non Labill.
Tragopogon, Lin.
Arospermum, Scop. Juss.
Arnopogon, Willd.
Hymenomena, Cass.
Scorzonera, Lin. (excl. sp.) DC.
Galasia, Cass.
Lasiospora, Cass.
Lasiospermum, Fisch. non Lag.
Picris, Lin. (sp. excl.) Juss.
Helminthia, Juss.
Helminthotheca, Vaill.
Sub-Trib. VI. LACTUCEÆ, Less.
Lactuca, Lin.
Mycelis, Cass.
Chondrilla, Lin. excl. sp.
Taraxacum, Hall, DC.
Leontodon, Willd.
Willemetia, Neck.
Calycocorsus, Schmidt.
Zollikoferia, Nees.
Wibelia, Hoppe.
Ixeris, Cass.
Barckhausia, Mœnch. DC.
Hostia, Mœnch. non alior.
Paleya, Cass.
Crepis, Lin. (excl. sp.) DC.
Berinia, Brign.
Brachyderea, Cass.
Calliopea, Don.
Omalocline, Monn.
Intybus, Fries.
Intybellia, Cass.
Phæcasium, Cass.
Ætheorhiza, Cass.
Troximon, Don.
Phænixopus, Cass.
Prenanthes, Lin. (excl. sp.) Gærtn.
Harpalyce, Don. non DC.
Nabalus, Cass.
Lygodesmia, Pursh.
Atalanthus,
Zacintha, Gærtn.
Nemauchenes, Cass.
Gatyona, Cass.
Lomatolepis, Cass.
Microrhynchus, Less.
Lomatolpis, Cass.
Macrorhynchus, Less.

Lagoseris, Bieb.
Pterotheca, Cass.
Pachylepis, Less.
Sclerolepis, Monn. non Cass.
Sonchus, Lin.
Picridium, Desf.
Closiospermum, Neck.

Sub-Trib. VII. HIERACIEÆ, Less.
Hieracium, Lin.
Miegia, Neck.
Plancia, Neck.
Lepicaunes, sp. Lapeyr.
Andryala, Lin. (excl. sp.)
Voigtia, Roth.
Rothia, Schreb. non alior.

Aracium, Neck.
Stenotheca, Monn.
Mulgedium, Cass.
Agathyrsus, Don.
Soyeria, Monn.
Catonia, Mœnch.
Hapalostephium, Don.
Lepicaune, Lapeyr. excl. sp.
Picrosia, Don.
Pinaropappus, Less.

† *Genera non satis cognita, aut incertæ sedis.*

1°. *ad Tubulifloras*, referenda.
Abasoloa, Lallav. et Lex.
Aganippea, Fl. Mex. ic. ined.
Allendea, Lallav. et Lex.
Damatris, Cass.
Dimerostemma, Cass.
Galeana, Lallav. et Lex.
Galophthalmum, Nees et Mart.
Glyphia, Cass.
Gomezia, Lallav. non Brown.
Heliophthalmum, Raf.
Jaumea, Pers.
Kleinia, Juss. non Lin. nec Jacq.
Lioydia, Neck.
Microspermum, Lag.
Mnesiteon, Raf.
Oteiza, Lallav. et Lex.
Peramibus, Raf.
Placus, Lour.
Roldana, Lallav. et Lex.
Rosalesia, Lallav. et Lex.
Trimetra, Fl. Mex. ic. ined.

2°. *ad Labiatifloras.*
Atractylodes, Less. Syn. p. 125.
Dolichlasium, Lag.
Pentaphorus, Don.
Plazia, R. et Pav.

3°. *ad Ligulifloras.*
Agoseris, Raf.
Anisoderis, Cass.
Apatanthus, Viv.
Apogon, Ell.
Asterothrix, Cass.
Deloderium, Cass.
Rhabdotheca, Cass.

Genera not in the List furnished by Professor De Candolle.

Scalesia, Arnott. (38)
Eriopappus, Arnott. (39)
Rancagua, Endl. et Popp.; next Hymenatherum.
Ammogeton, Schrad.
Dipterocome, F. et Meyer.
Heteracia, F. et Meyer.
Cyathidium, Lindl.; next Aplotaxis.
Microseris, Don.
Lepidonema, F. et Meyer.
Acanthophyllum, H. et Arn.; next Triptilion.
Pachylæna, Don.; next Chætanthera.
Hyalis, Don.; next Proustia.
Piptocarpha, H. et Arn.; next Flotovia.
Townsendia, Hooker.

ALLIANCE II. *DIPSALES.*

ESSENTIAL CHARACTER.—*Anthers* distinct. *Ovary* inferior. *Flowers* either in dense heads or loose.

ORDER CXCV. DIPSACEÆ. THE SCABIOUS TRIBE.

DIPSACEÆ, *Juss. Gen.* 194. (1789); *DC. et Duby Bot. Gall.* 255. (1828); *Lindl. Synops.* 139. (1829); *Coulter. Mem. in Act. Genev.* 2. 13. (1823); *DC. Prodr.* 4. 643. (1830).

ESSENTIAL CHARACTER.—*Calyx* superior, membranous, resembling pappus; surrounded by a scarious involucel. *Corolla* monopetalous, tubular, inserted in the calyx; *limb* oblique, 4- or 5-lobed, with an imbricated æstivation. *Stamens* 4, alternate with the lobes of the corolla; *anthers* distinct. *Ovary* inferior, 1-celled, with a single pendulous ovule; *style* 1; *stigma* simple. *Fruit* dry, indehiscent, 1-celled, crowned by the pappus-like calyx; *embryo* straight, in the axis of fleshy albumen; *radicle* superior.—*Herbaceous* plants or *under-shrubs*. *Leaves* opposite or whorled. *Flowers* collected upon a common receptacle, and surrounded by a many-leaved *involucre*.

AFFINITIES. The relation of this family is obviously in the first degree with Compositæ, from which it differs in its distinct stamens and its pendulous

albuminous seeds; and next with Calyceraceæ, which have connate anthers and alternate leaves. The same character of the capitate flowers, and the presence of albumen, forms the distinction between Dipsaceæ and Valerianaceæ. What is called the involucel is a curious organ, resembling an external calyx, and is to each particular flower of the head of Dipsaceæ what the partial involucre of Umbelliferæ is to each partial umbel; and, accordingly, we ought to expect to find instances of more flowers than one being enclosed within this involucel; and this is said by Coulter actually to take place in the genus Gundelia. This is, however, not the only peculiarity of the order. Brown has the following curious remarks.

"M. Auguste Saint Hilaire, in his excellent memoir on Primulaceæ, while he admits the correctness of M. De Candolle's account with respect to great part of Dipsaceæ, has at the same time well observed, that in several species of Scabiosa the ovarium is entirely united with the tube of the calyx. But neither of these authors has remarked the curious, and I believe peculiar, circumstance, of the base of the style cohering with the narrow apex of the tube of the calyx, even in those species of the order in which the dilated part of the tube is entirely distinct from the ovarium. This kind of partial cohesion between pistillum and calyx is directly opposite to what usually takes place, namely, the base of the ovarium being coherent, while its upper is distinct. It equally, however, determines the apparent origin or insertion of corolla and stamina, producing the unexpected combination of 'flos superus' with ovarium 'liberum.'" *Linn. Trans.* 12. 138.

Geography. Chiefly natives of the south of Europe, Barbary, the Levant, and the Cape of Good Hope; not affecting particular stations in any striking degree, except that they generally shun cold, and do not attain much elevation above the sea. *Coulter.*

Properties. Unimportant. The Teasel used by fullers in dressing cloth is the dried head of Dipsacus fullonum. Some of them are reputed febrifugal Scabiosa succisa is said to yield a green dye, and also to be astringent enough to deserve the attention of tanners. *Gmel. Fl. Bad.* 1. 319.

GENERA.

§ 1. Morineæ, DC.
Morina, Tourn.
Diotheca, Vaill.

§ 2. Scabioseæ, DC.
Dipsacus, Tourn.
Cephalaria, Schrad.
Lepicephalus, Lag.
Carionanthus, Schot.
Succisa, Vaill. Wallr.
Picnocomon, Wallr.
Knautia, Coult.
Trichera, Schrad.
Pterocephalus, Vaill.
Scabiosa, R. et S.
Asterocephalus, Vail.
Sclerostemma, Schot.
Spongostemma, Rchb.

Order CXCVI. VALERIANACEÆ. The Valerian Tribe.

Valerianeæ, *DC. Fl. Fr.* ed. 3. v. 4. p. 232. (1815); *Dufr. Valer. Monogr.* 56. (1811); *Lindl. Synops.* 137. (1829); *DC. Prodr.* 4. 623. (1830); *Royle's Illustrations*, 241. (1835).

Essential Character.—*Calyx* superior; the *limb* either membranous, or resembling pappus. *Corolla* monopetalous, tubular, inserted into the top of the ovary, with from 3 to 6 lobes, either regular or irregular, sometimes calcarate at the base. *Stamens* from 1 to 5, inserted into the tube of the corolla, and alternate with its lobes. *Ovary* inferior, with 1 cell, and sometimes 2 other abortive ones; *ovule* solitary, pendulous; *style* simple; *stigmas* from 1 to 3. *Fruit* dry, indehiscent, with 1 fertile cell and 2 empty ones. *Seed* solitary, pendulous; *embryo* straight, destitute of albumen; *radicle* superior.—*Herbs. Leaves* opposite, without stipules. *Flowers* corymbose, panicled, or in heads.

Affinities. Distinguished from Dipsaceæ by their flowers not being in

heads, by the want of albumen, by sensible properties, and the absence of an involucel.

Geography. Natives of most temperate climates; sometimes at considerable elevations. They are abundant in the north of India, Europe, and South America, but uncommon in Africa and North America.

Properties. The roots of Valeriana officinalis, Phu, and celtica, are tonic, bitter, aromatic, antispasmodic, and vermifugal; they are even said to be febrifugal. The scent of these roots is not agreeable to a European; and yet those of some species are highly esteemed as perfumes. Eastern nations procure from the mountains of Austria the Valeriana celtica to aromatise their baths; the Nardostachys Jatamansi, or true Spikenard of the ancients, is valued in India, not only for its scent, but also as a remedy in hysteria and epilepsy. The young leaves of the species of Valerianella are eaten as salad, under the French name of Mâche, or the English one of Lamb's Lettuce. Red Valerian is also eaten in the same way in Sicily. See *Royle*, p. 242, for an elaborate dissertation upon the *Nard* of the ancients. *DC.*

GENERA.

Patrinia, Juss.
Mouffeta, Neck.
Gytonanthus, Rafin.
Nardostachys, DC.
Dufresnea, DC.
Valerianella, Mœnch.
Odontocarpa, Neck.
Astrephia, Dufr.
Hemesotria, Raf.
Fedia, Mœnch.
Mitrophora, Neck.
Plectritis, Lindl.
Centranthus, DC.
Kentranthus, Neck.
Valeriana, Neck.
Phyllactis, Dufr.
Astrephia, Dufr.
Oligacoce, Willd.
Betckea, DC.
Triplostegia, Wall.

Alliance III. *BRUNONIALES.*

Essential Character.—*Style* single. *Stigma* with an indusium. *Flowers* in dense heads.

Order CXCVII. BRUNONIACEÆ.

Goodenoviæ, § 2. *R. Brown Prodr.* 589. (1810).

Essential Character.—*Calyx* inferior, in 5 divisions, with 4 bracts at the base. *Corolla* monopetalous, almost regular, 5-parted, inferior, withering. *Stamens* definite, hypogynous, alternate with the segments of the corolla; *anthers* collateral, slightly cohering. *Ovary* 1-celled, with a single erect ovule; *style* single; *stigma* enclosed in a 2-valved cup. *Fruit* a membranous utricle enclosed within the indurated tube of the calyx. *Seed* solitary, erect, without *albumen*; *embryo* with plano-convex fleshy *cotyledons*, and a minute inferior *radicle*.—*Herbaceous* plants, without stems, and simple glandless hairs. *Leaves* radical, entire, with no stipules. *Flowers* on scapes collected in heads, surrounded by enlarged bracts, blue.

Affinities. Placed by Brown as a section of Goodeniaceæ, from which this order, in my judgment, differs essentially in the superior 1-celled ovary and capitate flowers, thus approaching some species of Dipsaceæ, but differing in the want of an involucel, the erect ovule, superior ovary, and peculiar stigma. With reference to this, Brown says: "Brunonia agrees with Goodenoviæ in the remarkable indusium of the stigma, in the structure and connexion of the antheræ, in the seed being erect, and essentially in the æstivation of corolla. It differs from them in having both calyx and corolla distinct from the ovarium, in the disposition of vessels in the corolla, in the filaments being jointed at top, in the seed being without albumen, and in its remarkable inflorescence, compatible, indeed, with the nature of the irregularity in the corolla of Goodenoviæ, but which can hardly co-exist with that

characterising Lobeliaceæ. With Compositæ it agrees essentially in inflorescence, in the æstivation of corolla, in the remarkable joint or change of texture in the apex of its filaments, and in the structure of the ovarium and seed. It differs from them in having ovarium liberum or superum, in the want of a glandular disk, in the immediately hypogynous insertion of the filaments, in the indusium of the stigma, and in the vascular structure of the corolla, whose tube has five nerves only, and these continued through the axes of the laciniæ, either terminating simply (as is at least frequently the case in Brunonia sericea), or (as in B. australis) dividing at top into two recurrent branches, forming lateral nerves, at first sight resembling those of Compositæ, but which hardly reach to the base of the laciniæ. It is a curious circumstance that Brunonia should so completely differ from Compositæ in the disposition of vessels of the corolla, while both orders agree in the no less remarkable structure of the jointed filament; a character which had been observed in a very few Compositæ only, before the publication of M. Cassini's second Dissertation, where it is proved to be nearly universal in the order. In the opposite parietes of the ovarium of Brunonia two nerves or vascular cords are observable, which are continued into the style, where they become approximated and parallel. This structure, so nearly resembling that of Compositæ, seems to strengthen the analogical argument in favour of the hypothesis advanced in the present paper, of the compound nature of the pistillum in that order, and of its type in phænogamous plants generally; Brunonia having an obvious and near affinity to Goodenoviæ, in the greater part of whose genera the ovarium has actually two cells with one or an indefinite number of ovula in each; while in a few genera of the same order, as Dampiera, Diaspasis, and certain species of Scævola, it is equally reduced to one cell and a single ovulum." *R. Brown in Linn. Trans.* 12. 132. The habit of this order is very much that of Globulariaceæ.

Geography. Natives of New Holland.

Properties. Unknown.

GENUS.

Brunonia, R. Rr.

Alliance IV. *PLANTALES.*

Essential Character.—*Style* single: *Stigma* without an indusium. *Flowers* in dense heads or spikes, or panicled. *Ovary* superior.

Order CXCVIII. PLANTAGINACEÆ. The Rib-Grass Tribe.

Plantagines, *Juss. Gen.* 89. (1789).—Plantagineæ, *R. Brown Prodr.* 423. (1810); *Lindl. Synops.* 169. (1829).

Essential Character.—*Flowers* usually hermaphrodite, seldom unisexual. *Calyx* 4-parted, persistent. *Corolla* membranous, monopetalous, hypogynous, persistent, with a 4-parted limb. *Stamens* 4, inserted into the corolla, alternately with its segments; *filaments* filiform, flaccid, doubled inwards in æstivation; *anthers* versatile, 2-celled. *Ovary* sessile, without a disk, 2-, very seldom 4-celled, the cells caused by the growth of spurious dissepiments; *ovules* peltate or erect, solitary, twin, or indefinite; *style* simple, capillary; *stigma* hispid, simple, rarely half-bifid. *Capsule* membranous, dehiscing transversely. *Seeds* sessile, peltate, or erect, solitary, twin, or indefinite; *testa* mucilaginous; *embryo* in axis of fleshy albumen; *radicle* inferior; *plumula* inconspicuous.—*Herbaceous* plants,

usually stemless, occasionally with a stem; *hairs* simple, articulated. *Leaves* flat and ribbed, or taper and fleshy. *Flowers* in spikes, rarely solitary.

Anomalies. In Littorella the flowers are solitary.

Affinities. By Jussieu this is considered apetalous, the corolla being called calyx, and the calyx bracts. But this appears so contrary to all analogy, that it is impossible to adopt the opinion. To this order Plumbaginaceæ seems to be more near than any other, agreeing in habit, and also in the general structure of the flower, but differing in having a 1-celled ovary, with a solitary ovule, and several stigmas. Don (*Jameson's Journal, Jan.* 1830, p. 166) refers Glaux to Plantaginaceæ, "where it will form the connecting link between that family and Primulaceæ."

Geography. Scattered over the whole world, in almost every quarter of which they are found in one situation or another.

Properties. The herbage is slightly bitter and astringent, and they have even been reckoned febrifuges. Their seeds are covered with mucus. According to De Candolle, those of P. arenaria are exported in considerable quantities from Nismes and Montpellier to the north of Europe, and are supposed to be consumed in the completion of the manufacture of muslins. The seeds of Plantago Ispaghula are of a very cooling nature, and, like those of Plantago Psyllium, form, with boiling water, a rich mucilage, which is much used in India in catarrh, gonorrhœa, and nephritic affections. *Ainslie*, 2. 116.

GENERA.

Plantago, L.
Psyllium, Juss.
Littorella, L.

Order CXCIX. GLOBULARIACEÆ.

Globularineæ, *DC. Fl. Fr.* 3. 427. (1815); *Cambessédes in Ann. des Sciences*, 9, 15. (1826); *Link. Handb.* 1. 675. (1829).

Essential Character.—*Calyx* persistent, 5-cleft, usually equal, sometimes 2-lipped. *Corolla* hypogynous, tubular, bilabiate, rarely 1-lipped, made up of 5 petals. *Stamens* 4, the uppermost being wanting, arising from the top of the tube of the corolla, somewhat didynamous; *anthers* reniform, bursting longitudinally, the 2 cells confluent into 1. *Ovary* superior, 1-celled, with a single pendulous *ovule; style* filiform, emarginate at the apex. *Fruit* small, indehiscent, pointed with the persistent style. *Albumen* fleshy; *embryo* straight, in its axis; *radicle* superior, about as long as the ovate *cotyledons.*—*Shrubs* or small low *under-shrubs* or perennial *herbs*. *Leaves* alternate, often fascicled, turning black in drying. *Flowers* collected in small heads, upon a convex paleaceous receptacle.

Affinities. These were placed near Primulaceæ both by Jussieu and De Candolle; but their closest affinity is now known to be with Dipsaceæ, with which Globulariaceæ agree in a multitude of particulars, especially in habit, but differ in having a superior ovary, and in so little besides, that it may be doubted whether, considering the peculiar nature of the cohesion of the calyx and ovary of Dipsaceæ, they and Globulariaceæ are not the same family. They were united by Lamarck in the same order as Proteaceæ.

Geography. Natives of the hot and temperate parts of Europe; Dantzic is their most northern station.

Properties. Bitter, tonic, and purgative herbaceous plants.

GENUS.

Globularia, L.
Alypum, Tourn.

Order CXCIX.* SALVADORACEÆ.

Essential Character.—*Calyx* inferior, 4-leaved, minute. *Corolla* membranous, monopetalous, 4-parted. *Stamens* 4, connecting the petals into a monopetalous corolla; *anthers* round, 2-celled, bursting longitudinally. *Ovary* superior, 1-celled, with a single sessile stigma; *ovule* solitary, erect. *Pericarp* berried; 1-celled, indehiscent. *Seed* solitary, erect. *Embryo* amygdaloid, without albumen; *cotyledons* fleshy, plano-convex, fixed a little below their middle to a long axis, the radicle of which is enclosed within their bases.—*Shrubs*, with the stem slightly tumid at the articulations. *Leaves* opposite, leathery, entire, very obscurely veined. *Flowers* minute in loose panicles.

Affinities. By one author referred to Chenopodiaceæ or Amarantaceæ, notwithstanding its monopetalous corolla and embryo, by another to Myrsinaceæ, notwithstanding the position of its stamens and the structure of ovary and seeds, this plant appears to be in reality the type of a quite distinct order, the true relation of which is with Plumbaginaceæ and Plantaginaceæ. With the latter it agrees in the number of the parts of its flower, its membranous corolla and simple style; with the former more in habit, and especially in the leaves, which are much like those of a Statice. It, however, differs essentially in its polysepalous calyx, amygdaloid embryo, opposite leaves, and berried pericarp. In habit it agrees with Galenia, and this has probably been the cause of its having found its way to Chenopodiaceæ.

Geography. Indian and North African plants.

Properties. Fruit eatable.

GENUS.

Salvadora, L.

Alliance V. *PLUMBALES.*

Essential Character.—*Styles* 5. *Flowers* formed upon a quinary plan. *Ovary* superior.

Order CC. PLUMBAGINACEÆ. The Leadwort Tribe.

Plumbagines, *Juss. Gen.* 92. (1789).—Plumbagineæ, *R. Brown Prodr.* 425. (1810).

Essential Character.—*Calyx* tubular, plaited, persistent. *Corolla* monopetalous or 5-petalous, regular. *Stamens* definite; in the monopetalous species hypogynous! in the polypetalous arising from the petals! *Ovary* superior, single, 1-seeded; *ovule* inverted, pendulous from the point of an umbilical cord, arising from the bottom of the cavity; *styles* 5! seldom 3 or 4; *stigmas* the same number. *Fruit* a nearly indehiscent utricule. *Seed* inverted; *testa* simple; *embryo* straight; *radicle* superior.—*Herbaceous* plants or *under-shrubs*, variable in appearance. *Leaves* alternate or clustered, undivided, somewhat sheathing at the base. *Flowers* either loosely panicled, or contracted into heads, flowering irregularly.

Affinities. Distinguished from all other monopetalous orders by their plaited calyx and solitary ovule, suspended from the apex of a cord which arises from the base of a 1-celled ovary, with several stigmas. From Plantaginaceæ they are otherwise chiefly known by their inflorescence not being simply spiked, and their albumen not fleshy. The economy of the ovule is highly curious; before fecundation it is suspended from the apex of a cord, or rather strap, which lies over the foramen or orifice through which the vivifying influence of the pollen has to be introduced; this foramen is presented to

the summit of the cell immediately below the origin of the stigmas, but has no communication with that part of the cell, from contact with which it is further cut off by the overlying strap: but as soon as the pollen exercises its influence upon the stigmas, the strap slips aside from above the foramen, which is entered by an extension of the apex of the cell, and thus a direct communication is established between the pollen and the inside of the ovule. This phenomenon is obscurely hinted at by several writers, but was first distinctly shewn me by Brown, and has since been beautifully illustrated by Mirbel, *Nouvelles Recherches sur l'Ovule*, tab. 4. Nyctaginaceæ are distinguished by their curved embryo, want of petals, and coloured calyx, the base of which hardens and contracts an adhesion with the pericarp, which is finally absorbed.

Geography. Many are inhabitants of the salt marshes and sea coasts of the temperate parts of the world, particularly of the basin of the Mediterranean and the southern provinces of the Russian empire; others grow from Greenland and the mountains of Europe, to the sterile volcanic regions of Cape Horn. A few are found within the tropics; of these Plumbago zeylanica extends from Ceylon to Port Jackson, and Ægialitis grows among the Mangroves of northern Australasia.

Properties. This order contains plants of very opposite qualities; part are tonic and astringent, and part acrid and caustic in the highest degree. The root of Statice caroliniana is one of the most powerful astringents in the vegetable materia medica. *Bigelow*, 2. 55. The bruised fresh bark of the root of Plumbago zeylanica acts as a vesicatory, and is applied in India to buboes in their incipient state. *Ainslie*, 2. 77. Plumbago europæa is employed by beggars to raise ulcers upon their bodies to excite pity; and Plumbago scandens is remarkably acrid. Plumbago europæa is said by Duroques to have been used with considerable advantage in cases of cancer, for which purpose the ulcers were dressed twice daily with olive oil in which the leaves had been infused. *Ibid.* 2. 78. Plumbago scandens is called, on account of these properties, Herbe du Diable in St. Domingo. As garden plants, nearly the whole of the order is much prized for beauty, particularly the Statices, many of which are among the most lovely herbaceous plants we know.

GENERA.

Plumbago, L.	Ceratostigma, Bye.	Statice, L.	Armeria, Willd.
Thela, Lour.?	Ægialitis, R. Br.	*Taxanthema*. Neck.	
Vogelia, Lam.		R. Br.	

Group IV. Nucamentoseæ.

Essential Character.—*Fruit* consisting of several (usually 4) lobes which are either originally distinct or separate from each other when ripe, without any trace of a central placenta; if capsular, then with the inflorescence gyrate. *Æstivation* of corolla never plaited.

Under this character is assembled a collection of orders allied to each other in the most intimate manner, and so distinctly characterized, that but few remarks are necessary to explain their limits. It is, in the first place, to be remarked, that the æstivation of the corolla is never plaited; otherwise, Nolanaceæ, which can by no means be separated far from Convolvulaceæ, would belong to this group. Secondly, whenever the carpels are combined or lobeless, as in Verbenaceæ, &c. the fruit finally separates into little nuts

without leaving any central placenta behind. This arises from the style originating, in reality, in all cases from the base of the carpels, as it manifestly does in Boraginaceæ and Labiatæ. Thirdly, in the case of Hydrophyllaceæ, in which the nucamentaceous character gives way, a gyrate inflorescence points out the connection between these plants and Boraginaceæ. No mistake as to this character can be made, unless in regard to Hydroleaceæ; but that order has several styles, and therefore has fruit composed of more carpels than two.

Alliance I. *PHACELIALES.*

Essential Character.—*Fruit* capsular. *Inflorescence* gyrate.

Distinguished from Echiales by the capsular nature of the fruit, but united with them, by the greater part of the other characters.

Order CCI. HYDROPHYLLACEÆ. The Waterleaf Tribe.

R. Brown. Prodr. 1. 492. (1810); *without a name.*—Hydrophylleæ, *Von Martius N. G. et Sp.* 2. 138. (1828); *Link. Handb.* 1. 570. (1829), a § *of* Cordiaceæ; *Bentham in Linn. Trans.* 17. 267. (1834).

Essential Character.—*Calyx* inferior, persistent, deeply 5-cleft; the recesses usually augmented with reflexed appendages. *Corolla* monopetalous, hypogynous, regular, shortly 5-cleft, between campanulate and rotate, rarely funnel-shaped. *Stamens* 5, epipetalous, alternate with the segments of the corolla, inflected in æstivation; *anthers* versatile, 2-celled, the cells parallel dehiscing longitudinally. *Ovary* superior, simple, 1-celled; *style* long, 2-cleft; *stigmas* 2, terminal; *placenta* 2, free at their back or united to the shell of the ovary, with two or many ovules on their inner face. *Fruit* capsular, 2-valved, sometimes 1-celled, with a large placenta filling the capsule, sometimes somewhat 2-celled, with the dissepiments incomplete. *Seeds* reticulated; *albumen* abundant, cartilaginous; *embryo* conical with its radicle next the hilum. — American *herbaceous* plants, hispid like Boraginaceæ. *Leaves* usually lobed, alternate, or the lower ones opposite. *Flowers* arranged in gyrate racemes or unilateral spikes, or occasionally solitary and stalked in the axils of the leaves. *Bentham.*

Affinities. Very near Boraginaceæ and the orders which have been recently separated from it, with which Hydrophyllaceæ agree in the roughness of their leaves and many other marks of obvious resemblance. They are, however, known by their undivided 1-celled ovary, terminal style or styles, and ovules (if definite) attached to two stalked fungous placentæ, which arise from the base of the cell, having their ovules on their inner face, or (if indefinite) attached to parietal placentæ. They are further characterised by the presence, at the base of each lobe of the corolla, of 2 scales or lamellæ the nature of which is unknown. The former mode of placentation is highly curious, and, as far as I know, unlike that of any other plants. Many Polemoniaceæ have very much the habit of Hydrophyllaceæ. Bentham, who has recently re-examined this order, has the following remarks.

"I have never observed in Hydrophylleæ any trace of those corolline appendages, or squamæ, which may be termed laminal, from their position at the base of the limb of many infundibuliform corollæ, whether monopetalous (as Borragineæ) or polypetalous (as Caryophylleæ); but the unguicular or tubal squamæ are often remarkably prominent. These squamæ are analogous to those placed at the base of the tube of many Borragineæ (having at the same time ligular squamæ at the mouth of the tube) and to the annulus of hairs or scales in the tube of many Labiatæ. The laminal squamæ are evidently

of no organic importance, but mere excrescences of the petals, showing an approach to a transformation analogous to that by which the ligulæ are converted into anthers, but for a different purpose, whatever that purpose may be. But many circumstances might induce a supposition that the case may be different with regard to the tubal squamæ. Their origin is always below that of the stamina, and in some cases (as in Emmenanthe and some Eutocæ) they appear to be connected with the filaments of the stamina in a manner analogous to the abortive filaments in pentandrous Caryophylleæ, Paronychieæ, and Amaranthaceæ. On the other hand, like the ligular squamæ, although constant in form in the same species, they vary much in the most natural genera, such as Ajuga, Salvia, and Stachys in the Labiatæ, Echium in Borragineæ, or Eutoca and Phacelia in Hydrophylleæ, being present or absent in two species otherwise very closely allied. In Hydrophylleæ, their form is very variable. In general their centre is entirely blended with the corolla, and their broad dilated margins, embracing the basis of the filaments, are alone visible; but in the genus Hydrophyllum they appear to be constantly linear, adnate along the back, but free at the upper extremity and the margins. In Emmenanthe and some Eutocæ, as also in Echium vulgare and several Cynoglossa, they are reduced to ten very small orbicular squamæ, placed quite at the base of the corolla; and in Eutoca grandiflora and parviflora, Phacelia fimbriata, and some others, they disappear entirely, a transverse nerve connecting the base of the stamina alone indicating their usual position." *Linn. Trans.* 17. 269.

Geography. American herbaceous plants, found either in the north or among the most southern of the southern provinces; not known beyond that continent.

Properties. Unknown.

GENERA.

Hydrophyllum, L.	Nemophila, Barton.	Phacelia, Juss.	Emmenanthe, Benth.
Ellisia, L.	Eutoca, R. Br.	*Aldea*, R. et P.	

Alliance II. *ECHIALES.*

Essential Character.—*Fruit* nucamentaceous. *Inflorescence* gyrate. *Flowers* symmetrical.

Order CCII. CORDIACEÆ.

R. Brown Prodr. 492. (1810), *without a name; Martius N. G. et Sp.* 2. 138. (1828), *without a name.*—Cordiaceæ, *Link Handb.* 1. 569. (1829).—Arguziæ, *ib.*

Essential Character.—*Calyx* inferior, 5-toothed. *Corolla* monopetalous, with the limb in 5 divisions. *Stamens* alternate with the segments of the corolla, out of which they arise; *anthers* versatile. *Ovary* superior, 4-celled, with 1 pendulous ovule in each cell; *style* continuous; *stigma* 4-cleft, with recurved segments. *Fruit* drupaceous, 4-celled; part of the cells frequently abortive. *Seed* pendulous from the apex of the cells by a long funiculus, upon which it is turned back; *embryo* inverted, with the *cotyledons* plaited longitudinally; *albumen* 0.—*Trees.* *Leaves* alternate, scabrous, without stipules, of a hard harsh texture. *Flowers* panicled, with minute bracts.

Affinities. The plaited cotyledons and dichotomous style first induced the separation of this order from Boraginaceæ, with which it was formerly associated, chiefly, it is to be supposed, on account of the roughness of the leaves. Von Martius remarks, that it is in fact much nearer Convolvu-

laceæ, from which it differs in its inverted embryo and drupaceous fruit. *Nov. Gen. l. c.*

Geography. Natives of the tropics of both hemispheres.

Properties. The flesh of their fruit is succulent, mucilaginous, and emollient, as is seen in the Sebesten Plums, the produce of Cordia Myxa and Sebestena.

GENERA.

Cordia, L.
Varronia, L.
Cerdana, R. et P.
Patagonula, L.
Cordiopsis, Hamilt.
Erycibe, Roxb.
Erimatalia, Schultes.

Order CCIII. EHRETIACEÆ.

Ehretiaceæ, *Martius N. G. et Sp.* 2. 136. (1828); *Martius Conspectus, No.* 126. (1835).—Heliotropiceæ, *Id.* 2. 75. et 138. (1828).—Asperifoliæ b. Heliotropiceæ, *Id. Conspectus. No.* 118. (1835).

Essential Character.—*Calyx* inferior, 5-parted, imbricated in æstivation. *Corolla* monopetalous, tubular, with as many segments of its limb as the calyx, with an imbricated æstivation. *Stamens* alternate with the segments of the corolla, and equal to them in number, arising from the bottom of the tube; *anthers* innate; *pollen* minute, elliptical. *Ovary* seated in an annular disk, 2- or more celled; *style* terminal; *stigma* simple, 2-lobed; *ovules* suspended. *Fruit* drupaceous, with as many seeds as there are true cells of the ovary. *Seed* suspended, solitary; *testa* simple, thin; *embryo* in the midst of thin fleshy albumen, or exalbuminous; *radicle* superior; *cotyledons* plano-convex.—*Trees* or *shrubs*, or herbaceous plants, with a harsh pubescence. *Leaves* simple, alternate, without stipules. *Flowers* gyrate.

Affinities. A branch of the old Boraginaceæ, distinguished by a terminal style proceeding from the apex of a perfectly concrete ovary of 4 cells, a baccate fruit, and seeds furnished with thin fleshy albumen. Of these characters I conceive the former to be good, and the latter bad; and the order itself, which I adopt upon the authority of Von Martius, hardly tenable, differing from Boraginaceæ, with which it is connected through Heliotropiceæ, chiefly in its succulent (not dry) separable fruit. The nucamentaceous character here is obvious enough, notwithstanding the concretion of the carpels.

Geography. Tropical trees or shrubs, natives of either hemisphere. A few occur in the south of Europe and the southern States of America; but none appear further to the north than the parallel of 45°.

Properties. The root of Ehretia buxifolia is reckoned in India one of those medicines which assist in altering and purifying the habit in cases of cachexia and venereal affections of long standing. *Ainslie*, 2. 81.

GENERA.

§ 1. Ehretieæ.
Rhabdia, Mart.
Ehretia, L.
Carmona, Cav.?
Beurreria, Jacq.
§ 2. Heliotropiceæ,
Martius.
Tiaridium, Lehm.
Heliotropium, L.

Order CCIV. BORAGINACEÆ. The Borage Tribe.

Boragineæ, *Juss. Gen.* 143. (1789); *R. Brown Prodr.* 492. (1810); *Lindl. Synops.* 163. (1829); *Bartl. Ord. Nat.* 196. (1830); *Don in Edinb. Ph. Journal,* 13. 239. (1835). —Asperifoliæ, *Linn. Martius Conspectus, No.* 118. (1835).

Essential Character.—*Calyx* persistent, with 4 or 5 divisions. *Corolla* hypogynous, monopetalous, generally regular, 5-cleft, sometimes 4-cleft, with an imbricate æstivation. *Stamens* inserted upon the petals, equal to the number of lobes of the corolla, and alternate with them. *Ovary* 4-parted, 4-seeded; *ovules* attached to the lowest point of the cavity (pendulous, *R. Br.*); *style* simple, arising from the base of the lobes of the ovary; *stigma* simple or bifid. *Nuts* 4, distinct. *Seed* separable from the pericarp, destitute of albumen. *Embryo* with a superior *radicle*; *cotyledons* parallel with the axis, plano-convex, sometimes 4!—*Herbaceous* plants or *shrubs*.. *Stems* round. *Leaves* alternate, covered with asperities, consisting of hairs proceeding from an indurated enlarged base. *Flowers* in 1-sided gyrate spikes or racemes, or panicles, sometimes solitary and axillary.

Anomalies. Echium has rather irregular flowers; Amsinckia has 4 cotyledons.

Affinities. Nearly allied to Labiatæ, from which they are essentially distinguished by the regularity of the corolla, the presence of 5 fertile stamens, the absence of resinous dots, the round (not square) figure of the stem, the gyrate inflorescence, and the scabrous alternate leaves. On account of this last character, they are sometimes called Asperifoliæ. From all other orders of this alliance they are known by the 4 deep lobes of the ovary, called by Linnæan botanists naked seeds. Hydrophyllaceæ, Cordiaceæ, and Ehretiaceæ, are all distinguished by their undivided ovary, but, together with Boraginaceæ, are known by the quasi-quaternary structure of their ovary and the quinary division of the corolla and stamens. This order much requires the attention of some philosophical botanist.

Geography. Natives principally of the temperate countries of the northern hemisphere; extremely abundant in all the southern parts of Europe, the Levant, and middle Asia; less frequent as we approach the arctic circle, and almost disappearing within the tropics. A few species only are found in such latitudes. In North America they are less abundant than in Europe. Pursh reckons but 22 species in the whole of his Flora; while the little island of Sicily alone contains 35, according to Presl.

Properties. Soft, mucilaginous, emollient properties, are the usual characteristics of this order; some are also said to contain nitre, a proof of which is shewn by their frequent decrepitation when thrown on the fire. Borago officinalis gives a coolness to beverage in which its leaves are steeped. Echium plantagineum, naturalised in Brazil, is used in that country for the same purposes as the Borago officinalis in Europe. *Pl. Usuelles,* 25. The roots of Anchusa tinctoria or Alkanet, Lithospermum tinctorium, Onosma echioides, Echium rubrum, and Anchusa virginica, contain a reddish brown substance used by dyers. This matter is thought to be a peculiar chemical principle approaching the resins.

GENERA.

Coldenia, L.
Cerinthe, L.
Echiochilon, Desf.
Lobostemon, Lehm.
Echium, L.
Onosma, L.
Moltkia, Lehm.
Onosmodium, Michx.
Purshia, Spreng.
Rindera, Pall.
Batschia, Michx.
Solenanthus, Led.
Arnebia, Forsk.
Macromeria, Don.
Lithospermum, L.
Steenhammera, Rchb.
Casselia, Dumort.
Mertensia, Rth.
Pulmonaria, L.
Bessera, Schutt.
Amsinckia, Lehm.
Lycopsis, L.
Nonea, DC.

Colsmannia, Leh.	Myosotis, L.	Trichodesma, R. Br.	Echinospermum, Sw.
Craniospermum, Lehm.	Eritrichium, Schrad.	*Pollichia*, Medic.	*Rochelia*, Rœm. Schult.
Dioclea, Spreng.	Bothryospermum, Bge.	Asperugo, L.	
Anchusa, L.	Stomatechium, Lehm.	Cynoglossum, L.	
Buglossum, All.	Symphytum, L.	Mattia, Schult.	Menais, L.
Exarrhena, R. Br.	Borago, L.	Omphalodes, Tournef.	Cortesia, Cav.
	Trachystemma, Don.	*Picotia*, Schult.	Canala, Pohl.

Alliance III. *LABIALES.*

Essential Character.—*Fruit* nucamentaceous. *Inflorescence* terminal or axillary, never gyrate. *Flowers* usually irregular and unsymmetrical, often didynamous.

Order CCV. LABIATÆ, or LAMIACEÆ. } The Mint Tribe.

Labiatæ, *Juss. Gen.* 110. (1789); *R. Brown Prodr.* 499. (1810); *Mirbel in Ann. Mus.* 15. 213. (1810); *Lindl. Synops.* 196. (1829); *Bentham in Bot. Reg.* (1829); *Id. Gen. et Sp. Labiatarum*, (1832-1836).

Essential Character.—*Calyx* tubular, inferior, persistent, the odd tooth being next the axis; regular 5- or 10-toothed, or irregular bilabiate or 3- to 10-toothed. *Corolla* monopetalous, hypogynous, bilabiate; the upper lip undivided or bifid, overlapping the lower, which is larger and 3-lobed. *Stamens* 4, didynamous, inserted upon the corolla, alternately with the lobes of the lower lip, the 2 upper sometimes wanting; *anthers* 2-celled; sometimes apparently unilocular in consequence of the confluence of the cells at the apex; sometimes 1 cell altogether obsolete, or the 2 cells separated by a bifurcation of the connective. *Ovary* deeply 4-lobed, seated in a fleshy hypogynous disk; the lobes each containing 1 erect ovule; *style* 1, proceeding from the base of the lobes of the ovary; *stigma* bifid, usually acute. *Fruit* 1 to 4 small nuts, enclosed within the persistent calyx. *Seeds* erect, with little or no albumen; *embryo* erect; *cotyledons* flat.—*Herbaceous* plants or *undershrubs*. *Stem* 4-cornered, with opposite ramifications. *Leaves* opposite, divided or undivided, without stipules, replete with receptacles of aromatic oil. *Flowers* in opposite, nearly sessile, axillary cymes, resembling whorls; sometimes solitary or as if capitate.

Affinities. The 4-lobed ovary, with a solitary style arising from the base of the lobes, has no parallel among monopetalous orders, except Nolanaceæ which have a plaited corolla, and Boraginaceæ, to which Labiatæ must be considered as most closely allied. They differ in the latter having not only an irregular corolla, but not more than 2 or 4 stamens, while the lobes of the corolla are 5, and opposite leaves; circumstances in which Labiatæ resemble Scrophulariaceæ and the orders allied to it. From all such they are known, in the absence of fructification, by their square stem and the numerous reservoirs of oil in their leaves. For some good remarks upon the anatomy of the stem of Labiatæ, see Mirbel in the *Annales du Muséum*, vol. 15. p. 223. The æstivation of the corolla of this order, first well pointed out by Brown (*Prodr.* 500.), is an important consideration in determining whether a flower is resupinate or not. Prostanthera is remarkable for the appendages to its anthers, and for the remains of albumen existing in the ripe seeds of several of its species. *Brown in Flinders*, 566. According to Griesselich, the reservoirs of oil in the leaves of Labiatæ are not analogous to those of Oranges and other plants, but are little utricules having an open orifice; and hence he calls them pores. *Ferussac, Jan.* 1830, p. 96. The order has been recently revised and redescribed with great skill and learning by Bentham. Tectona, usually included in Verbenaceæ, is referred here by Hamilton under the name of Theka. *Linn.*

Trans. 16. 186. Oxera of La Billardiére is probably an error, as we have no instance of a pistil being schistocarpous and polyspermous at the same time.

Geography. Natives of temperate regions in greater abundance than elsewhere, their maximum probably existing between the parallels of 40° and 50° N. latitude. They are found in abundance in hot, dry, exposed situations, in meadows, hedgerows, and groves; not commonly in marshes. In France they form 1-24th of the Flora; in Germany, 1-26th; in Lapland, 1-40th; the proportion is the same in the United States of North America, and within the tropics of the New World (*Humboldt*); in Sicily they are 1-21 of flowering plants (*Presl.*); in the Balearic islands, 1-19th. About 200 species are mentioned in Wallich's *Catalogue of the Indian Flora*, a large proportion of which is from the northern provinces. They were not found in Melville Island.

Properties. Their tonic, cordial, and stomachic qualities, due to the presence of an aromatic volatile oil and a bitter principle, are the universal feature of Labiatæ, which do not contain a single unwholesome or even suspicious species. On account of the bitter qualities, several are used as febrifuges, as the Ocymum febrifugum of Sierra Leone; and many as aromatics in our food, such as Savory, Mint, Marjoram, and Basil. Others are found useful in the preparation of slightly tonic beverages, such as Nepeta (Glechoma) hederacea, Sage, Balm of Gilead, &c. When the volatile oil is in great abundance, as in Lavender and Thyme, an agreeable perfume is the result. Rosemary is the herb used in the manufacture of Hungary water. The leaves of Ocimum album are considered by the natives of India stomachic, and their juice is prescribed in the catarrhs of children. *Ainslie*, 2. 92. The fresh juice of Anisochilus (Lavandula carnosa, *L.*) mixed with powdered sugarcandy, is prescribed by the native practitioners of India in cynanche. *Ibid.* 2. 144. Tonic and stimulant properties have been ascribed to the Origanum Dictamnus. *Ibid.* 1. 112. It is asserted that the juice of the bruised leaves of Phlomis esculenta, drawn up the nose, is a specific against the bite of serpents; but there is reason to doubt the truth of this statement, as the plant which is a common weed in Bengal, possesses but a slight aromatic scent, and has scarcely any flavour. *Trans. M. and P. Soc. Calc.* 2. 405. Hedeoma pulegioides, the Pennyroyal of the North Americans, has a great popular reputation as an emmenagogue. *Barton*, 2. 168. Cunila mariana is beneficially employed in infusion in slight fevers and colds, with a view to excite perspiration. *Ibid.* 2. 175. The roots of Stachys palustris are described as an esculent by Mr. Joseph Houlton. The Panax Coloni of old botanists is the same thing. *Trans. Soc. Arts*, 46. 8. The tubers of the roots of some species of Ocimoideæ are a common esculent in Madagascar and the Malayan archipelago. Perhaps the most singular quality of these plants is their containing an abundance of camphor, a substance which seems to exist in the whole tribe, and which is found so copiously in the oils of Sage and Lavender as to be capable of being advantageously extracted.

GENERA.*

§ 1. Ocimoideæ, Benth.
Ocimum, L.
Geniosporum, Wall.
Platostoma, P. de B.
Mesona, Blume.
Acrocephalus, Benth.
Moschosma, Reichenb.
Lumnitzera, Jacq.
Orthosiphon, Benth.
Plectranthus, L'Her.
Germanea, Lam.
Dentidia, Lour.
Isodon, Schrad.
Coleus, Lour.
Solenostemon, Schm.
Hoslundia, Vahl.
Anisochilus, Wall.
Æollanthus, Mart.
Pycnostachys, Hook.
Peltodon, Pohl.
Marsypianthes, Mart.
Hyptis, Jacq. Benth.
Eriope, H. et B.
Lavandula, L.
Stæchas, Tourn.
Fabricia, Adans.
Chætostachys, Benth.

* For this list I am indebted to the friendship of Mr. Bentham, Feb. 1836.

§ 2. Menthoideæ, Benth.
Pogostemon, Desf.
Wensea, Wendl.
Dysophylla, Blume.
Chotekia, Opiz.
Elsholtzia, Willd.
Aphanochilus, Benth.
Cyclostegia, Benth.
Tetradenia, Benth.
Colebrookia, Smith.
Perilla, L.
Isanthus, Mich.
Preslia, Opiz.
Mentha, L.
Lycopus, L.
Meriandra Benth.
§ 3. Monardeæ, Benth.
Salvia, L.
Horminum, Tourn.
Sclarea, Tourn.
Æthiopis, Tourn.
Schraderia, Mœnch.
Jungia Mœnch.
Stenarrhena, Don.
Leonia, Llave.
Audibertia, Benth.
Rosmarinus, L.
Monarda, L.
Cheilyctis, Rafin.
Blephilia, Rafin.
Zizyphora, L.
Horminum, L.
§ 4. Satureineæ, Benth.
Bystropogon, L'Her.
Pycnanthemum, Mich.
Brachystemum, Mich.
Kœllia, Mœnch.
Tullia, Leavenworth.
Monardella, Benth.
Amaracus, Mœnch.
Origanum, L.
Majorana, Mœnch.
Thymus, L.
Serpyllum, Pers.
Satureia, L.
Hyssopus, L.
Collinsonia, L.
Cunila, L.
§ 5. Melissineæ, Benth.
Hedeoma, Pers.
Micromeria, Benth.
Sabbatia, Mœnch.
Piperella, Presl.
Melissa, Benth.
Clinopodium, L.
Calamintha, Mœnch.
Acinos, Mœnch.
Gardoquia, R. et P.
Rizoa, Cav.
Glechon, Spreng.
Keithia, Benth.
Thymbra, Linn.
Dicerandra, Benth.
Ceranthera, Elliott.
Pogogyne, Benth.
§ 6. Scutellarineæ, Benth.
Prunella, Linn.
Brunella, Mœnch.
Cleonia, L.
Scutellaria, L.
Cassida, Tourn.
Perilomia, H. B. K.
§ 7. Prostantheræ, Benth.
Chilodia, Br.
Cryphia, Br.
Prostanthera, La Bill.
Hemiandra, Br.
Hemigenia, Br.
Westringia, Sm. Br.
Microcorys, Br.
§ 8. Nepeteæ, Benth.
Lophanthus, Benth.
Nepeta, Benth.
Glechoma, L.
Cataria, Mœnch.
Marmoritis, Benth.
Dracocephalum, L.
Moldavica, Mœnch.
Zornia, Mœnch.
Ruyschiana, Mill.
Cedronella, Mœnch.
§ 9. Stachydeæ, Benth.
Melittis, L.
Physostegia, Benth.
Macbridea, Elliott.
Synandra, Nutt.
Lamium, Benth.
Orvala, L.
Galeobdolon, Huds.
Pollichia, Roth.
Erianthera, Benth.
Lagochilus, Bunge.
Leonurus, L.
Cardiaca, Mœnch.
Chaiturus, Mœnch.
Panzeria, Mœnch.
Galeopsis, L.
Tetrahit, Mœnch.
Anisomeles, R. Br.
Stachys, L.
Betonica, L.
Zietenia, Gleditsch.
Eriostomum, Hfsg.
Tetrahitum, Hfsg.
Trixago, Hfsg.
Sphacele, Benth.
Phytoxys, Molina.
Lepechinia, Willd.
Craniotome, Rchb.
Sideritis, L.
Hesiodia, Mœnch.
Burgsdorffia, Mœnch.
Marrubiastrum, Mœnch.
Empedoclea, Rafin.
Navicularia, Fabric.
Marrubium, L.
Lagopsis, Bunge.
Ballota, L.
Beringeria, Neck.
Pseudo-dictamnus, Mœnch.
Roylea, Wall.
Otostegia, Benth.
Leucas, Br.
Leonotis, Br.
Phlomis, L.
Phlomidopsis, Link.
Phlomoides, Mœnch.
Notochæte, Benth.
Eremostachys, Bunge.
Eriophyton, Benth.
Moluccella, L.
Molucca, Tourn.
Chasmonia, Presl.
Holmskioldia, Retz.
Hastingia, Sm.
Platunium, Juss.
Achyrospermum, Blume.
Colquhounia, Wall.
§ 10. Prasieæ, Benth.
Gomphostemma, Wall.
Phyllostegia, Benth.
Stenogyne, Benth.
Prasium, L.
§ 11. Ajugoideæ, Benth.
Amethystea, L.
Trichostemma, L.
Teucrium, L.
Chamædrys, Tourn.
Scorodonia, Tourn.
Scordium, Tourn.
Polium, Tourn.
Leucosceptrum, Smith.
Ajuga, L.
Phlebœanthe, Tausch.
Bugula, Tourn.
Chamæpithys, Tourn.
Cymaria, Benth.

Oxera, La Bill.
Oncoma, Spreng.

Order CCVI. VERBENACEÆ. The Vervain Tribe.

Vitices, *Juss. Gen.* 106. (1789).—Verbenaceæ, *Juss. in Ann. Mus.* 7. 63. (1806); *R. Brown Prodr.* 510. (1810); *Lindl. Synops.* 195. (1829); *Bartl. Ord. Nat.* 179. (1830).

Essential Character.—*Calyx* tubular, persistent, inferior. *Corolla* hypogynous, monopetalous, tubular, deciduous, generally with an irregular limb. *Stamens* usually 4, didynamous, seldom equal, occasionally 2. *Ovary* 2- or 4-celled; *ovules* erect or pendulous, solitary or twin; *style* 1; *stigma* bifid or undivided. *Fruit* nucamentaceous, sometimes berried, composed of two or four nucules in a state of adhesion. *Seeds* erect or pendulous; *albumen* none, or in very small quantity; *embryo* always erect.—*Trees* or *shrubs*, sometimes *herbaceous* plants. *Leaves* generally opposite, simple or compound, without stipules. *Flowers* in opposite corymbs, or spiked alternately; sometimes in dense heads; very seldom axillary and solitary.

Affinities. The difference between these plants and Labiatæ consists in

the concrete carpels of the former, their terminal style, and the usual absence of reservoirs of oil from their leaves, as contrasted with the deeply 4-lobed ovary and aromatic leaves of the latter. There are, however, particular species of Labiatæ which approach Verbenaceæ very closely, so that Brown has remarked (*Congo*, 451), that it has been difficult to distinguish the two orders. Verbenaceæ differ from Myoporaceæ and Selaginaceæ in the position of the radicle, which in the former points to the base, and in the two latter to the apex of the fruit. There are also other points of difference, which will be mentioned under those orders. Acanthaceæ and Scrophulariaceæ differ in not having 1- or 2- seeded indehiscent cells. Brown remarks, that although all the genera of Verbenaceæ have an embryo whose radicle points towards the base of the fruit, yet many of them have pendulous seeds, and consequently a radicle remote from the umbilicus. *Flinders*, 567. Aug. de St. Hilaire asserts, that all, except Avicennia, have a sessile erect ovule arising from the base of each cell. *Pl. Usuelles*, 40. Brown, however, places Avicennia in Myoporiaceæ.

Geography. Rare in Europe, northern Asia, and North America; common in the tropics of both hemispheres, and in the temperate districts of South America. In the tropics they become shrubs, or even gigantic timber, but in colder latitudes they are mere herbs.

Properties. Not of much inportance in a medicinal or economical point of view. Callicarpa lanata bark has a peculiar subaromatic and slightly bitterish taste, and is chewed by the Cingalese when they cannot obtain Betel leaves; the Malays reckon the plant diuretic. *Ainslie*, 2. 180. Stachytarpheta jamaicensis is a plant to which the Brazilians attach the same false notions of powerful action as Europeans formerly did to the common Vervain. Its leaves are sometimes used to adulterate Chinese Tea, and have even been sent to Europe under the name of Brazilian Tea. *Pl. Usuelles*, p. 39. Auguste de St. Hilaire speaks in terms of high praise of the agreeable properties of the aromatic Lantana pseudo-thea, used in infusion as tea. It is highly esteemed in Brazil, where it is vulgarly called Capitaô do matto, or Cha de pedreste. *Ibid.* p. 70. The root of Premna integrifolia is cordial and stomachic in decoction. *Ainslie*, 2. 210. Silex exists in abundance in the wood of the Teak Tree (Tectona grandis), which belongs here. *Ed. P. J.* 3. 413. The properties formerly ascribed to the Vervain appear to have been imaginary.

GENERA.

§ 1. Viticeæ, Bartl.
Clerodendron, L.
Volkameriæ spp. L.
Ovieda, L.
Siphonanthus, L.
Volkmannia, Jacq.
Agricolæa, Schrank.
Volkameria, L.
Pyrostoma, Meyer.
Hilsenbergia, Tausch.
Wallrothia, Roth.
Ægiphila, L.
Manabea, Aubl.
Omphalococca, W.
Chilianthus, Burch.
Cornutia, L.
Petitia, Jacq.
Callicarpa, L.
Porphyra, Lour.
Spondylococcus, Mitch.
Pityrodia, R. Br.
Premna, L.
Hosta, Jacq.
Peronema, Jack.
Vitex, L.
Limia, Vand.
Congea, Roxb.
Sphenodesme, Jack.
Symphorema, Roxb.
Chloanthes, R. Br.
Gmelina, L.
Tectona, L. fil.
Theka, Juss.
§ 2. Verbeneæ, Bartl.
Duranta, L.
Pöppigia, Bertero.
Petrea, L.
Citharexylon, L.
Rauwolfia, R. P.
Amasonia, L.
Taligalea, Aubl.
Melasanthus, Pohl.
Priva, Adans.
Phryma, Forsk.
Blairia, Houst. Gærtn.
Castelia, Cav.
Streptium, Roxb.
Tortula, Willd.
Barbula, Lour.
Callipeltis, Bge.
Tamonea, Aubl.
Kœmpfera, Houst.
Ghinia, Sw.
Leptocarpus, Link.
Spielmannia, Medic.
Platonia, Rafin.
Aloysia, Ort.
Verbena, L.
Glandularia, Gmel.
Stachytarphcta, Vahl.
Dipyrena, Hook.
Wilsonia, Hook.
Buchia, H. B. K.
Perama, Aubl.
Mattuschkea, Schreb.
Lippia, L.
Zapania, Scop.
Lantana, L.
Carachera, Forsk.
Riedelia, Schlecht.
Dipterocalyx, Schlech.
Bouchea, Schlecht.

Casselia, Nees.
Asaphes, Spreng.
Glossocarya, Wall.
Geunsia, Bl.
Hymenopyramis, Wall.
Monochilus, F. et M.

Order CCVII. MYOPORACEÆ.

Myoporinæ, *R. Brown Prodr.* 514. (1810); *Bartl. Ord. Nat.* 176. (1830).

Essential Character.—*Calyx* 5-parted, persistent. *Corolla* monopetalous, hypogynous, nearly equal or 2-lipped. *Stamens* 4, didynamous, with sometimes the rudiment of a fifth one, which occasionally bears pollen. *Ovary* 2- or 4-celled, the cells 1- or 2-seeded, with pendulous ovules; *style* 1; *stigma* scarcely divided. *Fruit* a drupe, with a 2- or 4-celled putamen, the cells of which are 1- or 2-seeded. *Seeds* with albumen; *embryo* taper; *radicle* superior.—*Shrubs*, with scarcely any pubescence. *Leaves* simple, without stipules, alternate or opposite. *Flowers* axillary, without bracts. *R. Br.*

Affinities. The principal characters in the fructification of this order, by which it is distinguished from Verbenaceæ, are the presence of albumen in the ripe seed, and the direction of the embryo, whose radicle always points towards the apex of the fruit. The first of these characters is, however, not absolute, and neither of them can be ascertained before the ripening of the seed. *R. Brown in Flinders*, 557.

Geography. This order, with the exception of Bontia, a genus of equinoctial America, and of the species of Myoporum, found in the Sandwich Islands, has hitherto been observed only in the southern hemisphere, and yet neither in South Africa nor in South America beyond the tropics. Its maximum is evidently in the principal parallel of Terra Australis, in every part of which it exists; in the more southern parts of New Holland, and even in Van Diemen's Island, it is more frequent than within the tropics. *R. Brown in Flinders*, 567.

Properties. The bark of Avicennia tomentosa. the White Mangrove of Brazil, is in great use at Rio Janeiro for tanning. *Pr. Max. Trav.* 206.

GENERA.

Myoporum, Banks.	Pholidia, R. Br.	Eremophila, R. Br.
Pogonia, Andr.	Stenochilus, R. Br.	Avicennia, L.
Andrewsia, Venten.	Bontia, L.	

Order CCVIII. SELAGINACEÆ.

Selagineæ, *Juss. Ann. Mus.* 7. 71. (1806); *Richard in Pers. Synops.* 2. 146. (1807); *Choisy Mémoire*, (1823); *Bartl. Ord. Nat.* 177. (1830).

Essential Character.—*Calyx* tubular, persistent, with a definite number of teeth, or divisions, rarely consisting of two sepals. *Corolla* tubular, hypogynous, more or less irregular, with 5 lobes. *Stamens* 4, usually didynamous, arising from the top of the tube of the corolla, seldom 2; *anthers* 1-celled, usually adnate to the dilated top of the filament, rarely versatile. *Ovary* superior, very minute; *style* 1, filiform. *Disk* hypogynous, fleshy. *Fruit* 2-celled, the cells either separable or inseparable, 1-seeded, membranous. *Seed* solitary, pendulous; *embryo* in the axis of fleshy albumen; *radicle* superior.—*Herbaceous* plants, or small branched *shrubs*. *Leaves* alternate, usually sessile, toothed, or entire, often fascicled. *Flowers* sessile, spiked, with large bracts.

Affinities. Originally separated from Verbenaceæ by Choisy, but with an erroneous character. The principal mark of the order is its 1-celled anthers. It differs from Verbenaceæ much as Epacridaceæ from Ericaceæ.

Geography. All found at the Cape of Good Hope.

Properties. Unknown.

GENERA.

Selago, L.	Microdon, Chois.	Polycenia, Chois.	Agathelepis, Chois.
Hebenstreitia, L.	*Dalea*, Gærtn.	Dischimia, Chois.	

Order CCIX. STILBACEÆ.

Stilbineæ, *Kunth in Verhandl. Königl. Acad. Wissensch. Berol.* (*März.* 1831); *Martius Conspectus, No.* 109. (1835).

Essential Character.—*Calyx* tubular, campanulate, with a 5-cleft limb, the segments of which are equal; the two lower sometimes cut deeper; seldom 5-leaved; persistent. *Corolla* monopetalous, hypogynous; the tube enlarged upwards, hairy in the throat; the limb 5-parted, spreading, somewhat 2-lipped, rarely 4-parted, and nearly regular; *Æstivation* valvate. *Stamens* equal in number to the segments of the corolla, inserted into the top of the tube of the corolla, alternate, exserted, nearly equal, the upper one of five always rudimentary, or even obliterated; *filaments* free, shortened in the bud; *anthers* elliptical, oblong, attached by the back, 2-celled; opening longitudinally by their face. *Ovary* superior, sessile, 2-celled; cells with only one ovule; one cell sometimes smaller and empty; *ovule* erect; *style* terminal, filiform, exserted; *stigma* simple, emarginate. *Disk* 0. *Fruit* dry, 1-seeded, indehiscent, surrounded by the permanent calyx.—Cape *shrubs*, with the habit of a Phylica or a Fir. *Leaves* whorled, close, narrow, entire, leathery, rigid, articulated at the base, without stipules. *Flowers* in dense spikes at the point of the branches, sessile, each with 3 bracts at the base, occasionally polygamous. *Kunth.*

Affinities. These differ from Selaginaceæ in little except their 2-celled anthers, erect ovules, and want of an hypogynous disk. Kunth also assimilates this order to Globulariaceæ, and considers it as it were intermediate between the two.

Geography. Cape of Good Hope.

Properties. Unknown.

GENERA.

Stilbe, L.
Lühea, Schmidt.
Campylostachys, Kunth.

Group V. Dicarpeæ.

Essential Character.—*Fruit* consisting of two carpels, capsular, with a distinct central placenta; if divided into lobes then either membranous and capsular, or succulent, never nucamentaceous. *Flowers* never gyrate.

At first sight this extensive group would seem to divide into two series, the one with regular, the other with irregular flowers; but upon a full consideration of the various connecting points and transition-cases which exist in such unusual abundance among these plants, I am induced to think it will be better to consider the whole as forming one great group, and to employ the regularity or irregularity of the corolla merely as a character of the alliances. Jasminaceæ which stand at the very end of the group are probably most nearly allied to the Echial alliance; while Pedaliaceæ at its commencement seems to offer the transition from nucamentaceous to capsular organization.

Alliance I. *BIGNONIALES.*

Essential Character—*Flowers* unsymmetrical, usually didynamous. *Seeds* often with wings or tail-like processes. *Albumen* 0. Stalks of the seeds never hooked.

Order CCX. PEDALIACEÆ. The Oil-Seed Tribe.

Pedalinæ, *R. Brown Prodr.* 519. (1810); *Lindley in Botan. Register*, 9. 934. (1825).—Sesameæ, *Kunth Synops.* 2. 251. (1823); *Bartl. Ord. Nat.* 175. (1830); *Endlicher in Linnæa, VII.* 1. (1832).—Martyniaceæ, *Link. Handb.* 1. 504. (1829) *a sect. of* Personatæ.

Essential Character.—*Calyx* divided into 5 nearly equal pieces. *Corolla* monopetalous, hypogynous, irregular; the throat ventricose, the limb bilabiate, the lobes somewhat valvate in æstivation. *Disk* hypogynous, fleshy, sometimes glandular. *Stamens* didynamous, included within the tube, together with a rudiment of a fifth. *Anthers* 2-celled; the *connective* articulated with the filament, a little prolonged beyond the cells, terminated by a gland. *Ovary* seated in a glandular disk, unilocular or bilocular, sometimes with several 1- or 2-seeded spurious cells, formed by the splitting of two placentas and the divergence of their lobes; *ovules* either erect, or pendulous, or horizontal, solitary, or two, or several; *style* 1; *stigma* divided. *Fruit* drupaceous or capsular, valvular, or indehiscent, with from 2 to 8 cells, which are usually oligospermous when numerous, and polyspermous only when two. *Seeds* with a papery testa wingless; *albumen* none; *embryo* straight.—*Herbaceous* plants. *Leaves* opposite, or nearly so. *Flowers* axillary, each with two bracts.

Affinities. These differ from Bignoniaceæ in their wingless seeds, which are in most cases definite, and sometimes in their woody parietal lobed placentæ, which spread and divide variously in the inside of the pericarp, so as to produce an apparently 4- or 6-celled fruit out of a 1-celled ovary. For an explanation of the manner in which this takes place, see the *Botan. Register*, fol. 934. From Bignoniaceæ they are known by their large seeds, free from all appendage at either end, often by their woody placentæ, and short fruit. Sesamum may be considered a transition from the one to the other. Endlicher rightly observes that Brown in forming his Pedalinæ (*Prodr.* 519.), does not combine with them Sesamum; neither, however does he explain how they are to be distinguished; but as usual the extreme and studied conciseness of this learned man leaves his readers almost as much in the dark as if the name of Sesamum had not been mentioned. In the mean while until some character is given by which Sesamum and its nearest allies are to be separated from Pedaliaceæ, I leave the genus in the same place as it occupied in the first edition of this work. A long and ingenious dissertation will be found in the Linnæa, vol. VII. p. 8. &c., by Endlicher, who considers that there are occasionally 4 carpels to the fruit of some Pedaliaceæ, such as Rogeria and Josephinia grandiflora.

Geography. Found only within the tropics of Africa, Asia, and America.

Properties. The leaves of Sesamum are emollient. Its seeds contain an abundance of a fixed oil, as tasteless as that of Olive oil, for which it might be substituted, and which is expressed in Egypt in great quantities. The fresh leaf of Pedalium murex, when agitated in water, renders it mucilaginous, in which state it is prescribed by Indian doctors in cases of dysuria and gonorrhœa.

GENERA.

Martynia, L.	Rogeria, Gay.	Pedalium, L.	Sesamum, L.
Craniolaria, L.	Pretrea, Gay.	Uncaria, Burchell (40).	Ceratotheca, Endl.
Dicerocaryum, Bojer.	Josephinia, Vent.	Carpoceras, A. Rich.	

Order CCXI. BIGNONIACEÆ. The Trumpet-Flower Tribe.

Bignoniæ, § 2. *Juss. Gen.* 137. (1789).—Bignoniaceæ, *R. Brown Prodr.* 470. (1810); *Link Handb.* 1. 503. (1829) *a sect. of* Personatæ; *Don in Edinb. Phil. Journ.* 9. 264. (1823); *Bartl. Ord. Nat.* 185. (1830).

Essential Character.—*Calyx* divided or entire, sometimes spathaceous. *Corolla* monopetalous, hypogynous, usually irregular, 4-5-lobed. *Stamens* 5, unequal: always 1, sometimes 3, sterile; *anthers* 2-celled, formed normally. *Ovary* seated in a disk, 2-celled, or spuriously 4-celled, polyspermous; *style* 1; *stigma* of 2 plates. *Capsule* 2-valved, 2-celled, often long and compressed, sometimes spuriously 4-celled. *Dissepiment* either parallel with the valves, or contrary to them, finally becoming separate, bearing the seeds at the commissure along with the valves. *Seeds* transverse, compressed, often winged; *albumen* 0; *embryo* straight, foliaceous; *radicle* centrifugal.—*Trees* or *shrubs*, often twining or climbing. *Leaves* opposite, very rarely alternate, compound or occasionally simple, without stipules. *Inflorescence* terminal, somewhat panicled.

Anomalies. Eccremocarpus has a 1-celled fruit with parietal placentæ. The fruit is sometimes spuriously 4-celled.

Affinities. Distinguished from Scrophulariaceæ and their immediate allies by the want of albumen, from Acanthaceæ and Pedaliaceæ by their winged seeds, and from both by their arborescent habit. Eccremocarpus is, however, an exception to the latter character, and also differs in having an unilocular ovary and fruit; in the latter respect approaching Cyrtandraceæ and Pedaliaceæ, from which, however, its winged seeds divide it. This wing to the seed is a beautiful membrane formed of transparent cellular tissue, which, in Wightia gigantea offers an instance of reticulated cellules, analogous to those of Maurandya Barclaiana. There do not appear to be any very certain limits between Bignoniaceæ, Cyrtandraceæ, and Pedaliaceæ, which might be reunited without much inconvenience. Eccremocarpus may be considered the link between the two former, and Sesamum that between the two latter. The order is in a state of great confusion, and requires to be carefully revised by some good botanist.

Geography. The tropics of either hemisphere are the chief station of this order, from which it extends northwards in North America as far as Pennsylvania, and southwards into the southern provinces of Chile. In Europe it is unknown in a wild state.

Properties. Little known, except for the great beauty of the flowers. Chica is a red feculent substance obtained by boiling the leaves of Bignonia Chica in water; the Chica is quickly precipitated by adding some pieces of the bark of an unknown tree, called Arayana. The Indians use it for painting their bodies red; it is also becoming an article of importance to dyers. *Brewster*, 2. 370. It approaches in nature the resins, but contains some peculiar properties; it gives an orange red to cotton. *Ed. P. J.* 12. 417. The tough shoots of Bignonia Cherere are woven into wicker-work; and several kinds of Bignonias form large trees in the forests of Brazil, where they are felled for the sake of their timber; that called Ipe-tabacco furnishes durable ship-timber; the Ipeuna, another species, the hardest wood in Brazil. *Pr. Max. Travels*, p. 68. Another, called the Pao d'arco, supplies one of the best kinds of wood used for bows by the Brazilian Indians, especially the Botocudos of the Rio Grande de Belmonte, and the Patachos of the Rio do Prado. *Ibid.* 238.

GENERA.

Bignonia, L.	Spathodea, P. Beauv.	Dolichandra, Cham.	Tecoma, Juss.
Millingtonia, L. f.	Zeyheria, N. ab E.	Stereospermum, Cham.	Catalpa, Juss.
Gelsemium, Juss.	Holoregmia, N. ab E.		Jacaranda, Juss.

Friedericia, Mart.
Aplolophium, Cham.
Amphilophium, H. B. K.
Ferdinandusa, Pohl.
Sickingia, W.
Platycarpium, H. B. K.
Chilopsis, Don.
Astianthus, Don.
Delostoma, Don.
Stenolobium, Don.
Schrebera, Roxb.
Trigonocarpus, Wall.
Wightia, Wall.
Calosanthes, Bl.
Fieldia, A. Cunn.
Rhigozum, Burch. (41)
Eccremocarpus, R. et P.
Calampelis, Don.
Tourretia, Dombey.
Argylia, Don.

Crescentia, L.

Order CCXII. CYRTANDRACEÆ.

Cyrtandraceæ, *Jack in Linn. Trans.* 14. 23. (*read* 1822, *in May*).—Didymocarpeæ, *Don in Edinb. Phil. Trans.* 7. 82. (1822, *July*); *Prodr. Fl. Nep.* 121. (1825); *Martius H. R. Mon.* (1829).

Essential Character.—*Calyx* campanulate, 5-cleft or 5-leaved, equal. *Corolla* tubular, irregular, 5-lobed, somewhat 2-lipped, the lobes imbricated in æstivation. *Stamens* 4, didynamous, of which 2 are sometimes sterile; *anthers* 2-celled. *Ovary* superior, elongated, surrounded by an annular disk, 1-celled, with 2 many-seeded placentæ, each of which consists of 2 diverging plates; *style* filiform; *stigma* 2-lobed, or consisting of 2 plates. *Fruit* capsular or succulent; the former siliquose and 2-valved, 1-celled, with double longitudinal placentæ, which often cohere, so as to give the appearance of two cells. *Seeds* very numerous, minute, suspended, naked, or with a coma; *albumen* none; *embryo* straight, taper, orthotropous.—*Terrestrial* or *parasitical* plants, usually *herbaceous* and stemless, occasionally caulescent, and sometimes shrubby. *Leaves* usually opposite, one of them being dwarfed, radical, crenate and rugose, or smooth. *Flowers* umbellate, often purple or pink.

Affinities. Very closely allied to Gesneraceæ, Bignoniaceæ, and Pedaliaceæ. From the former they differ in nothing except their never having any tendency to produce an inferior ovary, their deeply-lobed placentæ, their usually siliquose fruit, and the want of albumen; agreeing entirely with them in habit. From Bignoniaceæ they are distinguished by their herbaceous mode of growth, their minute apterous seeds, 1-celled ovary, with 2 double parietal placentæ. From Pedaliaceæ they differ in nothing whatever, except their minute indefinite seeds, and the membranous, not woody, texture of the siliquiform fruit and placentæ. Don appears to me to have been mistaken in assigning an heterotropous embryo to this tribe; the embryo is certainly orthotropous in Streptocarpus Rexii, with which other genera probably agree. Von Martius refers Ramonda hither.

Geography. This order occupies nearly the same station in the Old World as Gesneraceæ in the New, being almost entirely confined to the tropics, unless the Ramonda of the Pyrenees should be found a genuine plant of the order, as Von Martius supposes.

Properties. Unknown.

GENERA.

Chirita, Hamilt.
Calosacme, Wall.
Didymocarpus.
Henckelia, Schl.
Streptocarpus, Lindl.
Dorcoceras, Bge.
Loxotis, R. Br.
Antonia, R. Br.
Glossanthus, Klein.
Stauranthera, Benth.
Epithema, Bl.
Aikinia, R. Br.
Rehmannia, Libosch.
Whitia, Bl.
Tromsdorffia, Bl.
Agalmyla, Bl.
Rhyncotechum, Bl.
Loxonia, Jack.
Centronia, Bl.
Kuhlia, Rnwt.
Incarvillea, J.
Amphicome, Royle.
Campsis, Lour.
? Loxophyllum, Bl.
? Rhynchoglossum, Bl.

Alliance II. *ACANTHALES.*

Essential Character.—*Flowers* unsymmetrical, usually didynamous. *Seeds* adhering to hard hook-like processes of the placenta. *Albumen* 0. *Calyx* 4-5-leaved, remarkably imbricated, as if in more whorls than one; often enveloped in large bracts.

Order CCXIII. ACANTHACEÆ. The Justicia Tribe.

Acanthi, *Juss. Gen.* 102. (1789).—Acanthaceæ, *R. Brown Prodr.* 472. (1810); *Link Handb.* 1. 500. (1829) *a sect. of* Personatæ; *Nees ab Esenbeck in Wall. Plant. As. rar.* 3. 70. (1832).

Essential Character.—*Calyx* 4- or 5-divided, usually 5-leaved, equal or unequal, generally very much imbricated, occasionally multifid, or entire and obsolete, persistent. *Corolla* monopetalous, hypogynous, bearing the stamens, mostly irregular; the *limb* ringent or 2-lipped (the lower lip overlapping the upper in æstivation), occasionally 1-lipped, sometimes nearly equal, deciduous. *Stamens* mostly 2, both bearing anthers; sometimes 4, didynamous, the shorter ones being sometimes sterile; *anthers* either 2-celled, their cells being inserted equally or unequally, or 1-celled, opening lengthwise. *Ovary* seated in a disk, 2-celled, the cells either 2-or many-seeded; *style* 1; *stigma* 2-lobed, rarely undivided. *Capsule* 2-celled, the cells 2- or many-seeded, by abortion sometimes becoming 1-seeded, bursting elastically with 2 valves. *Dissepiment* opposite the valves, separable into two pieces through the axis (the middle being sometimes open); these pieces attached to the valves, sometimes separating from them with elasticity; entire, or occasionally spontaneously separating in two, their inner edge bearing the seeds. *Seeds* roundish, hanging by ascending processes of the placenta, hard, cup-shaped, or usually hooked; *testa* loose; *albumen* none; *embryo* curved or straight; *cotyledons* large, roundish; *radicle* taper, descending, and at the same time centripetal, curved, or straight; *plumula* inconspicuous. —*Herbaceous* plants or *shrubs*, chiefly tropical; their hairs, if they have any, simple, occasionally capitate, very rarely stellate. *Leaves* opposite, rarely in fours, without stipules, simple, undivided, entire, or serrated; rarely sinuate, or having a tendency to become lobed. *Inflorescence* terminal, or axillary, in spikes, racemes, fascicles, or panicles; the flowers sometimes even solitary. *Flowers* usually opposite in the spikes, sometimes alternate, with 3 bracts, of which the lateral are now and then deficient; these bracts sometimes large and leafy, and enclosing a diminished calyx, which is occasionally obsolete. *R. Br.* chiefly.

Anomalies. A singular depauperation of the calyx takes place in the genera Thunbergia, Mendozia, and Clistax, in which that organ is reduced sometimes to a mere obsolete ring, its place being supplied by bracts. Mendozia is also remarkable for its fruit being a 1-seeded drupe, with crumpled chrysaloid cotyledons.

Affinities. In habit these approach Scrophulariaceæ, from which their want of albumen, elastically dehiscing fruit, the hard processes of the dissepiment, and the much imbricated calyx, distinguish them; with Bignoniaceæ they agree so nearly in character, that they may be said to differ in nothing but their seeds not being winged, and their imbricated calyx, for the processes of the seeds are sometimes absent; generally, however, their flowers being intermixed with imbricated bracts, their many-leaved imbricated calyx, and their herbaceous habit, point them out sufficiently. To Pedaliaceæ they approach in character, but are at once known by their 2-celled ovary and peculiar habit. Von Martius remarks (*Nov. Gen. et Sp.* 3. 27.) that the didynamy of Acanthaceæ is frequently different from that of Scrophulariaceæ in the posterior pair of stamens being the longest, and the anterior pair shortest. Recently the order has been elaborately remodelled by Nees Von Esenbeck, to whose excellent memoir in the place above quoted all Botanists should have recourse. Among other curious speculations in this remarkable treatise is one that the irregularity so common in the anthers of this order is connected with a general tendency to unequal dichotomy, which is more particularly indicated by one of the opposite leaves being unequal, by the bases of the leaves being frequently oblique,

by the one-sided spikes with two rows of abortive, and two of flower-bearing bracts, &c. A second is that the ovary is really composed of 4 carpels instead of two, as is commonly understood, &c. &c.

I am indebted to Professor Nees Von Esenbeck for the following list of the genera of Aranthaceæ, corrected up to Dec. 2, 1835. The words enclosed in brackets [ ] are additions of my own.

Geography. Common in all tropical countries, and only found beyond them in very hot ones. In North America a few species extend to the northward as far as Pennsylvania; and in Europe two are found in the basin of the Mediterranean.

Properties. Scarcely known. Acanthus mollis is considered emollient; Justicia biflora is used in Egypt for poultices; J. Ecbolium is said to be diuretic. *DC.* The flowers, leaves, and roots of Justicia Adhatoda are supposed to possess antispasmodic qualities. They are bitterish and subaromatic. *Ainslie*, 2. 3. Justicia pectoralis, boiled in sugar, yields a sweet-scented syrup, which is considered in Jamaica a stomachic. *Swartz*, 1. 32. The leaves and tender stalks of Justicia Gendarussa have, when rubbed, a strong and not unpleasant smell, and are, after being roasted, prescribed in India in cases of chronic rheumatism attended with swelling in the joints. *Ainslie*, 2. 68. The basis of a famous French bitter tincture, called Drogue Amère, highly valued for its stomachic and tonic properties, is the Justicia paniculata, called Creyat in India. *Ibid.* 1. 96. The leaves of Ruellia strepens are subacrid. *Ibid.* 2. 153. Another species is reckoned a diuretic in Java. *Ibid.*

GENERA.

§ 1. Thunbergieæ, N. ab E.
Thunbergia, L. (42)
[*Diplocalymna ?* Spr.]
Meyenia, N. ab E.
Hexacentris, N. ab E.
[Mendozia, R. et P.
Clistax, Mart.]

§ 2. Nelsonieæ, N. ab E.
Elytraria, Vahl.
Nelsonia, R. Br.
Adenosma, R. Br.
Ebermayera, N. ab E.
Erythracanthus, N. ab E.
Gymnacanthus, N. ab E. (43)

§ 3. Echmatacanthi, N. ab E.

¶ 1. Hygrophileæ, N. ab E.
Hemiadelphis, N. ab E.
Hygrophila, R. Br.
[Geissomeria, Lindl.]

¶ 2. Ruellieæ, N. ab E.
Dyschoriste, N. ab E.
Chætacanthus, N. ab E. (44)
Dipteracanthus, N. ab E.
Aphragmia, N. ab E. (45)
Petalidium, N. ab E.
[Stephanophysum, Pohl.
Haberlea, Friwaldk.
Calophanes, Don.]
Ruellia, L. (ex parte).
Phlebophyllum, N. ab E.
Buteræa, N. ab E.
Adenacanthus, N. ab E.
Stenosiphonium, N. ab E.
Strobilanthes, Bl.
Stenandrium, N. ab E. (46).
Æchmanthera, N. ab E.
Goldfussia, N. ab E.
Asystasia, N. ab E.
Echinacanthus, N. ab E.
Leptacanthus, N. ab E.

¶ 3. Barlerieæ, N. ab E.
Asteracantha, N. ab E.
Barleria, L.
Lophostachys, Pohl.
Nomaphila, Bl.
Ætheliema, R. Br.
Lepidagathis, W.
Aphelandra, R. Br.
Neuracanthus, N. ab E.
Corythacanthus, N. ab E. (47)

¶ 4. Acantheæ, N. ab E.
Blepharis, Juss.
Blepharacanthus, N. ab E. (48)
Acanthus, L.
Acanthodium, DC.
Dilivaria, Juss.

¶ 5. Justicieæ, N. ab E.
*Ruellioideæ, N. ab E.
Crossandra, Salisb.
Harrachia, Jacq.
Endopogon, N. ab E.
Loxanthus, N. ab E.
Phlogacanthus, N. ab E.
Cryptophragmium, N. ab E.
**Gendarusseæ, N. ab E.
Rostellaria, N. ab E.
Hemichoriste, N. ab E.
Graptophyllum, N ab E.
Beloperone, N. ab E.
Adhatoda, N. ab E.
Gendarussa, N. ab E.
Rhytiglossa, N. ab E. (49)
Leptostachya, N. ab E.
Gymnostachyum, N. ab E.
***Eranthema, N. ab E.
Eranthemum, R. Br.
Chameranthemum, N. ab E. (50)
Justicia, L. (ex parte)
Rhinacanthus, N. ab E.

¶ 6. Diclipteræ, N. ab E.
Blechum, Juss.
Rungia, N. ab E.
Dicliptera, J. (ex parte)
Amphiscopia, N. ab E.
Peristrophe, N. ab E.
[Sautiera, Decaisne.]
Hypoestes, Sol.
Micranthus, Wendl.
? Phaylopsis, W.
Rhaphidospora, N. ab E.

¶ 7. Andrographideæ, N. ab E.
Erianthera, N. ab E.
Haplanthus, N. ab E.
Andrographis, Wall.

Genus incertum.
Brillantaisia, P. de Beauv.

Alliance III. *LENTIBALES.*

Essential Character.—*Flowers* unsymmetrical, diandrous. *Fruit* capsular, with a free central placenta. Marsh or water-plants.

Order CCXIV. LENTIBULACEÆ.

Lentibulariæ, *Richard in Flor. Paris*, p. 26. (1808).—Utriculinæ, *Hoffmannsegg et Link. Fl. Port.* (1806).—Lentibulariæ, *R. Brown Prodr.* 429. (1810); *Lindl. Synops.* 1806. (1829); *Link Handb.* 1. 511. (1829) *a sect. of* Personatæ.

Essential Character.—*Calyx* divided, persistent, inferior. *Corolla* monopetalous, hypogynous, irregular, bilabiate, with a spur. *Stamens* 2, included within the corolla, and inserted into its base; *anthers* simple, sometimes contracted in the middle. *Ovary* 1-celled; *style* 1, very short; *stigma* bilabiate. *Capsule* 1-celled, many-seeded, with a large central placenta. *Seeds* minute, without albumen; *embryo* sometimes undivided.—*Herbaceous* plants, living in water or marshes. *Leaves* radical, undivided; or compound, resembling roots, and bearing little vesicles. *Scapes* either with minute stipule-like scales, or naked; sometimes with whorled vesicles; generally undivided. *Flowers* single, or in spikes, or in many-flowered racemes; with a single bract, rarely without bracts. *R. Br.*

Affinities. The central free placentæ and minute exalbuminous embryo are the principal points of distinction between these and Scrophulariaceæ, to which their habit nearly approximates them. They are known from Primulaceæ by their irregular flowers, exalbuminous embryo, and stamens.

Geography. Natives of marshes, or rivulets, or fountains, in all parts of the world, especially within the tropics.

Properties. Pinguicula vulgaris has the property of giving consistence to milk, and of preventing its separating into either whey or cream.

GENERA.

Utricularia, L.
Pinguicula, L.

Alliance IV. *SCROPHULALES.*

Essential Character.—*Flowers* unsymmetrical, diandrous or didynamous. *Seeds* wingless and tailless, with the embryo in the axis of albumen; their stalks never hooked. *Fruit* capsular; *carpels* standing parallel with the axis of inflorescence ⊃.

For remarks upon the relation that exists between this and the neighbouring alliances and orders, see the remarks under Scrophulariaceæ, Order 217.

Order CCXV. GESNERACEÆ.

Gesnerieæ. *Rich. et Juss. Ann. Mus.* 5. 428. (1804); *Kunth in Humb. N. G. et Sp.* 2. 392. (1817); *Lindley in Bot. Reg.* 1110. (1827).—Gesneriaceæ, *Link. Handb.* 1. 504. (1829) *a sect. of* Personatæ.—Gesnereæ, *Von Martius Nov. Gen. Bras.* 3. 68. (1829); *Bartl. Ord. Nat.* 174. (1830).

Essential Character.—*Calyx* half superior, 5-parted, with a valvate æstivation. *Corolla* monopetalous, tubular, more or less irregular, 5-lobed, with an imbricate æstivation. *Stamens* 2, or didynamous; *anthers* cohering, 2-celled, innate, with a thick tumid connective; the rudiment of a fifth stamen is present. *Ovary* half superior, 1-celled, with 2

fleshy 2-lobed parietal polyspermous placentæ; surrounded at its base by glands alternating with stamens; *style* continuous with the ovary; *stigma* capitate, concave. *Fruit* capsular or succulent, half superior, 1-celled, 2-valved, with loculicidal dehiscence and 2 opposite lateral placentæ, each consisting of 2 plates. *Seeds* very numerous, minute; *embryo* erect, in the axis of fleshy *albumen*; *testa* thin, with very close fine oblique veins.—*Herbaceous* plants or *under-shrubs*. *Leaves* opposite, rugose, without stipules. *Flowers* showy, in racemes, or panicles, rarely solitary.

Affinities. Allied to Bignoniaceæ through Eccremocarpus, from which the order differs in the ovary being 1-celled and partly inferior, in the apterous seeds, and in habit. Distinguished from Cyrtandraceæ only by the usually inferior 1-celled ovary, with simple placentæ and albuminous seeds, the testa of which is often twisted in a singular manner. From Scrophulariaceæ the order is known by the same characters, with the exception of the albuminous seeds, in which respect it agrees. It also approaches Orobanchaceæ, Acanthaceæ, and Pedaliaceæ, with all which it agrees in the position of the pericarpial leaves being anterior and posterior with regard to the axis of inflorescence, and consequently the placentæ right and left.

Geography. Exclusively natives of the tropical parts of South America and of the West India Islands.

Properties. Generally beautiful herbaceous plants, bearing flowers, the prevailing colour of which is bright red, and having tuberous roots. The succulent fruits are mucilaginous, sweetish, and eatable. A dye is obtained from the calyxes and fruit of some of them for staining cotton, straw-work, and domestic utensils.

GENERA.

Gesnera, L.
Conradia, Mart.
Pentaraphia, Lindl.
Rytidophyllum, Mart.
Codonophora, Lindl.
Episcia, Mart.
Besleria, Plum.
Eriphia, P. Br.
Nematanthus, Schrad.
Hypocyrta, Mart.
Alloplectus, Marr.
Crantzia, Scop.
Orobanchia, Velloz.
Drymonia, Mart.
Tapina, Mart.
Gloxinia, L'Herit.
Paliavana, Velloz.
Sinningia, Nees.
Columnea, Plum.
Trevirania, W.
Cyrilla, L'Herit.
Achimenes, Pers.
Sarmienta, R. et P.
Urceolaria, Feuill.
Mitraria, Cav.
Corisanthera, Wall.
Picria, Lour.
Tussacia, Rchb.
Dalbergia, Tuss.
Quoya, Gaudich.
Ramondia, Rich.
Myconia, Lass.
Chaixia, Lass.

Order CCXVI. OROBANCHACEÆ. The Broom-Rape Tribe.

Orobancheæ, *Juss. Ann. Mus.* 12. 445. (1808); *Richard in Pers. Synops.* 2. 180. (1807); *DC. and Duby Bot. Gall.* 348. (1828); *Lindl. Synops.* 193. (1829); *Bartl. Ord. Nat.* 173. (1830).—Orobanchinæ, *Link Handb.* 1. 506. (1829) a § *of* Personatæ.

Essential Character.—*Calyx* divided, persistent, inferior. *Corolla* monopetalous, hypogynous, irregular, persistent, with an imbricated æstivation. *Stamens* 4, didynamous. *Anthers* 2-celled, the cells distinct, parallel, often mucronate or bearded at the base. *Ovary* superior, 1-celled, seated in a fleshy disk, with 2 or 4 parietal polyspermous placentæ; *style* 1; *stigma* 2-lobed. *Fruit* capsular, enclosed within the withered corolla, 1-celled, 2-valved, each valve bearing 1 or 2 placentæ in the middle. *Seeds* indefinite, very minute; *embryo* minute, inverted, at the apex of a fleshy albumen.—*Herbaceous* leafless plants, growing parasitically upon the roots of other species. *Stems* covered with brown or colourless scales.

Affinities. Orobanchaceæ are extremely near Gesneraceæ in character, although very different in habit. They are distinguished by their seeds having a minute embryo lying in one end of fleshy albumen, and spherical pollen, while the embryo of Gesneraceæ is cylindrical and erect, occupying the axis of the albumen, and the pollen elliptical, with a furrow on one side. In Gesneraceæ

the seeds are attached by rather long funiculi, while they are absolutely sessile in Orobanchaceæ. Moreover, there is a tendency in the latter to become pentandrous, or even hexandrous; but not only no such tendency exists in the former, but the reverse takes place, in the occasional increased sterility of the stamens. There is scarcely any trace of the glandular processes of the disk of Gesneraceæ in Orobanche, or at least nothing more than a thin glandular coating to the base of the ovary. See *Von Martius Nov. Gen. et Sp. Bras.* 3. 72. From Scrophulariaceæ they are known by their 1-celled ovary and minute inverted embryo; and from all that have been mentioned, by their habit and parasitical mode of growth. In this respect they resemble Monotropaceæ, from which they differ in their ovary being composed of 2, not 5 carpels, and their irregular unsymmetrical flowers. According to the observations of Vaucher, of Geneva, the seeds of Orobanche ramosa will lie many years inert in the soil unless they come in contact with the roots of Hemp, the plant upon which the species grows parasitically: when they immediately sprout. See *Ferussac, Feb.* 1824, 136.

Geography. Not uncommon in Europe, particularly in the southern kingdoms, Barbary, middle and northern Asia, and North America; very rare in India.

Properties. Orobanche virginiana is supposed to have formed, in conjunction with white oxide of arsenic, a famous cancer powder, which was known in North America under the name of "Martin's Cancer Powder." It is thought to participate in the powerful astringent properties of Orobanche major. *Barton*, 2. 38.

GENERA.

Orobanche, L.	Boschniakia, Bge.	Epiphegus, Nutt.
Osproleon, Wallr.	Phelipæa, Desf.	Obolaria, L.
Kopsia, Dumort.	Hyobanche, L.	Æginetia, Roxb.
Trionychon, Wallr.	Lathræa, L.	Alectra, Thunb.

Order CCXVII. SCROPHULARIACEÆ. The Figwort Tribe.

Scrophulariæ, *Juss. Gen.* 117. (1789).—Scrophularineæ, *R. Brown Prodr.* 433. (1810); *Lindl. Synops.* 187. (1829); *Bartl. Ord. Nat.* 169. (1830); *Bentham in Botan. Register, June* (1835); *Scrophular, Ind.* (1835); *Don in Ed. Phil. Journ.* (*July*, 1835).—Pediculares, *Juss. Gen.* 99. (1789) *in part.*—Personatæ, *DC. Fl. Fr.* 3. 573. (1815); *Don in Edinb. Phil. Journ.* (*July*, 1835).—Antirrhineæ, *DC. and Duby*, 342. (1828).—Halleriaceæ, *Link Handb.* 1. 506. (1829) *a* § *of* Personatæ.—Scopariaceæ, *Ib.* 822. *the same.*—Erineæ, *Ib.* 510. *the same.*—Cheloneæ, Aragoaceæ, Sibthorpiaceæ, *Don in Edinb. Phil. Journ.* (*July*, 1835).—Melampyraceæ, *Rich. Anal. du Fruit.* (1808); *Lindl. Synops.* 194. (1829).—Rhinanthaceæ, *DC. Fl. Fr.* 3. 454. (1815); *DC. and Duby Bot. Gall.* 351. (1828) *in part; Ed. Prior. No.* 212 (1830).—Pediculares, *Juss. Gen.* 99. (1789) *in part; Duvau in Ann. des Sc. Nat.* 8. 180. (1826).

Essential Character.—*Calyx* inferior, persistent, pentamerous or by abortion tetramerous, the sepals sometimes united almost to the point, sometimes only at their base, sometimes altogether distinct and imbricated, often unequal, the upper one being largest, the two lowest smaller, the lateral ones smallest. *Corolla* monopetalous, pentamerous, or, the upper petals being united to their points, tetramerous; *tube* short or long; *limb* flat or erect, nearly equally divided or labiate, imbricated in æstivation. *Stamens* in a single series opposite the sepals; the uppermost altogether deficient, or sterile, or very rarely fertile, and shorter than the others; the two lateral equal, antheriferous or very rarely sterile and abortive; the lower equal, sometimes fertile and equal to the lateral ones or longer, often sterile or deficient; *anthers* 2-celled, or, by growing together or half-disappearing, one-celled, opening longitudinally. *Ovary* superior 2-celled, many-seeded; *style* simple or rarely

shortly bifid, *stigma* generally simple, entire, emarginate, or bifid, often flattened, occasionally double at the points of the divisions of the style. *Fruit* capsular, seldom berried, bicarpellary, 2-celled, sometimes with 2 entire or bifid valves, sometimes with 4 entire ones, sometimes opening by pores or lids, very rarely almost indehiscent; dissepiment parallel or opposite to the valves, finally loose in the centre, or altogether. *Placentæ* adhering to the dissepiment, sometimes when mature separate and forming 1-2 central columns. *Seeds* indefinite, rarely definite, albuminous; *embryo* orthotropous, heterotropous or antitropous. —*Herbs, under-shrubs*, or sometimes *shrubs*, usually scentless, but sometimes fœtid, rarely aromatic. *Leaves* opposite, whorled, or alternate. *Flowers* axillary, or racemose, rarely spiked. *Peduncles* opposite or alternate; sometimes simple and 1-flowered, sometimes many-flowered in dichotomous cymes. *Bentham.*

Affinities. The capsular monopetalous genera of Dicotyledons, with a superior ovary, albuminous seeds, and irregular diandrous or didynamous stamens, were separated by Jussieu into two orders, which he called Scrophulariæ and Pediculares, distinguished from each other by the dehiscence of the former being septicidal, and of the latter loculicidal. Brown, in his *Prodromus*, pointed out the insufficiency of this character, which is often not even of generic value, and he combined the orders of Jussieu under the common name of Scrophularineæ. This opinion has been adopted by subsequent writers, with the exception of De Candolle, who, in Duby's *Botanicon Gallicon* (1828) adheres to the old division of Jussieu, the names being changed into Antirrhineæ and Rhinanthaceæ. Notwithstanding this almost universal assent to the identity of the two orders of Jussieu, some separations having been made upon different principles from those of that learned botanist. Thus Orobanchaceæ have been distinguished by himself; Gesneraceæ by Nees Von Esenbeck; and Melampyraceæ by Richard. The two former are adopted by botanists without dissent; the latter has not been so generally received. In my *Synopsis* I admitted it, upon the ground of its definite ascending seeds and inverted embryo; but subsequent observation led me to think that by excluding from the character all consideration of the number and direction of the seeds, an order would be formed, agreeing in a peculiar habit, and in the radicle of the embryo not being presented to the hilum, to which the name of Rhinanthaceæ might conveniently be retained. Upon this view of the subject, Scrophulariaceæ would include no genus the embryo of which is not orthotropous, and in Rhinanthaceæ it could be antitropous or heterotropous. The number of synonymous names above quoted, show into how many more supposed orders the old Scrophulariaceæ have been broken by one author or another. The whole matter has, however, been lately reinvestigated by Bentham, whose views appear to be so much more comprehensive than those of his predecessors, and who has treated the question in so philosophical and practical a way, that I have no hesitation in adopting his opinion: agreeing with him that in fact all the supposed orders are really some sections of one great natural order.) From the observations of my learned friend upon the Scrophulariaceæ of India I extract the following useful remarks:—

"The nearest affinities to Scrophularineæ are undoubtedly the Solaneæ, through the medium of the tribe of Salpiglossideæ; so much so, that it becomes necessary to separate them by a purely artificial distinction, considering as Solaneæ such genera as have the plaited corolla and 5 stamina, and as Scrophularineæ all those in which either the fifth stamen is wanting, or the æstivation of the corolla imbricated. The line would thus be drawn between Petunia and Salpiglossis, two genera closely allied in habit. In the first, however, the decidedly plicate corolla and 5 stamina shew it to be a true Solanea, whilst the slight irregularity of the corolla and the declinate very unequal stamina, indicate an approach to Salpiglossis, which, being always didynamous, with an imbricately æstivating, or obscurely plicate corolla, is a genuine Scrophularinea. In the tribe of Verbasceæ the genus Verbascum, as being pen-

tandrous, and Celsia, because it cannot be separated from Verbascum, have usually been referred to Solaneæ, although there are not in that tribe any plants nearly allied to them, but the æstivation of the corolla, besides the general habit, leave no doubt that Bartling and others are right in classing these genera among Scrophularineæ.

"Of the other Personate orders those whose genera or species have been most frequently mistaken for, or considered as Scrophularineæ, are—1. the Gesnereæ and Orobancheæ, distinguished in particular by their unilocular ovarium, with parietal placentæ, although the latter protrude sometimes after fecundation, so as to form a 2- 4-locular fruit; 2. the Bignoniaceæ, Cyrtandraceæ and Pedalineæ, which have exalbuminous seeds, besides which the two latter have a unilocular ovarium, with an unilocular, or spuriously 2- 4-locular fruit. The above characters, although not always very easy to ascertain, appear, nevertheless, to be decided and constant. They are, moreover, accompanied usually by differences in habit and other minor characters; and I am acquainted with few, if any, intermediates. Gesnereæ have usually a semi-adherent ovarium, a character which, amongst Scrophularineæ, I have only observed in a slight degree in some Calceolariæ; and these have the regular bilocular ovarium and fruit of the latter order. Any further details, however, respecting the character and affinities of Gesnereæ are rendered useless by the elaborate exposition of Martius, in his Nova Genera et Species, vol. 3."

"Orobancheæ are at once known by their peculiar habit. They appear to be always parasitical, are never green, and their leaves are converted into scales. The nearest approach to them amongst Scrophularineæ is to be found in the genus Buchnera, in which most, if not the whole, of the section Campyleia are parasitical, and the B. hydrabadensis is, like the Orobancheæ, leafless, but with the ovarium and capsule of Buchnera.

"Bignoniaceæ are frequently arborescent, which is very rarely the case amongst Scrophularineæ: the same thing may be said of their pinnate leaves, long capsules, and winged seeds; but as each of these characters is occasionally met with in Scrophularineæ, the inspection of the embryo must be resorted to for a certain character.

"Cyrtandraceæ and Pedalineæ are more readily distinguished by their ovarium always unilocular, if examined before the development occasioned by fecundation. Two other very extensive orders, the Acanthaceæ and Verbenaceæ, occasionally come also very near to Scrophularineæ, although they are in general sufficiently removed to have occasioned but little difficulty in their separation. Some connecting genera, call, however, for a few observations in the case of each. Acanthaceæ (of which the Indian species and the general character of the order are so admirably elucidated by Nees V. Esenbeck in Dr. Wallich's Pl. As. Rar. 3. 70.) are generally known by the imbricate polysepalous calyx, the elastically dehiscent capsule, the retinacula of the dissepiment, the want of albumen, and the peculiar habit derived chiefly from the inflorescence. The first of these characters is common to many Gratioleæ; the second is observable in Buchnera; the retinacula are wanting in some genera of Acanthaceæ, and the inflorescence of Lindenbergia grandiflora, of Beyrichia, &c., may be easily compared to that of Acanthaceæ; there remains, therefore, still the minute and often microscopic character derived from the embryo, as the only positive one which has hitherto proved constant. Verbenaceæ have the more decided character of a fruit which is indehiscent, and an ovarium divided into uniovulate cells. The first of these characters occurs in Thylacantha, Teedia, Leucocarpus, and Tozzia; the second in Melampyrum; but in neither of these cases are both combined. The calyx, corolla, and genitalia, are the same in Scrophularineæ and Verbenaceæ. In the latter order, the seeds are also said to have occasionally a small quantity of albumen.

"The Lentibularieæ, a small order, consisting of Pinguicula and Utricu-

laria, are very closely allied to Scrophularineæ, having the same calyx, corolla, stamina, bivalved capsule, and albuminous seeds, but distinguished solely by their really unilocular fruit, with a free central placenta, and the minuteness of their embryo. In respect of their former character, they come very near to Limosella, Lindernia, and other Gratioleæ, with parallel dissepiments and entire valves; for in these plants the dissepiment is very thin, and usually detaches itself from the valves before maturity, so that being concealed by the seeds, which fill nearly the whole capsule, it often escapes observation, and many of these genera have frequently been described as having an unilocular fruit.

"From the latter consideration it has been usual, however, to refer these supposed unilocular genera to Primulaceæ: an order perfectly well marked by a very different and a much more important character, that of the situation of the stamens, which are opposed to, not alternate with the petals, shewing them to belong to the inner set of a double series of stamina, whereas in Scrophularineæ the stamina are constantly alternate with the petals, and if the normal number be really double that of the petals, it is the inner series that is constantly abortive, leaving, as far as has been hitherto observed, no trace in any instance, unless, indeed, the deeply cleft disk, described by Martius as encircling the ovarium in Herpestis lanigera, or the scales in the tube of the corolla of Artanema, be considered as abortive stamina. Schwenckia, hitherto referred to Scrophularineæ, has the stamina constantly opposed to the petals, as observed by Dr. Lindley upon living specimens, and which at his suggestion I have verified upon dried specimens of several didynamous as well as pentandrous species. It is, therefore, unquestionably referable to Primulaceæ, and the glandular processes alternating with the petals may be considered probably as abortive stamina of the inner series, analogous to those of Samolus.

"It may be scarcely necessary to mention Gentianeæ among the affinities of Scrophularineæ, as their symmetrical flowers and the position of the carpels forming the fruit, which when only two in number are perpendicular to the axis, not parallel to it, as in Scrophularineæ, mark them out at once. Disandra, an anomalous genus of Scrophularineæ, has something the habit of Villarsia, but I have not had an opportunity of examining sufficiently good specimens to form any opinion as to its real situation."

Geography. Found in abundance in all parts of the world, from the coldest regions in which the vegetation of flowering plants takes place, to the hottest places within the tropics. One species is found in Melville Island; in the middle of Europe they form about a 26th of the flowering plants, and in North America about a 36th. In all India, New Holland, and South America, they are common, and, finally, the sterile shores of Tierra del Fuego are ornamented with several species.

Properties. Generally acrid, bitterish, suspected plants. The leaves and roots of Scrophularia aquatica, and perhaps nodosa, of Gratiola officinalis and peruviana, and of Calceolaria, act as purgatives, or even as emetics. In Digitalis, which is in many respects very near Solaneæ, this quality is so much increased, that its effects become highly dangerous. The powdered leaves, or an extract of them, produce vomiting, dejection, and vertigo, increase the secretion of the saliva and urine, lower the pulse, and even cause death. *DC.* According to Vauquelin, the purgative quality of Gratiola depends upon the presence of a peculiar substance, analogous to resin, but differing in being soluble in hot water. The leaves of Mimulus guttatus are eatable as salad. The juice of the leaves of Torenia asiatica are considered, on the Malabar coast, a cure for gonorrhœa. *Ainslie,* 2. 122. An infusion of Scoparia dulcis is used by the Indians of Spanish America to cure agues. *Humboldt Cinch. Forests,* 22. *Eng. ed.* Euphrasia officinalis is slightly bitter and aromatic, and was formerly employed in diseases of the eye, but is now disused. Cows

are said to be fond of Melampyrum pratense; and Linnæus says the best and yellowest butter is made where it abounds. The Pedicularises are acrid, but are eaten by goats. Nearly all that tribe turn black in drying.

GENERA.*

§ 1. VERBASCEÆ, Bartl.
Verbascineæ, N. ab E.
Calceolarieæ, Don.
Scrophularieæ, Don.
Verbascum, L.
? Isanthera, N. ab E.
Celsia, L.
Nefflea, Benth.
Sphenandra, Benth. (51)
Alonsoa, R. et P.
Jovellana, Cav.
Calceolaria, L.
Bœa, Comm.
Scrophularia, L.
§ 2. HEMIMERIDEÆ, Benth.
Angelonia, H. B. et K.
Thylacantha, Nees.
Hemimeris, L.
Diascia, Link.
Nemesia, Vent.
§ 3. ANTIRRHINEÆ, Chav.
Anarrhinum, Desf.
Linaria, Tourn.
Antirrhinum, L.
Maurandia, Jacq.
Usteria, Cav.
Galvesia, Juss.
Agassizia, Chav.
Lophospermum, Don.
Rhodochiton, Zucc.
? Gastromeria, Don.

? Collinsia, Nutt.
§ 4. SALPIGLOSSIDEÆ, Benth.
Schizanthus, R. et P.
Salpiglossis, R. et P.
Browallia, L.
Franciscea, Pohl.
Brunsfelsia, L.
Anthocercis, Lab.
§ 5. DIGITALEÆ, Benth.
Chelonеæ, Don.
Chelone, L.
Pentstemon, L'Hér.
Elmigera, Rchb.
Russelia, Jacq.
Digitalis, L.
Isoplexis, Lindl.
? Halleria, L.
§ 6. GRATIOLEÆ, Benth.
Teedia, Rud.
Aptosimum, Burch.
Pogostoma, Schrad.
Capraria, L.
? Ohlendorffia, Lehm.
Pterostigma, Benth.
Lindenbergia, Link.
Bovea, Decaisne.
Brachycoris, Schrad.
Stemodia, L.
Cybbanthera, Hamilt.
Dodartia, L.
Mazus, Lour.
Hornemannia, Willd.
Limnophila, R. Br.
Morgania, R. Br.
Leucocarpus, Don.
Mimulus, Linn.
Uvedalia, R. Br.
Herpestis, Gærtn.
Monnicra, Mich.
Calytriplex, R. et P.
Bramia, Lam.
Curanga, Juss.
Sphærotheca, Cham.
Conobea, Aubl.
Matourea, Aubl.
Caconapea, Cham.
Ranaria, Cham.
Gratiola, L.
Beyrichia, Cham.
? Achetaria, Cham.
Hydrotriche, Zucc.
Dopatrium, Hamilt.
Microcarpæa, R. Br. (52)
Peplidium, Del.
Bonnaya, Link.
Vandellia, L.
Tittmannia, Rchb.
Artanema, Don.
Diceros, Pers.
Torenia, L.
Nortenia, Pet. Th.
Heteranthia, Nees.
Vrolikia, Spr.
Mecardonia, Mart.
Hydranthelium, H. B. K.
Willichia, Mut.
Lindernia, L.
Limosella, L.
Micranthemum, Mich.
Hemianthus, Nutt.

Ellobum, Blum.
§ 7. BUCHNEREÆ, Benth.
Sophronanthe, Benth. (53)
Sutera, Roth.
Leucospora, Nutt.
Manulea, L.
Nemia, Berg.
Erinus, L.
Nycterinia, Don.
Zaluzianskia, Schmidt. ?
Buchnera, L.
Campuleia, Pet. Th.
Piripea, Aubl.
§ 8. BUDDLEIEÆ, Benth.
Buddleia, L.
Nuxia, Vent.
§ 9. VERONICEÆ, Benth.
Sibthorpiaceæ, Don.
Aragoaceæ, Don.
Veronica, L.
Pœderota, L.
Leptandra, Nutt.
Diplophyllum, Lehm.
Cochlidiospermum, Rchb.
Omphalospora, Bess.
Hebe, Juss.
Aidelus, Spr.
Calorhabdos, Benth.
Campylanthus, Roth.
Eranthemum, Vahl.
Wulfenia, Jacq.
Gymnandra, Pall.
Lagotis, Gærtn.
Picrorhiza, Royle.
Scoparia, L.
Aragoa, H. B. K.
Hemiphragma, Wall.
Sibthorpia, L.
Geochorda, Cham.
Leucophyllum, H. B. K.
Ourisia, Comm.
Dichroma, Cav.

? Polypremum, L.
? Disandra, L.
§ 10. GERARDIEÆ, Benth.
Escobedia, R. et P.
Physocalyx, Pohl.
Melasma, Berg.
Nigrina, Linn.
Lyncea, Cham. ?
Esterhazya, Mikan.
Macranthera, Leconte.
Conradia, Nutt.
Seymeria, Pursh.
Afzelia, Gmel.
Gerardia, L.
Virgularia, R. et P.
Sopubia, Don.
Glossostyles, Cham.
Starbia, Pt. Th. ?
Hymenospermum, Benth.
? Phtheirospermum, Bunge.
Centranthera, R. Br.
Razumovia, Spr. ?
§ 11. RHINANTHEÆ, Benth.
Pediculares, Juss.
Rhinanthaceæ, DC.
Melampyraceæ, Rich.
Euphrasieæ, Don.
Orthocarpus, Nutt.
Castilleia, Mut.
Euchroma, Nutt.
Adenostegia, Benth. (54)
Triphysaria, F. et M.
Schwalbea, L.
Lamourouxia, H. B. K.
Cymbaria, L.
Odontites, Stev.
Euphrasia, L.
Parentucellia, Viv. ?
Lafuentea, Lag.
Durieua, Mérat.
Siphonostegia, Benth.
Bartsia, L.
Trixago, Stev.
Lasiopera, Link.
Bungea, C. A. Meyer.
Pedicularis, L.
Rhinanthus, L.
Alectorolophus, Stev.
Elephas, Tourn.
Rhinanthus, Stev.
Melampyrum, L.
Tozzia, L.

Gomara, R. et P.
Sanchezia, R. et P.
Diceros, Lour.
Picria, Lour.
Tripinna, Lour.
Palmstruckia, Retz. f.
Prosopia, Rchb.

* Mr. Bentham has been so obliging as to prepare this list of genera for me.

Alliance V. *SOLANALES.*

Essential Character.—*Flowers* symmetrical, but sometimes irregular. *Carpels* 2, parallel with the axis of inflorescence ↻. *Seeds* with an embryo lying in the midst of albumen.

Order CCXVIII. SOLANACEÆ. The Nightshade Tribe.

Solaneæ, *Juss. Gen.* 124. (1789); *R. Brown Prodr.* 443. (1810); *Lindl. Synops.* 180. (1829); *Bartl. Ord. Nat.* 193. (1830); *Schlecht in Linnæa.* 7. 66. (1832); *Nees v. Esenbeck in Linn. Trans.* 17. 37. (1834).

Essential Character.—*Calyx* 5-parted, seldom 4-parted, persistent, inferior. *Corolla* monopetalous, hypogynous; the *limb* 5-cleft, seldom 4-cleft, regular, or somewhat unequal, deciduous; the *æstivation* plaited or imbricated. *Stamens* inserted upon the corolla, as many as the segments of the limb, with which they are alternate; *anthers* bursting longitudinally, rarely by pores at the apex. *Ovary* 2-celled, rarely 4- or many-celled, with 2 polyspermous placentæ; *style* continuous; *stigma* simple. *Pericarp* with 2, or 4, or many cells, either a capsule with a double dissepiment parallel with the valves, or a berry with the placentæ adhering to the dissepiment. *Seeds* numerous, sessile; *embryo* straight or curved, often out of the centre, lying in a fleshy *albumen*; *radicle* next the hilum.—*Herbaceous* plants or *shrubs*. *Leaves* alternate, undivided, or lobed, sometimes collateral; the floral ones sometimes double, and placed near each other. *Inflorescence* variable, often out of the axil; the *pedicels* without bracts.

Anomalies. The anthers of Solanum open by pores. Nicotiana multivalvis has many cells in the capsule, so has Lycopersicon, Nicandra is 5-celled, Datura 4-celled.

Affinities. Brown remarks, that this order is chiefly known from Scrophulariaceæ by the curved or spiral embryo, the plaited æstivation of the corolla, and the flowers being usually regular, with the same number of stamens as lobes. Hence the genera with a corolla not plaited, and at the same time a straight embryo, should either be excluded, or placed in a separate section, along with such as have an imbricated corolla, a slightly curved embryo, and didynamous stamens. *Prodr.* 444. It does not, however, appear necessary to separate the latter as a distinct order, but it is better to understand them as genera passing into the condition of Scrophulariaceæ, which are in fact nothing but unsymmetrical Solanaceæ. Upon this subject I have the following remarks in the Botanical Register :—

The general mode of distinguishing Solanaceæ from Scrophulariaceæ is by the very obscure character of the curved embryo of the former. It is true that Brown adds to this a plaited corolla, and stamens equal in number to the segments of the corolla and calyx; but it is plain that he considers these less absolute than the curved embryo, because he admits such plants as Anthocercis, which has didynamous stamens and an imbricated corolla, placing them indeed in a distinct section, but still referring them to Solanaceæ. Bartling in his valuable work on the Natural Orders of Plants, does not adopt this view, but attaches only a subordinate importance to the form of embryo, and makes the distinction between the two orders depend upon the plaited corolla and symmetrical flowers of Solanaceæ, as contrasted with the imbricated corolla and didynamous flowers of Scrophulariaceæ. Hooker adopts Brown's opinion, as I have also myself in the first edition of this work, and Arnott does the same, but with some misgivings as to its being right. In the Nixus Plantarum, I followed Bartling, abandoning my former view of the matter.

There can be only one reason for such a character as the curved embryo being adopted, in preference to all others, as an absolute distinction between two nearly allied orders, and that must be its uniformly accompanying other essential points of structure. How far this is the case will be apparent from

two or three plants allied to that now under consideration (Petunia violacea). In Petunia nyctaginiflora is found the common curved and twisted embryo of Solanaceæ; but in Petunia violacea, the seeds of which cannot be externally distinguished from those of the latter, not even when lying side by side upon the field of the microscope, the embryo is perfectly straight and much shorter, so that it appears to be of no more than specific importance in this case; in Salpiglossis straminea the embryo is curved and partly spiral; yet in all other characters the genus agrees with Scrophulariaceæ: finally, in Nicotiana persica, which no one can doubt being a genuine species of Solanaceæ, the embryo is nearly straight. We therefore are obliged to conclude, that a false importance has been given to this, as it certainly has to a great many other microscopic characters; a truth which has not escaped the acuteness of Fries. But to the plaited corolla and symmetrical flowers there are no exceptions that I know of; and these, therefore, I prefer as marks of distinction.

Solanaceæ and Scrophulariaceæ are, however, orders so very nearly related in nature, that scarcely any real limits can be expected between them. Where they touch, their similarity must almost amount to identity. Nevertheless, as the orders are no doubt most truly and naturally distinct to a great extent, I would not for the reasons just mentioned combine them. They should rather be considered as the connecting groups of two larger masses of plants, of which one has a tendency towards regular flowers and symmetrical stamens, and the other a tendency towards irregular flowers and didynamous stamens.

Geography. Natives of most parts of the world without the arctic and antarctic circles, especially within the tropics, in which the mass of the order exists, in the form of the genera Solanum and Physalis.

Properties. At first sight this family would seem to offer a strong exception to the general uniformity of structure and property, containing as it does the deadly Nightshade and Henbane, and the wholesome Potato and Tomato; but a little inquiry will explain this apparent anomaly. The tubers of the Potato are well known to be perfectly wholesome when cooked, any narcotic property which they possess being wholly dissipated by heat. This is the case with other succulent underground stems in equally dangerous families, as the Cassava among Euphorbiaceæ; besides which, as De Candolle justly observes,—"Il ne faut pas perdre de vue que tous nos alimens renferment une petite dose d'un principe excitant, qui, s'il y était en plus grande quantité, pourrait être nuisible, mais qui y est nécessaire pour leur servir de condiment naturel." The leaves of all are narcotic and exciting, but in different degrees, from the Atropa Belladonna, which causes vertigo, convulsions, and vomiting, the well-known Tobacco, which will frequently produce the first and last of these symptoms, the Henbane and Stramonium, down to some of the Solanum tribe, the leaves of which are used as kitchen herbs. The juice of Datura Stramonium is used in the United States, in doses of from 20 to 30 grains, in cases of epilepsy, or of mania without fever. *DC.* The Quina of Brazil is the produce of Solanum pseudoquina, and is so powerful a bitter and febrifuge, that the Brazilians scarcely believe that it is not the genuine Jesuits' Bark. It has been analysed by Vauquelin, who found that it contained $\frac{1}{50}$ of a bitter resinoid matter, slightly soluble in water, about $\frac{1}{12}$ of a vegetable bitter, and a number of other principles in minute quantities. *Plantes Usuelles*, 21. The juice of Atropa Belladonna is well known to produce a singular dilatation of the pupil of the eye. Duval found that the same property exists in Solanums of the Dulcamara tribe, but in a more feeble degree. It is in the fruit that the greatest diversity of character exists; Atropa Belladonna, Solanum nigrum, and others, are highly dangerous poisons; Stramonium, Henbane, and Physalis, are narcotic; the fruit of Physalis Alkekengi is diuretic, for which quality it is employed by veterinary surgeons; that of Capsi-

cum is pungent, or even acrid; some Physalis are subacid, and so wholesome as to be eaten with impunity; and, finally, the Egg plant, Solanum esculentum, and all the Tomato tribe of Solanum, yield fruits which are common articles of cookery. But it is stated that the poisonous species derive their properties from the presence of a pulpy matter which surrounds the seeds; and that the wholesome kinds are destitute of this pulp, the fruit consisting only of what botanists call the sarcocarp; that is to say, the centre of the rind, in a more or less succulent state. It must also be remembered, that if the fruit of the Egg-plant is eatable, it only becomes so after undergoing a particular process, by which all its bitter acrid matter is removed, and that the Tomato is always exposed to heat before it is eaten. The fruit of Solanum Jacquini is considered by the native practitioners of India as expectorant. The juice of that of Solanum bahamense is used in the West Indies in cases of sore throat. *Ainslie*, 2. 91. A decoction of the root of S. mammosum is bitter, and reckoned a valuable diuretic. *Ibid.* The roots of Physalis flexuosa are supposed by the Indian doctors to have deobstruent and diuretic qualities, and also to be alexipharmic. The leaves moistened with a little warm castor oil are a useful external application in cases of carbuncle. *Ibid.* 2. 15. The common Potato, in a state of putrefaction, is said to give out a most vivid light, sufficient to read by. This was particularly remarked by an officer on guard at Strasburgh, who thought the barracks were on fire, in consequence of the light thus emitted from a cellar full of potatos. *Ed. P. J.* 13, 376. It has been supposed that Potash may be advantageously obtained from the stalk of Potatos; but it appears, from the experiments of Macculloch and Hay, that the quantity they contain is so small as not to be worth the manufacture. *Ibid.* 2. 399. The deleterious principle of the Belladonna has been ascertained by Vauquelin to be a bitter nauseous matter, soluble in spirit of wine, forming an insoluble combination with tannin, and yielding ammonia when burnt. *DC. Prodr.* 225. The active principle of Solanum Dulcamara is an alkali, called Solania, which is in that plant combined with malic acid. *Turner*, 654. According to Mr. Houlton, the active principle of Hyoscyamus is only developed in the second year of its growth; a remark of much practical consequence. *Journ. of the R. Inst. Oct.* 1830, p. 196. A spinose species of Solanum called Burabara is reputed in Demarara to be an antidote to the bite of the Rattlesnake. *Ed. N. Ph. Journ. June* 1830, p. 169. For excellent remarks upon the geographical distribution and sensible properties of the order, especially with relation to Tobacco, see *Royle's Illustrations*, p. 279.

GENERA.

Juanulloa, R. et P.
Ulloa, Pers.
Lycium, L.
Acnistus, Schott.
Grabowskia, Schlecht.
Capsicum, L.
Solanum, L.
Nycterium, Vent.
Androcera, Nutt.
Bassovia, Aubl.
Aquartia, Jacq.
Lycopersicon, Tourn.
Dierbachia, Spreng.
Dunalia, H. B. K.
Witheringia, L'Herit.
Xuaresia, Fl. Per.
Physalis, L.
Herschellia, Bowd.
Duperreya, Gaudich.
Nicandra, Adans.
Calydermos, R. et P.
Atropa, L.
Mandragora, Tourn.
Saracha, R. et P.
Bellinia, Rœm. et Sch.
Withania, Pauquy.
Anisodus, Link.
Whitleya, Swt.
Nectouxia, H. B. K.
Jaborosa, Lam.
Solandra, L.
Swartzia, Gmel.
Metternichia, Mik.
Datura, L.
Stramonium, Bernh.
Dutra, Bernh.
Ceratocaulis, Bernh.
Brugmansia, R. et P.
Nierembergia, R. et P.
Nicotiana, L.
Petunia, Juss.
Lehmannia, Spreng.
Scopolina, Schult.
Scopolia, Jacq.
Hyoscyamus, L.
Stigmatococca, W. rel.

Lamarkia, R. et Sch.
Dartus, Lour.
Dorœna, Thunb.
Bellonia, L.
Cotylanthera, Bl.
Triguera, Cav.
Roussea, Sm. (55)

Order CCXIX. CESTRACEÆ.

Solanaceæ, § Cestrinæ, *Schlecht. in Linnæa.* 7. 52. (1832).—Cestrinæ, *Martius Conspectus, No.* 121. (1835).

I do not attempt to characterize this assemblage of plants, being uncertain what its real peculiarity is. According to Schlechtendahl it has all the characters of Solanaceæ, except that the embryo is nearly straight, and the cotyledons foliaceous. To this, however, it is possible that the valvate æstivation of the corolla ought to be added; but I am by no means sure that the species of Periphragmos of the Flora Peruviana, with winged seeds, ought not to be included, although as they have an imbricated æstivation, and a tricarpellary fruit, they are placed in Polemoniaceæ. These plants, which are very different from most of Jussieu's Cantuas, especially C. quercifolia, have much the habit of Lycium as well as Vestia. If they really do belong to Polemoniaceæ they must be considered a connecting link between that order and Cestraceæ.

GENERA.

Cestrum, L.	Sessea, R. et P.
Vestia, W.	Fabiara, R. et P. (56)

Alliance VI. *GENTIANALES.*

Essential Character.—*Flowers* symmetrical, usually tetrandous or pentandrous. *Carpels* perpendicular to the axis of inflorescence (). *Fruit* either a dry capsule, or a berry, or a drupe, or composed of two diverging follicles. *Seeds* often winged or comose. *Leaves* almost always opposite.

Order CCXX. GENTIANACEÆ. The Gentian Tribe.

Gentianeæ, *Juss. Gen.* 141. (1789); *R. Brown Prodr.* 449. (1810); *Lindl. Synops.* 177. (1829); *Von Martius Nov. Gen. &c.* 2. 132. (1828); *Bartl. Ord. Nat.* 199. (1830); *Royle's Illustrations,* 276. (1835).

Essential Character.—*Calyx* monophyllous, divided, inferior, persistent. *Corolla* monopetalous, hypogynous, usually regular, and persistent; the limb divided, equal, its lobes of the same number as those of the calyx, generally 5, sometimes 4, 6, 8, or 10; with an imbricated twisted æstivation. *Stamens* inserted upon the corolla, all in the same line, equal in number to the segments, and alternate with them; some of them occasionally abortive. *Pollen* 3-lobed or triple. *Ovary* single, 1- or 2-celled, many-seeded. *Style* 1, continuous; *stigmas* 1 or 2. *Capsule* or *berry* many-seeded, with 1- or 2-cells, generally 2-valved; the margins of the valves turned inwards, and in the genera with 1 cell, bearing the seeds; in the 2-celled genera inserted into a central placenta. *Seeds* small; *testa* single; *embryo* straight in the axis of soft fleshy albumen; *radicle* next the hilum.—*Herbaceous* plants, seldom *shrubs*, generally smooth. *Leaves* opposite, entire, without stipules, sessile, or having their petioles confluent in a little sheath, in most cases 3-5-ribbed; very rarely brown and scale like; sometimes alternate. *Flowers* terminal or axillary.

Affinities. Very near Apocynaceæ, from which the order differs in the herbaceous habit, permanent corolla, entire ovary, imbricated, not contorted, æstivation, want of milk, usually capsular fruit, and especially in the ribbed leaves which in by far the majority of cases afford a certain mark of recognition; to this may be added their bitterness. Brown remarks, that this order is better known by its habit than by any particular character; being on the one hand, allied to Polemoniaceæ and Scrophulariaceæ, from the latter of which

it is distinguished by its regular flowers, the stamens of which are equal to the lobes of the corolla, and from the former by the dehiscence of the capsule and the placentation of the seeds; and, on the other hand, to certain Apocynaceæ. From Scrophulariaceæ it is frequently difficult to distinguish this order, especially if the flowers are absent; Loganiaceæ and Spigeliaceæ are also very closely allied. For remarks on the three last, see those orders respectively. Von Martius, points out some differences between Gentianaceæ and Scrophulariaceæ, and their allies, which will further assist in distinguishing them. No Gentianaceæ, except Tachia, have a hypogynous disk; and the two carpellary leaves of which the fruit is formed are lateral, or right and left with respect to the common axis of the inflorescence, their placentæ being consequently anterior and posterior; but in Scrophulariaceæ, Gesneraceæ, Bignoniaceæ, Acanthaceæ, and their allies, a hypogynous disk is very common in the shape of a fleshy ring, or of glands, or teeth, and the two carpellary leaves are anterior and posterior, the dissepiment being consequently in the same transverse line as that which separates the upper from the lower lip. Menyanthes and Villarsia have been sometimes considered the type of a small order distinguished by the alternate and sometimes compound toothed leaves, but Royle has an alternate leaved Swertia. (*Illustr.* p. 277. t. 67. 2.) Von Martius excludes them absolutely; Brown places them at the end of the order: it will be seen, further on, that the properties of these plants are absolutely the same as those of Gentianaceæ. Crawfurdia seems to connect this order with Convolvulaceæ and Polemoniaceæ; and Leiphaimos a parasitical, scaly, leafless species offers an unexpected transition to Orobanchaceæ. A clear natural relation even to Cinchonaceæ is demonstrated by the circumstance of Mitreola and Houstonia having both been mistaken by good botanists for Cinchonaceous plants.

Geography. A numerous order of herbaceous plants, extending over almost all parts of the world, from the regions of perpetual snow upon the summits of the mountains of Europe, to the hottest sands of South America and India. They, however, do not appear in the Flora of Melville Island; but they form part of that of the Straits of Magellan.

Properties. The intense bitterness of the Gentian is a characteristic of the whole order; it resides both in the stems and roots, and renders them tonic, stomachic, and febrifugal; and it is very remarkable that there are no exceptions to these properties in the whole order, as it is now limited. The principal species enumerated by De Candolle are, Gentiana lutea, employed in France and England; G. rubra, substituted for it in Germany; G. purpurea in Norway; G. amarella, campestris, cruciata, Chlora perfoliata, G. peruviana, called Cachen in Peru, G. Chirita (Agathotes, Don), a famous stomachic of the East Indies, and Coutoubea alba and purpurea. The root of Gentiana lutea, notwithstanding its bitterness, contains a considerable proportion of sugar; it is, on this account, sometimes manufactured into brandy, for which purpose it is exported from some parts of Switzerland. Menyanthes trifoliata and Villarsia nymphoides are bitter, tonic, and febrifugal; and the same has been remarked of Villarsia ovata. *Essai Méd.* 216. Sabbatia angularis is held in estimation in North America for its pure bitter, tonic, and stomachic virtues. *Barton*, 1. 259. The root of Frazera Walteri is a pure, powerful, and excellent bitter, destitute of aroma. It is accounted in North America not inferior to the Gentian or Calumbo of their shops. In its recent state it is said to possess considerable emetic and cathartic powers. *Ibid.* 2. 109. The roots of Lisianthus pendulus are used by the Brazilians in decoction as a febrifuge; they are intensely bitter. Tachia guianensis exudes little yellow drops of pellucid resin from the axils of the leaves; its bitter root is used as a febrifuge. *Von Martius.*

GENERA.

Gentiana, L.
Asterias, Brkh.
Coilantha, Brkh.
*Gentianella, Col.
Crossopetalum, Rth.
Uranianthe, Gaud.
*Eurythalia, Ren.
Hippion, Schm.
*Ericala, Ren.
*Pneumonanthe, Cord.
Ciminalis, Brkh.
Thylacites, Ren.
Cyane, Ren.
Dasystephana, Ren.
Tetrorhiza, Ren.
Agathotes, Don.
Ophelia, Don.
Lomatogonium, Braun.
Chlora, L.
Swertia, L.
Halenia, Borkh.
Voyra, Aubl.
Vohiria, Lam.
Lita, Schreb.
Callopisma, Mart.
Dejanira, Chamiss.
Sabbatia, Adans.
Frasera, Michx.
Centaurella, Michx.
Bartonia, Willd.
Andrewsia, Spreng.
Erythræa, Borkh.
Rich.
Orthostemon, R. Br.
Canscora, Lam.
Centaurium, Borkh.
Pladera, Roxb.
Hoppea, Willd. Vahl.
Chironia, L.
Slevogtia, Rchb.
Coutoubea, Aubl.
Picrium, Schreb.
Sebæa, Sol.
Schultesia, Mart.
Prepusa, Mart.
Schüblera, Mart.
Curtia, Chamiss.
Cicendia, Adans.
Microcala, Lk.
Exacum, L.
Helia, Mart.
Irlbachia, Mart.
Lisianthus, L.
Tachia, Aubl.
Myrmecia, Schreb.
Mitreola, L. Rich.
Houstonia, L.
Poiretia, Gmel.
Mitrasacme, La Bill.
Enicostema, Bl.
Tripterospermum, Bl.
Crawfurdia, Wall.
Leiphaimos, Schlecht.
Villarsia, Vent.
Waldschmidtia, Wigg.
Schweykerta, Gmel.
Menyanthes, L.

The genera marked with an * are possibly mere sub-divisions of those they follow.

Order CCXXI. SPIGELIACEÆ. The Wormseed Tribe.

Spigeliaceæ, *Martius N. G. et Sp.* 2. 132. (1828).

Essential Character.—*Calyx* inferior, regularly 5-parted. *Corolla* regular, with 5 lobes, which have a valvate æstivation. *Stamens* 5, inserted into the corolla all in the same line; *pollen* 3-cornered, with globular angles. *Ovary* superior, 2-celled; *style* articulated with it, inserted; *stigma* simple. *Fruit* capsular, 2-celled, 2-valved, the valves turned inwards at the margin and separating from the central placenta. *Seeds* several, small; *testa* single; *embryo* very minute, lying in a copious fleshy *albumen*, with the radicle next the *hilum*.—*Herbaceous* plants or *under-shrubs*. *Leaves* opposite, entire, with stipules, or a tendency to produce them. *Flowers* arranged in 1-sided spikes. *Pubescence* simple or stellate.

Affinities. This order was founded by Von Martius, from whose splendid work upon the Brazilian Flora I extract the following remarks:—"There are many reasons for separating Spigelia from Gentianaceæ; and I am the more disposed to attend to those reasons, from seeing daily instances of the necessity of establishing new orders, to avoid weakening the characters of old ones. For example, Aquilariaceæ, Datiscaceæ, Hamamelaceæ, and other orders constructed upon a few species, are so many instances of this practice, by which the science is both embellished and strengthened by our most skilful botanists. With regard to Spigelia, if we retain it among Gentianaceæ, I do not know how we are to distinguish that order with certainty from those of its neighbourhood; for this genus approaches Scrophulariaceæ in the division of the two valves of the fruit, and in the central, not parietal, origin of the placentæ; and Cinchonaceæ in the insertion of the style into the ovary, and the distension of the petiole into the form of a stipule. Scrophulariaceæ are, indeed, so nearly related to Gentianaceæ, that the best botanists have admitted that there are scarcely any marks of distinction between them, besides the regular number of the stamens of the latter, and the simplicity of the valves of the capsule." (The position of the pericarpial leaves with relation to the axis of inflorescence, is known to be a certain mark of distinction between Gentianaceæ and Scrophulariaceæ.) "Some may possibly adduce the irregularity of the corolla of Scrophulariaceæ, and the origin of the placentæ from the mere inflexion of the valves of the capsule in Gentianaceæ; but it must be remembered, that there are certain genera of Scrophulariaceæ, such as Limnophila,

Xuaresia, Ourisia, and Veronica, the corolla of which is regular or nearly so; and that certain Gentianaceæ, for instance Exacum and Schübleria, have central placentæ, which, although deriving their origin from the inflexion of the valves of the capsule, yet become loose and more or less distinct. Others may refer to the æstivation as another source of differences, it being in Gentianaceæ, on account of the lateral and somewhat contorted twisting of the nearly equal segments, *contorted-convolutive*, and in Scrophulariaceæ, on account of the involution of the unequal segments towards the centre of the flower, merely *imbricated;* but these differences, on account of the different forms of the corolla in these extensive orders, are scarcely distinguishable, and are more available in theory than in practice. Besides, in Spigelia the æstivation is different from either, being valvate, with the margins of the segments often protruding into acute angles, and is more like that of Cinchonaceæ. It must not be omitted, that while the seeds of Gentianaceæ are uniformly indefinite, those of Spigelia are definite, or nearly so. Upon all these considerations, and to avoid confusing the distinctive characters of the orders, I have formed that of Spigeliaceæ, the distinction of which will depend upon the symmetry of the stamens, corolline and calycine segments, the division of the valves of the capsule, and the presence of stipules. In this last point they approach Cinchonaceæ, as also in a tendency in their leaves to become whorled, their intruded style, and valvate æstivation; but differ in their superior ovary, and the want of the glandular disk which covers the apex of the ovary of Cinchonaceæ; so establishing, along with other things, an affinity between that order and Compositæ and Umbelliferæ," &c. &c. In one point of view Spigeliaceæ bear the same relation to Gentianaceæ as Cestraceæ to Solanaceæ.

Geography. All American, chiefly natives of the southern hemisphere within the tropics.

Properties. Spigelia marilandica root is used in North America as a vermifuge: if administered in large doses, it acts powerfully as a cathartic. Its use is, however, attended occasionally with violent narcotic effects, such as dimness of sight, giddiness, dilated pupil, spasmodic motions in the muscles of the eyes, and even convulsions. *Barton*, 2. 80.

GENERA.

Canala, Pohl.
Spigelia, L.

Order CCXXII. APOCYNACEÆ.

Apocyneæ, *Juss. Gen.* 143. (1789) *in part; R. Brown Prodr.* 465. (1810); *Lindl. Synops.* 176. (1829); *Royle's Illustrations*, 269. (1835).—Contortæ, *Linn.* Strychneæ, *DC. Théorie, ed.* 1. 217. (1813).—Vinceæ, *DC. and Duby Bot. Gall.* 324. (1828), *a § of* Apocyneæ.—Strychnaceæ, *Blume Bijdr.* 1018. (1826); *Link. Handb.* 1. 439. (1829).

Essential Character.—*Calyx* divided into 5, persistent. *Corolla* monopetalous, hypogynous, regular, 5-lobed, with contorted æstivation, deciduous. *Stamens* 5, arising from the corolla, with whose segments they are alternate. *Filaments* distinct. *Anthers* 2-celled, opening lengthwise. *Pollen* granular, globose, or 3-lobed, immediately applied to the stigma. *Ovaries* 2, or 1 2-celled, polyspermous. *Styles* 2 or 1. *Stigma* 1. *Fruit* a follicle, capsule, or drupe, or berry, double or single. *Seeds* with fleshy or cartilaginous *albumen; testa* simple; *embryo* foliaceous; *plumule* inconspicuous; *radicle* turned towards the hilum.—*Trees* or *shrubs*, usually milky. *Leaves* opposite, sometimes whorled, seldom scattered, quite entire, often having ciliæ or glands upon the petioles, but with no stipules. *Inflorescence* tending to corymbose.

Anomalies. Corolla valvate in Gardneria. Leaves subalternate in succulent species. Rhazya has alternate leaves.

Affinities. These are strongest with Asclepiadaceæ, in which they will presently be discussed; otherwise the order lies between Cinchonaceæ and Gentianaceæ. From Cinchonaceæ it is distinguished by the superior ovary, contorted flowers, and absence of stipules: in room of which are, however, sometimes produced certain ciliæ, or other appendages of the petiole, which the inexperienced observer may mistake for stipules. The same characters divide them from Gentianaceæ; and I think the combination of these peculiarities is sufficient to destroy all doubt about the limits of any of these orders. From Potaliaceæ and Loganiaceæ they are distinguished almost entirely by the perfect symmetry of the calyx, corolla, and stamens, and the want of true stipules. I agree with Von Martius, Brown, and other botanists, who consider Strychneæ a mere section of Apocynaceæ, rather than a distinct order: it differs chiefly in its peltate seeds and simple succulent fruit. Plumieria is the most succulent genus of the order.

Geography. Natives of nearly the same localities as Asclepiadaceæ, with the exception that they are less abundant at the Cape of Good Hope.

Properties. Not very different from those of Asclepiadaceæ, but perhaps rather more suspicious. The order contains species with the same purgative, the same acrid, the same febrifugal qualities. The bark of Cerbera Manghas is purgative; that of Echites antidysenterica is astringent and febrifugal. The leaves of Nerium Oleander contain an abundance of gallic acid; The fruit of the succulent-fruited genera is often emetic. The bark of the root and the sweet-smelling leaves of Nerium odorum are considered by the native Indian doctors as powerful repellents, applied externally. The root, taken internally, acts as a poison. *Ainslie*, 2. 23. It would seem, from an examination by Arnott of flower-buds of a milk-tree called Hya-hya in Demerara, that this remarkable vegetable production belongs to this order. It is described by its European discoverer, to yield a copious stream of thick, rich, milky fluid, destitute of all acrimony, and only leaving a slight clamminess upon the lips. A tree which was felled on the banks of a small stream had completely whitened the water in an hour or two. Arnott calls it Tabernæmontana utilis. *Jameson's Journal, Ap.* 1830. The milk has been analysed by Christison, who finds it to consist of a small proportion of caoutchouc, and a large proportion of a substance possessing in some respects peculiar properties, which appear to place it intermediate between caoutchouc and the resins; it probably, therefore, has no nutritive qualities. *Ed. N. Ph. Journ. June* 1830, p. 34. Birdlime is obtained in Madagascar from the Voacanga; and the *caoutchouc* of Sumatra is produced by the genus Urceola (elastica). *Brown in Congo*, 449. A species of Vahea furnishes this substance in Madagascar, and Willughbeia edulis in India, but the latter of indifferent quality. *Royle*. The root of Plumeria obtusa is used as a cathartic in Java. *Ainslie*, 2. 137. The Conessi Bark of the British Materia Medica, the Palapatta of the Hindoos on the Malabar coast, is the produce of Wrightia antidysenterica; it is a valuable tonic and febrifuge. On the Coromandel side of India it seems chiefly to be given in dysenteric affections. The milky juice of the tree is used as a vulnerary. *Ibid.* 1. 88. The Wrightia tinctoria is extremely valuable as a dyer's plant, the blue colour it yields equalling Indigo. The wood of Wrightia coccinea for its lightness and strength is used in making palanqueens in the south of India, while in the north, that of W. mollissima is used by turners. *Royle*, 270. An infusion of the leaves of Allamanda cathartica is a valuable cathartic. *Ibid.* 2. 9. The leaves of Cynanchum Argel are used in Egypt for adulterating Senna. A powerful poison is yielded by the kernel of the Tanghin tree of Madagascar (Cerbera Tanghin), a single seed being

sufficient to destroy twenty persons; see the *Botanical Magazine*, folio 2968, for an excellent account of this plant. Strychnos colubrina is used in Java in intermittent fever, and as an anthelmintic. According to Horsfield, the Malays prepare from it an excellent bitter tincture. Virey says, in an overdose it occasions tremors and vomiting. *Ainslie*, 2. 203. The St. Ignatius's bean (Strychnos St. Ignatii), called Papeeta in India, is prescribed by the native practitioners of India in cholera with success: it is mixed with Jehiree or Durreoaye Narriol (Cocos maldivica). If given in over-doses, vertigo and convulsions come on; but they are easily cured by lemonade drank largely. *Trans. M. and P. S. Calc.* 3. 432. Strychnos Tieute is one of the kinds of Upas. *Royle*. The seeds of Strychnos Nux vomica are well known, under the latter name, for containing a dangerous narcotic property, which modern chemists have ascertained to depend upon the presence of a peculiar principle called strychnia. Small quantities of the extract have been given with uncertain success in cases of mania, gout, epilepsy, hysteria, and dysentery, and also in paraplegia and hemiplegia. *Ainslie*, 1. 321. This strychnia is one of the most violent poisons hitherto discovered; its energy is so great, that half a grain blown into the throat of a rabbit, occasioned death in the course of five minutes. Its operation is always accompanied with symptoms of locked jaw and other tetanic affections. *Turner*, 651. A peculiar acid, called by Pelletier and Caventou the Igasuric acid, occurs in combination with strychnia in nux vomica and the St. Ignatius bean; but its existence, as different from all other known acids, is doubtful. *Ibid.* 641. It is remarkable, that one of the most valuable febrifuges of Brazil belongs to this order. The bark of the Strychnos Pseudo-quina is fully equal to Cinchona in curing intermittent fevers; it appears to possess some of the dangerous properties of nux vomica; but according to the analysis of Vauquelin, it contains no strychnia whatever. *Pl. Usuelles*, no. 1. The seeds of Strychnos potatorum, *Nirmulee* of the natives of India, are sold in every bazaar for the purpose of clearing muddy water. Bitter almonds are said to be employed for the same purposes in Egypt, as those of the Kola are in Africa. Notwithstanding the poisonous nature of the seeds, the pulpy part of the fruit of some species is eaten by the natives of the countries where they are indigenous, as those of S. innocua in Egypt, of S. pseudo-quina in Brasil, of S. potatorum in India, and even that of S. nux vomica by birds. (Roxb.) To these exceptions to the general hurtful nature of this order must be added Melodinus monogynus and Willughbeia edulis in India, Carissa edulis in Nubia, the Hya-hya already mentioned, and the Cream fruit of Sierra Leone; all of which yield edible fruit, while that of Carissa carandas is also eaten in India, and made into a jelly, as the best substitute for that most commonly employed in Europe. *Royle*, 272.

GENERA.

§ 1. ECHITEÆ, Bartl.
Echites, L.
Pycnostelma, Bge.
Hæmadictyon, Lindl.
Ichnocarpus, R. Br.
Beaumontia, Wall.
Holarrhena, R. Br.
Pachypodium, Lindl.
Isonema, R. Br.
Vallaris, R. Br.
Emericia, R. et S.
Peltanthera, Roth.
Parsonsia, R. Br.
Forsteronia, Meyer.
Lyonsia, R. Br.
Apocynum, L.
Cryptolepis, R. Br.
Thenardia, H. B. K.
Prestonia, R. Br.
Balfouria, R. Br.
Nerium, L.
Strophanthus, DC.
Wrightia, R. Br.
Alstonia, R. Br.
Vinca, L.
Lochnera, Rchb.
Tabernæmontana, L.
Vahea, Lam.
Urceola, Roxb.
Cameraria, L.
Amsonia, Walt.
Plumeria, L.
Plectaneia, Pet. Thou.
Allamanda, L.
Aspidosperma, Mart.
§ 2. CARISSEÆ, Bartl.
Carissa, L.
Arduina, L.
Ambelania, Aubl.
Hancornia, Gomez.
Melodinus, Forst.
Landolphia, P. Beauv.
Rouhamon, Aubl.
Lasiostoma, Schreb.
Strychnos, L.
Ignatiana, Lour.
§ 3. RAUWOLFIEÆ, Bartl.
Cerbera, L.
Dicaryum, Willd.
Thevetia, Juss.
Vallesia, R. et P.
Voacanga, Pet. Thou.
Rauwolfia, L.
Ochrosia, Juss.
Ophioxylon, Pers.
Tanghinia, Pet. Th.
Cynoctonum, Gmel.
Hunteria, Roxb.

Alyxia, Banks.	Syringosma, Mart.	Dissolena, Lour.	Kopsia, Bl.
Gynopogon, Forst.	Adenium, Ehrenb.	Leuconotis, Jack.	Helygia, Bl.
Ophioxylon, Burm.	Anabata, Willd.	Cyrtophyllum, Rwdt.	Hasseltia, Bl.
Willughbeia, Roxb.	Systrepha, Burch. (57)	Cereocoma, Wall.	Picrophlæos, Bl.
Ancylocladus, Roxb.	Pacouria, Aubl.	Cryptolepis, Wall.	Chilocarpus, Bl.
———	Couma, Aubl.	Orchipeda, Bl.	Rhazya, Decaisne.

Somewhere here seems to be the station of the little known

RETZIACEÆ.

Bartl. Ord. Nat. (1830).

The plants upon which it has been proposed to construct this group are very little known. They appear to differ from Apocynaceæ principally in the æstivation of their corolla not being valvate, and have assuredly no relation whatever to Polemoniaceæ. Retzia has in some measure the habit of Cerbera Thevetia.

GENERA.

Retzia, L.
Lonchostoma, Wikstr.

Order CCXXIII. ASCLEPIADACEÆ.

Apocyneæ, *Juss. Gen.* 143. (1789) *in part; DC. and Duby Bot. Gall.* 323. (1828).—Asclepiadeæ, *R. Brown in Wern. Trans.* 1. 12. (1809); *Prodr.* 458. (1810); *Royle Illust.* 272. (1835); *Wight's Contributions to the Botany of India, No.* 2. *p.* 77. (1834).

Essential Character.—*Calyx* 5-divided, persistent. *Corolla* monopetalous, hypogynous, 5-lobed, regular, with imbricated, very seldom valvular, æstivation, deciduous. *Stamens* 5, inserted into the base of the corolla, alternate with the segments of the limb. *Filaments* usually connate. *Anthers* 2-celled, sometimes almost 4-celled in consequence of their dissepiments being nearly complete. *Pollen* at the period of the dehiscence of the anther cohering in masses, either equal to the number of the cells, or occasionally cohering in pairs and sticking to 5 processes of the stigma either by twos, or fours, or singly. *Ovaries* 2. *Styles* 2, closely approaching each other, often very short. *Stigma* common to both styles, dilated, 5-cornered, with corpusculiferous angles. *Follicles* 2, 1 of which is sometimes abortive. *Placenta* attached to the suture, finally separating. *Seeds* numerous, imbricated, pendulous, almost always comose at the hilum. *Albumen* thin. *Embryo* straight. *Cotyledons* foliaceous. *Radicle* superior. *Plumule* inconspicuous.—*Shrubs*, or occasionally *herbaceous* plants, almost always milky, and often twining. *Leaves* entire, opposite, sometimes alternate or whorled, having ciliæ between their petioles in lieu of stipules. *Flowers* somewhat umbelled, fascicled, or racemose, proceeding from between the petioles. *R. Br.*

Anomalies. Periploca and some others have granular pollen. Corolla valvate in Leptadenia.

Affinities. So closely are these plants allied to Apocynaceæ, that the affinities of the one are precisely the same as those of the others; I shall therefore, in this place, speak of the difference between those two orders, and of the peculiarities of that more immediately under consideration. Brown, who distinguishes them, admits (*Flinders*, 564) that they differ solely in the peculiar character of their sexual apparatus; but this is of so unusual a kind in Asclepiadaceæ, that it justifies a deviation from the general rule, that orders cannot be established upon solitary characters. In Apocynaceæ the stamens are distinct, the pollen powdery (that is to say, in the ordinary state), the stigma capitate and thickened, but not particularly dilated, and all these parts

distinct the one from the other. But in Asclepiadaceæ the whole of the sexual apparatus is consolidated into a single body, the centre of which is occupied by a broad disk-like stigma, and the grains of pollen cohere in the shape of waxy bodies attached finally to the 5 corners of this stigma, to which they adhere by the intervention of peculiar glands. For a long time this structure was misunderstood; but Brown, in a dissertation in the Transactions of the Wernerian Society, placed its true nature beyond doubt. I subjoin the explanation given by this celebrated botanist, who thus describes the flower of Asclepias syriaca :—

"The flower-bud of this plant I first examined, while the unexpanded corolla was yet green and considerably shorter than the calyx. At this period the gland-like bodies which afterwards occupy the angles of the stamen were absolutely invisible; the furrows of its angles were extremely slight, and, like the body of the stigma, green; the antheræ, however, were distinctly formed, easily separable from the stigma, and their cells, which were absolutely shut, were filled with a turbid fluid, the parts of which did not so cohere as to separate in a mass; of the cuculli, which in the expanded flower are so remarkable, and constitute the essential character of the genus, there was no appearance.

"In the next stage submitted to examination, where the corolla nearly equalled the calyx in length, the gland-like bodies of the stigma were become visible, and consisted of 2 nearly filiform, light brown, parallel, contiguous, and membranaceous substances, secreted by the sides of the furrow, which was now somewhat deeper. Instead of the filiform processes, a gelatinous matter occupied an obliquely descending depression proceeding from towards the base of each side of the angular furrow.

"In a somewhat more advanced stage, the membranes which afterwards become glands of the stigma were found to be linear, closely approximated, and to adhere at their upper extremity. At the same time the gelatinous substance in the oblique depression had acquired a nearly membranaceous texture and a light brown colour; and on separating the glands from its furrow, which was then practicable, this membrane followed it. At this period, too, the contents of each cell of the anthera had acquired a certain degree of solidity, a determinate form, and were separable from the cell in one mass; the cuculli were also observable, but still very small and green, nearly scutelliform, having a central papilla, the rudiment of the future horn-like process. Immediately previous to the bursting of the cells of the antheræ, which takes place a little before the expansion of the corolla, the cuculli are completely formed, and between each, a pair of minute, light green, fleshy teeth are observable, the single teeth of each pair being divided from each other by the descending alæ of the antheræ. The glands of the stigma have acquired a form between elliptical and rhomboidal, a cartilaginous texture, and a brownish black colour; they are easily separable from the secreting furrow, and on their under surface there is no appearance of a suture, or any indication of their having originally consisted of two distinct parts: along with them separate also the descending processes, which are compressed, membranous, and light brown; their extremity, which is still unconnected, being more gelatinous, but not perceptibly thickened. The pollen has acquired the yellow colour, and the degree of consistence which it afterwards retains. On the bursting of the cells, the gelatinous extremity of each descending process becomes firmly united with the upper attenuated end of the corresponding mass of pollen. The parts are then in that condition in which they have been commonly examined, and are exhibited in the figures of Jacquin, who, having seen them only in this state, naturally considered these plants as truly gynandrous, regarding the masses of pollen as the antheræ, originating

in the glands of the stigma, and merely immersed in the open cells of the genuine antheræ, which he calls antheriferous sacs; an opinion in which he has been followed by Rottbœll, Kœlreuter, Cavanilles, Smith, and Desfontaines. The conclusion to be drawn from the observations now detailed is sufficiently obvious; but it is necessary to remark, that these observations do not entirely apply to all the plants which I have referred to the Asclepiadeæ; some of them, especially Periploca, having a granular pollen, applied in a very different manner to the glands of the stigma; they all, however, agree in having pollen coalescing into masses, which are fixed or applied to processes of the stigma, in a determinate manner; and this is, in fact, the essential character of the order. Dr. Smith, in the second edition of his valuable *Introduction to Botany*, has noticed my opinion on this subject: but, probably from an indistinctness in the communication, which took place in conversation, has stated it in a manner somewhat different from what I intended to convey it to him; for, according to his statement, the pollen is *projected* on the stigma. The term projection, however, seems to imply some degree of impetus, and at the same time presents the idea of something indeterminate respecting the part to which the body so projected may be applied. But nothing can be more constant than the manner in which the pollen is attached to the process of the stigma in each species."

The order is one of those which contain indifferently what are called succulent plants and such as are in the usual state of other plants; this excessive development of the cellular tissue of the stem, and reduction of that of the leaves, is in its greatest degree in Stapelia and Ceropegia; it is diminished in Dischidia, the succulence of which is confined to the leaves; and it almost disappears in Hoya, the stem of which is in the usual state, but the leaves between fleshy and leathery.

Geography. Africa must be considered as the great field of Asclepiadaceæ, especially its southern point, where vast numbers of the succulent species occupy the dry and sterile places of that remarkable country. In tropical India and New Holland, and in all the equinoctial parts of America, they all abound. Two genera only are found in northern latitudes, one of which, Asclepias, abounds in species, and is confined apparently to the eastern side of North America; the other, Cynanchum, is remarkable for extending from 59° north latitude to 32° south latitude.

Properties. The roots are generally acrid and stimulating, whence some of them act as emetics, as Cynanchum tomentosum and Periploca emetica; others are diaphoretic and sudorific, as the purgative Asclepias decumbens, which has the singular property of exciting general perspiration without increasing in any perceptible degree the heat of the body; it is constantly used in Virginia against pleurisy. *DC.* Their milk is usually acrid and bitter, and is always to be suspected, although it probably participates in a slight degree only in the poisonous qualities of that of Apocynaceæ, if we can judge from the use of some species as articles of food. Asclepias lactifera is said to yield so sweet and copious a milk, that the Indians use it for aliment; and Pergularia edulis, Periploca esculenta, Asclepias aphylla and stipitacea, are all reported to be eatable. *DC.* The Cow Plant of Ceylon, or Kiriaghuna plant, Gymnema lactiferum, yields a milk of which the Cingalese make use for food; its leaves are also used when boiled. But very little is known about the real qualities of such plants. The root and tender stalks of Asclepias volubilis L. sicken and excite expectoration. *Ainslie*,2. 154. Asclepias tuberosa, or Butterfly weed, is a popular remedy in the United States for a variety of disorders; its properties seem be those of a mild cathartic, and of a certain diaphoretic attended with no inconsiderable expectorant effect. *Barton*, 1. 244. The root of Diplolepis vomitoria has a bitterish and somewhat nauseous taste.

The Indian doctors prize it for its expectorant and diaphoretic qualities. It possesses virtues somewhat similar to those of Ipecacuanha, and has been found an extremely useful medicine in dysenteric complaints. *Ainslie*, 2. 84. A decoction of Asclepias curassavica is said to be efficacious in gleets and fluor albus. *Lunan*, 1. 64. The root and bark, and especially the inspissated milk, of Calotropis gigantea, the Akund, Yercum, or Mudar plant of India, is a powerful alterative and purgative; it is especially in cases of leprosy, elephantiasis, intestinal worms, and venereal affections that it has been found important. A variety of cases are mentioned in books upon Indian medicine; and there seems to be no doubt that this will form one of the most important of all the articles of the Materia Medica. See, for information upon this point, *Ainslie's Materia Medica*, 1. 486.; *Trans. of the Med. Chir. Soc.* vol. 10.; *Edinb. Med. Chir. Trans.* 1. 414. The leaves of Cynanchum Argel are used in Egypt for adulterating Senna. The Sarsaparilla of India is chiefly the root of Hemidesmus (Periploca) indica; a decoction of it is prescribed by European practitioners in cutaneous diseases, scrofula, and venereal affections. *Ainslie*, 1. 382. It is more than probable that *Caoutchouc* is contained in several, as Cynanchum ovalifolium, according to Wallich, yields excellent Caoutchouc at Penang; the tenacity of some species may be owing to its presence, as of Marsdenia tenacissima employed for bowstrings by the mountaineers of Rajmahl; the fibre of this plant, and of Urtica tenacissima was the strongest Roxburgh ever met with. Orthanthera viminea, attaining a height of 10 feet, is also remarkable for the length and tenacity of its fibre. Some species yield indigo of excellent quality, as Marsdenia tinctoria found in Sylhet, and Gymnena tingens. *Royle's Illustrations*, p. 274., which see for much more interesting matter connected with the sensible properties of plants of this order, and especially of the *Mudar*.

GENERA.

§ 1. GENUINÆ, Bartl.
Ceropegia, L.
Stephanotis, Pet. Th.
Huernia, R. Br.
Piaranthus, R. Br.
Stapelia, L.
Caruncularia, Haw.
Duvalia, Haw.
Obesia, Haw.
Orbea, Haw.
Tromotriche, Haw.
Tridentea, Haw.
Podanthe, Haw.
Gonostemon, Haw.
Apteranthes, Mikan.
Desmidochus, Ehrenb.
Brachystelma, Ker.
Caralluma, R. Br.
Boucerosia, W. et A.
Hitchinia, W. et A.
Microstemma, R. Br.
Eriopetalum, Wght.
Leptadenia, R. Br.
Orthanthera, Wght.
Pentasacme, Wall.
Hoya, R. Br.
Schollia, Jacq.
Pterostelma, Wght.
Physostelma, Wght.
Tylophora, R. Br.
Belostemma, Wall.
Iphisia, W. et A.
Marsdenia, R. Br.
Cosmostigma, Wght.
Heterostemon, W. et A.
Pergularia, L.
Dischidia, R. Br.
Gymnema, R. Br.
Sarcolobus, R. Br.
Gonolobus, Rich.
Matelea, Aubl.
Hostia, Willd.
Asclepias, L.
Acerates, Ell.
Gomphocarpus, R. Br.
Enslenia, Nutt.
Xysmalobium, R. Br.
Podostigma, Ell.
Calotropis, R. Br.
Lachnostoma, H. B. K.
Macroscepis, H. B. K.
Kanahia, R. Br.
Raphistemma, Wall.
Oxystelma, R. Br.
Urostelma, Bge.
Oxypetalum, R. Br.
Gothofreda, Vent.
Sonninia, Reichenb.
Diplolepis, R. Br.
Seutera, Reichenb.
Lyonia, Ell.
Holostemma, R. Br.
Fischera, DC.
Cynanchum, L.
Vincetoxicum, Pers.
Schubertia, Mart.
Solenostemma, Hayne.
Metaplexis, R. Br.
Ditassa, R. Br.
Dæmia, R. Br.
Dimia, Spreng.
Philibertia, H. B. K.
Sarcostemma, R. Br.
Eustegia, R. Br.
Pentaphragma, Zucc.
Metastelma, R. Br.
Tweedia, H. et A.
Microloma, R. Br.
Astephanus, R. Br.
Arauja, Brot.
Physianthus, Mart.
Baxtera, Reichenb.
Harrisonia, Hook.
Secamone, R. Br.
Oncinema, W. et A.
Toxocarpus, W. et A.
Goniostemma, Wall.
§ 2. PERIPLOCEÆ, Bartl.
Brachylepis, W. et A.
Decalepis, W. et A.
Streptocaulon, W. et A.
Hemidesmus, R. Br.
Finlaysonia, Wall.
Periploca, L.
Gymnanthera, R. Br.
Cryptostegia, R. Br.

Schistogyne, H. et A.
Phyllanthera, Bl.
Leposma, Bl.
Leptostemma, Bl.
Conchophyllum, Bl.
Fereiria, Velloz.
Hybanthera, Endl.
Pentatropis, R. Br.

Alliance VII. *LOGANIALES.*

Essential Character. — *Flowers* unsymmetrical. *Stamens* never 2, usually more numerous; often more than the segments of the corolla. *Leaves* always opposite.

Order CCXXIV. LOGANIACEÆ.

Loganieæ, *R. Brown in Flinders*, (1814); *Von Martius N. Gen. et Sp. Pl.* 2. 133. (1828); *Bartl. Ord. Nat.* 205 (1830); *Arnott in Edinb. Encycl.* 120. (1832).

Essential Character.—*Calyx* inferior, 5-parted. *Corolla* regular or irregular, with convolute æstivation. *Stamens* arising from the corolla, all placed upon the same line, 5 or 1, therefore not always symmetrical with the divisions of the corolla; *pollen* with 3 bands. *Ovary* superior, 2-celled; *style* continuous; *stigma* simple. *Fruit* either capsular and 2-celled with placentæ finally becoming loose; or drupaceous, with 1- or 2-seeded stones. *Seeds* peltate, with a finely reticulated integument, sometimes winged; *albumen* fleshy or cartilaginous; *embryo* with the radicle turned towards the hilum.—*Shrubs, herbaceous* plants, or *trees*. *Leaves* opposite, entire, usually with stipules which are combined in the form of interpetiolary sheaths. *Flowers* racemose, corymbose, or solitary.

Affinities. It is not clear, from the remarks upon Logania by Brown in his *Prodromus*, whether he intended to establish this order or not. He states that he has placed Logania at the end of Gentianaceæ, on account of some affinity between it and Exacum and Mitrasacme, and also because it does not answer ill to the artificial character of that order; adding that it, however, might have a still closer connexion with Apocynaceæ and with Usteria among Cinchonaceæ. He further points out the close relation of Geniostoma to Logania, and concludes by inquiring whether those 2 genera do not, with Anasser, Fagræa, and Usteria, form an order intermediate between Apocynaceæ and Cinchonaceæ. This view has been adopted by Von Martius, with the exception of Fagræa, which he places among his Potaliaceæ; he founds the distinction of the order upon the want of symmetry between the parts of the calyx, corolla, and stamens, upon the æstivation of the corolla being convolute, not contorted, and in the presence of stipules combined in interpetiolary sheaths. Mr. Arnott remarks to me (letter, Dec. 1835.) that the order may be in some respects looked upon as consisting of Cinchonaceæ with superior fruit.

Geography. Found in tropical India and Africa, and in the temperate parts of New Holland.

Properties. Unknown.

GENERA.

Logania, R. Br.	Geniostoma, Forst.	Usteria, Lam.	Gærtnera, Lam.
Euosma, Andr.	*Anasser*, Juss.	Fagræa, Thunb.	*Andersonia*, W. hrb.
	? Gardneria, Wall.	*Willughbeia*, Scop.	Pagamea, Aubl.

Order CCXXV. POTALIACEÆ.

Brown in Tuckey, 449 (1819). Potalieæ, *Martius N. G. et Sp.* 2. 91. *and* 133. (1828); *Royle Illustr.* 269. (1835).

Essential Character.—*Calyx* inferior, with 4, 5, or 6 partitions. *Corolla* regular, with from 5 to 10 divisions, which are therefore not symmetrical with the segments of the calyx; the æstivation contorted, convolute. *Stamens* arising from the corolla, all upon the same line; *pollen* simple, elliptical. *Ovary* superior; *style* continuous; *stigma* simple.

Fruit succulent, with from 2 to 4 cells, and central placentæ. *Seeds* numerous, peltate; *testa* double; *embryo* supposed by Von Martius to be heterotropous (that is, to have its radicle not turned towards the hilum), lying in cartilaginous *albumen*.—*Trees* or *shrubs*, quite smooth. *Leaves* opposite, entire, united by interpetiolar sheathing stipules. *Flowers* terminal, with bracts, in panicles or corymbs.

Affinities. According to Von Martius, this order lies between Loganiaceæ and Apocynaceæ. Its chief characteristics are the inequality of the segments of the calyx and corolla and the stamens, and a 4-lobed placenta, which produces in Fagræa obovata, according to Wallich, a 4-celled berry. With that part of Apocynaceæ to which Strychnos belongs the order very nearly agrees, differing principally in the above-mentioned character, the æstivation of the calyx, and the embryo not being foliaceous, agreeing in the peltate seeds and corneous albumen.

Geography. Natives of the tropics of Africa, America, and India.

Properties. An infusion of the leaves of Potalia resinifera is slightly mucilaginous and astringent, and is used in Brazil as a lotion for inflamed eyes. *Von Martius*, 2. 90. Potalia amara is bitter like the Gentians, and acrid and emetic like Apocynaceæ. *DC. Prodr. Méd.* 217.

GENERA.

Potalia, Aubl.
Nicandra, Schreb.
Anthocleista, Afz.

Alliance VIII. *OLEALES.*

Essential Character. *Flowers* regular, but unsymmetrical, always diandrous.

Order CCXXVI. OLEACEÆ. The Olive Tribe.

Oleineæ, *Hoffmannsegg et Link Fl. Port.* (1806); *Brown Prodr.* 522. (1810); *Lindl. Synops.* 171. (1829).—Lilaceæ, *Vent. Tabl.* 1. 306. (1799).—Fraxineæ, *Martius Conspectus, No.* 209. (1835).

Essential Character.—*Flowers* hermaphrodite, sometimes dicœcious. *Calyx* monophyllous, divided, persistent, inferior. *Corolla* hypogynous, monopetalous, 4-cleft, occasionally of 4 petals connected in pairs by the intervention of the filaments, sometimes without petals; *æstivation* somewhat valvate. *Stamens* 2, alternate with the segments of the corolla or with the petals; *anthers* 2-celled, opening longitudinally. *Ovary* simple, without any hypogynous disk, 2-celled; the *cells* 2-seeded; the *ovules* pendulous and collateral; *style* 1 or 0; *stigma* bifid or undivided. *Fruit* drupaceous, berried, or capsular, often by abortion 1-seeded. *Seeds* with dense, fleshy, abundant albumen; *embryo* about half its length, straight; *cotyledons* foliaceous, partly asunder; *radicle* superior; *plumule* inconspicuous.—*Trees* or *shrubs*. *Branches* usually dichotomous and ending abruptly by a conspicuous bud. *Leaves* opposite, simple, sometimes pinnated. *Flowers* in terminal or axillary racemes or panicles; the *pedicels* opposite, with single bracts. *R. Br.*

Anomalies. Fraxinus is generally apetalous.

Affinities. Very near Jasminaceæ, with which they are combined by Ach. Richard; see the observations upon that order. To some, it, I believe, still appears expedient to separate the small tribe of Lilaceæ, the representative of which is the Lilac of the gardens; but I am not aware of there being any greater peculiarity in that plant than its capsular fruit, a character very rarely of importance in distinguishing orders. Reichenbach thinks Oleaceæ

related to Styraceæ, because, according to Hayne (*Arzngw. XI.* 23. *adn. ult.*) a sort of Storax is yielded by Olea europæa. De Candolle suggests (*Essai Méd.* p. 204.) that the Ash is related to the Maple tribe, and this view is lately adopted by Von Martius; I also find in the same work the following very good observations upon this order:—"However heterogeneous the Olive tribe may appear as at present limited, it is remarkable that the species will all graft upon each other; a fact which demonstrates the analogy of their juices and their fibres. Thus the Lilac will graft upon the Ash, the Chionanthus and the Fontanesia, and I have even succeeded in making the Persian Lilac live ten years on Phillyrea latifolia. The Olive will take on the Phillyrea, and even on the Ash: but we cannot graft the Jasmine on any plant of the Olive tribe: a circumstance which confirms the propriety of separating these two tribes."

Geography. Natives chiefly of temperate latitudes, inclining towards the tropics, but scarcely known beyond 65° N. lat. The Ash is extremely abundant in North America; the Phyllireas and Syringas are all European or Eastern plants. A few are found in New Holland and elsewhere within the tropics. One Ash is a native of Nipal.

Properties. This order (and Aurantiaceæ) offer one of the few instances of oil being contained in the pericarp, from which Olive oil is entirely expressed; in most other plants oil is yielded by the seed. The flowers are frequently slightly fragrant; those of Olea fragrans are employed in China for flavouring tea. The bark of the Olive, but especially of the Ash, is so bitter and astringent, that it has been not only highly celebrated as a febrifuge, but even compared with Quinquina (*DC.*) for effect. The sweet gentle purgative, called Manna,* is a concrete discharge from the bark of several species of Ash, but especially from Fraxinus rotundifolia. The sweetness of this substance is not due to the presence of sugar, but to a distinct principle, called Mannite, which differs from sugar in not fermenting with water and yeast. *Turner*, 682. A peculiar substance, called *Olivile*, is contained in the gum of Olea europæa. *Ibid.* 701.

GENERA.

Olea, L.	Notelæa, Venten.	Chionanthus, L.	Myxopyrum, Bl.
Osmanthus, Lour.	*Physospermum*,	Ligustrum, L.	Chondrospermum,
Phillyrea, L.	Gærtn.	Syringa, L.	Wall.
Fontanesia, La Bill.	Linociera, Sw.	Noronhia, Thouars.	§ Fraxineæ, Bartl.
	Mayepea, Aubl.	Pachyderma, Bl.	Fraxinus, L.
			Ornus, Scop.

Order CCXXVII. JASMINACEÆ. The Jasmine Tribe.

Jasmineæ, *Juss. Gen. Plant.* 104. (1789) *in part; R. Brown Prodr.* 520. (1810).

Essential Character.—*Calyx* divided or toothed, persistent. *Corolla* monopetalous, hypogynous, regular, hypocrateriform, with from 5 to 8 divisions, which lie laterally upon each other, being imbricated and twisted in æstivation. *Stamens* 2, arising from the corolla, enclosed within its tube. *Ovary* destitute of a hypogynous disk, 2-celled, with

* Of this substance Royle mentions the following as known in India. 1. The best, called *Sheerkhist*, said to be procured from a tree of Khorasan, perhaps a species of Fraxinus; 2. *Torunjbeen*, the produce of Alhagi Maurorum; 3. *Guzunjbeen*, from a Tamarisk; 4. *Shukhr-ool-askur*, found on Calotropis procera, or a kindred species; and 5, one kind is mentioned as being obtained from an Umbelliferous plant. *Illustr.* 267.

1-seeded cells, the ovules in which are erect; *style* 1; *stigma* 2-lobed. *Fruit* either a double *berry* or a *capsule* separable in two. *Seeds* either with no albumen, or very little; *embryo* straight; *radicle* inferior.—*Shrubs*, having usually twining stems. *Leaves* opposite or alternate, mostly compound, ternate or pinnate, with an odd one; sometimes simple, the petiole almost always having an articulation. *Flowers* opposite, in corymbs. *R. Br.*

Affinities. Formerly combined with Oleaceæ, from which they are distinguished by Brown by their ovules being erect, their seed with no, or very little, albumen, by the æstivation of the corolla being imbricate, not valvate, and by the number of its divisions being five or more, and consequently not regularly a multiple of the stamens, instead of 4, which is a multiple of them. Ach. Richard (*Ann. des Sc.* 350.) endeavours to shew that these differences are insufficient. He states, that the ovules of Jasminaceæ are originally pendulous, as in Oleaceæ; but that they subsequently become erect in consequence of the growth of the ovary, whose apex does not elongate, while its sides extend considerably during the growth of the fruit. He says, upon the authority of his father, that albumen does exist in Jasminum and Nyctanthes; a fact which had been previously mentioned by Brown in defining the orders, but to which that distinguished botanist attached no importance, because only a small quantity was found by him to exist, while it is very abundant in Oleaceæ; and he probably conceived, as I certainly do, that it is the difference of its quantity only which gives the albumen value as a mark of ordinal distinction. I confess it does not appear to me that these remarks lessen the propriety of dividing Jasminaceæ and Oleaceæ, which are still known by abundantly sufficient characters. The affinity of Jasminaceæ, otherwise, is with those monopetalous orders, in which the number of stamina is different from that of the divisions of the corolla, as Labiatæ, Scrophulariaceæ, Verbenaceæ, and the like, but particularly with the latter, which sometimes resemble them in their fruit, as Clerodendron. Brown stations them between Pedaliaceæ and Oleaceæ (*Prodr.*); De Candolle between Oleaceæ and Strychneæ (*Théorie*, ed. 2.).

Geography. Chiefly inhabitants of tropical India, in all parts of which they abound. One Jasminum only is mentioned from South America, but there are at least 3 species of Bolivaria on that continent; a few are natives of Africa and the adjoining islands; New Holland contains several; and, finally, 2 extend into the southern climates of Europe.

Properties. Not very different from Oleaceæ in qualities, except that their oil is deliciously fragrant, and produced by the flowers, and not by the pericarp. The genuine essential oil of Jasmine of the shops is produced by Jasminum officinale and grandiflorum; but a similar perfume is also procured from Jasminum Sambac. The leaves of Jasminum undulatum are slightly bitter. The bitter root of Jasminum angustifolium, ground small and mixed with powdered Acorus Calamus root, is considered in India as a valuable external application in cases of ringworm. *Ainslie*, 2. 52. In India Proper the tube of the corolla of Nyctanthes arbor tristis is used as an orange dye. *Buchanan L. Tr.* 13. 484. This plant, the *Hursinghar* of India, scents the gardens with its delicious perfumes only during the night, covering the ground in the morning with its short-lived flowers, which being collected like those of the *Chumbelee* (Jasminum grandiflorum) are strung on threads and worn as necklaces, or entwined in the hair of the native women. *Royle*, 269.

GENERA.

Jasminum, L.
Mogorium, Juss.
Nyctanthes, L.
Forsythia, Vahl.
Bolivaria, Schlecht.
Menodora, Humb. Bonpl.

Class II. GYMNOSPERMS.

Synorhizæ, *Rich. Anal. du Fr. Eng. ed.* (1819).—Phanerogames Gymnospermes, *Ad. Brongniart Veget. Foss.* 88. (1828).—Gymnospermæ, *Nixus Plantarum*, 21. (1833).

Essential Character.—These agree in all respects with Exogens, except that their ovules instead of being enclosed in a pericarp are exposed naked to the fertilizing influence of the pollen.

The plants comprehended in this class have nearly an equal relation to flowering and flowerless plants. With the former they agree in habit, in the presence of sexes, and in their vascular tissue being complete; with Ferns and Lycopodiums, among the latter, they also accord in habit, in the peculiar gyrate vernation of the leaves of Cycadaceæ, in their spiral vessels being imperfectly formed, and in the sexes being less complete than in other flowering plants; the females wanting a pericarpial covering, and receiving fertilization directly through the foramen of the ovule, without the intervention of style or stigma, and the males consisting of leaves imperfectly contracted into an anther bearing a number of pollen-cases upon their surface. So great is the resemblance between Lycopodiums and certain Coniferæ, that I know of no external character, except size, by which they can be distinguished. Gymnosperms are known from most other Vasculares by the vessels of their wood having large apparent perforations or disks. It is not, however, on this account to be understood that these differ in growth from other Exogenous plants; on the contrary, they are essentially the same, deviating in no respect from the plan upon which Exogenous plants increase, but having a kind of tissue peculiar to themselves.

At this point of the vegetable kingdom there is a plain transition from the highest form of organization to the lowest. Gymnosperms are essentially Exogens in all that appertains to their organs of vegetation; they have concentric zones in their wood, a vascular system in which spiral vessels are found, and a central pith; but they are analogous to reptiles in the animal kingdom, inasmuch as their ova are fertilized by direct contact with the pollen. The two most remarkable of the orders are Coniferæ and Cycadaceæ. Of these, the former is connected with Lycopodiaceæ among Acrogens by means of the extinct genus Lepidodendron (see *Fossil Flora*, vol. 2. t. 98), and their branches are sometimes so similar to those of certain Lycopodiums themselves as to leave no doubt of their relation. Compare, for instance, Lycopodium Phlegmaria, and Cunninghamia sinensis. Cycadaceæ have the gyrate vernation of the leaves of true Ferns, along with the inflorescence of Coniferæ; and their mode of forming their trunk, although essentially the same as that of Exogens, yet resembles in a remarkable degree the growth of Acrogens, lengthening by a terminal bud only. It is usual to refer Equisetaceæ to Acrogens, but I consider them a degenerate form of Gymnosperms for reasons that are explained under the order itself.

Order CCXXVIII. GNETACEÆ.

Gneteæ, *Blume in Ann. Sc.* 2. *Ser.* 2. 105. (1834).—Gnetaceæ, *Lindl. in Bot. Reg.* 1686. (*July*, 1834).

Essential Character.—*Flowers* monœcious or diœcious, arranged in catkins or heads, involucrated with opposite decussating scales which are connate at the base or altogether.— ♂ or *Males*. *Calyx* 1-leaved, transversely slit at the end, projecting from its bottom a filament whose apex is simple or branched, and which bears one or several anthers; cells of the anthers separated, or combined in various ways, opening by a pore at the apex.— ♀ or *Females*. Altogether naked, or sheltered by a false calyx consisting of two scales, more or less combined, each of which surrounds one or two flowers. *Ovary* perforated at the apex, containing in a single cavity a solitary erect *ovule*. *Ovule* pointed by a style-like process formed from the membrane of the nucleus. Not a trace of *style* or *stigma*. *Fruit* indehiscent, drupaceous, before maturity pierced at the point and terminated by a style-shaped protruded process; finally pointless. *Pericarp* thickish, either altogether leathery or shelly or fibrous internally, and succulent externally. *Seed-coat* composed at the apex of a double, and at the base of a simple membrane. *Embryo* dicotyledonous, in the middle of fleshy albumen; *radicle* superior.—*Small trees* very much branched, or sarmentose *shrubs*, with opposite or clustered branches, with thickened separable articulations. *Leaves* opposite, entire, with pinnate veins, sometimes very minute and scale-shaped. *Blume*. *Wood* with the ligneous tissue marked with circular disks.

Affinities. As I have had no opportunity of examining any species of the genus Gnetum in a fresh state, but as my observations upon its dried fruit lead me to adopt the opinion of Blume, I abstain from making any remarks beyond the following, translated from the paper of that learned Botanist in the Annales des Sciences:—

"This little family constitutes a part of that natural class of Vegetables in which the fertilization of the ovule takes place immediately, without the aid of style or stigma, through the foramen of the ovule itself. Through Ephedra, which has been hitherto placed with Coniferæ, the order is closely connected with the latter; and on the other hand it tends towards Casuarinaceæ, plants of a higher degree of organization, since Gnetum is beyond all doubt an instance of a more perfect kind of evolution than either Coniferæ or Cycadaceæ. From both these orders Gnetaceæ differ in the greater perfection of their sexual organs, especially of their stamens; and at the same time their ovules are not absolutely naked, but covered with a pericarpial integument pierced at the summit. In the male flowers the perianth is tubular, at first quite closed up, in the way of certain Artocarpeæ, but eventually it is ruptured by the rising stamen. There is no trace of a perianth of this sort in the neighbouring orders; and in Coniferæ a totally different organization of anther occurs, that part not opening as in Gnetaceæ by transverse pores of the apex, but always at the side, and generally longitudinally." For many other excellent remarks upon the details of the structure of Gnetum, see the same place.

Gnetaceæ appear allied to Chloranthaceæ in their articulated stems, and subamentaceous inflorescence; and Equisetaceæ approach those through the genus Ephedra.

Geography. Natives of the temperate parts of Europe, Asia, and South America, and in the case of Gnetum, of the hottest parts of India and Guiana.

Properties. The interior of the pericarp of Gnetum urens is lined with stinging hairs; the seeds are eaten; the stem exudes a transparent gum, and when cut across yields an abundance of clear transparent tasteless water which may be drank. *Aubl.* In Amboyna the seeds of Gnetum Gnemon are eaten roasted, boiled, or fried, and the green leaves form a favourite vegetable in lieu of Spinach; they are, however, very tasteless. *Rumf.*

GENERA.

Ephedra, L.
Gnetum, L.
Gnemon, Rumf.
Thoa, Aubl.
Abutua, Lour.

Order CCXXIX. CYCADACEÆ.

Cycadeæ, *Rich. in Pers. Synops.* 2. 630. (1807); *Brown Prodr.* 346. (1810); *Kunth in Humb. et Bonpl. Nov. Gen. et Sp.* 2. 1. (1817); *Synops.* 1. 349. (1822); *R. Brown in King's Voyage*, (1825); *Rich. Mémoire*, 195. (1826); *Ad. Brongniart in Ann. des Sc.* 16. 589. (1829).

Essential Character.—*Flowers* dicœcious, terminal. *Males* monandrous, naked, collected in cones; each floret consisting of a single scale (or anther) bearing the pollen on its under surface in 2-valved cases which adhere in clusters of 2, 3, or 4. *Females* either collected in cones, or surrounding the central bud in the form of contracted leaves without pinnæ, bearing the ovules on their margins. *Ovules* solitary, naked, with no other pericarp than the scale or contracted leaf upon which they are seated. *Embryo* in the midst of fleshy or horny albumen; the *radicle* next the apex of the seed, from which it hangs by a long funiculus with which it has an organic connexion.—*Trees*, with a simple cylindrical trunk, increasing by the development of a single terminal bud, and covered by the scaly bases of the leaves; the wood consisting of concentric circles, the cellular zones between which are exceedingly loose, the ligneous tissue having the tubes marked by circular disks. *Leaves* pinnated, not articulated, having a gyrate vernation.

Affinities. One of the botanists who originally noticed the plants that constitute this order referred them to the Fern tribe; an opinion to which Linnæus, having first adopted the idea of Adanson that they were related to Palms, finally acceded. He was followed by other botanists, until, after some suggestions by Ventenat that the genera Cycas and Zamia ought to form a particular tribe, the present order was finally characterised by the late L. C. Richard in Persoon's *Synopsis*, in 1807, with the observation that it was intermediate between Ferns and Palms. The opinion of their affinity to Ferns seems to have been thus generally adopted in consequence of their striking resemblance in the mode of developing their leaves; but the supposed relation to Palms was suggested rather by a vague notion of some general resemblance, as, for instance, in their cylindrical trunks, than by any precise knowledge of the structure of Cycadaceæ. It is only within a few years that a more accurate knowledge of their structure has determined the real nature of their affinities. In 1825, the publication of Brown's remarks upon the ovule, in which he demonstrated the similarity of conformation between the flowers of Cycadaceæ and Coniferæ, suggested new ideas of the affinities of both tribes; and the determination, in 1829, by Adolphe Brongniart, of the resemblance between these two tribes in the structure of the vessels of their wood, while it decided the near relation of Coniferæ and Cycadaceæ, confirmed the proximity of the latter to Ferns, and shewed the inaccuracy of the ideas formerly held of a close resemblance between the latter and Palms. As this is still a matter but ill understood in general, it may be useful to make some further remarks upon the subject.

It has been said that the dissimilarity between Cycadaceæ and Coniferæ is such as to render it impossible to admit of their close approximation in any natural arrangement; and that the affinity of Cycadaceæ being with Palms, the former must necessarily be widely apart from Firs. These views of the subject appear to have arisen either from an imperfect knowledge of the real

vegetation of the stem of Cycadaceæ, or from a too superficial consideration of such points as were really well known. The affinity of Cycadaceæ and Palms does at first sight appear probable, in consequence of the large pinnated leaves and simple cylindrical stems of both tribes; but here I think the resemblance stops. Cycadaceæ have a gyrate, Palms a convolute vernation; Cycadaceæ are naked-seeded and bear their seeds on the margins of a contracted leaf, Palms have the ordinary inflorescence of flowering plants: Cycadaceæ are dicotyledonous, Palms monocotyledonous; and finally, the internal structure of the trunk of Cycadaceæ is essentially exogenous, as is now perfectly well known: the affinity of Cycadaceæ is therefore not with Palms. With regard to the nature of the evidence by which their strict relation to the Pine tribe is to be established, it may be observed, that they both are dicotyledonous in seed, both have naked ovules constructed in a similar remarkable manner, and borne in both cases not upon a rachis, but upon the margin or face of metamorphosed leaves; that they have the same peculiar form of inflorescence, the same kind of male flowers, the same constant separation of sexes; that there is a like imperfect formation of spiral vessels, a most important consideration; and finally, that they both agree in having the vessels of their wood marked with circular disks; a character which, if not confined to these two tribes, is extremely uncommon elsewhere. The difference between the cylindrical simple stem of Cycadaceæ and the branched conical one of Coniferæ arises from the terminal bud only of the former developing, its axillary ones all being uniformly latent, unless called into life by some accidental circumstance, as in the case recorded in the *Horticultural Transactions*, 6. 501.; while in Coniferæ a constant tendency to a rapid evolution of leaf-buds takes place in every axil. With regard to their foliage, on which the difference of their aspect chiefly depends, the leaves of Coniferæ are minute and undivided, while those of Cycadaceæ are very large and pinnated; in both they are simple, and in Coniferæ there is a tendency to a higher development in the scales of the cones, while in Cycadaceæ there is a corresponding contraction firstly in Cycas itself, and especially in Zamia, in which the contraction takes place, to exactly the same point as the evolution of Coniferæ.

Geography. Natives of the tropics of America and Asia; not found in equinoctial Africa, although they exist at the Cape of Good Hope and in Madagascar. *Brown Congo*, 464.

Properties. The only remarkable quality in the order is the production of a kind of Sago, by the soft centre of Cycas circinalis. They all abound in a mucilaginous nauseous juice.

GENERA.

Zamia, L.	Encephalartos, Lehm.
Arthrozamia, Rchb.	Cycas, L.

Order CCXXX. CONIFERÆ, or PINACEÆ. } The Fir Tribe.

Coniferæ, *Juss. Gen.* 411. (1789); *Mirbel Elémens*, 2. 906. (1815) *Brown in King's Voyage, Appendix*, (1825); *Rich. Monogr.* (1826); *DC. and Duby*, 431. (1828); *Lindl. Synops.* 240. (1829).—Abietinæ et Cupressinæ, *Rich. l. c.* (1826); *Bartl. Ord. Nat.* 94 et 95. (1830).—Abietinæ, *Endl. Prodr. Norf.* 35. (1833).—Conaceæ, *Lindl. Key. No.* 232. (1835).

Essential Character.—*Flowers* monœcious or dicœcious. *Males* monandrous or

monadelphous; each floret consisting of a single *stamen*, or of a few united, collected, in a deciduous amentum, about a common rachis; *anthers* 2-lobed or many-lobed, bursting outwardly; often terminated by a crest, which is an unconverted portion of the scale out of which each stamen is formed; *pollen* large, usually compound. *Females* in cones. *Ovary* spread open, and having the appearance of a flat scale destitute of style or stigma, and arising from the axil of a membranous bract. *Ovule* naked; in pairs on the face of the ovary, having an inverted position, and consisting of 1 or 2 membranes open at the apex, and of a nucleus. *Fruit* consisting of a cone formed of the scale-shaped ovaries, become enlarged and indurated, and occasionally of the bracts also, which are sometimes obliterated, and sometimes extend beyond the scales in the form of a lobed appendage. *Seed* with a hard crustaceous integument. *Embryo* in the midst of fleshy oily albumen, with 2 or many opposite *cotyledons*; the *radicle* next the apex of the seed, and having an organic connexion with the albumen.—*Trees* or *shrubs*, with a branched trunk abounding in resin. *Wood* with the ligneous tissue marked with circular disks. *Leaves* linear, acerose or lanceolate, entire at the margins; sometimes fascicled in consequence of the non-development of the branch to which they belong; when fascicled, the primordial leaf to which they are then axillary is membranous, and enwraps them like a sheath.

Affinities. With the exception of Orchidaceæ, there is perhaps no natural order the structure of which has been so long and so universally misunderstood as Coniferæ. This has arisen from the exceedingly anomalous nature of their organisation, and from the investigations of botanists not having been conducted with that attention to logical precision which is now found to be absolutely indispensable. The description above given is that which I conceive proper to explain the views now taken upon the subject, in consequence of the discovery by Brown of the ovules of the whole order being naked; and it will probably be found to offer a more intelligible account of the fructification than is to be met with in even the most recent systematic works. It is not expedient to enter here upon an inquiry into the ideas that botanists have successively entertained upon this subject. Those who are desirous of informing themselves upon this point will find all they can desire in the Appendix to Captain King's *Voyage to New Holland*, and in Richard's *Mémoires sur les Conifères et les Cycadées*. It may, however, be useful to advert briefly to the principal theories which have met with advocates. These are, firstly, that the female flowers consist of a bilocular ovary having a style in the form of an external scale, an opinion held by Jussieu, Smith, and Lambert; secondly, that they have a minute cohering perianth, and an external additional envelope called the cupule: this view was taken by Schubert, Mirbel, and others; thirdly, that they have a monosepalous calyx cohering more or less with the ovary, contracted and often tubular at the apex, with a lobed, or glandular, or minute entire limb, an erect ovary, a single pendulous ovule, no style, and a minute sessile stigma: this explanation is that of Richard, published in his memoir upon the subject in 1826. It appears, however, from the observations of Brown, that the female organ of Coniferæ is a naked ovule, the integuments of which have been mistaken for floral envelopes, and the apex of whose nucleus has been considered a stigma. Of the accuracy of this view there is probably, at this time, little difference in opinion. These female organs, or naked ovules, are 2 in number, and they originate from the larger scales of the cone towards their base, have an inverted position, and occupy the same relative place in Coniferæ and in Zamia, a genus of Cycadaceæ. Now, as there cannot be any doubt of the perfect analogy that exists between the scales of the cone of Zamia and the fruit-bearing leaves of Cycas, the former differing from the latter only in each being reduced to 2 ovules, and to an undivided state; so there can be no doubt of the equally exact analogy between the scales of Coniferæ and Zamia, and therefore the former would be called reduced leaves if the general character of the tribe was to produce a highly developed foliage; but as the foliage of Coniferæ is in a much more contracted state than the scales of their cones, the latter must be understood to be the leaves of Coni-

feræ in a more developed state than usual. That the scales of the cone really are metamorphosed leaves, is apparent not only from this reasoning, but from the following facts. They occupy the same position with respect to the bracts as the leaves do to their membranous sheaths; they surround the axis of growth as leaves do, and usually terminate it; but in some cases, as often in the Larch, the axis continues to elongate beyond them, and leaves them collected round it in the middle. In Araucaria they have absolutely the same structure as the ordinary leaves; and finally they sometimes assume the common appearance of leaves, as is represented in Richard's memoir, tab. 12., in the case of a monstrous Abies. The scales of the cones of Coniferæ and strobilaceous Cycadaceæ are therefore to these orders, what carpellary leaves are to other plants. With regard to the male flowers, it is obvious that in the Larch, the Cedar of Lebanon, the Spruce, and the like, each anther is formed of a partially converted scale, analogous to the indurated carpellary scale of the females; and therefore each amentum consists of a number of monandrous naked male flowers, collected about a common axis. Some botanists, however, consider each male catkin as a single monadelphous male flower, which is impossible. But in Araucaria, these cavities occupy one side only of an ordinary flat scale. In this genus, and such others as agree with it in structure, the anthers may be considered to consist of an uncertain number of lobes, and in this respect to recede from the usual structure of the male organs of plants: in Coniferæ, the anthers of which are normal, we have 2; in Juniperus, the like number; in Cunninghamia, but 3; in Agathis,14; and in Araucaria, from 12 to 20. Brown remarks, what is certainly very remarkable, that in Cunninghamia the lobes of the anther agree in number, as well as insertion and direction, with the ovules. *King's Appendix*, 32. The same author has noticed a very general tendency in some species of Pinus and Abies to produce several embryos in a seed, *4th Report of Brit. Assoc.* 1835, *p.* 596; where also are some curious remarks upon the origin of the embryo in such plants.

Geography. Natives of various parts of the world, from the perpetual snows and inclement climate of arctic America, to the hottest regions of the Indian Archipelago. The principal part of the order is found in temperate climates; in Europe, Siberia, China, and the temperate parts of North America, the species are exceedingly abundant, and have an aspect very different from that of the southern hemisphere. In the former we have various species of Pines, the Larch, the Cedar, the Spruce, and the Juniper; the place of which is supplied in the latter by Araucarias, Podocarpuses, Dammars, and Dacrydiums.

Properties. No order can be named of more universal importance to mankind than this, whether we view it with reference to its timber or its secretions. Gigantic in size, rapid in growth, noble in aspect, robust in constitution, these trees form a considerable proportion of every wood or plantation in cultivated countries, and of every forest where nature remains in a savage state. Their timber, in commerce, is known under the names of Deal, Fir, Pine, and Cedar, and is principally the wood of the Spruce, the Larch, the Scotch Fir, the Weymouth Pine, and the Virginian Cedar; but others are of at least equal, if not greater value: the Norfolk Island Pine is an immense tree, known to botanists as Araucaria excelsa; the Kawrie Tree of New Zealand, or Dammara australis, attains the height of 200 feet, and yields a light compact wood, free from knots. *Ed. Ph. Journ.* 13. 378. But they are both surpassed by the stupendous Pines of north-west America, one of which, P. Lambertiana, is reported to attain the height of 230 feet, and the other, Abies Douglasii, to equal or even to exceed it. The latter is probably the most valuable of the whole for its timber. Their secretions consist of various

kinds of resinous matter. Oil of turpentine, common and Burgundy pitch, are obtained from Pinus sylvestris; Hungarian balsam from Pinus Pumilio; Bourdeaux turpentine from P. Pinaster; Carpathian balsam from P. Pinea; Strasburg turpentine from Abies pectinata (P. Picea *L*,), our Silver Fir; Canadian balsam from Abies balsamea, or the Balm of Gilead Fir. The common Larch yields Venetian turpentine. Liquid storax is thought to be yielded by the Dammar Pine; and a substance called in India Dammar, or country resin, is procured from the same plant, or from a tree which Dr. Buchanan calls Chloroxylon Dupada. *Ainslie*, 1. 337. Sandarach, a whitish yellow, brittle, inflammable, resinous substance, with an acrid aromatic taste, is said by Thomson to exude from Juniperus communis; but upon the authority of Brongniart and Schousboe, it is the tears of Thuja articulata (or quadrivalvis). *Ibid.* 1. 399. I have seen a plank two feet wide of the tree that produces Sandarach, and which is called the *Arar Tree* in Barbary; hence it is probably the Thuja, for the Juniper never reaches these dimensions. The wood of the Sandarach tree is considered by the Turks indestructible, and they use it for the ceilings and floors of their mosques. The substance from which spruce beer is made is an extract of the branches of the Abies canadensis, or Hemlock Spruce, and of Abies nigra. Great tanning powers exist in the bark of the Larch; as great, it is said, as in the Oak. *Ed. P. J.* 1. 319. The stimulating diuretic powers of the Savin, Juniperus Sabina, are well known, and are partaken of in some degree by the common Juniper, the berries of which are an ingredient in flavouring gin. The large seeds of many are eatable. Those of the Stone Pine of Europe, the Pinus Cembra, the Pinus Lambertiana and Gerardiana, and the Araucaria Dombeyi, are all eatable when fresh.

GENERA.

§ 1. Abietinæ, Rich.
Pinus, L.
Abies, DC.
Larix, DC.
Cunninghamia, Rich.
Belis, Salisb.
Dammara, Mirb.
Agathis, Salisb.
Araucaria, Juss.
Dombeya, Lamb.
Entassa, Salisb.
Colymbea, Salisb.

§ 2. Cupressinæ, Rich.
Thuja, L.
Callitris, Vent.
Frenela, Mirb.
Cupressus, L.
Taxodium, Rich.
Schubertia, Mirb.
Juniperus, L.

Order CCXXXI. TAXACEÆ.

Taxinæ, *Rich. Conif.* 124. (1826); *Bartl. Ord. Nat.* 95. (1830); *Martius Conspectus, No.* 58. (1835).

Essential Character.—*Flowers* monœcious or dicœcious, solitary, and surrounded by imbricated bracts, or in spikes surrounded by bracts, or naked.—*Males.* Cal. 0. *Stamens* several; *filaments* usually monadelphous; *anthers* combined or distinct.—*Females. Flowers* solitary, naked. *Ovules* naked, the foramen at their apex, their outer skin becoming finally hard; *nucleus* erect. *Seed* hard, either altogether naked, or surrounded by a succulent imperfect cup-shaped pericarp. *Albumen* fleshy. *Embryo* straight, dicotyledonous.—*Trees* or *shrubs* with continuous, unarticulated branches. *Wood* having the ligneous tissue marked with circular disks. *Leaves* usually narrow, rigid, entire and veinless, evergreen, alternate or distichous; sometimes dilated and lobed, and in those cases having forked veins of equal thickness.

Affinities. Separated from Coniferæ by their fruits not being collected in cones, but each ovule growing singly, unprotected by hardened scales; so that this is a degree of organization yet lower than that of Coniferæ themselves. It is also to be observed, that in this order the leaves do not always

preserve the veinless acerose state of Coniferæ, but expand and form veins, which are then forked and of uniform thickness, just as in Ferns.

Geography. Natives of the temperate climates of all the quarters of the globe; they occasionally make their appearance in hot latitudes, as in the Indian Archipelago, but they can hardly be called common anywhere.

Properties. Resinous like Coniferæ, and often valuable for their timber. The Dacrydium taxifolium, or *Kakaterro* of New Zealand acquires a height of 200 feet. *Ed. Ph. Journ.* 13. 378. Its branches may be manufactured into spruce beer. The succulent covering of the Yew fruit is fœtid,and is said to be deleterious by De Candolle; there is also a prejudice against the seeds. The seeds of Salisburia and Podocarpus neriifolia are large and eatable.

GENERA.

Taxus, L.	Phyllocladus, Rich.	Salisburia, Sm.
Podocarpus, L'Herit.	*Thalamia*, Spreng.	*Ginkgo*, Thunb.
Dacrydium, Banks.	*Brownetera*, Rich.	

Order CCXXXII. EQUISETACEÆ. The Horse-tail Tribe.

Equisetaceæ, *DC. Fl. Fr.* 2. 580. (1805); *Agardh Aph.* 119. (1822); *Kaulfuss Enum. Filicum*, 1. (1824); *Greville Flora Edin.* xiii. (1824); *Adolphe Brongniart Hist. Veg. Foss.* 99. (1828.)

Essential Character.—*Inflorescence* cone-like, consisting of peltate scales. *Flowers* naked, collected in great numbers in the inside of the deflected lobes of the peltate scales, which lobes open inwards by a longitudinal slit. *Stamens* 4, clavate, wrapped round a naked ovule, and remarkably hygrometrical. — *Leafless* branched plants with a striated fistular stem, in the cuticle of which silex is secreted; the *articulations* separable and surrounded by a membranous toothed sheath. *Stem* fistular, with many longitudinal cavities in its circumference; chiefly consisting of cellular substance, but coated externally with a layer of hard woody tubes from which plates of a similar nature project towards the centre, partially dividing the longitudinal cavities from each other. *Stomates* arranged longitudinally on the cuticle. *Spiral* vessels very few.

Affinities. The very remarkable plants known by the vulgar name of horsetails, seem to have no very decided affinity to any existing order. With Ferns their relation is not at all obvious, depending almost entirely upon the supposed want of sexes. In the arrangement and appearance of their reproductive organs they have a striking resemblance to Zamia, and in general aspect to Casuarina. Their germination is that of Cellular plants, and approaches nearly to Mosses. Upon the whole, they must be considered an exceedingly anomalous tribe, approaching Coniferæ through Cycadaceæ more closely than any thing else. The curious structure of their stem is well described by Ad. Brongniart in his *History of Fossil Vegetables*, as are, indeed, all the parts of their organisation: see Tables 11 and 12 of that work. This ingenious writer entertains the opinion that the green body, which is known to be the sporule, is a naked ovule, and the 4 swollen filaments that surround it 4 grains of pollen united in pairs to the base of the ovule. It is probable that the nearest approach to the structure of sexual organs does take place here, and that, considering the analogy between the thecæ of Equisetum and the lobes of the anther of Coniferæ, and between the filaments of the former and the quaternary grains of pollen of Cycas, the parallel drawn by Brongniart is substantially just, but it must, at the same time, I think, be admitted, that it is very doubtful whether, in this order, the parts are any thing more than representatives of the sexual apparatus, without the power of performing its functions.

Upon the whole, however, I think we must admit that Equisetaceæ are more like flowering than flowerless plants; and it seems to me most advisable to consider them a degeneration of Coniferæ, to which they have so much resemblance, rather than a race in affinity with Ferns, with which they really have no resemblance. They are apparently to other Gymnosperms what Ceratophyllum is to Exogens and Lemna to Endogens.

The germination of the sporules has been explained, both by Agardh and Bischoff. The former (*Aphor.* 120) describes it thus: From 3 to 14 days after they are sown, they send down a filiform, hyaline, somewhat clavate, simple root, and protrude a confervoid, cylindrical, obtuse, articulated, torulose thread, either 2-lobed (in E. pratense) at the apex, or simple (in E. palustre). Some days after, several branches grow out and are agglutinated together, forming a body resembling a bundle of confervoid threads, each of which pushes out its own root. The account of Bischoff (*Nov. Act. Acad. N. Cur.* 14. t. 44.) is not materially different: he finds the confervoid threads or numerous processes of cellular developement go on growing and combining, until a considerable cellular mass is formed; then this mode of developement ceases, and a young bud is created, which springs up in the form of the stem of the Equisetum, at once completely organised, with its air-cells, its central cavity, and its sheaths, the first of which is formed before the elongation of the stem, out of the original cellular matter.

Geography. Found in ditches and rivers in most parts of the world, within and without the tropics.

Properties. None of importance in a medicinal point of view; they are said to be slightly astringent and stimulating, and have even been recommended as diuretics, and emmenagogues; they are, however, not now employed. In economical purposes they are found highly useful, for polishing furniture and household utensils; a property which is due to the presence of a great quantity of silex in their cuticle. According to the observations of John of Berlin, they contain full 13 per cent. of siliceous earth. *Ed. P. J.* 2. 394. The ashes have been found by chemists to contain half their weight of silica. *Jameson's Journal, Jan.* 1830, p. 101. The quantity of silex contained in the cuticle of Equisetum hyemale is so great, that Sivright succeeded in removing the vegetable matter and retaining the form. *Grev. Fl. Edin.* 214. On subjecting a portion of the cuticle of Equisetum hyemale to the analysis of polarised light under a high magnifying power, Brewster detected a beautiful arrangement of the siliceous particles, which are distributed in two lines parallel to the axis of the stem, and extending over the whole surface. The greater number of the particles form simple straight lines, but the rest are grouped into oval forms connected together like the jewels of a necklace, by a chain of particles forming a sort of curvilinear quadrangle, these rows of oval combinations being arranged in pairs. Many of those particles which form the straight lines do not exceed the 500th of an inch in diameter. Brewster also observed the remarkable fact, that each particle has a regular axis of double refraction. In the straw and chaff of Wheat, Barley, Oats, and Rye, he noticed analogous phenomena; but the particles were arranged in a different manner, and displayed figures of singular beauty. From these data it is concluded that the crystalline portions of silex and other earths, which are found in vegetable tissues, are not foreign substances of accidental occurrence, but are integral parts of the plant itself, and probably perform some important function in the process of vegetable life. *Grevill. Fl. Edinens.* 214.

GENUS.

Equisetum, L.

Class III. ENDOGENS, or MONOCOTYLEDONS.

Monocotyledones, *Juss. Gen.* 21. (1789); *Desf. Mém. Inst.* 1. 478. (1796).—Endorhizeæ, *Rich. Anal.* (1808).—Monocotyledoneæ *or* Endogenæ, *DC. Théorie*, 207. (1813).—Cryptocotyledoneæ *or* Graniferæ, *Agardh. Aph.* 73. (1821).

Essential Character.—*Elementary organs* consisting of both cellular and vascular tissue, a portion of the latter being elastic spiral vessels. *Cuticle* with stomates. *Trunk* usually cylindrical when a terminal bud only is developed, becoming conical and branched when several develope; consisting of cellular tissue, among which the vascular tissue is mixed in bundles, without any distinction of bark, wood and pith, and destitute of medullary rays; increasing in diameter by the addition of new matter to the centre. *Leaves* frequently sheathing at the base, and not readily separating from the stem by an articulation, mostly alternate, with parallel simple veins, connected by smaller transverse ones. *Flowers* usually having a ternary division; the calyx and corolla either distinct, or undistinguishable in colour and size, or absent. *Embryo* with but 1 cotyledon; if with 2, then the accessory one is imperfect and alternate with the other; *radicle* usually enclosed within the substance of the embryo, through which it bursts when germinating.

Nothing can be more simple that the mode of distinguishing Monocotyledonous from Dicotyledonous plants, notwithstanding the difficulty of fixing upon any single character of separation. It is true that the structure of the stem is not sufficient, because it is frequently impossible, in annual plants, to ascertain if it be Exogenous or Endogenous; the parallel veins of the leaves of Monocotyledons do not always afford a constant character, because some genera have reticulated ones; the want of articulation between the stem and the leaves, although very prevalent in Monocotyledons, sometimes changes to perfect articulation, as in Orchidaceæ; the ternary division of the flower of Monocotyledons is often departed from, as in Araceæ and the neighbouring orders; many Dicotyledons have also ternary floral envelopes: Monocotyledons have sometimes more than one cotyledon, as the common Wheat; finally, when the stem is capable of being strictly examined, a distinction between wood and pith occasionally exists, as in the common Rush; and the conical branched character of Dicotyledons is assumed in Grasses and Asphodeleæ. Hence it is by a combination of characters that the two great divisions are to be known, and not by any absolute single mark: for instance, in Grasses, in which the stem is, as an eminent botanist has justly remarked, less Endogenous than in almost any other Monocotyledons, the leaves, flowers, and seeds, will shew them to be at once of the latter structure; so in Juncus, in which pith is present, no other character is at variance with those of Monocotyledons; and again in Orchidaceæ, in which a complete disarticulation of the stem and leaves takes place, every other point of structure is that of Monocotyledons. Brown has remarked (*Congo.* 481.), that the presence of albumen may be considered as the natural structure of this primary division; seeds without albumen occurring only in certain genera of the paradoxical Araceæ, and in some other Monocotyledonous orders which are chiefly aquatic. It is a fact well deserving attention, that Monocotyledons differ from Dicotyledons in their geographical distribution as well as in structure; a seeming corroboration of the hypothesis, that the forms of vegetation are controlled by peculiarities of climate, acting in an unknown manner. From the enquiries of Humboldt, it appears that Monocotyledons form, in equinoctial regions, about 1-6th of the flowering plants; in the temperate zone, between 36° and 52° latitude, 1-4th; and towards the polar circle, nearly 1-3d.

The most important substance that they produce is amylaceous matter, which exists in great quantity in some of them, which hence become of incalculable value as aliment for man; such are all the Corn tribe, Plantains, and some Palms, which contain it in the fruit: the Sago and other Palms, in which it occupies the trunk; and the eatable Araceous plants, Orchises, Yams, &c., in which it is found in the root. Sugar, gluten, oil, and aromatic principles, are also frequently met with in Monocotyledons; but, as Humboldt well remarks, acids, bitters, resins, camphor, tannin, milk, or poisonous matter, are either wholly wanting or very uncommon. The latter chiefly exists in Araceæ, some Amaryllidaceæ, and Melanthaceæ.

The orders of Monocotyledons are given in the state in which they now exist; but it must be confessed that the characters and limits of many of them are far from satisfactory. The whole of those which border upon Liliaceæ require to be reconsidered by some botanist who is in possession of the means of examining them in great detail; their actual condition is, no doubt, attributable to the partial view that has hitherto been taken of them.

It seems to me that they naturally divide into six principal groups, of which one has the ovary adherent with the calyx (Epigynosæ); another the same character with the stamens and styles combined into a solid central column (Gynandrosæ); a third with a superior ovary, and the floral envelopes for the most part petaloid (Hypogynosæ); a fourth with Exogenous leaves (Retosæ); a fifth with the floral envelopes either altogether absent, or in a very imperfect state, analogous to those of Incompletæ among Dicotyledons (Spadicosæ), and a sixth with the true floral envelopes altogether absent, their place being supplied by alternate bracts, which are packed one over the other about the ovary (Glumosæ). And I think, whatever may be the changes that the limits of the orders themselves may undergo, such groups must be considered natural. If their mutual affinities are attentively considered, it will be seen that as usual no linear arrangement is capable of expressing their relationship. Let us begin their comparison where we will, it can only end in their arrangement in a circle. Suppose, for example, omitting Retosæ, which do not affect the illustration, we take Epigynosæ to start from. That group contains the genus Gladiolus, which, if its stamens and style were consolidated, would be almost an Orchidaceous plant; therefore, Epigynosæ and Gynandrosæ are in contact. On the other hand, the Bromelial alliance in Epigynosæ is so allied to the Pandanal in Spadicosæ, that we cannot doubt these two groups also touching. Gynandrosæ are also in like manner placed as it were between Epigynosæ and Hypogynosæ, Scilla, or some such regular-flowered Asphodeleous plant, being a clear ally of such genera as Thelymitra among Orchidaceæ. Now let us see what further affinities can be traced from Spadicosæ and Hypogynosæ elsewhere. The latter contain the Juncal alliance, in both whose orders the perianth is so nearly glumaceous as to leave no doubt of their connection with Glumosæ; on the other hand, the Typhal alliance in Spadicosæ approximates so very nearly to Glumosæ, as for instance Typha to Pennisetum, and Sparganium to many Carices, that the connection of Hypogynosæ and Spadicosæ may be said to be nearly equal with Glumosæ. If these affinities are expressed on paper by the position the groups really occupy, we shall have the latter thus—

Epigynosæ, Gynandrosæ,
Spadicosæ, Hypogynosæ,
Glumosæ.

But this is a kind of connection that cannot be preserved in a linear arrangement. In my *Key to Structural, Physiological, and Systematic Botany*, I attempted to manage by beginning with Epigynosæ and ending with Gynan-

drosæ; by this means opening the circle on one side, and following the course till it brought me back to the point whence I started. But I find that there are practical inconveniences in the way of this arrangement, and as it is after all a matter of no great importance, I have thought it better in the present work to revert to the order proposed in my *Nixus*, p. 21. The sequence of the groups will, therefore, be as under :—

1. **Epigynosæ.** Anthers distinct. Flowers complete, formed upon a ternary plan. Ovary inferior; or if superior, then the leaves either scurfy or equitant.
2. **Gynandrosæ.** Stamens and style consolidated into a central column. Flowers complete, formed upon a ternary plan. Ovary inferior, usually one-celled with scobiform seeds.
3. **Hypogynosæ.** Flowers coloured, formed upon a ternary plan. Ovary superior.
4. **Retosæ.** Leaves either with many ribs, the intervals between which are irregularly netted, or with a midrib and netted sides; foot-stalk taper, articulated with the stem. Embryo without a lateral slit. Flowers never arranged in a spadix. Floral envelopes complete.
5. **Spadicosæ.** Flowers herbaceous or imperfect; the perianth sometimes absent. Embryo with a lateral slit for the emission of the plumule.
6. **Glumosæ.** Bracts scale-like, glumaceous, imbricated, in the room of calyx.

Group I. Epigynosæ.

Essential Character.—*Anthers* distinct. *Flowers* complete, divided upon a ternary plan. *Ovary* inferior; or if superior, then the leaves either scurfy or equitant.

In most of the orders this character is so perfectly preserved that no mistake is likely to be made about it, unless in regard to the Retose group, but that is known by its totally different leaves. In Hæmodoraceæ and Bromeliaceæ, indeed, genera are not unfrequent in which the ovary is really superior; and which would consequently be referred to Hypogynosæ. I believe, however, that this deviation from the usual character of Epigynosæ only occurs in plants whose leaves are either equitant or scurfy, and as I am not aware that such peculiarities ever exist in the vegetation of Hypogynosæ, the exceptions will be readily recognised. The Gynandrous group is sufficiently defined by the combination of the styles and stamens into a homogeneous central column. The Hæmodoraceous and Bromeliaceous genera already alluded to, with a superior ovary, form a transition from this group to Hypogynosæ: it is connected with Gynandrosæ by Iridaceæ on the one hand and Apostasiaceæ on the other.

Alliance I. *AMOMALES.*

Essential Character.—*Leaves* with the veins diverging from the midrib to the margin.

This remarkable character is confined to the following 3 orders in all Epigynous Monocotyledons with the exception of one species of Tacca, and it is even unknown in any other group except Hypogynosæ, where it is found in Asphodeleæ. This renders the distinctions of the three orders exceedingly simple.

Zingiberaceæ are monandrous, with a whole anther.

Marantaceæ are monandrous, with only half an anther.

Musaceæ have 5 or six anthers.

Order CCXXXIII. ZINGIBERACEÆ, or SCITAMINEÆ. } The Ginger Tribe.

Cannæ, *Juss. Gen.* 62. (1789), *in part.*—Drymyrhizeæ, *Vent. Tabl.* (1799); *DC. Ess. Méd.* 281. (1816).—Scitamineæ, *R. Brown, Prodr.* 305. (1810); *Agardh Aph.* 182. (1823); *Rosc. Monogr.*; *Blume Enumeratio*, p. 39. (1827).—Zingiberaceæ, *Rich. Anal. Fr.* (1808).—Amomeæ, *Juss. in Mirbel's Elém.* 854. (1815); *Ach. Rich. Nouv. Elém. ed.* 4. 438. (1828).—Alpiniaceæ, *Link Handb.* 1. 228. (1829), *a § of* Scitamineæ.

Essential Character.—*Calyx* superior, tubular, 3-lobed, short. *Corolla* tubular, irregular, with 6 segments in 2 whorls; the *outer* 3-parted, nearly equal, or with the odd segment, sometimes differently shaped; the *inner* (sterile stamens) 3-parted, with the intermediate segment *(labellum)* larger than the rest, and often 3-lobed, the lateral segments sometimes nearly abortive. *Stamens* 3, distinct, of which the 2 lateral are abortive, and the intermediate 1 fertile; this placed opposite the labellum, and arising from the base of the intermediate segment of the outer series of the corolla. *Filament* not petaloid, often extended beyond the anther in the shape of a lobed or entire appendage. *Anther* 2-celled, opening longitudinally, its lobes often embracing the upper part of the style. *Pollen* globose, smooth. *Ovary* 3-celled, sometimes imperfectly so; *ovules* several, attached to a placenta in the axis; *style* filiform; *stigma* dilated, hollow. *Fruit* usually capsular, 3-celled, many-seeded, [sometimes by abortion 1-celled]; occasionally berried (the dissepiments generally central, proceeding from the axis of the valves, at last usually separate from the latter, and of a different texture. *R. Br.*) *Seeds* roundish, or angular, with or without an aril (*albumen* floury, its substance radiating, and deficient near the hilum. *R. Br.*); *embryo* enclosed within a peculiar membrane (*vitellus*, R. Br. Prodr.; *membrane of the amnios*, ibid. in King's Voyage, 21), with which it does not cohere.—Aromatic tropical *herbaceous* plants. *Rhizoma* creeping, often jointed. *Stem* formed of the cohering bases of the leaves, never branching. *Leaves* simple, sheathing, their *lamina* often separated from the sheath by a taper neck, and having a single midrib, from which very numerous, simple, crowded veins diverge at an acute angle. *Inflorescence* either a dense spike, or a raceme, or a sort of panicle, terminal or radical. *Flowers* arising from among spathaceous membranous bracts, in which they usually lie in pairs.

Anomalies.—Monocystis has a unilocular monospermous ovary.

Affinities. Formerly Zingiberaceæ and Marantaceæ were united in one tribe called Canneæ, and this is even yet followed by some botanists: hence it is certain that they are at least more nearly related to each other than to any thing else, and that whatever is the affinity of the one will be that of the other. Taking the vegetation into account, these two tribes are exceedingly nearly allied to Musaceæ, in which is found the same kind of leaf, the veins of which are closely set, and diverge from the midrib to the margin, being connected by very weak and imperfect intermediate veins; the leaves have

also the same distinct petiole, often with a thickened rounded space at the apex; Musaceæ are, however, pent- or hexandrous, with a calyx and corolla of the same texture. Iridaceæ are the next order with which Zingiberaceæ may be compared, agreeing in their superior flowers, which have sometimes an approach to the irregularity of Alpinia and the like, and also in the triple number of their stamens; but while these organs are all developed in Iridaceæ, two are abortive or deformed in both Zingiberaceæ and Marantaceæ. Bromeliaceæ have been identified with them of old, but their resemblance consists chiefly in the distinction of calyx and corolla, and their inferior ovary. To Orchidaceæ they are related in consequence of the reduction of their three stamens to one by the abortion of two: but the cohesion of the stamens and style in the latter, and the want of any distinction between calyx and corolla, sufficiently separate them, besides which the series which produces the stamens in Orchidaceæ answers to the sterile stamens or inner limb of the corolla in Zingiberaceæ. For the difference between Zingiberaceæ and Marantaceæ, see the latter. There is a fine volume consecrated to plants of these two tribes by Roscoe, who first remodelled the genera and reduced them within fixed limits. Between the embryo and the albumen is interposed a fleshy body enveloping the former: this has been called a process of the rostellum by Correa, a cotyledon by Smith, a vitellus by Gærtner and Brown, a central indurated portion of the albumen by Richard. It is now known to be the innermost integument of the ovule, unabsorbed during the advance of this body to maturity.

Independently of the presence of this vitellus, the most remarkable part of the structure of Zingiberaceæ depends on the number of divisions of the floral envelopes, which consist of a tubular calyx, and of two more series instead of one. Brown struck with this unusual deviation from the ordinary organisation of Monocotyledons, was disposed to consider the calyx an accessory part (*Prodr.* 305); but Lestiboudois' explanation appears more satisfactory. According to this botanist (as quoted in Ach. Richard's *Nouv. Elém.* 439), Zingiberaceæ are really hexandrous, like the nearly-related Musaceæ; but of their stamens the outer series is petaloid, and forms the inner limb of the corolla, and of the inner series of stamens the central one only developes, the lateral ones appearing in the form of rudimentary scales. The notion of Lestiboudois is confirmed by Marantaceæ, in which the inner stamens (even that which is antheriferous (become petaloid like the outer: thus shewing that in these plants there is a strong and general tendency in the filaments to assume the state of petals.

Geography. All tropical, or nearly so. By far the greater number inhabit various parts of the East Indies; some are found in Africa, and a few in America. They form a part of the singular Flora of Japan.

Properties. Generally objects of great beauty, either on account of the high degree of developement of the floral envelopes, as in Hedychium coronarium and Alpinia nutans; or because of the rich and glowing colours of the bracts, as in Curcuma Roscoeana (*Wallich Plant. As. Rar.* vol. 1. tab. 9.) They are, however, principally valued for the sake of the aromatic stimulating properties of the root or rhizoma, such as are found in Ginger (Zingiber officinalis), Galangale (Alpinia racemosa and Galanga), Zedoary (Curcuma Zedoaria and Zerumbet), and many other species of the latter genus. The warm and pungent roots of the greater and lesser Galangale are not only used by the Indian doctors in cases of dyspepsia, but are also considered useful in coughs, given in infusion. *Ainslie*, 1. 141. The seeds of many partake of the properties of the root. Cardamoms are the seeds of several plants of this order. On the eastern frontiers of Bengal the fruit of Amomum aromaticum is used; the lesser Cardamom of Malabar is the

Elettaria Cardamomum; another sort is the produce of Amomum maximum; and the greater Cardamoms are yielded by the Amomum Granum Paradisi. Others are known for their dyeing properties, such as Turmeric. This substance, obtained from Curcuma longa, is cordial and stomachic; it is also considered by the native practitioners of India an excellent application in powder for cleaning foul ulcers. *Ibid.* 1. 455. The fruit of Globba uviformis is said to be eatable. Generally, in consequence of the presence of the aromatic oil that is so prevalent in the order, the roots or rhizomas, although abounding in fæcula, are not fit for the preparation of arrow-root; but an excellent kind is prepared in Travancore, in the East Indies, from Curcuma angustifolia. *Ibid.* 1. 19.

GENERA.

§ 1. Zingibera, Blume.
Zingiber, Gærtn.
Curcuma, L.
Hitchenia, Wall.
Kæmpferia, L.
§ 2. Amoma, Bl.
Amomum, L.
Elettaria, Rheede.
Donacodes, Bl.
Diracodes, Bl.
Hedychium, Kön.
§ 3. Alpiniæ, Bl.
Alpinia, L.
Gethyra, Salisb.
Zerumbet, Wendl.
Hellenia, W.
Gastrochilus, Wall.
Monolophus, Wall.
Cassumunar, Colla.
Galanga, Roxb.
Monocystis, (58)
Cenolophon, Bl.
Phæomeria, (59)
Peperidium, (60)
§ 4. Costi, Bl.
Costus, L.
§ 5. Globbæ, Bl.
Globba, L.
Colebrookia, Donn.
Ceratanthera, Horn.
Mantisia, Sims.
Renealmia, L. f.
Catimbium, Juss.
Leptosolena, Presl.
Hornstedtia, Retz.
Kolovratia, Presl.
Roscoea, Sm.

Order CCXXXIV. MARANTACEÆ. The Arrow-Root Tribe.

Cannæ, *Juss. Gen.* 62. (1789) *in part.*—Cannæ, *R. Brown Prodr.* 1. 307. (1810); *Lindl. in Bot. Reg.* 932. (1825).—Canneæ *or* Marantæ, *Brown in Flinders* (1814).—Cannaceæ, *Agardh Aph.* 181. (1823); *Link Handb.* 1. 223. (1829), *a* § *of* Scitamineæ.

Essential Character.—*Calyx* superior, of 3 sepals, short. *Corolla* tubular, irregular, with the segments in 2 whorls; the *outer* 3-parted, nearly equal; the *inner* very irregular; one of the lateral segments usually coloured, and formed differently from the rest; sometimes by abortion fewer than 3. *Stamens* 3, petaloid, distinct, of which one of the laterals and the intermediate one are either barren or abortive, and the other lateral one fertile. *Filament* petaloid, either entire or 2-lobed, one of the lobes bearing the anther on its edge. *Anther* 1-celled, opening longitudinally. *Pollen* round (papillose in Canna coccinea, smooth in Calathea zebrina). *Ovary* 3-celled; *ovules* solitary and erect, or numerous and attached to the axis of each cell; *style* petaloid or swollen; *stigma* either the mere denuded apex of the style, or hollow, cucullate, and incurved. *Fruit* capsular, as in Scitamineæ. *Seeds* round, without aril; *albumen* hard, somewhat floury; *embryo* straight, naked, its *radicle* lying against the hilum.—*Herbaceous* tropical plants, destitute of aroma. *Rhizoma* creeping, abounding in nutritive fæcula. *Stem* often branching. *Leaves*, *inflorescence*, and *flowers*, as in Zingiberaceæ.

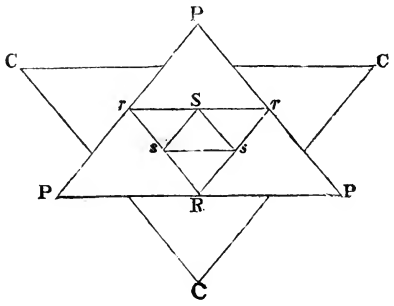
Anomalies. The ovary of Thalia is monospermous.

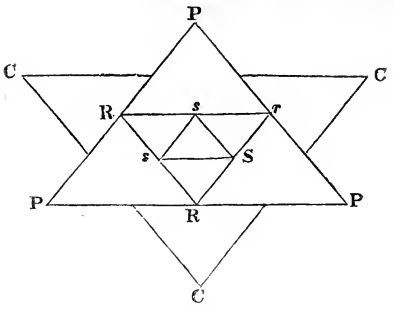
Affinities. Under Zingiberaceæ, the relations of that order and the present to other monocotyledonous groups has been noticed. In this place the distinction between the two orders has to be explained. Brown was the first to propose the separation of them, in which he has not been followed generally; a circumstance that has possibly arisen from a belief that Marantaceæ differed from Zingiberaceæ only in the absence of aroma and vitellus, and in the imperfection of their anther. But, as I have formerly stated in the *Botanical Register*, folio 932, the distinction of the two orders depends upon a much more important consideration than either of these. In true Zingiberaceæ, as Brown has observed (*Prodr.* 305.), the stamen is always

placed opposite the labellum or anterior division of the inner series of the corolla, and proceeds from the base of the posterior outer division; while the sterile stamens, when they exist, are stationed right and left of the labellum. But in Marantaceæ the fertile stamen is on one side of the labellum, occupying the place of one of the lateral sterile stamens of Zingiberaceæ. This peculiarity of arrangement indicates a higher degree of irregularity in Marantaceæ than in Zingiberaceæ, which also extends to the other parts of the flower. The suppression of parts takes place in the latter in a symmetrical manner; the two posterior divisions of the inner series of the perianthium, which are occasionally absent, corresponding with the abortion of the two anterior stamens. In Marantaceæ, on the contrary, the suppression of organs takes place with so much irregularity, that the relation which the various parts bear to each other is not always apparent: instead of the central stamen being perfect while the two lateral ones are abortive, as in Zingiberaceæ and most Orchidaceæ, or of the central stamen being abortive and the two lateral ones perfect, as in some Orchidaceæ, it is the central and one lateral one that are suppressed in Marantaceæ. In the perianthium of Canna only the most external within the calyx can properly be called corolla; the remainder of the segments being attempts to produce barren petaloid stamens analogous to what is called the inner limb of the corolla in Zingiberaceæ; and the characters upon which botanists found their specific distinctions depend upon the degree to which this developement of petaloid abortive stamens extends. When, for instance, they describe some as having an inner limb of 2 or of 3, or of 4 or of 5 segments, they should rather say 2, 3, 4, or 5 stamens are partially developed. For remarks upon the proof thus afforded of the affinity of Zingiberaceæ and Marantaceæ to Musaceæ, see the former order.

Perhaps it will be possible to put the relative structure of Zingiberaceæ and Marantaceæ in a clearer light by the following diagrams, in which the triangle C, C, C represents the calyx, the angles corresponding with the position of the sepals; the triangle P, P, P the corolla; R, *r*, *r* an outer series of petaloid stamens, of which *r*, *r* are rudimentary only; and S, *s*, *s* the inner series of stamens, of which S is the fertile and fully developed one.

ZINGIBERACEÆ.





Lestiboudois has endeavoured to show (*Ann. des Sc.* 20. 316.) that the anther of Canna does not consist of one lobe only; his dissertation is a signal instance of confused reasoning and inaccurate observation.

Agardh describes the albumen of Canna as a fungous elastic substance, formed of densely compact hyaline granules, white internally, gradually passing through yellow and brown into black, and more analogous to an internal membrane than to albumen, because it undergoes little change during germination. But the albumen is better understood now than in 1823. See Introduction, and *Key to Botany*, par. 494, &c.

Geography. The greater part are found in tropical America and Africa; several are natives of India; some are known in a wild state beyond the tropics.

Properties. While the ginger tribe (Zingiberaceæ) is valued for its aromatic heating principle, the arrow-root tribe (Marantaceæ) is esteemed on account of the fæcula, which abounds in the rhizoma and root of both tribes, being destitute of that principle: on this account it is collected as a delicate article of food, both from Maranta arundinacea, Allouyia, and nobilis in the West Indies, and also from Maranta ramosissima in the East. The fleshy cormus of some Cannas is reported to be eaten in Peru. A tough fibre is obtained from Phrynium dichotomum; and the leaves of the South American Calatheas are worked into baskets, whence their name. The juice of Maranta arundinacea is said to be efficacious in poisoned wounds. *Agdh.*

GENERA.

Myrosma, L. f.	Thalia, L.	Maranta, L.
Phrynium, Willd.	*Peronia*, DC.	Calathea, Meyer.
		Canna, L.

Order CCXXXV. MUSACEÆ. The Banana Tribe.

Musæ, *Juss. Gen.* (1789).—Musaceæ, *Agardh Aph.* 180. (1823); *Ach. Rich. Nouv. Elém. ed.* 4. 436. (1828); *Endlicher Prodr. Fl. Norf.* 34. (1833).

Essential Character.—*Flowers* spathaceous. *Perianth* 6-parted, superior, petaloid, in 2 distinct rows, more or less irregular. *Stamens* 6, inserted upon the middle of the divisions, some often becoming abortive; *anthers* linear, turned inwards, 2-celled, often having a membranous petaloid crest. *Ovary* inferior, 3-celled, many-seeded, rarely 3-seeded; *style* simple; *stigma* usually 3-lobed. *Fruit* either a 3-celled capsule with a loculicidal dehiscence, or succulent and indehiscent. *Seeds* sometimes surrounded by

hairs, with an integument which is usually crustaceous; *embryo* in the axis of mealy albumen.—Stemless or nearly stemless plants. *Leaves* sheathing at the base, and forming a kind of spurious stem; often very large; their limb separated from the taper petiole by a round tumour, and having fine parallel veins diverging regularly from the midrib towards the margin.

Anomalies. Heliconia has only 1 ovule in each cell. The lamina of the leaf occasionally disappears in Strelitzia.

Affinities. These have been pointed out under Zingiberaceæ and Marantaceæ, with which the Banana tribe is strictly related. Agardh characterises it as gynandrous (*l. c.*) but it does not appear upon what principle. The flower of Musa is well described in the Appendix to the *Congo Expedition*, 471., in a note: that of Strelitzia is pentandrous and exceedingly irregular, and is admirably illustrated in Bauer's drawings, published some years since by Ker, under the title of *Strelitzia Depicta*. The hilum of the seed gives rise to a tuft of long hairs in Urania and Strelitzia. For remarks upon the distinctive characters of some of the genera of Musaceæ, see *Endl. Prodr.* p. 34.

Geography. Natives of the Cape of Good Hope, the islands of its south-east coast, and generally of the plains of the tropics, beyond which they do not naturally extend, unless in Japan, the climate of which seems to be much at variance with that of other countries in the same latitude.

Properties. Most valuable plants, both for the abundance of nutritive food afforded by their fruit, and for the many domestic purposes to which the gigantic leaves of some species are applied. These are used for thatching Indian cottages, for a natural cloth from which the traveller may eat his food, as a material for basket-making, and finally they yield a most valuable flax (Musa textilis), from which some of the finest muslins of India are prepared. The stems are formed of the united petioles of the leaves, which are remarkable for the vast quantity of spiral vessels they contain: these exist in such numbers as to be capable of being pulled out by handfuls, and they are actually collected in the West Indies and sold as a kind of tinder. *Dec. Org.* 38. The number of threads in each convolution of these spiral vessels varies from 7 to 22. *Ibid.* 37. The young shoots of the Banana are eaten as a delicate vegetable. The root of Heliconia Psittacorum, and the seed of Urania speciosa, are said to be eatable. The juice of the fruit and the lymph of the stem of Musa are slightly astringent and diaphoretic. The juice of the fruit of Urania is used for dying. *Agdh.*

GENERA.

Heliconia, L.	Musa, L.
Strelitzia, Ait.	Ravenala, Adans.
	Urania, Schreb.

Alliance II. *NARCISSALES.*

Essential Character.—*Flowers* hexandrous. *Sepals* and *Petals* equally petaloid. *Leaves* smooth or hairy, never scurfy, with the veins running parallel from the base to the apex.

The regular flowers, with all the parts equally and completely developed, form these plants into a peculiar group. Ixiales differ in the suppression of one series of the stamens; and Bromeialles in the outer series of the floral envelopes being calycine; while Hydrales, agreeing with the latter in the

floral envelopes, differ from them in their seeds being destitute of albumen, which in Monocotyledons is a very remarkable circumstance.

Order CCXXXVI. AMARYLLIDACEÆ.

The Narcissus Tribe.

Narcissi, the second section, *Juss. Gen.* 54. (1789).—Amaryllideæ, *R. Brown Prodr.* 296. (1810); *Herbert Appendix to the Bot. Mag.* (1821); *DC. and Duby*, 454. (1828); *Lindl. Synops.* 264. (1829).—Narcisseæ *Agardh. Aph.* 173. (1823).—Hypoxideæ, *R. Brown in Flinders.* (1814); *Agardh. Aph.* 164. (1823). *Ed. Prior. No.* 235. (1830).

Essential Character.—*Calyx* and *corolla* confounded, superior, regular, coloured, the former overlapping the latter. *Stamens* 6, arising from the sepals and petals, sometimes cohering by their dilated bases into a kind of cup; sometimes an additional series of barren stamens is present, often forming a cup which surmounts the tube of the perianth; *anthers* bursting inwardly. *Ovary* 3-celled, the cells many-seeded, or sometimes 1- or 2-seeded; *style* 1; *stigma* 3-lobed. *Fruit* either a 3-celled, 3-valved *capsule*, with loculicidal dehiscence, or a 1-3-seeded berry. *Seeds* with either a thin and membranous, or a brittle and black or a thick and fleshy testa; *albumen* fleshy or corneous; *embryo* nearly straight, with its radicle turned towards the hilum.—Generally *bulbous*, sometimes *fibrous*-rooted, occasionally with a tall, cylindrical, woody stem. *Leaves* ensiform, with parallel veins. *Flowers* usually with spathaceous bracts. *Stem* or scape not spadiceous.

Affinities. The only orders with which this need be compared are Liliaceæ, from which it is known by its inferior ovary: Iridaceæ, which are distinguished by being triandrous, with the anthers turned outwards; and Hæmodoraceæ, which see. No one has ever thought of dismembering it, since Brown founded it upon Jussieu's 2d section of Narcissi; and it can scarcely be said to comprehend an anomalous genus, unless Clivia and Doryanthes be so considered, on account of their fascicled roots, Agave and Fourcroya which I place here at the instance of Mr. Herbert, the stems of which are woody, and Gethyllis, because of its being polyandrous. The latter deviation from the ordinary character of the order will probably be considered of less importance, if we bear in mind the polyandrous structure of some Hæmodoraceæ, and especially if, in the first place, the genuine Amaryllidaceous genus Phycella be attended to, which has a tendency to produce additional stamens, and if, secondly, the corona of Narcissus itself be borne in mind, which is in fact an organ representing an extra number of stamens. I have elsewhere remarked (*Bot. Reg.* 1341.) that this is connected with a strong tendency in the whole order to form another set of male organs between the perianth and those stamens that actually develope. Hence a curious instance is exhibited, to which several parallels may, however, be found in other families, of the force of developement being generally confined to a series of organs originating within those which should be formed according to the ordinary laws of structure. Of course, in all such orders a multiplication of the usual number of stamens is more to be expected than where this peculiar circumstance does not exist. The order is now undergoing a careful revision by the Hon. and Rev. William Herbert, to whom I am much indebted for many valuable remarks, and for the materials from which the following list of genera has been prepared. I give up the possibility of characterizing Hypoxideæ as a distinct order, for their occasionally rostellate seeds appear of no value as an ordinal distinction. Mr. Herbert would also bring here Dioscoreaceæ. The public will soon have an opportunity of seeing the views of this gentleman fully developed in his forthcoming Monograph.

Geography. A very few only are found in the north of Europe and the same parallel; these are plants of the genera Narcissus and Galanthus. As we proceed south they increase. Pancratium appears on the shores of the Mediterranean; Crinums and Pancratiums abound in the West and East Indies; Hæmanthus is found for the first time with some of the latter on the Gold Coast; Hippeastra show themselves in countless numbers in Brazil, and across the whole continent of South America; and, finally, at the Cape of Good Hope the maximum of the order is beheld in all the beauty of Hæmanthus, Crinum, Clivia, Cyrtanthus, and Brunsvigia. A few are found in New Holland, the most remarkable of which is Doryanthes.

Properties. One of the few monocotyledonous orders in which any poisonous properties are found. These are principally apparent in the viscid juice of the bulbs of Hæmanthus toxicarius and some neighbouring species, in which the Hottentots are said to dip their arrow-heads. The bulbs of Narcissus poeticus have for ages been known as emetic; and it has recently been shown by Loiseleur Deslongchamps that a similar power exists in Narcissus Tazetta, odorus, and Pseudo-Narcissus, and Pancratium maritimum. The flowers of Narcissus Pseudo-Narcissus are also said to be emetic. De Candolle considers the principle found in Amaryllidaceæ analogous to that of the Squill (*Essai*, p. 290). Oporanthus luteus is purgative, Alströmeria salsilla diaphoretic and diuretic, Amaryllis ornata astringent. *Agardh Aph.* 178. A kind of arrow-root is prepared from the succulent roots of Alströmeria pallida and others, in Chile. The wild Agave of Mexico yields, when tapped, a copious juice, which is fermented into a wine called Pulque, from which a spirit known under the name of Vino Mercal is obtained.

GENERA.

§ 1. Hypoxideæ, R.Br.
Curculigo, Gærtn.
Molineria, Colla.
Hypoxis, L.
Fabricia, Thunb.
Cælanthus, Schlecht.

Molinanthus, Herb.
Alströmeria, L.
Collania, Herb.
Sphærine, Herb.
Bomarea, Mirb.

§ 2. Agaveæ, Herb.
Fourcroya, Vent.
Agave, L.
Littæa,
Doryanthes, Correa.

Bravoa, La Ll.
Cætocapnia, Lk. et Oth.
Ixiolirion, Fisch.
? Tecophilea, Pöpp.

§ 3. Amaryllideæ, Herb.
Cyrtanthus, Ait.
Gastronema, Herb.
Vallota, Herb.

Sprekelia, Herb.
Hippeastrum, Herb.
Phycella, Lindl.
? Eustephia, Cav. (61)
Habranthus, Herb.
Zephyranthes, Herb.
Haylockia, Herb.
Cooperia, Herb.
Sphærotele, Presl.
Pyrolirion, Herb.

Gethyllis, L.
Sternbergia, W. et K.
Oporanthus, Herb.
Lapiedra, Lga.

Corbularia, Haw.
Ajax, Salisb.
Queltia, Salisb.
Diomedes, Haw.
Narcissus, L.
Philogyne, Haw.
Hermione, Salisb.
Schisanthes, Haw.
Chloraster, Haw.
Ganymede, Haw.

Liriope, Herb.
Clinanthus, Herb.
? Chlidanthus, Herb.
? Urceolina, Rchb.
Urceolaria, Herb.
Leperiza, Herb.
Carpodetus, Herb.
Coburgia, Herb.
Stenomesson, Herb.
Chrysiphiala, Ker.
Tapeinanthus, Herb.
Pancratium, Herb.
Hymenocallis, Herb.
Ismene, Herb.
Callithauma, Herb.
Calostemma, R. Br.
Eurycles, Salisb.
Proiphys, Herb.
Eucrosia, Ker.

Griffinia, Ker.
Lycoris, Herb.
Clivia, Lindl.
Imatophyllum, Hook.
Hæmanthus, L.
Buphane, Herb.
Ammocharis, Herb.
Amaryllis, L.
Crinum, L.
Brunsvigia, Ker.
Nerine, Herb.
Strumaria, Jacq.
Imhofia, Herb.
Hessea, Herb.
Carpolyza, Salisb.
Hessea, Berg.

§ 4. Galantheæ, Herb.
Galanthus, L.
Acis, Salisb.
Leucoium, L.

Order CCXXXVII. HÆMODORACEÆ.

The Blood-root Tribe.

Hæmodoraceæ, *R. Brown Prodr.* 299. (1810); *Agardh. Aphor.* 170. (1823); *Ach. Rich. Nouv. Elém.* 436. (1828).

Essential Character.—*Calyx* and *corolla* confounded, more or less woolly, superior, or inferior. *Stamens* arising from the sepals and petals, either 3 and opposite the petals, or 6; *anthers* bursting inwardly. *Ovary* with the cells 1- 2- or many-seeded, superior or inferior, usually 3-celled, occasionally 1-celled; *style* simple; *stigma* undivided. *Fruit* capsular, valvular, seldom indehiscent, somewhat nucamentaceous. *Seeds* either definite and peltate, or indefinite.—*Leaves* equitant, never flat.

Affinities. The principal distinction between these and Amaryllidaceæ consists in their perianth not having the regular equitant position of sepals and petals which is found in the latter, in their constantly equitant leaves, and in their flowers, which have frequently a woolly surface, and a small limb compared with the tube. From Iridaceæ they are divided by the number of their stamens, and by their anthers turning inwards, or, if their stamens are reduced to three by those organs being opposite the petals, and by their simple stigma. In the first edition of this work I modified the character in conformity to the views of Von Martius, who includes Vellozia and Barbacenia. But further consideration has led me to confine the order to the plants which are indicated by Brown in his *Prodromus*. Mr. Herbert includes all the hexandrous genera in Amaryllidaceæ; but it seems to me that the characters above given are sufficiently well marked to establish this order as firmly as Amaryllidaceæ themselves. As to Wachendorfia, with its triandrous flowers, and superior ovary, Mr. Herbert looks upon it as the type of an order (Wachendorfiaceæ, Herb. MSS.) of rare occurrence, but quite unconnected with Hæmodorum and Conostylis. Supposing this to be so, still I think it will be better to group Hæmodoraceæ as Brown proposed.

Geography. Found in North America sparingly, and the Cape of Good Hope; 12 are described chiefly from the more temperate parts of New Holland.

Properties. De Candolle remarks, that the red colour found in the roots of Dilatris tinctoria in North America, where it is used for dying, prevails in Hæmodorum and Wachendorfia, and deserves to be studied in the rest of the order.

GENERA.

Hæmodorum, Sm.
Dilatris, L.
Lachnanthes, Ell.
Gyrotheca, Salisb.
Heritiera, Mchx.
Conostylis, R. Br.
Lanaria, Ait.
Argolasia, Juss.
Lophiola, Ker.
Anigozanthus, La B.
Schwægrichenia, Spr.
Wachendorfia, L.
Pedilonia, Presl.
Xiphidium, Lœfl.
Phlebocarya, R. Br.

Order CCXXXVIII. BURMANNIACEÆ.

Burmanniæ, *Spreng. Syst.* 1. 123. (1825); *Reichenb. Conspect.* 60. (1828) *a sect. of* Amaryllideæ.—Burmanniaceæ, *Blume Enum. Pl. Jav.* 27. (1827); *Bartl. Ord. Nat.* 41. (1830); *Schult. f. in Röm. et Sch. Syst. Veg.* 7. *LXXIII.* (1830).—Tripterelleæ, *Nuttall in Act. Philadelph.* 7. 23.

Essential Character.—*Flowers* hermaphrodite. *Perianthium* tubular, superior, coloured, membranous, with 6 teeth, the 3 inner of which (petals) are minute, the 3 outer larger, and with a wing or keel at the back. *Stamens* 3, inserted in the tube opposite

the petals; *anthers* sessile, 2-celled, opening transversely, with a fleshy connective; sometimes 3 sterile stamens, alternate with them. *Ovary* inferior, or 3-celled, many-seeded, with the dissepiments alternate with the wings of the perianth; *style* single: *stigma* 3-lobed, petaloid. *Capsule* covered by the withered perianth, or 3-celled, bursting irregularly. *Seeds* very numerous and minute, striated; [with an aril; attached to each side of the inflected dissepiments; *albumen* fleshy; *embryo* minute included. *Blume.*]—*Herbaceous* plants, with tufted radical acute *leaves*, or none; a slender naked stem; and terminal flowers, sessile upon a 2- or 3-branched rachis, or solitary.

Affinities. The single genus upon which this was founded, was placed by Jussieu in Bromeliaceæ; Brown stationed it as a doubtful genus at the end of Juncaceæ, with the remark, that it is extremely distinct both in flower, fruit, and inflorescence, and not really allied to any other known plant, but more nearly related to Xyris and Philydrum than to either Bromelia or Hypoxis. Von Martius, who has beautifully illustrated the Brazilian species, refers them to Hydrocharaceæ. Blume, who has added two new genera, merely remarks that "the order is known from Juncaceæ by its tubular perianth which is petaloid instead of glumaceous, and by the structure of the fruit; it is well distinguished from Iridaceæ by the station of the stamina, and the transverse dehiscence of the anthers." *Enum.* p. 27. Nuttall asserts that Tripterella is a genus distinct from Burmannia l. c. To me it seems that they are, upon the whole, nearest Hæmodoraceæ, with which they agree in their tubular perianthium, in having the stamens reduced to three and opposite the petals, a much enlarged connective, the ovary inferior, and some resemblance in foliage and habit. It is, however, certain that there is no known monocotyledonous order to which these really approach very closely.

Geography. Natives of the tropics of Asia, Africa, and America. Tripterella is found as far to the north as Virginia in North America.

Properties. Apteria setacea is slightly bitter and very astringent. Similar flavour, something like that of Green Tea, is discernible in Tripterella cærulea. *Nuttall.*

GENERA.

Burmannia, L.	Tripterella, Mx.
Maburnia, Pet. Th.	Gonyanthes, Bl.
Vogelia, Gmel.	Gymnosiphon, Bl.
	Apteria, Nutt.

Order CCXXXIX. TACCACEÆ.

Taccæ, *Presl. Reliq. Hænk.* 1. 149. (1830); *Bartl. Ord. Nat.* 82. (1830).—Taccaceæ, *Key, &c.* 70. (1835).

Essential Character.—*Perianth* superior; *limb* petaloid, equal, or unequal, persistent. *Stamens* 6, inserted into the base of the segments of the perianth, distinct; *filaments* dilated, petaloid, hooded at the apex; *anthers* inserted below the points of their filaments, in their concavity; 2-celled, the cells distinct. *Ovary* composed of 3 connate carpels, 1-celled, or half 3-celled, with 3 parietal polyspermous placentæ; *styles* 3, connate; *stigmas* connate at the base, radiating, 2-lobed. *Pericarp* berried, indehiscent, 1-celled, or half 3-celled, many-seeded. *Seeds* lunate or somewhat ovate, striated. *Albumen* fleshy. *Embryo* placed on the outside of the albumen in the region of the hilum.—Large perennial *herbs*, with a tuberous root. *Stem* very short, bearing scapes. *Leaves* all radical, stalked pedatifid, the segments pinnatifid and entire; rarely undivided, with curved parallel veins. *Stipules* 0. *Flowers* placed on the top of a simple taper or angular furrowed scape, in umbels, hermaphrodite, regular, surrounded by undivided bracts forming an involucre. *Bartling.*

Affinities. Personally I have had no opportunity of examining critically

the plants which compose this small order; the character, therefore, I borrow from Bartling who oddly enough considers the species Dicotyledonous. They are in some respects like Araceæ, in others like Zingiberaceæ (Tacca lævis); but certainly have nothing to do with Dicotyledons. Blume has the following remarks upon Tacca. *Enum.* 1. 82. "The genus Tacca offers the type of a new family between Araceæ and Aristolochiaceæ. To the former it approaches closest in habit, especially in the leaves, but it is very different from them in the structure of the parts of fructification. For in no species of true Araceæ is a corolline perianth, properly so called, to be found; what we have the custom of calling so in Dracontium and others, is nothing but scales, and not even a calycine integument; the perianth is moreover superior in Tacca. By this superior perianth the affinity with Aristolochiaceæ is evident; but from those too Tacca differs in the situation of the stamens, which are not as in that order adherent to the pistil with the anthers opening outwards, but are placed on the perianth itself with the anthers turned inwardly." In Tacca it is probable that there are several germinating points upon the embryo, analogous to the double or triple plumule of Dracontium; hence embryos of such a kind may be said to be tubers formed in the fruit itself. Brown long since stated (*Prodromus*, 1810) that a relation is established between Araceæ and Aristolochiaceæ by means of Tacca. See also *Agardh Aphorism*, 245.

Geography. Found in the hotter parts of India, the South Sea Islands, and the tropical parts of Africa.

Properties. The great fleshy tuberous roots are filled with a nutritive fæcula resembling arrow root, but its petioles are acrimonious. *Agardh.*

GENERA.

Tacca, Forst.
Ataccia, Presl.

Alliance III. *IXIALES.*

Essential Character.—*Stamens* 3, with the anthers turned outwards.

Order CCXL. IRIDACEÆ. The Cornflag Tribe.

Irides, *Juss. Gen.* 57. (1789).—Ensatæ, *Ker in Ann. of Botany*, 1. 219. (1805).—Irideæ, *R. Brown Prodr.* 302. (1810); *Ker. Gen. Irid.* (1827); *DC. and Duby*, 451. (1828); *Lindl. Synops.* 254. (1829); *Bartl. Ord. Nat.* 44. (1830).

Essential Character.—*Calyx* and *corolla* superior, confounded, their divisions either partially cohering, or entirely separate, sometimes irregular, the 3 petals being sometimes very short. *Stamens* 3, arising from the base of the sepals; *filaments* distinct or connate; *anthers* bursting externally lengthwise, fixed by their base, 2-celled. *Ovary* 3-celled, cells many-seeded; *style* 1; *stigmas* 3, often petaloid, sometimes 2-lipped. *Capsule* 3-celled, 3-valved, with a loculicidal dehiscence. *Seeds* attached to the inner angle of the cell, sometimes to a central column, becoming loose; *albumen* corneous, or densely fleshy; *embryo* enclosed within it.—*Herbaceous* plants, or very seldom *under-shrubs*, usually smooth; the hairs, if there are any, simple. *Roots* tuberous or fibrous. *Leaves* equitant, distichous, in most genera. *Inflorescence* terminal, in spikes, corymbs, or panicles, or crowded. *Bracts* spathaceous, the partial ones often scarious; the *sepals* occasionally rather herbaceous.

Affinities. This order differs from Amaryllidaceæ essentially, in being

triandrous, with the anthers turned outwards; from Orchidaceæ, to which it approaches very nearly in some respects, in not being gynandrous, and in all the anthers being distinct; from Zingiberaceæ and Marantaceæ the three perfect stamens divide it, independently of the structure of the leaves, which are extremely different. Hæmodoraceæ, which are often triandrous and have equitant leaves, have the anthers bursting inwardly, and when triandrous their stamens are opposite the petals. The Iris represents the general structure of the order; but a departure from the form of perianth found in that genus takes place in Crocus, the flower of which is extremely like that of Gethyllis and Oporanthus among Amaryllidaceæ on the one hand, and of Colchicum among Melanthaceæ on the other; the latter is known by its superior triple ovary. The dilated stigma found in Iris is characteristic of the whole order; in Crocus it is rolled up instead of being spread open. Brown observes, that Burmannia appears at first sight to agree with Iridaceæ, especially in its equitant leaves, coloured superior triandrous perianth, and 3 dilated stigmas; it cannot, however, be united with them, on account of its fertile stamens being opposite the inner segments of the perianth, and alternating with an equal number of sterile ones, because of the transverse dehiscence of the anthers, and also the structure of the seeds. In Xyris some resemblance with this order is discoverable, especially in the disposition of the leaves, the triandrous flowers, and anthers turned outwards; but that genus is very distinct in its inferior perianth, the outer segments of which are glumaceous, and the inner distinctly petaloid, in the ungues bearing the stamens at their apex, in their sterile alternate stamens, and especially in the structure of the seed. *Prodr.* 302.

Geography. Principally natives either of the Cape of Good Hope, or of the middle parts of North America and Europe. A few only are found within the tropics, and the order is generally far from abundant in South America, if compared with the numbers that exist at the Cape. The genera Marica and Moræa appear to occupy the same station in hot climates that Iris, a closely related genus, does in cooler latitudes.

Properties. More remarkable for their beautiful fugitive flowers than for their utility. The rhizoma of some of them is slightly stimulating, as the violet-scented Orris root, the produce of Iris Florentina. A few, such as Iris tuberosa are purgative; and Iris versicolor and verna are used as cathartics in the United States. The substance called Saffron is the dried stigmas of Crocus sativus, the colouring ingredient is a peculiar principle, to which the name Polychroite has been given. It possesses the remarkable properties of being totally destroyed by the action of the solar rays, of colouring in small quantity a large body of water, and of forming blue and green tints when treated with sulphuric and nitric acid, or with sulphate of iron. *DC.* According to Gray, the roasted seeds of Iris pseud-acorus very nearly approach Coffee in quality. *Suppl. Pharmac.* 237.

GENERA.

Diasia, DC.
Aglæa, Pers.
Melasphærula, Ker.
Diplarrhena, La Bill.
Gladiolus, L.
Montbretia, DC.
Watsonia, Ker.
Antholyza, L.
Ovieda, Spreng.
Lapeyrousia, Pourr.
Anomatheca, Ker.
Tritonia, Ker.
Waitzia, Rchb.
Sparaxis, Ker.
Synnetia, Swt.
Babiana, Ker.
Galaxia, Thunb.
Crocus, L.
Trichonema, Ker.
Romulea, Maratt.
Geissorrhiza, Ker.
Hesperantha, Ker.
Ixia, L.
Aristea, Ait.
Genlisia, Rchb.
Nivenia, Vent.
Pardanthus, Ker.
Belemcanda, Mnch.
Witsenia, L.
Sophronia, L.
Tapeinia, Juss.
Libertia, Spreng.
Renealmia, R. Br.
Nematostigma, Diet.
Patersonia, R. Br.
Cipura, Aubl.
Marica, Schreb.
Sisyrinchium, L.
Bermudiana, Gærtn.
Tigridia, Juss.
Cypella, Herb.
Ferraria, L.
Moræa, L.
Hermodactylus, Tourn.
Juno, Tratt.
Homeria, Vent.
Vieusseuxia, La Roche.
Iris, L.
Isis, Tratt.
Orthrosanthus, Swt.
Herbertia, Swt.
Streptanthera, Swt.
Spatalanthus, Swt.

Alliance IV. *BROMELIALES.*

Essential Character.—*Calyx* usually calycine, sometimes petaline. *Petals* petaline. *Stamens* 6 or more. *Albumen* mealy.

Order CCXLI. BROMELIACEÆ. The Pine-Apple Tribe.

Bromellieæ, *Juss. Gen.* 49. (1789); *Dict. Sc. Nat.* 5. 347. (1817).—Bromeliaceæ, *Lindl. in Bot. Reg.* fol. 1068. (1827); *DC. and Duby*, 472. (1828); *Bartl. Ord. Nat.* 46. (1830); *Schult. f. in Röm. and Sch. Syst. Veg. vol.* 7. (1830).

Essential Character.—*Calyx* 3-parted or tubular, persistent, more or less cohering with the ovary, usually herbaceous, sometimes coloured. *Petals* 3, coloured, withering or deciduous, equal or unequal. *Stamens* 6, or more, inserted into the tube of the calyx and corolla. *Ovary* 3-celled, many-seeded; *style* single; *stigma* 3-lobed, or entire, often twisted. *Fruit* capsular or succulent, 3-celled, many-seeded. *Seeds* numerous; *embryo* taper, recurved, or minute, lying in the base of mealy albumen.—*Stemless* or *short-stemmed* plants, their stems sometimes composed of fibrous roots consolidated round a slender centre, with rigid channelled *leaves* often covered with cuticular scales, and spiny at the edge or point. *Fruit* sometimes eatable.

Affinities. Stratiotes among Hydrocharaceæ has so much the foliage of this order as to render it probable, taking the fructification also into account, that the nearest affinity of the Pine Apple tribe is with the former. It is, however, essentially distinguished by its seeds having mealy albumen. This circumstance also cuts it off from Amaryllidaceæ, to which it approaches in the case of Hypoxis. The habit of Bromeliaceæ is peculiar; the order consists of hard dry-leaved plants, often with a scurfy surface; the species are often capable of sustaining long drought without inconvenience, and in the case of the Barbacenias and Vellozias, have a most remarkable organization of the stem. This part consists of a central slender subcylindrical column, which never increases in diameter after its first formation, and which has the ordinary monocotyledonous structure. Outside of the column are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface, and form a spurious kind of wood, which is extremely like that of some kinds of Palm wood, only it is developed by constant additions to the very outside of the original stem. Something analogous occurs in Pandanus.

Geography. All, without exception, natives of the continent or islands of America, whence they have migrated eastwards in such numbers as to have established themselves as part of the present Flora of the west coast of Africa, and some parts of the East Indies.

Properties. The most remarkable is the Pine Apple, or Ananas, which is well known for the sweetness and fine aromatic flavour of its fruit. No other species is of the same interest. They are all capable of existing in a dry hot air without contact with the earth; on which account they are favourites in South American gardens, where they are suspended in the dwellings, or hung to the balustrades of the balconies; situations in which they flower abundantly, filling the air with their fragrance. Ropes are made in Brazil from a species of Bromelia, called Grawatha. *Pr. Max. Trav.*

GENERA.

Ananassa, Lindl.
Bromelia, L.
Aechmea, R. et P.
Billbergia, Thunb.
Pitcairnia, L'Herit.
Hepetis, Swz.
Spirastigma, L'Her.
Xerophyta, Juss.
Vellozia, Vandelli.
Campderia, Kth.
Raddia, Rich.
Barbacenia, Vandelli.
Tillandsia, L.
Strepsia, Nutt.
Caraguata, Pl.
Devillea, Bert.
Bonapartea, R. et P.
Acanthospora, Spr.
Misandra, Dietr.
Pourretia, R. et P.
Guzmannia, R. et P.
Cottendorfia, Schult. f.
Dyckia, Schult. f.
Navia, Schult. f.
Encholirium, Schult. f.
Puya, Molin.
Brocchinia, Schult. f.
Hohenbergia, Schult. f.
? Weldenia, Sch.

Alliance V. *HYDRALES.*

Essential Character.—*Calyx* calycine. *Petals* petaline. *Stamens* more numerous than 6. *Albumen* always absent.

Order CCXLII. HYDROCHARACEÆ. The Frog-Bit Tribe.

Hydrocharides, *Juss. Gen.* 67. (1789).—Hydrocharideæ, *DC. Fl. Fr.* 3. 265. (1815); *R. Brown Prodr.* 344. (1810); *Richard in Mem. Mus.* vol. 1. 365. (1815); *Agardh Aph.* 127. (1822); *Lindley's Synopsis.* 254. (1829).—Vallisneriaceæ *and* Stratioteæ, *Link Handb.* 1. 281. (1829).

Essential Character.—*Flowers* hermaphrodite or unisexual. *Sepals* 3, herbaceous. *Petals* 3, petaloid. *Stamens* definite or indefinite. *Ovary* single, inferior, 1- or many-celled; *stigmas* 3-6; *ovules* indefinite, often parietal. *Fruit* dry or succulent, indehiscent, with 1 or more cells. *Seeds* without albumen; *embryo* undivided, antitropous.—*Floating* or water-plants. *Leaves* with parallel veins, sometimes spiny. *Flowers* spathaceous.

Affinities. These water-plants are readily distinguished from all other monocotyledons by their tripetaloideous flowers, with an inferior ovary; by this they are separated from Alismaceæ, with which they agree in habit and want of albumen, but from which they also differ, as Pomeæ and Ranunculaceæ, in the carpels being definite, not indefinite. Commelinaceæ are at once recognised by their superior trilocular ovary. Agardh refers here Trapa (see p. 37); Linnæus placed Hydrocharaceæ along with Palms! in his natural arrangement.

Link defines his Hydrocharideæ, Stratioteæ, and Vallisneriaceæ, thus:—

Hydrocharideæ. Aquatic herbs. Leaves with parallel veins connected with lateral ones; sheath separate. Calyx divided to the base. Corolla polypetalous. Pericarpium. Albumen none, unless the thickened part of the embryo. *Hydrocharis.*

Stratioteæ. Aquatic herbs. Leaves sheathing with parallel veins. Flowers spathaceous. Calyx tubular. Corolla polypetalous, inserted on the calyx. A berry. *Stratiotes.*

Vallisneriaceæ. Aquatic herbs. Dicœcious, diclinous. *Males;* Flowers in a spadix, from which they finally separate. Corolla monopetalous. *Females;* Spathe 1-flowered. Peduncles spiral. Calyx 1-leafed. Corolla polypetalous. Capsules 1-celled, many-seeded. Seeds parietal. *Vallisneria.*

Geography. Natives of Europe, North America, and the East Indies. One species is found in Egypt (Damasonium indicum), and two Vallisnerias in New Holland.

Properties. Nothing known, unless that the fruit of Euhalus is eatable, and its fibres capable of being woven, according to Agardh (*Aph.* 128). The *Janji* of Hindostan, called Vallisneria alternifolia by Roxburgh, Hydrilla by Hamilton, is one of the plants used in India for supplying water mechanically to sugar in the process of refining it. *Brewster*, 1. 34.

GENERA.

Hydrocharis, L.	Stratiotes, L.	Anacharis, Rich.	Boottia, Wall.
Limnobium, Rich.	Euhalus, Rich.	Elodea, Rich.	Saivala, Wall. cat.
Damasonium, Schreb.	Blyxa, Pet. Thou.	Udora, Nutt.	
Ottelia, Pers.	Valisneria, L.	*Serpicula*, Roxb	
	Physcium, Lour.	*Hydrilla*, Rich.	

Group II. Gynandrosæ.

Essential Character. — *Stamens* and *style* consolidated into a central column. *Flowers* complete, formed upon a ternary plan. *Ovary* always inferior, usually 1-celled, with scobiform seeds.

The greatest exception to the character of this group,—indeed the only one worth naming,—occurs in Apostasiaceæ, which have not only a trilocular ovary, but separate stamens. Here then we find, in a very large assemblage of otherwise unvarying plants, a direct case of transition to Hæmodoraceæ or Amaryllidaceæ. This instance is a useful hint to those who believe that any order exists in which the limits are absolutely defined. I have no doubt that time will discover Compositæ, Cinchonaceæ, Stellatæ, and Umbelliferæ with superior fruit, and that other orders will have their characters equally broken down.

Regular flowered Orchidaceæ, such as Thelymitra, approach Liliaceæ, and the ordinary structure of the order approaches very much to that of Gladiolus among Iridaceæ.

Order CCXLIII. ORCHIDACEÆ. The Orchis Tribe.

Orchides, *Juss. Gen.* 64. (1789).—Orchideæ, *R. Brown Prodr.* 309. (1810); *Rich. in Mém. Mus.* 4. 23. (1818); *Lindl. Synops.* 256. (1829); *Id. Genera and Species of Orch.* (1830); *R. Brown Observations on the Sexual Organs, &c. of Orchideæ and Asclepiadeæ* (1831).

Essential Character.—*Perianth* superior, ringent. *Sepals* 3, usually coloured, of which the odd one is uppermost in consequence of a twisting of the ovary. *Petals* 3, 2 sometimes absent, usually coloured, of which 2 are uppermost in consequence of the twisting of the ovary, and 1, called the *lip*, undermost; this latter is frequently lobed, of a different form from the others, and very often spurred at the base. *Stamens* 3, united in a central column, the 2 lateral abortive, the central perfect, or the central abortive, and the 2 lateral perfect; *anther* either persistent or deciduous, 2- or 4- or 8-celled; *pollen* either powdery, or cohering in definite or indefinite waxy masses, either constantly adhering to a gland or becoming loose in their cells. *Ovary* 1-celled, with 3 parietal placentæ; *style* forming part of the column of the stamens; *stigma* a viscid space in front of the column, communicating directly with the ovary by a distinct open canal. *Impregnation* taking effect by absorption from the pollen masses through the gland into the stigmatic canal. *Capsule* inferior, bursting with 3 valves and 3 ribs. *Seeds* parietal, very numerous; *testa* loose, reticulated, contracted at each end; *albumen* none; *embryo* a solid, undivided, fleshy mass.—*Herbaceous* plants, either destitute of a stem, or forming a kind of above-ground tuber (pseudo-bulb) by the cohesion of the bases of the leaves, or truly caulescent. *Roots* in the herbaceous species fleshy, divided or undivided, or fasciculate; in the caulescent species tortuous, and green and proceeding from the stem. *Leaves* simple, quite entire, often articulated with the stem. *Pubescence* rare; when present, sometimes glandular. *Flowers* in terminal or radical spikes, racemes, or panicles; sometimes solitary.

Affinities. It is not necessary to enter, in this place, into an historical inquiry as to the gradual alteration that has taken place in the views of botanists with regard to the structure of the sexual apparatus of these most curious plants, or to explain what degree of error existed in the description of those who mistook masses of pollen for anthers, or a column of stamens for a style; such errors could only have occurred at a period when the laws of organisation were totally unknown. They have been corrected, in a more or less perfect manner, by various writers; most completely by Brown in his *Prodromus*, published in 1810, and subsequently by the late most accurate and indefatigable Richard. But long before the publication of any rational explanation of the structure of the Orchis tribe, while botanists were in utter darkness upon the subject, it had been most fully investigated by a gentleman un-

rivalled for the perfection of his microscopical analyses, the beauty of his drawings, and the admirable skill with which he follows Nature in her most secret workings; and let me add, which is a still rarer quality, the generous disinterestedness with which he communicates to his friends the result of his patient and silent labours. I have sketches before me by Mr. Bauer, executed from 1794 to 1807, in which the most material part of what has been published since that period is shewn in the most distinct and satisfactory manner. I am happy to have been the humble means of giving some of these extraordinary productions of the pencil to the world, in the *Illustrations of the Genera and Species of Orchideous Plants*, of which 3 parts in 4to. with 30 plates have appeared.*

If the sexual apparatus of an Orchideous plant is examined, it will be found to consist of a fleshy body stationed opposite the lip, bearing a solitary anther at its apex, and having in front a viscid cavity, upon the upper edge of which there is often a slight callosity. This cavity is the stigma, and the callosity is the point through which the fertilising matter of the pollen passes into the tissue communicating with the ovules. Hence such a plant would appear to be monandrous; it will be seen, however, in Scitamineæ and Marantaceæ, the only other monandrous orders of Monocotyledons, that, while only one perfect stamen is developed, two others exist in a rudimentary state; so that the ternary number prevalent in Monocotyledons is not departed from. So it is in Orchidaceæ: the column does not consist of a single filament cohering with a style, but of three filaments firmly grown together, the central of which is antheriferous, and the lateral sterile. This is proved by the frequent presence of callosities, or processes in the place of the sterile stamens; by imperfectly-formed anthers occasionally appearing at the side of the perfect one; and, if any further evidence were wanted, by monsters, in which a regular structure is exchanged for the ordinary irregular one. Such an instance in Orchis latifolia is described by Achille Richard, in the *Mémoires de la Soc. d'Hist. Nat. of Paris*, in which the flowers were perfectly triandrous, with no trace of irregularity in any part of the floral envelopes.

The opinion above mentioned concerning the manner in which fertilization is accomplished has been objected to by Brown and Brongniart, who believe that in these as in other plants this effect is produced by the emission of pollen tubes, produced by pollen fallen upon the stigma. See my *Introduction to Botany, 2d edition*, p. 284, for this theory and for my objections to it.

Orchidaceæ are remarkable for the bizarre figure of their multiform flower, which sometimes represents an insect, sometimes a helmet with the visor up, and sometimes a grinning monkey: so various are these forms, so numerous their colours, and so complicated their combinations, that there is scarcely a common reptile or insect to which some of them have not been likened.

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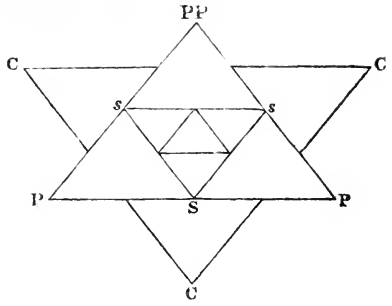
* It was a subject of sorrow to me to find, shortly after the appearance of the first edition of the present work, that some observations, substantially the same as these, had given rise to the pretence, on the part of a northern critic, that what was intended as a mere act of justice to the little known labours of Mr. Bauer, was in fact to be understood as a hint, that Dr. Brown had been indebted to Mr. Bauer for information of which he had profited without acknowledgement. I know nothing of the person, or the motives of the writer from whom this calumny did emanate; but this I know, that no person of common sense, or common feeling, would have thought of casting such an imputation upon the man to whom Botany owes more in this country than to any individual since the time of Ray. Nevertheless there were certain well-meaning persons who thought I ought to have noticed these aspersions, and who have quarrelled with me (God save the mark!) because I was of another opinion. *Pace tantorum virorum* I think myself a better judge than they of what concerns mine own honour, and I am not likely to take them into my counsels as to what it is, or is not, befitting me to do.

Their flowers, however, will all be found to consist of three outer pieces belonging to the calyx, and three inner belonging to the corolla; and all departure from this number, six, depends upon the cohesion of contiguous parts: with the solitary exception of Monomeria, in which the lateral petals are entirely abortive. Sometimes two of the sepals cohere into one, as in certain species of Oncidium, and then the calyx has the appearance of consisting of but two sepals; sometimes the lateral petals are connate with the column, as in Gongora and Lepanthes, and then the column appears furnished with two wings. In nearly the whole order the odd petal, called the lip, arises from the base of the column, and is opposite it; but in the Cape genus Pterygodium, the lip sometimes grows from the apex of the column, and sometimes is stalked and turned completely over between the fork of the inverted anther, and thus seems to belong to the back of the column. Nor is the anther less subject to modification, although constant to its place: sometimes it stands erect, the line of dehiscence of its lobes being turned towards the lip; sometimes it is turned upside down, so that its back regards the lip; often it is prone upon the apex of the column, where a niche is excavated for its reception. The pollen is not less curious: now we have it in separate grains, as in other plants, but cohering to a meshwork of cellular tissue, which is collected into a sort of central elastic strap; now the granules cohere in small angular indefinite masses, and the central elastic strap becomes more apparent, becomes attached to a glandular process of the stigma which is often enclosed in a peculiar pouch especially destined for its protection; again, the pollen combines into larger masses, which are definite in number, and attached to another modification of the elastic strap; and finally a complete union of the pollen takes place, in solid waxy masses, without any distinct trace of this central elastic tissue. Such is a part of the singularities of Orchideous plants, and upon these the distinctions of their tribes and genera are naturally founded. Whoever studies them must bear in mind that their fructification is always reducible to 3 sepals, 3 petals, a column consisting of 3 stamens grown firmly to one another, and to a single style and stigma; and, with this view, he will have no difficulty in understanding the organisation of even the most anomalous Cape species. For many curious, and, for systematic purposes most important, remarks upon this order, see Brown's observations as above quoted.

If the following diagram be compared with those employed to illustrate the distinctions of Marantaceæ and Zingiberaceæ, p. 326, the relation borne to those orders by Orchidaceæ will be distinctly seen. In the diagram the parts are arranged as they are in nature before the ovary twists; that is, with the lip next the axis, or uppermost, and the stamen undermost. Let C, C, C represent the outer series of floral envelopes or calyx, and PP, P, P the inner, or corolla, of which PP is the labellum: then the position of the single fertile stamen will be at S, and the sterile ones at *s*, *s*; that is to say, in the situation of the supernumerary petaloid stamens of Zingiberaceæ and Marantaceæ, while the second series of stamens, to which the fertile stamen of these orders belongs, is not developed in Orchidaceæ.



Geography. Found in almost all parts of the world, except upon the verge of the frozen zone, and in climates remarkable for dryness. In Europe, Asia, and North America, they are seen growing every where, in groves, in marshes, and in meadows; in the drier parts of Africa they are either rare or unknown; at the Cape of Good Hope they abound in similar situations as in Europe; but in the hot damp parts of the West and East Indies, in Madagascar, and the neighbouring islands, in the damp and humid forests of Brazil, in the warm mild parts of Central America, and Western Mexico, in the damp tropical parts of India, and on the lower mountains of Nipal, these Orchideous plants flourish in the greatest variety and profusion, no longer seeking their nutriment from the soil, but clinging to the trunks and limbs of trees, to stones and bare rocks, where they vegetate among ferns and other shade-loving plants, in countless thousands. Of the epiphytic class, one only is found so far north as South Carolina, growing upon the branches of the Magnolia, if we except the species from Japan, which, as I have elsewhere stated, appears to have a climate peculiar to itself, among countries in the same parallel of latitude. The most southern stations are those of Earina mucronata in New Zealand, in lat. 35° S., and of Gunnia australis in Emu Bay, Van Diemen's Land, lat. 41° S. See *Botan. Register*, 1699. The number of species of this tribe is unknown, but probably is not less than 1500.

Properties. It often happens that those productions of nature which charm the eye with their beauty, and delight the senses with their perfume, have the least relation to the wants of mankind, while the most powerful virtues or most deadly poisons are hidden beneath a mean and insignificant exterior: thus Orchidaceæ, beyond their beauty, can scarcely be said to be of known utility, with a few exceptions. The nutritive substance called Salep has been said to be prepared from the subterraneous succulent roots of Orchis mascula and others; but it is now known from the enquiries of Royle, to be the produce of the tubers of a species of Eulophia; it consists almost entirely of a chemical principle called Bassorin. *Turner*, 699. The root of Bletia verecunda is said to be stomachic. *Lunan*. Some of the South American species, such as the Catasetums, Cyrtopodiums, &c., contain a viscid juice, which, being inspissated by boiling, becomes a kind of vegetable glue used for economical purposes in Brazil.

GENERA.

§ 1. Malaxideæ, Lindl.
¶ 1. Pleurothalleæ, Lindl.
Pleurothallis, R. Br.
Cadetia, Gaudich.
Specklinia, Lindl.
Physosiphon, Lindl.
Octomeria, R. Br.
Bryobium, (51)
Lepanthes, Swartz.
Stelis, Swartz.
Osyricera, Blume.
Chrysoglossum, Blum.
Gastroglottis, Blume.
Restrepia, Kunth.
Oberonia, Lindl.
Titania, Endl.
Empusa, Lindl.
Empusaria, Rchb.
Platystylis, Blume.
Microstylis, Nutt.
Pterochilus, Hooker.
Crepidium, Blume.
Dienia, Lindl.
Pedilea, Lindl.
Malaxis, Swartz.
Nephelaphyllum, Blume.
Corallorhiza, Sw.
Aphyllorchis, Bl.
Aplectrum, Nutt.
Acianthus, R. Br.
Cyrtosia, Blume.
Liparis, Rich.
Sturmia, Rchb.
Cestichis, Thouars.
Dendrochilum, Blume.
Otochilus, Lindl.

Cœlia, Lindl.
Pholidota, Lindl.
Ptilocnema, Don.
Crinonia, Blume.
Dilochia, Lindl.
Earina, Lindl.
Cœlogyne, Lindl.
Pleione, Don.
Chelonanthera, Blume.
Hexisea, Lindl.
¶ 2. Dendrobieæ, Lind.
Cochlia, Blume.
Lyræa, Lindl.
Megaclinium, Lindl.
Bolbophyllum, Thouars.
Diphyes, Blume.
Tribrachia, Lindl.
Anisopetalum, Hooker.
Cirrhopetalum, Lindl.
Ephippium, Bl.
Zygoglossum, Rnw.
Trias, Lindl.
Macrostomium, Blum.
Epicranthes, Blume.
Monomeria, Lindl.
Stenoglossum, Kunth.
Diglyphosa, Blume.
Mycaranthes, Blume.
Phreatia, Lindl.
Bryobium, (62)
Eria, Lindl.
Dendrolirium, Blum.
* Pinalia, Lindl.
Aporum, Blume.
Schismoceras, Presl.
Oxystophyllum, Blum.
Polystachya, Hooker.
Metachilum, Lindl.
Dendrobium, Swartz.
Onychium, Blume.
Pedilonum, Blume.
Sarcostoma, Blume.
Desmotrichum, Blume.
Grastidium, Blume.
Ceraia, Lour.
§ 2. Epidendreæ, Lindl.
Collabium, Blume.
Epidendrum, Linn.
Auliza, Salisb.
Amphiglottis, Salisb.
Dinema, Lindl.
Diothonea, Lindl.
Encyclia, Hook.
Isochilus, R. Br.
Arpophyllum, La Llav.
Ponera, Lindl.
Brassavola, R. Br.
Lælia, Lindl.
Cattleya, Lindl.
Maelenia, Dumort.
Broughtonia, R. Br.
Leptola, Lindl.
Tetramicra, Lindl.
Spathoglottis, Blume.
Bletia, R. et P.
Thiebaudia, Colla.
Gyas, Salisb.
? *Pachystoma*, Bl.
Ipsea, Lindl.
Arundina, Blume.
Phajus, Loureir.
Pachyne, Salisb.
Cytheris, Lindl.
Callostylis, Blume.
Ania, Lindl.
Ceratium, Blume.
Apaturia, Lindl.
Trichotosia, Blume.
Tainia, Blume.
Plocoglottis, Blume.
Sophronitis, Lindl.
§ 3. Vandeæ, Lindl.
Nanodes, Lindl.
Aspasia, Lindl.
Ornithidium, Salisb.
Acriopsis, Blume.
Trizeuxis, Lindl.
Ornithocephalus, Hook.
Cirrhæa, Lindl.
Sarcochilus, R. Br.
Maxillaria, R. et P.
Xylobium, Lindl.
Colax, Lindl.
Bifrenaria, Lindl.
Batemannia, Lindl.
Cladobium, (63)
Dicrypta, Lindl.
Heterotaxis, Lindl.
Govenia, Lindl.
Alamania, La Llave.
Psittacoglossum, La Llave.
Cycnoches, Lindl.
Myanthus, Lindl.
Mormodes, (64)
Catasetum, Richard.
Monachanthus, Lindl.
Stanhopea, Hook.
Ceratochilus, Lindl.
Gongora, R. et P.
Coryanthes, Hook.
Anguloa, R. et P.
Peristeria, Hook.
Eucnemis, Lindl.
Grobya, Lindl.
Cymbidium, Swartz.
Mesoclastes, Lindl. (65)
Camaridium, Lindl.
* Bolbidium, Lindl.
* Angidium, Lindl.
Acropera, Lindl.
Cremastra, Lindl.
Grammatophyllum, Blume.
Gabertia, Gaudich.
Trichoceros, Humb. et Kunth.
Geodorum, Jackson.
Cistella, Blume.
Otandra, Salisb.
Sobralia, R. et P.
Acanthophippium, Blume.
Doritis, Lindl.
Chelonanthera, Blum.
Acanthoglossum, Blume.
Sunipia, Buchanan.
Calypso, Salisb.
Norna, Wahl.
Cytherea, Salisb.
Orchidium, Swartz.
Eulophia, R. Br.
Dipodium, R. Br.
Galeandra, Lindl.
Zygopetalum, Hook.
Cyrtopodium, R. Br.
Cyrtopera, Lindl.
Lissochilus, R. Br.
Notylia, Lindl.
Masdevallia, R. et P.
Cryptochilus, Wall.
Ionopsis, Humb. et Kunth.
Iantha, Hook.
Trichopilia, (66)
Rodriguezia, R. et P.
Gomeza, R. Br.
Macradenia, R. Br.
Cryptarrhena, R. Br.
Cuitlauzina, La Llave.
Oncidium, Swartz.
Fernandezia, R. et P.
Lockhartia, Hook.
Pachyphyllum, Humb. et Kunth.
Dichæa, Lindl.
Phymatidium, Lindl.
Cyrtochilum, Humb. et Kunth.
Odontoglossum, Humb. et Kunth.
Brassia, R. Br.
Tetrapeltis, Wall.
Phalænopsis, Blume.
Trichoglottis, Blume.
Telipogon, Humb. et Kunth.
Vanda, R. Br.
Luisia, Gaudich.
Fieldia, Gaudich.
Renanthera, Lour.
Arachnis, Bl.
Diplocentrum, Lindl.
Microsaccus, Blume.
Camarotis, Lindl.
Chiloschista, Lindl.
Gunnia, Lindl.
Micropera, Lindl.
Saccolabium, Blume.
Gastrochilus, Don.
Robiquetia, Gaud.
Gussonea, Ach. Rich.
Rhyncostylis, Blume.
* Ceratidium, Lindl.
Tæniophyllum, Blume.
Cleisostoma, Blume.
Appendicula, Blume.
Cryptoglottis, Blume.
Ceratostylis, Blume.
Ephippium, Blume.
Ceratochilus, Blume.
Omæa, Blume.
Echioglossum, Blume.
Sarcanthus, Lindl.
Podochilus, Blume.
Platysma, Blume.
Apista, Blume.
Adenoncos, Blume.
Œceoclades, Lindl.
Aerides, Loureir.
Dendrocolla, Blume.
Schœnorchis, Blume.
Aeranthus, Lindl.
Cryptopus, Lindl.
Beclardia, A. Rich.
Œonia, Lindl.
Microcælia, Lindl.
Angræcum, Pet. Th.
Aerobium, Spreng.
Agrostophyllum, Blume.
Calanthe, R. Br.
Centrosia, Thouars.
Amblyglottis, Blume.
Tipularia, Nutt.
Limatodes, Blume.
Oxyanthera, Brongn.
Glomera, Blume.
Thelasis, Blume.
§ 4. Ophrydeæ, Lindl.
Orchis, L.
Anacamptis, Rich.
Gymnadenia, R. Br.
Perularia, Lindl.
Nigritella, Rich.
Aceras, R. Br.
Loroglossum, Rich.
Himantoglossum, Spr.
Holothrix, Rich.
Glossaspis, Lindl.
Platanthera, Rich.
Mecosa, Bl.
Hemipilia, Lindl.
Peristylus, Bl.
Benthamia, A. Rich.
Saccidium, Lindl.
Pachites, Lindl.
Cœloglossum, Lindl.
Monotris, Lindl.
Scopularia, Lindl.
Aopla, Lindl.
Herminium, R. Br.
Chamorchis, Rich.
Habenaria, W.
Ate, Lindl.
Bonatea, Willd.

Diplomeris, Don.
Diplochilus, Lindl.
Paragnathis, Spr.
Cynorchis, Thouars.
Tryphia, Lindl.
Arnottia, A. Rich.
? Amphorchis, Thou.
Bartholina, R. Br.
Bicornella, Lindl.
Satyrium, Swz.
Diplecthrum, Rich.
Repandra, Lindl.
Disa, L.
Monadenia, Lindl. (67)
Penthea, Lindl. (68)
Serapias, L.
Helleborine, Pers.
Pterygodium, Swz.
Corycium, Swz.
Ophrys, L.
Disperis, Swz.
Dryopeia, Thouars.
*§ 5. Gastrodieæ, Lindl.
Gastrodia, R. Br.
Epiphanes, Bl.
Epipogium, R. Br.
? Hysteria, Rnwdt.
§ 6. Arethuseæ, Lindl.
Caleana, R. Br.
Calcearia, Bl.
Corysanthes, R. Br.
Corybas, Salisb.
Pterostylis, R. Br.
Crybe, (69)
Arethusa, Swz.
Odonectis, Raf.
Pogonia, Juss.
Nervilia, Gaud.
Triphora, Nutt.
Cleistes, Rich.
Calopogon, R. Br.
Cathea, Salisb.
Glossodia, R. Br.
Thelychiton, Endl.
* *
Anthogonium, Wall.
Limodorum, Haller.
Chlorœa, Lindl.
Gavilea, Pöpp.
Asarca, Lindl.
Bipinnula, Juss.
? Chlorosa, Bl.
Lyperanthus, R. Br.
Epipactis, Hall.
Serapias, Pers.
Cephalanthera, Rich.
* *
Caladenia, R. Br.
* Leptoceras, R. Br.
Eriochilus, R. Br.
Chiloglottis, R. Br.
Cyrtostylis, R. Br.
Microtis, R. Br.
§ 7. Neottieæ, Lind.
Spiranthes, Rich.
Gyrostachys, Pers.
Ibidium, Salisb.
Cyclopogon, Presl.
Sarcoglottis, Presl.
Stenorhynchus, Rich.
Aristotelia, Lour.
Adenostylis, Bl.
Ulantha, Hooker.
Plexaure, Endl.
Neottia, Rich.
Listera, R. Br.
Epipactis, Pers.
Pelexia, Poit.
Sauroglossum, Lindl.
Stenoptera, Presl.
Eucosia, Bl.
Georchis, Lindl.
Etæria, Bl.
Goodyera, R. Br.
Tussaca, Raf.
Peramium, Salisb.
Hæmaria, Lindl.
Gonogona, Link.
Hylophila, Lindl.
Physurus, Rich.
Microchilus, Presl.
Erythrodes, Bl.
Galera, Bl.
Herpysma, Lindl.
Anecochilus, Bl.
Chrysobaphus, Wall.
Myoda, Lindl.
Cheirostylus, Bl.
* *
Ponthieva, R. Br.
Tripleura, Lindl.
Cranichis, Swz.
? Galeola, Lour.
Prescottia, Lindl.
Altensteinia, Kth.
Decaisnia, Ad. Brong.
Zeuxina, Lindl.
* *
? Cordyla, Bl.
Cryptostylis, R. Br.
Zosterostylis, Bl.
Calochilus, R. Br.
Prasophyllum, R. Br.
Genoplesium, R. Br.
Orthoceras, R. Br.
Diuris, R. Br.
Epiblema, R. Br.
Thelymitra, Forst.
* *
Synassa, Lindl.
Tropidia, Lindl.
Cnemidia, Lindl.
Decaisnia, Lindl. ol.
§ 8. Cypripedieæ, Lindl.
Cypripedium, Linn.

Order CCXLIV. VANILLACEÆ.

Vanillaceæ, *Key to Structural Physiological and Systematic Botany*, *p.* 73. (1835).

Essential Character.—*Perianth* articulated with the ovary, sometimes with an external calycine cup. *Sepals* 3. *Petals* 3, of which 1 is unlike the others and forms a lip. *Stamen* 1, consolidated with the style into a column; *anther* terminal, opercular; *pollen* granular. *Ovary* 1-celled, with 3 parietal placentæ. *Fruit* succulent, indehiscent, 1-celled. *Seeds* either with a smooth testa tightly adhering to them, or with a thin membranous wing surrounding a firm nucleus.—*Herbaceous* plants, with broad *leaves* sessile and often strongly veined; *stem* mostly climbing, in Epistephium erect (?). *Flowers* large and succulent.

Affinities. I separate Vanilla and Epistephium from Orchidaceæ because of their succulent valveless fruit, of their seeds not having the loose testa which exists in all true Orchidaceæ, and of their peculiar habit; to which may be added their aromatic properties. The winged seeds of Vanilla ? pterosperma form no exception to the character of the order, for their nucleus is as tightly coated by the testa as in common Vanilla.

Geography. Found on trees or in the fissures of rocks in the hottest parts of equinoctial America, in shaded places, where the air is loaded with vapour arising from aqueous exhalations or condensation of clouds. *Humboldt*. Also in similar situations in India. One species is found in Japan.

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* The genera in this and the following §§ are to be considered arranged only provisionally. I have not yet made up my mind as to the order in which they had best follow each other.

Properties. Vanilla is one of the most delightful aromatics known; it is used in the manufacture of Chocolate, of Liqueurs, and of various articles of confectionary. The substance called by this name in the shops is the dried fruit of Vanilla aromatica, and probably other species; it contains a great quantity of essential oil, and a good deal of benzoic acid. *Fée.* See also *Linnæa.* 4. 573, for some account of the cultivation of the plant in Mexico.

GENERA.

Vanilla, Plum.
Myrobroma, Salisb.
Epistephium, Kth.

Order CCXLV. APOSTASIACEÆ.

Apostasieæ, *Lindl. Nixus Plantarum*, p. 22. (1833); *Blume in Ann. Sc. Nat. Ser.* 2. 2. 91. (1834).

Essential Character.—*Calyx* and *Corolla* each consisting of 3 similar pieces. *Anthers* 2 or 3, sessile upon a short column, erect, 2-celled, opening longitudinally; *pollen* cohering in 3s or 4s according to Mr. Bauer *(Illust.* fruct. *t.* 15),—in single oval grains with a longitudinal furrow according to Mr. Griffith *(Letter dated Merqui Dec.* 28. 1834) and Blume. *Ovary* 3-celled, with 3 polyspermous placentæ in the axis; *ovules* with their integuments very distinct and much shorter than the protruded nucleus *(Griffith)*; *style* filiform with a slightly 3-lobed stigma as long as the anthers, and adhering with their filaments into a short column. [*Capsule* 3-celled, 3-valved; the valves bearing the dissepiment in the middle, but cohering at the apex and base. *Seeds* very numerous, minute, ovate and with a skin fitting the nucleus, or scobiform with a membranous testa loose at each end. *Blume.*]—Perennial *herbaceous* plants. *Stem* simple or branched. *Leaves* firm, thin, sheathing at the base. *Flowers* in simple or compound terminal *racemes.*

Affinities. Very closely allied to Orchidaceæ, from which they differ essentially in having a 3-celled fruit, with loculicidal dehiscence, and in the style being altogether free from the stamina for the principal part of its length. There are many admirable observations upon Apostasia itself in *Brown's Observations on the organs and mode of fecundation in Orchideæ and Asclepiadeæ*, and some further information is given by Blume in the place above quoted. The order seems as if connecting Orchidaceæ and Hypoxideæ. If Rhyncanthera is correctly represented by Blume, its 3-locular ovary will refer it here, while the structure of its column would keep it in Orchidaceæ. The essential character of this order is, however, framed without reference to it.

Geography. Found in damp woods in the hotter parts of India.

Properties. Unknown.

GENERA.

Apostasia, Bl.
Neuwiedia, Bl.
? Rhyncanthera, Bl.

Group III. Hypogynosæ.

Essential Character.—*Flowers* coloured, in all cases formed upon a ternary plan. *Ovary* superior.

This group can only be confounded with the superior-fruited genera of Hæmodoraceæ, the mode of recognising which has already been pointed out, or with certain Spadicosæ. The latter, are, however, generally known by having little more than scales in the room of petals and sepals, if they have any floral envelopes at all. As to Retosæ, with whose characters, so far as fructification is concerned, these very nearly agree, their peculiar foliation and habit offer a sufficient means of distinction.

Alliance I. *PALMALES.*

Essential Character.—Arborescent plants, with sub-cylindrical stems growing by the constant developement of a central terminal bud; very rarely dichotomous. *Embryo* in no certain position with regard to the hilum (vague).

This, which is the most highly developed part of the Endogenous division of vegetation, although it consists for the most part of trees having little apparent relation to other alliances, nevertheless, may be considered connected very nearly with Liliales through both the simple-stemmed and branching Dracænas, with Pandales among Spadicosæ by their arborescent habit and terminal spathaceous inflorescence, and even with Grasses by Calamus or the Cane Palm, which cannot be considered far removed from the Beesha Bamboo.

Order CCXLVI. PALMACEÆ. The Palm Tribe.

Palmæ, *Juss. Gen.* (1789); *R. Brown Prodr.* 266. (1810); *Von Martius Palm. Bras.* (1824 to 1836); *Id. Programma* (1824); *Bartl. Ord. Nat.* 63. (1830).

Essential Character.—*Flowers* hermaphrodite, or frequently polygamous. *Perianth* 6-parted, in two series, persistent; the 3 outer segments often smaller, the inner sometimes deeply connate. *Stamens* inserted into the base of the perianth, usually definite in number, opposite the segments of the perianth, to which they are equal in number, seldom 3; sometimes, in a few polygamous genera, indefinite in number. *Ovary* 1, 3-celled, or deeply 3-lobed, the lobes or cells 1-seeded, with an erect ovule, rarely 1-seeded. *Fruit* baccate or drupaceous, with fibrous flesh. *Albumen* cartilaginous, and either ruminate, or furnished with a central or ventral cavity; *embryo* lodged in a particular cavity of the albumen, usually at a distance from the hilum, dorsal and indicated by a little nipple, taper or pulley-shaped; *plumule* included, scarcely visible; the cotyledonous extremity becoming thickened in germination, and either filling up a pre-existing cavity, or one formed by the liquefaction of the albumen in the centre.—*Trunk* arborescent, simple, occasionally shrubby and branched, rough with the dilated half-sheathing bases of the leaves or their scars. *Leaves* clustered, terminal, very large, pinnate or flabelliform, plaited in vernation. *Spadix* terminal, often branched, enclosed in a 1- or many-valved spatha. *Flowers* small, with bractlets. *Fruit* occasionally very large. *R. Brown* (1810).

Affinities. The race of plants to which the name of Palms has been assigned is, no doubt, the most interesting in the vegetable kingdom, if we consider the majestic aspect of their towering stems, crowned by a still more gigantic foliage; the character of grandeur which they impress upon the landscape of the countries they inhabit; their immense value to mankind, as affording food, and raiment, and numerous objects of economical importance; or, finally, the prodigious developement of those organs by which their race is to be propagated. A single spathe of the Date contains about 12,000 male flowers; Alfonsia amygdalina has been computed to have 207,000 in a spathe, or 600,000 upon a single individual; while every bunch of the Seje Palm of the Oronoco bears 8000 fruit. They are very uniform in

the botanical characters by which they are distinguished, especially in their fleshy colourless 6-parted flowers, enclosed in spathes, their minute embryo lying in the midst of albumen and remote from the hilum, and their arborescent stems with rigid, plaited or pinnated, inarticulated leaves, called fronds; but their aspect and habits are extremely various. To use the words of the most accomplished traveller of our own, or any age;—"While some (Kunthia montana, Aiphanes Praga, Oreodoxa frigida) have trunks as slender as the graceful reed, or longer than the longest cable, (Calamus Rudentum, 500 feet), others (Jubæa spectabilis and Cocos butyracea) are 3 and even 5 feet thick; while some grow collected in groups (Mauritia flexuosa, Chamærops humilis), others (Oreodoxa regia, Martinezia caryotæfolia) singly dart their slender trunks into the air; while some have a low caudex (Attalea amygdalina), others exhibit a towering stem 160-180 feet high (Ceroxylon andicola); and while one part flourishes in the low valleys of the tropics, or on the declivities of the lower mountains, to the elevation of 900 feet, another part consists of mountaineers bordering upon the limits of perpetual snow." To which may be added, that while many have a cylindrical undivided stem, the Doom Palm of Upper Egypt, and the Hyphæne coriacea, are remarkable for their dichotomous repeatedly-divided trunk. The Calamus genus, and the siliceous secretions of their leaves, indicate an affinity with Gramineæ, which would hardly be anticipated, if the grasses of our European meadows were compared with the Cocoa Nuts of the Indies, but which becomes more apparent when the Bamboo is placed by the side of the Cane.

Geography. Von Martius, the great illustrator of this noble family, speaks thus of their habits and geographical arrangement:—"Palms, the splendid offspring of Tellus and Phœbus, chiefly acknowledge as their native land those happy regions seated within the tropics, where the beams of the latter for ever shine. Inhabitants of either world, they hardly range beyond 35° in the southern, or 40° in the northern hemisphere. Particular species scarcely extend beyond their own peculiar and contracted limits, on which account there are few countries favourable for their production in which some local and peculiar species are not found; the few that are dispersed over many lands are chiefly Cocos nucifera, Acrocomia sclerocarpa, and Borassus flabelliformis. It is probable that the number of species thus scattered over the face of nature will be found to amount to 1000 or more. Of these not a few love the humid banks of rivulets and streams, others occupy the shores of the ocean, and some ascend into alpine regions; some collect into dense forests, others spring up singly or in clusters over the plains." *Progr.* 6. But if this statement be true as to the probable number of Palms, how little can be now known of their structure, seeing that not more than 175 are at this moment described, of which 119 are South American, 14 African, and 42 Indian. The testimony of Von Martius is, however, confirmed by Humboldt, who also asserts that there must be an incredible number still to discover in equinoctial regions, especially if we consider how little is yet known of Africa, Asia, New Holland, and America. He and Bonpland discovered a new species in almost every 50 miles of travelling, so narrow are the limits within which their range is confined. A different opinion appears to be entertained by Schouw, a respectable Danish writer upon botanical geography, whose views deserve to be quoted, although he is far from having had such personal means of judging as Humboldt and Von Martius. He seems to consider that we are acquainted already with the greater part of the Palms; for he says, "it appears from the reports of travellers that such Palm woods as those of South America are less frequent in other parts of the world. Africa and New Holland seem to be less favourable to this tribe, for on the Congo, Smith found

only from 3 to 4 Palms; in Guinea we know merely of the same number; and of the other African Palms, 6 belong to the Isles of Bourbon and France; New Holland has, in the torrid zone, three species, while Forster's *Prodromus* of the Flora of the South Sea Islands contains four." The most northern limit of Palms is that of Chamærops palmetto in N. America, in lat. 34°-36°, and of Chamærops humilis in Europe, near Nice, in 43°-44° N. lat. They are found in the southern hemisphere as low as 38° in New Zealand. "It is remarkable that no species of Palm has been found in South Africa, nor was any observed by M. Leschenault on the west coast of New Holland, even within the tropic." *Brown in Flinders*, 577. If Palms were not, as some say, among the earliest plants that clothed the face of the globe, none of their remains existing, mixed with the Ferns and Calamites of the old coal formations, it is at least certain that their creation dates long before that of the present Flora of the globe. But it is probable that they actually did exist at the most remote periods; for the Nöggerathia foliosa of Sternberg from the coal-fields of Bohemia seems really to have been a Palm; Adolphe Brongniart refers two other fossils of the same epoch to this family, and I have produced in the Fossil Flora proofs of their fruits being traceable in the shale of the old coal formations. No one doubts that they appeared immediately after the developement of Cycadaceæ ceased in European latitudes, and that of Coniferæ took a more decided form; as we find unquestionable traces of them in those deposits above the plastic clay which Brongniart calls Marno-charbonneux.

Properties. Wine, oil, wax, flour, sugar, salt, says Humboldt, are the produce of this tribe; to which Von Martius adds, thread, utensils, weapons, food, and habitations. The most remarkable is the Cocoa Nut, of which an excellent account will be found in the *Trans. of the Wernerian Society*, vol. 5. The root is sometimes masticated instead of the Areca Nut; of the small fibres baskets are made in Brazil. The hard case of the stem is converted into drums, and used in the construction of huts; the lower part is so hard as to take a beautiful polish, when it resembles agate; the reticulated substance at the base of the leaf is formed into cradles, and, as some say, into a coarse kind of cloth. The unexpanded terminal bud is a delicate article of food; the leaves furnish thatch for dwellings, and materials for fences, buckets, and baskets; they are used for writing on, and make excellent torches; potash in abundance is yielded by their ashes; the midrib of the leaf serves for oars; the juice of the flower and stems is replete with sugar, and is fermented into excellent wine, or distilled into a sort of spirit, called Arrack; or the sugar itself is separated under the name of Jagery. The value of the fruit for food, and the delicious beverage which it contains, are well known to all Europeans. The fibrous and uneatable rind is not less useful; it is not only used to polish furniture and to scour the floors of rooms, but is manufactured into a kind of cordage, called Coir rope, which is nearly equal in strength to hemp, and which Roxburgh designates as the very best of all materials for cables, on account of its great elasticity and strength. Finally, an excellent oil is obtained from the kernel by expression. The juice which flows from the wounded spathes of Palms, especially of Cocos nucifera, is known in India by the name of Toddy. Independently of the grateful qualities of this fluid as a beverage, it is found to be the simplest and easiest remedy that can be employed for removing constipation in persons of delicate habit, especially European females. *Ainslie*, 1. 451. Palm oil is chiefly obtained from Elais guineensis, and this tree is also said to yield the best kind of Palm-wine. The succulent rind of the Date is one of the most agreeable of fruits. Sago is yielded by the trunk of nearly all, except Areca Catechu, but especially of Sagus farinifera and Phœnix farinifera. The well known Betel Nut is the fruit of Areca Catechu, and remarkable for its narcotic or

intoxicating power; from the same fruit is prepared a kind of spurious Catechu. *Ibid.* 1. 65. It seems to me however doubtful whether the intoxicating effect of the Betel nut is not owing to the Piper leaf in which it is wrapped when eaten, rather than to any special property of its own. The Brazilian Indians, especially the Puris, Patachos, and Botocudos, manufacture their best bows from the wood of a species of Cocoa Nut, called the Airi, or Brejeuba. *Pr. Max. Trav.* 238. The Ceroxylon andicola, or Wax Palm of Humboldt, has its trunk covered by a coating of wax, which exudes from the spaces between the insertion of the leaves. It is, according to Vauquelin, a concrete inflammable substance, consisting of 1-3d wax and 2-3ds resin. It is a very remarkable fact, first noticed by Brown (*Congo*, 456.) that the plants of this order whose fruit affords oil belong to a tribe called by him Cocoinæ, which are particularly characterised by the originally trilocular putamen having its cells when fertile perforated opposite the seat of the embryo, and when abortive indicated by foramina cæca. The dark-coloured inodorous and insipid resin, called Dragon's Blood, is obtained in the eastern islands of the Indian Archipelago by wounding the Calamus Draco; it is said to be of finer quality than that procured from Pterocarpus.

The following are Von Martius's sections of the tribe. (*Programma*, p. 7.)

1. Sabalinæ. Spathes numerous, incomplete. Ovary 3-celled. Berry or drupe 1-3-seeded.

2. Coryphinæ. Spathes numerous, incomplete. Pistils 3, cohering inwardly, 1 only usually ripening. Berry or drupe many-seeded.

3, Lepidocaryæ. Spathes numerous, incomplete. Flowers in catkins. Ovary 3-celled. Berry 1-seeded, with a tessellated rind.

4. Borasseæ. Spathes many, incomplete. Flowers in catkins. Ovary 3-celled. Berry or drupe 3-seeded.

5. Arecinæ. Spathe none, or one or more, complete. Ovary 3-celled. Berry 1-seeded.

6. Cocoinæ. Spathe one, or several, complete. Ovary 3-celled. Drupe 1-3-seeded.

GENERA.

§ 1. Sabalinæ, Mart.
Chamædorea, W.
Nunnezia, W.
Nunnezharia, R. et P.
Thrinax, L. fil.
Sabal, Adans.
Licuala, Rumf.

§ 2. Coryphinæ, Mart.
Morenia, R. et P.
Rhapis, L. fil.
Chamærops, L.
Livistoma, R. Br.
Gimbanga, Bl.
Crypha, L.
Taliera, Mart.
Phœnix, L.

§ 3. Lepidocaryæ, Mart.
Lepidocaryum, Mart.
Mauritia, L. fil.
Calamus, L.
Zalacca, Rumf.
Ceratolobus, Bl.
Sagus, Rumf.
Metroxylon, Rottb.
Raphia, Beauv.
Nipa, Thunb.

§ 4. Borasseæ, Mart.
Borassus, L.
Lontarus, Rumf.
Lodoicea, Lab.
Latania, Comm.
Hyphæne, Gærtn.
Cucifera, Del.

§ 5. Arecinæ, Mart.
Leopoldinia, Mart.
Geonoma, W.
Gynestum, Poit.
Hyospathe, Mart.
Ptychosperma, Lab.
Kunthia, Humb.
Areca, L.
Œnocarpus, Martius.
Euterpe, Gærtn.
Seaforthia, R. Br.
Iriartea, R. et P.
Wallichia, Roxb.
Caryota, L.

§ 6. Cocoinæ, Mart.
Syagrus, Mart.
Elate, Ait.
Cocos, L.
Jubæa, Humb.
Maximiliana, Mart.
Diplothemium, Mart.
Desmoncus, Mart.
Bactris, Jacq.
Gulielma, Mart.
Martinezia, R. et P.
Elaeis, Jacq.
Alphonsia, H. B. K.
Acrocomia, Mart.
Astrocaryum, Meyer.
Attalea, Humb.
Areng, Lab.
Gomutus, Rumf.
Manicaria, Gærtn.
Pilophora, Jacq.

Ceroxylon, Humb.
Aiphanes, W.
Oreodoxa, W.
Bentinckia, Roxb.

Alliance II. *LILIALES.*

Essential Character.—*Calyx* and *Corolla* distinct, but similar in degree of development, both being petaloid. *Embryo* in the axis of albumen.

Order CCXLVII. PONTEDERACEÆ.

Pontedereæ, *Kunth in Humb. et Bonpl. N. G.* 1. 211. (1815); *Agardh Aph.* 169. (1823); *Hooker in Bot. Mag.* 2932. (1829).—Pontederaceæ, *Ach. Rich. Nouv. Elém. ed.* 4. 427. (1828).

Essential Character.—*Perianth* tubular, coloured, 6-parted, more or less irregular, with a circinate æstivation. *Stamens* 3 or 6, unequal, arising from the calyx. *Ovary* superior, or rarely half inferior, 3-celled, many-seeded; *style* 1; *stigma* simple. *Capsule* 3-celled, 3-valved, with loculicidal dehiscence. *Seeds* indefinite, attached to a central axis; *hilum* small; *embryo* orthotropous, in the axis of somewhat mealy *albumen*.—*Aquatic* or *marsh*-plants. *Leaves* sheathing at the base, with parallel veins. *Flowers* either solitary, or in spikes or umbels, spathaceous, frequently blue.

Affinities. These were referred to Commelinaceæ by Salisbury, and are considered nearly related to that order by Achille Richard, who, however, separates them, suggesting their being referable to Liliaceæ. It is not improbable that the nearest relation of Pontederaceæ is with Asphodeleæ, (to which Link actually refers Pontedera) and Butomaceæ, from both which they are known by their irregular flowers rolling inwards after expansion, independently of more minute characters derived from the structure of the seeds and fruit. Hooker, who has given an excellent figure of Pontedera azurea, states that each fibre of the roots has a calyptrate covering at the extremity, similar to that found on the roots of the Duck-weed.

Geography. Water-plants found exclusively in North and South America, the East Indies, and tropical Africa.

Properties. Plants with neat deep-green leaves and showy flowers; of no known use.

GENERA.

Pontedera, L.	Leptanthus, Michx.
Monochoria, Presl.	Heteranthera, P. de B.

Order CCXLVIII. MELANTHACEÆ. The Colchicum Tribe.

Melantheæ, *Batsch. Tab. Aff.* (1802).—Colchicaceæ, *Dec. Fl. Fr.* 3. 192. (1815); *Ess. Méd.* 298. (1816); *Bartl. Ord. Nat.* 51. (1830).—Melanthaceæ, *R. Brown. Prodr.* 272. (1810); *Lindl. Synops.* 264. (1829); *DC. and Duby*, 473. (1828).—Veratreæ, *Salisb. in Hort. Trans.* 1. 328. (1812); *Agardh Aphor.* 166. (1823).—Merenderæ, *Mirb. according to De Candolle.*—Parideæ, *Link Handb.* 277. (1829).—Trilliaceæ, *DC. Ess. Méd.* 294. (1816).

Essential Character.—*Perianth* inferior, petaloid, in 6 pieces, or, in consequence of the cohesion of the claws, tubular; the pieces generally involute in æstivation. *Stamens* 6; *anthers* mostly turned outwards. *Ovary* 3-celled, many-seeded; *style* trifid or 3-parted; *stigmas* undivided. *Capsule* generally divisible into 3 pieces; sometimes with a loculicidal dehiscence. *Seeds* with a membranous testa; *albumen* dense, fleshy. *R. Br.*—*Roots* fibrous, sometimes fascicled. *Rhizoma* sometimes fleshy. *Leaves* sheathing at the base, with parallel veins. *Flowers* either arising from under the surface of the ground,

or arranged upon tall leafy stems in large panicles, or disposed in spikes or racemes upon a naked scape.

Affinities. Brown, who restored this tribe, considers its station to be between Asphodeleæ and Juncaceæ, from both which it is known by its tripartible fruit, and anthers turned outwards. The genera differ very much in habit, which renders it doubtful whether some further change in the order will not be necessary. Their properties are more uniform than their appearance. The little section Parideæ, usually referred to Asphodeleæ or Smilaceæ, seems upon the whole most near this order, on account of the apocarpous pistil; the anthers, however, are not turned towards the perianth.

Geography. Frequent at the Cape of Good Hope, not uncommon in Europe, Asia, and North America, and existing in the tropics of India and New Holland, this order appears to be confined within no geographical limits; it is, however, far more abundant in northern countries than elsewhere.

Properties. Poisonous in every species, but more especially in the Colchicum and Veratrum. The cormus of the former is a well-known acrid cathartic, narcotic, and diuretic; the latter is a nauseous dangerous emetic. The medicinal properties of the root of Veratrum are, owing to a peculiar alkaline principle, called Veratrin, which acts with singular energy on the membrane of the nose, exciting violent sneezings, though taken in very minute quantity. When taken internally in very small doses, it produces excessive irritation of the mucous coat of the stomach and intestines; and a few grains are found fatal to the lower animals. *Turner*, 652. Veratrum viride of North America is an acrid, emetic, and powerful stimulant, followed by sedative effects. *Bigelow*, 2. 125. Veratrin is found in the root of the Colchicum. *Turner*, 652. The root of Helonias dioica in infusion is anthelmintic, but its tincture is bitter and tonic. *DC.* The root of Medeola virginica is stated to be diuretic, and to have some reputation as a hydragogue. *Barton*, 2. 147. The roots of Trillium are generally violently emetic, and their mawkish, rather nauseous, berries are at least suspicious. *DC.*

GENERA.

Colchicum, L.
Hermodactylum, R.Br.
Merendera, Ram.
Monocaryum, R. Br.
Bulbocodium, L.
Bæometra, Salisb.
Kolbea, Schl.
Jania, Schult. f.
Melanthium, L.
Erythrostictus, Schlectend.
Androcymbium, Willd.
Cymation, Spreng.
Lichtensteinia, Willd.
Burchardia, R. Br.
Anguillaria, R. Br.
Schelhammera, R. Br.
Ornithoglossum, Salisb.
Wurmbea, Thunb.
Zigadenus, Mich.
Xerophyllum, Mich.
Helonias, L.
Veratrum, L.
Nolina, Mich.
Tofieldia, Huds.
Heritiera, Schrank.
Hebelia, Gmel.
Pleea, Mich.
Drapiezia, Bl.
Compsoa, Don.
Compsanthus, Spr.
Disporum, Salisb.
Tricyrtis, Wall.
? Campynema, R. Br.
§ Parideæ, Link.
Myrsiphyllum, W.
Medeola, L.
Trillium, L.
Paris, L.

Order CCXLIX. GILLIESIACEÆ.

Gilliesieæ, *Lindl. in Bot. Reg.* 992. (1826); *Hooker in Bot. Mag.* 2716. (1827).

Essential Character.—*Flowers* hermaphrodite, surrounded by bracteæ, the outer of which are petaloid and herbaceous, the inner depauperated and coloured. *Perianth* minute, either a single labelloid lobe, or an urceolate 6-toothed body. *Stamens* 6, either all fertile, or 3 sterile and nearly obliterated. *Ovary* superior, 3-celled; *style* 1; *stigma* simple. *Capsule* 3-celled, 3-valved, with a loculicidal dehiscence, many-seeded. *Seeds* attached to the axis, by means of a broad hollow neck; *testa* black and brittle; *embryo* curved in the

midst of fleshy albumen.—Small *herbaceous* plants, with tunicated bulbs. *Leaves* grass-like. *Flowers* umbellate, somewhat spathaceous, inconspicuous.

Affinities. The distinctions of many of the natural orders among hexapetaloideous Dicotyledons are so slight, as far as technical characters are capable of being employed, that the separation of this tribe from Asphodeleæ seems justifiable, even now that the structure of the seeds is known, and that they are found to be essentially those of Asphodeleæ, except in having a crustaceous neck that connects them with the placenta. The tribe was originally proposed in the *Botanical Register*, from which, as that work is in few hands, I make the following rather long extract.

"The whole structure of this most remarkable plant is so peculiar, that we scarcely know whether the definition and description of the parts of fructification above given will not be considered more paradoxical than just; and yet, if the analogies the various organs bear to those of other plants be carefully considered, their structure will scarcely admit of any other interpretation. With respect to the five petaloid leaves, which are here described as bracteæ, and which bear a considerable degree of resemblance to a perianthium, it may be observed, that this appearance is more apparent than real; they neither correspond in insertion nor in number with the segments of a monocotyledonous perianthium, nor do they bear the same relation to the parts contained as a perianthium should bear. The three outer are not inserted on the same line, but are distinctly imbricated at the base; and the two inner do not complete the second series, as would be required in a regular monocotyledonous perianthium.

"But if we were to admit, for a moment, the possibility of these bracteæ being segments of a perianthium, what explanation could be given of the setiform processes proceeding from their base, or of the central fleshy slipper-like body from within which the stamens proceed? The former bear no determinate relation to the other parts of the flower in their insertion; they are subject to much diversity of form and number, being sometimes *eight*, consisting of *two* unequal subulate bodies proceeding from the edges of each lateral segment, the outermost of the two being wider than the innermost, and being, moreover, not unfrequently a manifest process of the margin of the segment itself; sometimes having their number reduced to *four* by the suppression of the exterior processes of each lateral segment; and occasionally having the outer processes suppressed on one segment, and not suppressed on the other. In the many flowers which have been under examination, the processes, moreover, were always constituted of cellular tissue alone, without either tracheæ or tubular vessels. These circumstances being considered, it will scarcely be proposed, we presume, to identify them with abortive stamina. If they are, notwithstanding what has been advanced, determined to be the perianthium itself, what becomes of the outer segments, which had previously been referred to perianthium? for it would be difficult to trace any analogy between the structure of Gilliesia and of those genera in which a third series is added to the usual senary division of Monocotyledones. But none of the peculiarities adverted to are opposed to those bodies being referred to depauperated or reduced bracteæ.

"With respect to the central body from which the stamens proceed, this body, which might be conveniently disposed of by referring it to what Linnæan botanists call a nectarium, consists, as we have seen, of a fleshy slipper-like lobe, with or without two auricles at the base, and within which the cup of stamens is inserted. The relation it bears, as regards insertion, to the parts which have been already noticed, is very obscure; it is always opposite the solitary external bracteæ; but whether it is anterior with respect to the

common axis of inflorescence, or posterior, has not at present been ascertained. The reasons which have been offered for the view here taken of the parts surrounding this body, make it obvious that it must be considered the perianthium. But of this more will be said hereafter. For the present it will be sufficient to remark, that it manifestly bears an intimate relation to the stamens, being obliterated in the same direction and degree as they are.

" In this view, then, the petaloid segments are considered perfect bracteæ, the subulate interior processes abortive bracteæ, and the fleshy central labelloid body the perianthium.

" However paradoxical this description of Gilliesia may appear, and however inconclusive the arguments adduced in support of the view we have taken of it may have hitherto been considered, they will probably be found more deserving of attention if compared with a nearly-allied plant discovered in Chile, by our friend John Miers, Esq., after whom it has been named. This singular genus forms part of a most valuable and remarkable collection of botanical drawings, which were made by Mr. Miers during his long residence in Chile, and which, it is to be hoped, will, at some future day, be laid before the public. Having been kindly permitted to make use of the drawing and manuscript description of the plant alluded to, we shall endeavour to explain the analogies and relation which exist between it and Gilliesia.

" In Miersia the bracteæ are six in number, of which two are interior and four exterior, a still more valid reason against their being segments of a perianthium. The subulate processes assume a more regular form, and a more constant mode of insertion, but still bear no very apparent relation to the bracteæ; and the fleshy labelloid central body is represented by an urceolate six-toothed cup, within the orifice of which six fertile stamens are included. In Miersia, therefore, the perianthium, which was in Gilliesia subject to a certain degree of imperfection, in which the stamens also participated, is in the usual regular form of many Monocotyledones, no irregularity occurring in the stamens. As there can be no doubt of the strict analogy which exists between Gilliesia and Miersia in their fructification, and as there can also be little doubt that the central body of the latter genus is perianthium, it will follow as a necessary consequence, that as the supernumerary appendages of that genus are external with respect to the perianthium, and therefore neither perianthium nor stamens, so also will the analogous appendages of Gilliesia not be perianthium. And the central body having been ascertained to be perianthium, all the parts which surround it will necessarily be bracteæ, or modifications of bracteæ.

" The natural affinity of these two genera is extremely obscure; and till some accurate information can be obtained of the structure of their seeds, it must be a subject of much uncertainty. Even with the requisite information upon that point, it is not probable that they will be found to bear any very close relation to the other monocotyledonous orders at present known. Their tunicated bulbs, spathaceous inflorescence, and general appearance, place them near Asphodeleæ, with some genera of which, especially Muscari and Puschkinia, Miersia at least agrees in the structure of perianthium; but we are acquainted with no genus of Asphodeleæ to which the fructification of Gilliesiaceæ can be otherwise compared. If the one-flowered species of Schoenus, in which a single naked flower is surrounded by several imbricated squamæ, be admitted as a form of inflorescence analogous to that under consideration, it may perhaps be allowable to carry this comparison yet further, and to suggest an identity of origin and function between the depauperated bracteæ of Gilliesia and the hypogynous setæ of Scirpus and other Cyperaceæ. But on account of the presence of a perianthium, and of their polyspermous three-celled capsule, Gilliesiaceæ may perhaps be with most propriety referred to the

neighbourhood of Restiaceæ, whose imbricated inflorescence does not offer any very powerful obstacle."

At this time the structure of the seeds was unknown: I have since been able to ascertain their nature, in consequence of a supply having been given me by Mr. Cruckshanks. The result of their examination, while it strengthens the opinion of their vicinity to Asphodeleæ, and weakens that of a relation to Restiaceæ, does not induce me to alter my view of them as constituting a small but distinct order.

Geography. Chilian bulbs.

Properties. Unknown.

GENERA.

Gilliesia, Lindl.
Miersia, Lindl.

Order CCL. LILIACEÆ. The Lily Tribe.

Lilia, *Juss. Gen.* 48. (1789).—Narcissi, *the first sect. Ibid.* 54. (1789).—Hemerocallideæ, *R. Brown Prodr.* 295. (1810).—Liliaceæ, *DC. Théor. Elém.* 1. 249. (1813); *DC. and Duby*, 461. (1828) *in part; Lindl. Synops.* 266. (1829).—Tulipaceæ, *DC. Ess. Méd.* 297. (1816); *DC. and Duby*, 461. (1828); *Link Handb.* 1. 177. (1829) *Bernh. in Botan. Zeit. Oct.* 1835.—Coronariæ, *Agardh Aphor.* 165. (1823).—Asparagi *and* Asphodeli, *of Juss.* (1789).—Asphodeleæ, *R. Brown Prodr.* 275. (1810); *DC. and Duby* 463. (1828); *Lindl. Synops.* 266. (1829).—Alliaceæ, Aloinæ, Hyacinthinæ, Dracænaceæ, *Link Handb.* vol. 1. (1829).—Asparaginæ, *Ib.* 272. (1829).—Smilaceæ, *R. Brown Prodr.* 292. (1810); *Lindl. Synops.* 270. (1829); *Bartl. Ord. Nat.* 52. (1830).—Asparageæ, *DC. and Duby*, 458. (1828).—Asparagineæ, *Ach. Rich. Dict. Class.* 2. 20. (1822); *Nouv. Elém.* ed. 4. 430. (1828). Convallariaceæ, *Link Handb.* 184. (1829).

Essential Character.—*Calyx* and *corolla* confounded, coloured, regular, occasionally cohering in a tube. *Stamens* 6, inserted into the sepals and petals. *Anthers* opening inwards. *Ovary* superior, 3-celled, many-seeded; *style* 1; *stigma* simple, or 3-lobed. *Fruit* succulent, or dry and capsular, 3-celled. *Seeds* packed one upon another in 1 or 2 rows; *embryo* with the same direction as the seed, in the axis of fleshy *albumen*, or uncertain in direction and position.—*Roots* fibrous, or fasciculate. *Stem* none, except a bulb; or tuberous, or creeping, or erect, or arborescent. *Leaves* with parallel veins, membranous, not articulated with the stem; either sessile or with a narrow leafy petiole.

Affinities. It will be seen from the numerous synonyms above quoted, how unsteady the opinions of Botanists are concerning this natural order. Some like Brown divide it into three, others like Bartling into two, while some break it up into many. After giving the subject all the attention in my power, I am forced to the conclusion that nothing like a solid distinction either in the vegetation or the fructification can be discovered by which the following genera can be separated into distinct orders; indeed the characters proposed by botanical writers are so unsatisfactory, that I think it superfluous to notice any others than those of Brown and Bartling. Brown himself admits that his Hemerocallideæ are a section of Liliaceæ, rather than a distinct order (*Prodr.* 295); the same may be said of his Asphodeleæ, for which he states he has sought in vain for a character; finding nothing that will circumscribe them except a black crustaceous brittle seedcoat which is easily separable from a fine proper membrane; but he distinguishes Smilaceæ by their membranous seedcoat, and by the embryo being usually remote from the hilum. With regard to the colour of the seedcoat or even its texture, I must remark firstly, that one would be slow to recognize such a peculiarity as a valid distinction even of genera, and that as an ordinal characteristic it is

still less admissible; and secondly, that Paris, which Brown admits into his Smilaceæ has a leathery testa; Streptopus moreover, which is expressly named by this distinguished botanist as one of his Smilaceæ, has the embryo next the hilum; so that the characters of that order, as proposed by Brown, break down in all directions. Bartling who retains Smilaceæ, adds to the distinction of the order a minute embryo, but then he admits such genera as Asparagus and Drymophila, in which the embryo is the same as that of Asphodeleæ. Bernhardi in recently characterizing Tulipaceæ, does not appear to me to have been more happy, for he points out nothing of any importance to keep apart the genera he assembles under that name, beyond what may suffice for a sectional distinction. And in reality when one casts an eye over the genera of Liliaceæ, as I now propose to understand the order, they do appear to be so closely connected with each other by a complicated interchange of resemblances and differences, that the fructification will furnish nothing for even sectional characters of which any use can be advantageously made. It is very much to be desired that this were carefully looked into by some botanist of leisure and good general views; for until this is done, and until the whole series of hypogynous orders is skilfully revised, it seems to me better to abandon characterizing the sections of Liliaceæ otherwise than by their peculiarities of vegetation, which seem to me to be by far the most solid on which to rely for natural groups. I therefore propose until something better can be struck out, the following sections; in which we advance from the most simple to the most highly developed cases of organization in the organs of vegetation.

§ 1. Tulipeæ. Bulbous. Sepals and petals scarcely adhering in a tube. Seedcoat soft and pale.

§ 2. Hemerocallideæ. Bulbous. Sepals and petals united into a tube. Seedcoat soft and pale.

§ 3. Scilleæ. Bulbous. Flowers usually smaller than in the preceding, and the seed coat black and brittle.

§ 4. Anthericeæ. Not bulbous. Stem if developed erect. Roots fascicled or fibrous. Leaves never coriaceous and permanent.

§ 5. Convallarinæ. Stem developed as a rhizoma or tuber.

§ 6. Asparageæ. Stem usually fully developed, often arborescent, sometimes branched, sometimes twining. Leaves in the stemless species often coriaceous and permanent.

§ 7. Aloinæ. Stem usually fully developed, sometimes arborescent. Leaves succulent.

Liliaceæ as here understood, differ from Melanthaceæ in their anthers not bursting at their back, and by their fruit not being apocarpous; from Pontederaceæ in the æstivation of the petals. With other orders their relation will be explained in the proper places.

Geography. Scattered widely over the world; but much more abundant in temperate climates than in the tropics, where they chiefly exist in an arborescent state. Aloes are mostly found in the southern parts of Africa. One species is a native of the West Indies, and two or three more of Arabia and the East. Dracænas, the most gigantic of the order, attain their largest size in the Canaries. A Dracæna Draco is described in the *Annales des Sciences*, 14. 140. as being between 70 and 75 feet high, 46½ feet in circumference at the base, and it was known to have been a very ancient tree in the year 1496. The northern Flora comprehends for the most part plants of the genera Scilla, Hyacinthus, Allium, and Ornithogalum. In the East Indies Liliaceæ are rare; in New Holland they form a distinctly marked feature of the vegetation.

Properties. The bulbs of Lilium pomponium are roasted and eaten in

Kamtchatka, where it is as commonly cultivated as the potato with us. *Gard. Mag.* 6. 322. The roots of Erythronium indicum are employed in India in cases of strangury and fever in horses. *Ainslie*, 1. 403. Polianthes tuberosa, or the Tuberose, is well known for its delicious fragrance. This plant emits its scent most strongly after sunset, and has been observed in a sultry evening, after thunder, when the atmosphere was highly charged with electric fluid, to dart small sparks, or scintillations of lucid flame, in great abundance from such of its flowers as were fading. *Ed. P. J.* 3. 415. Gloriosa superba is said to be acrid. A bitter stimulant principle, contained in a gummy viscid juice, prevails in all, differing in the species chiefly in regard to its quantity and degree of concentration. The bulb of the Scilla maritima is nauseous and acrid; it acts either as an emetic, purgative, or expectorant and diuretic, in proportion to the dose in which it is given. Its properties are said to be due to a peculiar principle, called by Vogel, Scillitin. The Onion, Garlic, Shallot, Chive, Rocambole, all species of Allium, agree in their stimulant, diuretic, and expectorant effects, differing in their degree of activity. According to Dr. A. T. Thomson, the virtues of the genus Allium depend on an acrid principle, soluble in water, alcohol, acids, and alkalies. *Conspectus*, p. 9. In consequence of the free phosphoric acid which the common Onion bulbs contain, they are supposed to be useful in calculous cases. *Ibid.* Aloes act in like manner as stimulants, to which they owe their remarkable cathartic powers. Soccotrine Aloes, so called from being produced in Zocotora, are obtained from Aloë spicata. *Linn.* An inferior sort, sold in the East Indian bazars, is supposed to be the produce of Aloë perfoliata. *Ainslie*, 1. 9. This is the Barbadoes Aloes, or Hepatic Aloes of the shops. The root of Dracæna terminalis is considered by the Javanese a valuable medicine in dysenteric affections. *Ibid.* 2. 20. The juice of Dracæna Draco is the Gum Dragon, a styptic substance, well known in medicine; it flows from the plants abundantly when cut. The bitter resinous root of Aletris farinosa is tonic and stomachic, in small doses; but a dose of 20 grains occasions much nausea, with a tendency to vomit. *Bigelow*, 3. 96. The bulbs of Scilla Lilio-Hyacinthus, and the roots of Anthericum bicolor, are both purgative, according to De Candolle, *Propr. Med.* 296. The juice of common Asparagus contains a peculiar principle, called Asparagin. *Turner*, 699.

GENERA.

§ 1. TULIPACEÆ, DC.
Gloriosa, L.
Methonica, Herm.
Lilium, Tournef.
? Amblirion, Raf.
Rhinopetalum, Fisch.
Fritillaria, L.
Petilium, L.
Imperialis, Juss.
Eucrinum, Nutt.
Calochortus, Ph.
Cyclobothra, Sweet.
Lloydia, Salisb.
Rhabdocrinum, Rchb.
Nectaribothrium, Led.
Gagea, Salisb.
Ornithoxanthum, Link.
Tulipa, Tourn.

Erythronium, L.

Susum, Bl.

§ 2. HEMEROCALLIDEÆ, R. Br.
Hemerocallis, L.
Funkia, Spr.
Hosta, Tratt.
Libertia, Dumort.
Niobe, Salisb.
Bryocles, Salisb.
Saussurea, Salisb.
Agapanthus, L'Her.
Mauhlia, Thunb.
Polianthes, L.
Blandfordia, Sm.
Velthejmia, Gleditsch.
Tritoma, Ker.
Tritomanthe, Hsgg.

§ 3. SCILLEÆ, Bartl.
Alliaceæ, Link.
Conantheræ, Don.
Allium, L.
Porrum, Tourn.
Codonoprasum, Rchb.
Ophioscorodon, Wallr.
Hesperoscordum, Lindl.
Calliprora, Lindl.
? Milla, Cav.
Ledebouria, Roth.
Scilla, L.
Bellevalia, Lap.
Urginea, Steinh.
Barnardia, Lindl.
Camassia, Lindl.
Trichopetalum, Lindl.
Bottionea, Colla.
Ornithogalum, L.
Stellaris, Mœnch.
Myogalum, Link.
Albuca, L.
Uropetalum, Ker.
Polemannia, Berg.
Drimia, Jacq.
Massonia, L.
Daubenya, Lindl.
Eucomis, L'Herit.
Basilæa, Lam.
* *
Puschkinia, Adams.
Adamsia, W.
Cummingia, Don.
Conanthera, R. et P.
Bessera, Schultz.
Zephyra, Don.
* *
Lachenalia, Jacq.
Hyacinthus, L.
Muscari, Desf.
Triteleia, Lindl.
Pharium, Herb.
Brodiæa, Sm.
Leucocoryne, Lindl.

§ 4. Anthericeæ, Bartl.
Bulbine, W.
Anthericum, Lam.
Arthropodium, R. Br.
Pasithea, Don.
Anthericum, L.
? Tristagma, Pöpp.
Czackia, Andrz.
Phalangium, DC.
Allobrogia, Tratt.
Chlorophytum, Ker.
Hartwegia, Goethe.
Chloopsis, Bl.
Asphodelus, L.
Asphodeline, Rchb.
Eremurus, M. Bieb.
Tricoryne, R. Br.
Cæsia, R. Br.
Sowerbæa, Sm.
Drapiezia, Bl.
Cyanella, L.
Thysanotus, R. Br.
Chlamysporum, Salisb.
Bulbospermum, Bl.
Tulbaghia, L.
Aletris, L.
Borya, La Bill.
Baumgartenia, Spr.
Daviesia, Lam.
Johnsonia, R. Br.
Aphyllanthes, L.
Narthecium, Möhr.
Abama, Adans.
Liriope, Lour.
Ophiopogon, Ker.
Fluggea, Rich.
Slateria, Desv.
Salmia, Cav.
Pleomeles, Salisb.
Laxmannia, R. Br.

§ 5. Convallarinæ, Th. N. ab E.
Convallaria, L.
Styrandra, Raf.
Polygonatum, Desf.
Maianthemum, Wigg.
Smilacina, Desf.
Brachypetalum, Nutt.
Drymophila, R. Br.
Streptopus, Mchx.
Uvularia, L.
? Stypandra, R. Br.
Echeandia, Ort.
Eriospermum, Jacq.
Anemarrhena, Bge.
Peliosanthes, Andr.
§ 6. Asparageæ, Asparagus, L.
Ruscus, L.
Rhuacophila, Bl.
Dianella, Lam.
Dracæna, L.
Stoerria, Crz.
Œdera, Crz.
Cordyline, Comm.
Charlwoodia, Sweet.
Sanseviera, Thunb.
Phormium, Thunb.
Chlamydia, Bks.
Yucca, L.
Xanthorrhœa, Sw.
* *
Eustrephus, R. Br.
Luzuriaga, R. et P.
Callixene, Comm.
Herreria, R. et P.
Geitonoplesium, Cunn.
§ 7. Aloinæ, Link.
Aloe, L.
Rhipidodendron, W.
Gasteria, Haw.
Bowiea, Haw.
Haworthia, Salm.
Apicra, W.

Alliance III. *COMMELALES.*

Essential Character.—*Sepals* leafy. *Petals* coloured. *Carpels* 3, completely combined.

Order CCLI. COMMELINACEÆ. The Spider-wort Tribe.

Ephemereæ, *Batsch. Tab. Affin.* 125. (1802) *in part.*—Commelineæ, *R. Brown Prodr.* 268. (1810); *Richard in Humb. Bonpl. N. Gen.* 1. 258. (1815); *Agardh Aph.* 168. (1823).

Essential Character.—*Sepals* 3, distinct from the petals, herbaceous. *Petals* coloured, sometimes cohering at the base. *Stamens* 6, or a smaller number, hypogynous, some of them either deformed or abortive. *Ovary* 3-celled, with few-seeded cells; *style* 1; *stigma* 1. *Capsule* 2- or 3-celled, 2- or 3-valved, the valves bearing the dissepiments in the middle. *Seeds* often twin, inserted by their whole side on the inner angle of the cell, whence the hilum is linear; *embryo* pulley-shaped, antitropous, lying in a cavity of the albumen remote from the hilum; *albumen* densely fleshy.—*Herbaceous* plants. *Leaves* usually sheathing at the base.

Affinities. Brown remarks upon this order (*Prodr.* 269.), that "it is very different from Juncaceæ both in habit and structure; it agrees better with Restiaceæ in the situation of the embryo and the sheathing leaves, although otherwise quite distinct; it has scarcely any affinity with Palms, except in its trochlear embryo, remote from the hilun, and indicated in both orders by an external papilla." Agardh adds, that it agrees with Orchidaceæ in the structure of the seeds and stamens. I know not in what respect this resemblance is shewn. Endlicher considers Mayaca to be the type of a distinct order (v. *Meletemata*).

Geography. Chiefly found in the East and West Indies, and Africa. A few are found in North America, but none in northern Asia or Europe.

Properties. Often mere weeds, sometimes beautifully-flowering plants; otherwise having no known properties.

GENERA.

Commelina, L.
Aclisia, E Mey.
Campelia, Rich.
Tradescantia, L.
Cyanotis, Don.
Zygomenes, Salisb.
Callisia, L.
Hapalanthus, Jacq.

Aneilema, R. Br.
Palisota, Rchb.
Dichorizandra, Mik.
Cartonema, R. Br.

Rapatea, Aubl.
Mnasium, Schreb.
Hagenbachia, Nees.
Pollia, Thunb.

Mayaca, Aubl.
Syena, Schreb.
Biaslia, Vandell.

Alliance IV. *ALISMALES.*

Essential Character.—*Sepals* usually herbaceous. *Petals* coloured. *Carpels* more or less distinct from each other. *Albumen* 0.

Order CCLII. BUTOMACEÆ. The Flowering Rush Tribe.

Butomeæ, *Richard in Mém. Mus.* 1. 364. (1815); *Lindley's Synopsis*, 271. (1829); *DC. and Duby*, 437. (1828) *a* § *of* Alismaceæ.

Essential Character.—*Sepals* 3, usually herbaceous. *Petals* 3, coloured, petaloid. *Stamens* definite or indefinite, hypogynous. *Ovaries* superior, 3, 6, or more, either distinct or united into a single mass; *stigmas* the same number as the ovaries, simple. *Follicles* many-seeded, either distinct and rostrate, or united in a single mass. *Seeds* minute, very numerous, attached to the whole of the inner surface of the fruit; *albumen* none; *embryo* with the same direction as the seed.—*Aquatic* plants. *Leaves* very cellular, often yielding a milky juice, with parallel veins. *Flowers* in umbels, conspicuous, purple, or yellow.

Affinities. Butomaceæ are readily known by the remarkable circumstance of their placenta extending over the whole lining of the fruit, which is formed either of separate or concrete carpels. In this respect there is an evident analogy with Nymphæaceæ, which Limnocharis resembles in the structure of its fruit. Butomaceæ are most closely akin to Alismaceæ. De Candolle has a remark (*Syst.* 2, 42.), that no Endogens are lactescent; but Limnocharis yields milk in abundance. This genus offers a singular example of a large conspicuous open hole in the apex of its leaf, apparently destined by nature as an outlet for superfluous moisture, which is constantly distilling from it.

Geography. Natives of the marshes of Europe, and equinoctial America.

Properties. Butomus is acrid.

GENERA.

Limnocharis, Bonpl.
Hydrocleis, Rich.
Butomus, L.

Order CCLIII. ALISMACEÆ. The Water-Plantain Tribe.

Alismaceæ, *R. Brown Prodr.* 342. *in part* (1810); *Rich. in Mém. Mus.* 1. 365. (1815); *Juss. Dict. Sc. Nat.* 1. 217. (1822); *Lindl. Synops.* 253. (1829).—Alismoideæ, *DC. Fl. Fr.* 3. 188. (1805).

Essential Character—*Sepals* 3, herbaceous. *Petals* 3, petaloid. *Stamens* definite or indefinite. *Ovaries* superior, several, 1-celled; *ovules* erect or ascending, solitary, or 2 attached to the suture at a distance from each other. *Styles* and *stigmas* the same number as the ovaries. *Fruit* dry, not opening, 1- or 2-seeded. *Seeds* without albumen; *embryo*

shaped like a horse-shoe, undivided, with the same direction as the seed.—*Floating* plants. *Leaves* with parallel veins.

Affinities. This order is to Monocotyledons what Ranunculaceæ are to Polypetalous Dicotyledons, and is in like manner recognised by its indefinite distinct carpels and hypogynous stamens; from Butomaceæ it is known by the indefinite ovules of that order being scattered over the face of the cells. Juncaginaceæ, sometimes referred to Alismaceæ, appear nearer Araceæ, and are distinguished by their depauperated floral envelopes, concrete carpels, and straight embryo having a lateral slit for the emission of the plumule. The plants belonging to Alismaceæ, Hydrocharaceæ, Fluviales, Juncaginaceæ, and Butomaceæ, have all a disproportionately large radicle, whence the embryos of such were called by the late L. C. Richard, macropodal.

Geography. Chiefly natives of the northern parts of the world. Several Sagittarias and Actinocarpi inhabit the tropics, the former those of both hemispheres.

Properties. All aquatic plants with a lax tissue, and many with a fleshy rhizoma, which is eatable; such are Alisma and Sagittaria: a species of the latter is cultivated for food in China. The herbage is acrid. Alisma Plantago is one of the plants recommended in hydrophobia. *Agdh.*

GENERA.

Sagittaria, L. Alisma, L. Actinocarpus, R. Br. *Damasonium*, Juss. Hydromystria, Meyer. Hydrogeton, Pers. *Ouvirandra*, Pet. Th.

Alliance V. *JUNCALES.*

Essential Character.—*Flowers* somewhat glumaceous.

Order CCLIV. JUNCEÆ. The Rush Tribe.

Junci, *Juss. Gen.* (1789), *in part.*—Junceæ, *DC. Fl. Fr.* 3. 155. (1815); *R. Brown Prodr.* 257. (1810); *DC. and Duby*, 474. (1828); *Lindl. Synops.* 273. (1829).—Juncaceæ, *Agardh Aphor.* 156. (1823), *in part.*

Essential Character.—*Flowers* hermaphrodite or unisexual. *Calyx* and *corolla* forming an inferior, 6-parted, more or less glumaceous *perianth*. *Stamens* 6, inserted into the base of the segments; sometimes 3, and then opposite the calyx. *Anthers* 2-celled. *Ovary* 1- or 3-celled, 1- or many-seeded, or 1-celled and 3-seeded. *Style* 1. *Stigmas* generally 3, sometimes only 1. *Fruit* capsular, with 3 valves, which have the dissepiment in their middle, sometimes destitute of valves, and 1-seeded by abortion. *Seeds* with a testa, which is neither black nor crustaceous; *albumen* firm, fleshy, or cartilaginous; *embryo* within it. *R. Br.* (1810)—*Herbaceous* plants, with fascicled or fibrous roots. *Leaves* fistular, or flat and channelled with parallel veins. *Inflorescence* often more or less capitate. *Flowers* generally brown or green.

Affinities. This order, in its most genuine state, may be said to stand between Petaloideous and Glumaceous Monocotyledons, agreeing with the former in the floral leaves having assumed the verticillate state necessary to constitute a perianth, and with the latter in their texture. But while a glumaceous confused calyx and corolla are the characteristic of one part of the order, another part, approaching Liliaceæ, assumes a petaloid state; so that little is finally left to separate Juncaceæ from the latter, except the difference in the testa of their seed. Brown remarks that Juncaceæ are intermediate between Restiaceæ and Asphodeleæ, differing from the former in having an

included embryo, a radicle usually centripetal, and the stamens, when there are only 3, opposite the sepals: from Asphodeleæ in the integument of the seed, in the texture of the perianth, and in habit. *Prodr.* 258. Agardh combines Restiaceæ and Junceæ. *Aph.* 157.

From Palms they are distinguished, independently of their habit, by the texture of the perianth, by the constant tendency to produce more than 1 ovule in each cell, and by the embryo never being remote from the hilum. Juncus is an instance of a monocotyledonous plant having distinct pith. "Xerotes, in the structure and appearance of its flowers, and in the texture of albumen, has a considerable resemblance to Palms, but it wants the peculiar characters of the seed, and also the habit of that remarkable order. Flagellaria differs from Xerotes chiefly in its pericarp, and in the form and relation of its embryo to the albumen, which is also of a different texture. In all these respects it approaches to Cyperaceæ, with some of whose genera it has even a certain resemblance in habit." *Brown in Flinders*, 578. From Melanthaceæ the order is known by the concrete carpels and anthers turned inwards.

Geography. Chiefly found in the colder parts of the world, some even in the coldest, two existing in the ungenial climate of Melville Island. Several, however, are known in the tropics. Eight are mentioned as inhabiting the tropical parts of New Holland alone. According to Humboldt (*Diss. Geogr.* 43), they constitute $\frac{1}{400}$ of the flowering plants in the equinoctial zone; in the temperate zone, $\frac{1}{90}$; in the frozen zone $\frac{1}{25}$; in North America, $\frac{1}{150}$; in France, $\frac{1}{86}$. In Sicily, according to Presl, they do not form more than $\frac{1}{306}$.

Properties. Only employed for mechanical purposes, as the Rush and others for making the bottoms of chairs, &c.; the pith of the same for the wick of common candles. Juncus effusus is cultivated in Japan for making floor-mats. *Thunb.* The leaves of Flagellaria are said to be astringent and vulnerary.

GENERA.

Cephaloxys, Desv.
Juncus, L.
Rosthovia, Desv.
Marsippospermum, Desv.
Luzula, DC.
Xerotes, R. Br.
Lomandra, La Bill.
Kingia, R. Br.
Astelia, Bks.
Flagellaria, L.
§ Aphyllantheæ, Bartl.
Dasypogon, R. Br.
Calectasia, R. Br.

Order CCLV. PHILYDRACEÆ.

Philydreæ, *R. Br.* (1832?); *Lindl. Nixus*, 22. (1833).

Essential Character.—*Perianth* 2-leafed, coloured, withering. *Filaments* 3, united at the base, inserted into the base of the lower leaf of the perianth; the lateral ones petaloid and sterile; *anther* with distinct cells. *Ovary* superior; *style* simple; *stigma* capitate. *Capsule* 3-celled, 3-valved; the valves having the partition in their middle. *Seeds* numerous, minute.—*Root* fascicled-fibrous. *Stems* erect, simple, leafy. *Leaves* ensiform, somewhat cellular, equitant with their half-sheathing bases. *Spikes* terminal, simple or divided. *Flowers* alternate, solitary, sessile, subtended by a spathaceous persistent bract, yellow, scentless.

Affinities. "At the end of Juncaceæ I have placed, not without hesitation, a genus which in the structure of the flower is most distinct from all others, but which nevertheless shews some affinity with Xyris, and perhaps Burmannia. These plants, indeed, which is curious enough, in certain points belonging to the structure of the seed and stamen, agree with Orchidaceæ, otherwise very different." *R. Br. Prodr.* 264. To this I have nothing to add, as

I have never had the opportunity of examining Philydrum. Brown has lately proposed to constitute it into a distinct order; for the character of which I have translated his generic description in the Prodromus, with a few omissions.

GEOGRAPHY. New Holland plants.
PROPERTIES. Unknown.

GENUS.

Philydrum, Banks.
Garciana, Lour.

GROUP IV. Retosæ.

ESSENTIAL CHARACTER.—*Leaves* either with many ribs the intervals between which are irregularly netted, or with a mid-rib and netted sides; foot-stalk taper, articulated with the stem. *Embryo* without a latteral slit. *Flowers* never arranged in a spadix. Floral envelopes complete. Twiners or climbers.

By the strongly marked peculiarity in the foliage, it seems to me desirable to cut off the following orders from all others. They have a most peculiar aspect, and it is plain that they constitute a most remarkable transition from Endogens to Exogens. Nevertheless if the organs of vegetation are not taken into account, I know of no verbal character which will divide Smilaceæ from Liliaceæ, and Mr. Herbert is equally unable to distinguish Dioscoreaceæ from Amaryllidaceæ. I see no objection to the admission of such a character, provided it is constant and uniform, and that it is so I hope to shew: first remarking that Alismaceæ are separated from Ranunculaceæ upon a still more slender verbal distinction, the embryo of the former being undivided, and the other 2-lobed at the apex; there is *no other positive difference between these orders*, which in fact represent two lines diverging from a common point; yet they are universally recognized, and with great propriety. The first point in the character assigned to this group is that the leaves are like those of Exogens, that is to say, irregularly netted between the ribs, or ribless with netted sides, and that they disarticulate from the stem, a circumstance which is indicated by their tapering footstalks. There are no other Endogens in which such a character exists, except certain Araceæ, to which I shall advert presently. The nearest approach to the structure with which I am acquainted, occurs in Lilium giganteum, but the leaves of that plant have a flat foliaceous petiole and do not disarticulate. The broad-leaved Amaryllidaceous plants like Griffinia, Eurycles, &c. are totally different; their leaves not only having no articulation with the stem, but having no reticulations between the ribs further than is produced by the anastomosing of the fine parallel secondary veins that connect the ribs. In this circumstance Roxburghia alone among Retosæ corresponds with them; but the petioles of that genus being rounded and disarticulating from the stem, a sufficiently plain distinction still remains. From some Araceæ the structure of the leaves will not divide Retosæ; and it was for that reason that in my Nixus, in which I first proposed to form this combination, I actually regarded the group of Retosæ as a mere alliance among Spadicosæ; but the lax inflorescence and more perfect floral envelopes as an external, and the embryo without a lateral slit for the emission of the plumule as an internal character, will prevent all possibility of confounding Retosæ with Spadicosæ.

I regard this group as passing directly into Menispermaceæ through Ripogonum, but as preserving a close connection with Liliaceæ through Roxburghia, and with Amaryllidaceæ through Dioscorea.

Order CCLVI. SMILACEÆ. The Smilax Tribe.

Essential Character.—*Flowers* hermaphrodite or dicœcious. *Calyx* and *corolla* confounded, inferior, 6-parted. *Stamens* 6, inserted into the perianth near the base; seldom hypogynous. *Ovary* 3-celled, the cells 1- or many-seeded; *style* usually trifid; *stigmas* 3. *Fruit* a roundish berry. *Albumen* between fleshy and cartilaginous; *embryo* usually distant from the hilum.—*Herbaceous* plants or *under-shrubs*, with a tendency to climb. *Stems* woody. *Leaves* reticulated.

Affinities. From what I have already said in a previous page, it is obvious that Smilaceæ, as I understand the order, is very different from that of other botanists. For its affinities see Liliaceæ, and Retosæ.

Geography. Found in small quantities in most parts of the world, especially in Asia and N. America.

Properties. Best known for the diuretic demulcent powers of Smilax Sarsaparilla, which also exist in other species of the same genus. Smilax aspera is a common substitute in the south of Europe. Smilax China has a large fleshy root, the decoction of which is supposed to have virtues equal to that of Sarsaparilla in improving the health after the use of Mercury. According to the Abbé Rochon, the Chinese often eat it instead of Rice, and it contributes to make them lusty. *Ainslie*, 1. 70.

GENERA.

Smilax, L.
Ripogonum, Forst.

Order CCLVII. DIOSCOREACEÆ. The Yam Tribe.

Dioscoreæ, *R. Brown Prodr.* 294. (1810); *Agardh Aphor.* 169. (1823); *Ach. Rich. Nouv. Elém.* 434. (1828).

Essential Character.—*Flowers* dicœcious. *Calyx* and *corolla* confounded, superior. *Males: Stamens* 6, inserted into the base of the sepals and petals. *Females: Ovary* 3-celled, with 1- or 2-seeded cells; *style* deeply trifid; *stigmas* undivided. *Fruit* leafy, compressed, with two of its cells sometimes abortive; occasionally succulent. *Seeds* flat. compressed; *embryo* small, near the hilum, lying in a large cavity of cartilaginous albumen, —Twining *shrubs*. *Leaves* alternate, occasionally opposite, with reticulated veins. *Flowers* small, spiked, with from 1 to 3 bracts each.

Affinites. According to Brown separable from Smilaceæ by the threefold character of inferior ovary, capsular fruit, and albumen having a large cavity. Tamus is, however, between the two tribes, agreeing with Smilaceæ in its baccate, with Dioscoreaceæ in its inferior fruit. *Prodr.* 294.

Geography. Found exclusively in tropical countries of either hemisphere, if Tamus be excluded.

Properties. The yams, so important a food in all tropical countries, because of their large, fleshy, mucilaginous, sweetish tubers, are the only remarkable plants of the order.

GENERA.

Tamus, L.
Tamnus, Juss.
Testudinaria, Salisb.
Rajania, L.
Dioscorea, L.
Ubium, Rumf.

Order CCLVIII. ROXBURGHIACEÆ.

Roxburghiaceæ, *Wall. Plant. As. Rar.* 3. 50. (1832); *Lindl. Nixus*, 23. (1833).

Essential Character.—*Perianth* of from 4 to 6 large petaloid divisions, occasionally subtended by membranous bracts. *Stamens* 4 to 6, sub-hypogynous; *anthers* opening inwards. *Ovary* superior, 1-celled, with polyspermous placentæ, which are either parietal or situated at the base of the pericarp; *style* filiform or none; *stigma* capitate, lobed, or roundish. *Pericarp* 1-celled, 2-valved, or valveless, either with 3 parietal polyspermous placentæ, or with 2 clusters of seeds at the base. *Seeds* (in Roxburghia) with a taper *embryo* in the axis of fleshy *albumen*.—Twining *shrubs*. *Leaves* either reticulated and coriaceous, or thinner with parallel secondary veins connecting several primary ribs. *Flowers* large and showy.

Affinities. This character, imperfect as it is, is framed for the purpose of comprehending the three genera mentioned below; I am by no means certain, however, that the two South American genera ought to be actually combined in the same natural order with that from India; they correspond very much in habit, and also in their parietal polyspermous placentæ; this I am able to state from having examined the ovary of both Lapageria and Philesia. In Roxburghia the placenta occupies the base of the shell of the fruit, in Philesia it runs up the side about half way, and in Lapageria it extends through the whole side. But on the other hand the structure of the flower of Roxburghia is dimerous, that of the other two trimerous; Roxburghia has no style and peculiar stamens, the others a long style like that of Lilium, and stamens of an ordinary character. Moreover the fruit of Lapageria is only known from the imperfect figure in the Flora Peruviana, and that of Philesia has never yet been even described. These genera, therefore, require to be examined in much more detail before they can be considered settled. Let me add, that in Lapageria the ovules are enveloped in mucus, and have the foramen at their point. Roxburghia is said to have stems 100 fathoms long. *Rees' Cycl.*

Geography. Natives of the hotter parts of India, and the temperate or cool parts of South America.

Properties. The roots of Roxburghia previously prepared with lime-water, are candied with sugar and taken with tea. Their flavour is insipid. *Roxb.*

GENERA.

Roxburghia, Dryand.
Stemona, Lour.

? § Philesieæ.
Philesia, Comm.
Lapageria, R. et P.

Group V. Spadicosæ.

Essential Character.—*Flowers* usually imperfect, with scales in the room of calyx and corolla, or naked; often unisexual; in most cases arranged on a spadix within a spathe. *Embryo* usually with a lateral cleft for the emission of the plumule.

The genus Arum will furnish the student with a good illustration of this group. He may consider that there is a tendency on the one hand to become arborescent, bear drupaceous fruit, and produce a larger number of stamens, as in Pandales; and on the other hand to lose the spadiceous character, firstly, by the production of ordinary spikes as in Juncaginaceæ; and secondly, by the reduction of the inflorescence to a single flower as in some Fluviales and in Pistiaceæ. It is not unworthy of remark, that in all these Endogenous

groups, with the exception of Gynandrosæ, there is at one point a very low form of organization, and at another a very high form. In the following lines the genera which are equivalent to each other in these respects are placed one over the other :—

Group 1.	Epigynosæ,	highest form Musaceæ;	lowest form Hydrocharaceæ.
2.	Gynandrosæ	?	?
3.	Hypogynosæ	Palmaceæ;	Juncaceæ.
4.	Retosæ	Roxburghia;	Dioscorea
5.	Spadicosæ	Pandanaceæ;	Pistiaceæ.
6.	Glumosæ	Bambuseæ;	Eriocauloneæ.

Are we to infer this, that Gynandrosæ ought to be sunk in Epigynosæ?

Alliance I. *PANDALES.*

Essential Character.—*Flowers* on a spadix. *Fruit* drupaceous. *Leaves* rigid and with parallel veins. *Stem* usually arborescent.

Order CCLIX. PANDANACEÆ. The Screwpine Tribe.

Pandaneæ, *R. Brown Prodr.* 340. (1810) ; *De Cand. Propr. Méd.* 278. (1816); *Agardh Aph.* 133. (1822) ; *Gaudichaud in Ann. des Sc.* 3. 509. (1824) ; *Schott et Endlicher Meletemata, p.* 15. (1832).

Essential Character.—*Flowers* dicœcious or polygamous, arranged on a wholly covered spadix. *Perianth* wanting. *Males: Filaments* with single anthers; *anthers* 2-celled. *Females: Ovaries* usually collected in parcels, 1-celled; *stigmas* as many as the ovaries, sessile, adnate (*ovules* solitary, erect). *Fruit* either fibrous drupes, usually collected in parcels, each 1-seeded; or many-celled *berries*, with polyspermous cells. *Albumen* fleshy; *embryo* in its axis, erect (not slit on one side); *plumule* inconspicuous.—*Stem* arborescent, usually sending down aerial roots, sometimes weak and decumbent. *Leaves* imbricated, in three rows, long, linear-lanceolate, amplexicaul, with their margins almost always spiny. *Floral leaves* smaller, often coloured. *R. Br.*

Affinities. This is a tribe of plants having the aspect of gigantic Bromelias, bearing the flowers of a Sparganium. While there is no analogy with the former in structure beyond the general appearance of the foliage; the organisation of the fructification bears so near a resemblance to the latter as to have led to the combination of Pandanaceæ and Typhaceæ by botanists of the first authority. But when we contrast the naked flowers, the compound highly-developed fruit, the spathaceous bracts, the entire embryo, and the arborescent habit of the former, with the half-glumaceous flowers, the simple fruit, the want of spathaceous bracts, the slit embryo, and the herbaceous sedgy habit of the latter, it is difficult to withhold our assent from the proposition to separate them. Brown justly remarks (*Prodr.* 341.), that these have no affinity with Palms beyond their arborescent stems. Freycinetia, the genus to which the character of polyspermous cells, minute seeds, and a pulpy pericarp belongs, is described by Gaudichaud as having a very minute embryo lodged in the upper part of semitransparent albumen. Pandanaceæ are remarkable among arborescent monocotyledons for their constant tendency to branch, which is always effected in a dichotomous manner. Their leaves have also a uniform spiral arrangement round the axis, so as to give the stems a sort of corkscrew appearance before the traces of the leaves are worn away. The Chandelier Tree of Guinea and St. Thomas's derives its name (Pandanus

Candelabrum) from this peculiar tendency to branching. According to *Fée* (1, 223.), Nipa ought to be referred here, and not to Palms.

Geography. Abundant in the Mascaren Islands, especially the Isle of France, where, under the name of Vaquois, they are found covering the sandy plains. They have peculiar means given them by nature to subsist in such situations in the shape of strong aerial roots, which are protruded from the stem, and descend towards the earth, bearing on their tips a loose cup-like coating of cellular integument, which preserves their tender newly-formed absorbents from injury until they reach the soil, in which they quickly bury themselves, thus adding at the same time to the number of mouths by which food can be extracted from the unwilling earth, and acting as stays to prevent the stems from being blown about by the wind. They are common in the Indian Archipelago, and in most tropical islands of the Old World, but are rare in America. *Humb. de Distr. Géogr.* 198.

Properties. The seeds of Pandanus are eatable. The flowers of Pandanus odoratissimus are fragrant and eatable. The fruit of several is also an article of food. The leaves are used for thatching and cordage. The immature fruit is reputed emmenagogue. *Humb.* l. c.

GENERA.

Pandanus, L. fil.
Arthrodactylis, Forst.
Keura, Forsk.
Freycinetia, Gaudich.

Order CCLX. CYCLANTHACEÆ.

Cyclantheæ, *Poiteau in Mem. Mus.* 9. 34. (1822); *Schott et Endlicher, Meletemata, p.* 15. (1832); *Martius Conspectus, No.* 22. (1835).—Phytelephanteæ, *Id. No.* 21. (1835).

Essential Character.—*Flowers* monœcious or polygamous, on the same densely covered spadix, spirally arranged; the spires alternately male and female. *Males:* (first completed) consisting of distinct stamens each with two anthers ? (or with 4-celled anthers,) opening longitudinally in 4 lines. *Females: Ovaries* surrounded with scales, often grown together, with parietal placentæ. *Fruit* often clustered, berried, growing together along with the scales that surround them. *Seeds* .—*Leaves* plaited, petiolate. *Spathes* dilated, membranous and coloured. *Inflorescence* terminal. *Schott.*

Affinities. Very near Pandanaceæ, from which their leaves and spirally arranged flowers chiefly divide them. Phytelephas resembles Palms in its fronds, which equal those of the Cocoa Nut in dimensions, in its torulose scaly stem, and, finally, in the remarkable structure and weight of its fruit. *Humb. de Distr. Géogr.* 198.

Geography. Natives of the tropics of the western hemisphere.

Properties. Buttons are turned from the hard albumen of Phytelephas or the Tagua plant. *Humb.* l. c.

GENERA.

Phytelephas, R. et P.
Elephantusia, W.

Carludovica, R. et P.
Salmia, W.
Ludovia, Pers.

Cyclanthus, Poit.
Cyclosanthes, Pöpp.

Alliance II. *ARALES.*

Essential Character.—*Flowers* on a spadix. *Fruit* either berried or capsular.

Order CCLXI. ARACEÆ. The Arum Tribe.

Aroideæ, *Juss. Gen.* 23. (1789); *R. Brown Prodr.* 333. (1810); *DC. and Duby*, 480. (1828); *Lindl. Synops.* 246. (1829); *Martius in Bot. Zeitung*, 1831. p. 449. *Richard in Arch. de Bot.* 1. 11. (1833).—Araceæ, *Schott Meletemata*, 16. (1832).

Essential Character.—*Flowers* unisexual, arranged upon a spadix, within a spathe, *Perianth* wanting. *Males: Stamens* definite or indefinite, hypogynous, very short; *anthers* 1- 2- or many-celled, ovate, turned outwards. *Females: Ovary* superior, 1-celled, very seldom 3-celled, and many-seeded; *ovules* erect, or pendulous, or parietal; *stigma* sessile. *Fruit* succulent. *Seeds* pulpy; *embryo* in the axis of fleshy or mealy albumen, straight, taper, with a cleft in one side, in which the plumule lies; (*radicle* obtuse, usually next the hilum, occasionally at the opposite extremity. *R. Br.*) *Albumen* sometimes wanting.—*Herbaceous* plants, frequently with a fleshy *cormus*, or *shrubs*; stemless or arborescent, or climbing by means of aerial roots. *Leaves* sheathing at the base, convolute in the bud, either with parallel or branching veins; sometimes compound! often cordate. *Spadix* generally enclosed in a *spathe*.

Affinities. The Arum tribe may be considered the centre of a system of organisation, of which the other orders of Spadicosæ are rays of unequal length. Taking its diagnosis as given above, we shall have it specially known by its highly developed spathe; Typhaceæ will be distinguished by their long anthers and want of spathe; Pandanaceæ by their arborescent habit and drupaceous compound fruit; Fluviales and Juncaginaceæ by their want of spathe and by their return from the spadiceous form of inflorescence; and Pistiaceæ by their reduction to the simplest state in which flowering plants can exist. The whole of these tribes, taken together, are known by their general tendency to develope their flowers upon a spadix, by their want of floral envelopes, or by those parts not assuming the distinct forms of calyx and corolla, but existing only in the state of herbaceous scales. With the exception of Pandanaceæ, they are all also known by their plumule lying within a cleft of the embryo; a structure found in no other monocotyledonous plants, except Grasses, in which the embryo is otherwise widely different. Brown has remarked that in Dracontium polyphyllum and fœtidum, in which there is no albumen, the plumule consists of imbricated scales, and that is sometimes double or even triple. In the former of these plants the external scales, in germination, quickly wither away, when other internal and larger ones appear, and remain for some time round the base of the primordial leaf, before the developement of which no rootlets are emitted. *Prodr.* 334. A similar economy has been noticed by Du Petit Thouars, in his genus Ouvirandra in Alismaceæ. The order has been remodelled by Schott, upon whose authority I give the genera, &c.

Geography. Natives of all tropical countries abundantly, but of temperate climates rarely, not extending in Europe further north than 64° north latitude, in the form of Calla palustris, which inhabits the deep, muddy, frozen marshes of southern Lapland. In cold or temperate climates they are usually herbaceous, while in tropical countries they are often arborescent and of considerable size, frequently clinging to trees by means of their aerial roots, which they protrude in abundance. In America, according to Humboldt (*Distr. Géogr.* 196.), their principal station is on the submontane region between 1200 and 3600 feet of elevation, where the climate is temperate and the rains abundant. In the Andes, Pothos pedatus and P. quinquenervius rise to the height of 8400 feet.

Properties. A principle of acridity generally pervades this tribe, and ex-

ists in so high a degree in some of them as to render them dangerous poisons. The most remarkable is the Dumb Cane, or Caladium Seguinum, a native of the West Indies and South America, growing to the height of a man: this plant has the power, when chewed, of swelling the tongue and destroying the power of speech. Hooker relates an account of a gardener, who "incautiously bit a piece of the Dumb Cane, when his tongue swelled to such a degree that he could not move it; he became utterly incapable of speaking, and was confined to the house for some days in the most excruciating torments." *Exot. Bot.* 1. The same excellent botanist adds, that it is said to impart an indelible stain to linen. P. Browne states, that its stalk is employed to bring sugar to a good grain when it is too viscid, and cannot be made to granulate properly by the application of lime alone; Arum ovatum is used for the same purpose. The leaves of Arum esculentum excite violent salivation and a burning sensation in the fauces, as I have myself experienced. The fresh leaves of Dracontium pertusum are employed by the Indians of Demerara as vesicatories or rubefiants in cases of dropsy. Milk in which the acrid root of Arum triphyllum has been boiled has been known to cure consumption. *DC.* Notwithstanding this acridity, the flat under-ground stems, called roots, and the leaves of many Araceæ, are harmless, and even nutritive when roasted or boiled, as, for instance, the roots of Arum esculentum, Colocasia, mucronatum, violaceum, and others, which, under the names of Cocoa root, Eddoes, and Yams, are common articles of food in hot countries. The roots (cormi) of the Arum maculatum are commonly eaten by the country people in the Isle of Portland; they are macerated, steeped, and the powder obtained from them is sent to London for sale under the name of Portland Sago. *Enc. of Pl.* 800. Medicinally, the root in its recent state is stimulant, diaphoretic, and expectorant. The root and seeds of the Skunk Cabbage, Symplocarpus fœtida, are powerful antispasmodics; they are also expectorants, and useful in phthisical coughs. They have considerable reputation in North America as palliatives in paroxysms of asthma. *Barton*, 1. 130. The prepared root of Dracontium polyphyllum is supposed in India to possess antispasmodic virtues, and is considered a valuable remedy in asthma; it is also used in hemorrhoids. *Ainslie*, 2. 50. The root of the Labaria plant of Demerara, which is probably the same thing, is thought by the Indians to be an antidote to the bite of serpents. *Ed. N. Ph. Journ. June* 1830, p. 169. The root of Acorus calamus is aromatic and stimulant. The seeds of Orontium aquaticum and Arum sagittifolium are acrid, but become eatable by roasting. The spadixes of some species have a fetid putrid smell; others, such as Arum cordifolium, Italicum, and maculatum, are said to disengage a sensible quantity of heat at the time when they are about to expand. Agardh considers that the acrid principle, which, notwithstanding its fugacity, has been lately obtained pure, is no doubt of great power as a stimulant. *Aph.* 133.

GENERA.

§ 1. Ambrosinieæ, Schtt.
Cryptocoryne, Fisch.
Ambrosinia, Mich.
Stylochæton, Lepr.

§ 2. Dracunculineæ, Schtt.
Arisarum, Tourn.
Balmisa, Lag.
Arisæma, Mart.
Biarum, Schtt.
Arum, L.
Typhonium, Schtt.
Sauromatum, Schtt.
Dracunculus, Tourn.
Pythion, Mart.
Candarum, Rchb.
Amorphophallus, Bl.
Thomsonia, Wall.
Pythonium, Schtt.

§ 3. Caladieæ, Schtt.
Remusatia, Schtt.
Colocasia, Ray.
Caladium, Vent.
Peltandra, Raf.
Xanthosoma, Schtt.
Acontias, Schtt.
Syngonium, Schtt.
Culcasia, Beauv.
Denhamia, Schtt.
Philodendron, Schtt.

§ 4. Anaporeæ, Schtt.
Pothos, L.
Lasia, Lour.
Anthurium, Schtt.
Spathiphyllum, Schtt.
Dracontium, L.
Symplocarpus, Salisb.
Ictodes, Big.
Spathyema, Raf.
Orontium, L.
Spathicarpa, Hooker.
Dieffenbachia, Schtt.
Homalomena, Schtt.
Aglaonema, Schtt.
Richardia, Kth.
Zantedeschia, Spr.

§ 5. Calleæ, Schtt.
Calla, L.
Monstera, Adans.
Scindapsus, Schtt.

§ 6. Orontiaceæ, R. Br. Prodr. 337. (1810)

Order CCLXII. ACORACEÆ.

Acoroideæ, *Ag. Aphorism.* 133. (1822); *Schott Meletemata*, 22. (1832).—Acorinæ, *Link Handb.* 1. 144. (1829).

Essential Character.—*Flowers* hermaphrodite, surrounded with scales. *Spathe* leaf-like, not rolled up. *Stamens* complete, opposite the scales, with 2-celled anthers turned inwards. *Ovaries* distinct. *Fruit* baccate, finally juiceless. *Seeds* albuminous, with the embryo in the axis.—*Rhizoma* jointed. *Leaves* ensiform, embracing each other in the bud. *Schott.*

Affinities. Cut off from Araceæ chiefly on account of the different arrangement of leaves in the bud, and consequent habit; and because of the scaly rudiments of the perianth which are always present. I place here Aspidistra and Tupistra, not because I believe that this is really the station of these curious plants, but because I really do not know what else to do with them.

Geography. Entirely inhabitants of the temperate parts of the Eastern hemisphere.

Properties. Acorus Calamus is slightly aromatic.

GENERA.

Acorus, L.	Tupistra, Ker.	Aspidistra, Ker.
Gymnostachys, R. Br.	*Rohdea*, Roth.	*Macrogyne*, Lk.

* *

Alliance III. *TYPHALES.*

Essential Character.—*Flowers* on a spadix. *Anthers* clavate on long filaments. *Sepals* of the females either 3, or a ring of long hairs.

Order CCLXIII. TYPHACEÆ. The Bulrush Tribe.

Typhæ, *Juss. Gen.* 25. (1789).—Aroideæ, § 3. *R. Brown Prodr.* 338. (1810).—Typhinæ, *Agardh Aph.* 139. (1823).—Typhaceæ, *DC. and Duby*, 482. (1828); *Lindl. Synops.* 247. (1829); *Richard in Arch. de Bot. vol.* 1. *p.* 193. (1833).—Typhoideæ *and* Sparganioideæ, *Link Handb.* 1. 132. 133. (1829), *both sections of* Cyperaceæ.

Essential Character.—*Flowers* unisexual, arranged upon a naked spadix. *Sepals* 3, or more, sometimes a mere bundle of hairs. *Petals* wanting. *Males: Stamens* 3 or 6, *anthers* wedge-shaped, attached by their base to long filaments, which are sometimes monadelphous. *Females: Ovary* single, superior, 1-celled; *ovule* solitary, pendulous; *style* short; *stigmas* 1 or 2, simple, linear. *Fruit* dry, not opening, 1-celled, 1-seeded. *Embryo* in the centre of *albumen*, straight, taper, with a cleft in one side, in which the plumule lies; *radicle* next the hilum.—*Herbaceous* plants, growing in marshes or ditches. *Stems* without nodi. *Leaves* rigid, ensiform, with parallel veins. *Spadix* without a spathe.

Affinities. Jussieu, following Adanson, distinguishes these from Araceæ, with which Brown re-unites them, retaining them, however, in a separate section. They are generally regarded as a distinct tribe by most writers, and are surely sufficiently characterised by their calyx being 3-sepaled and half-glumaceous, or a mere bundle of long hairs, long lax filaments, clavate anthers, solitary pendulous ovules, and peculiar habit. Agardh refers Typhaceæ to glumaceous Monocotyledons, on account of the analogy between the calyx of Typha and the hypogynous hairs of Eriophorum, a genus of Cyperaceæ. They are combined with Pandanaceæ by Kunth, but appear to be sufficiently distin-

guished by the slit in the side of their embryo, their simple fruit, pendulous ovule, trisepalous calyx, and habit.

Geography. Found commonly in the ditches and marshes of the northern parts of the world, but uncommon in tropical countries; a species is found in St. Domingo, and another in New Holland. Two are described from equinoctial America.

Properties. Of little known use. The powdered flowers have been used as an application to ulcers. The pollen of Typha is inflammable, like that of Lycopodium, and is used as a substitute for it. De Candolle remarks that it is probable the facility of collecting this pollen is the real cause of its use, and that any other kind would do as well.

GENERA.

Typha, L. Sparganium, L.

Alliance IV. *FLUVIALES.*

Essential Character.—*Flowers* in loose spikes or solitary.

Order CCLXIV. FLUVIALES, or NAIADACEÆ.

Naiades, *Juss. Gen.* 18. (1789) *in part.*—Fluviales, *Vent. Tabl.* 2. 80. (1799).—Potamophilæ, *Rich. Anal. Fr.* (1808).—Potameæ, *Juss. Dict. Sc. Nat.* 43. 93. (1826); *DC. and Duby,* 439. (1828).—Naiadeæ, *Agard Aph.* 125. (1822).—Fluviales, *Rich. Mém. Mus.* 1. 364. (1815); *Lindl. Synops.* 248. (1829).—Hydrogetones, *Link Handb.* 1. 282. (1829).—Naiadeæ, *Ib.* 1. 820. (1829).—Potamogetoneæ, *Rchb. Fl. Excurs.* 1. 6. (1830).

Essential Character.—*Flowers* hermaphrodite or unisexual. *Perianth* of 2 or 4 pieces, often deciduous, rarely wanting. *Stamens* definite, hypogynous. *Ovaries* 1 or more, superior; *stigma* simple; *ovule* solitary, pendulous. *Fruit* dry, not opening, 1-celled, 1-seeded. *Seed* pendulous; *albumen* none; *embryo* antitropous, with a lateral cleft for the emission of the plumule.—*Water-plants. Leaves* very cellular, with parallel veins. *Flowers* inconspicuous, usually arranged in terminal *spikes.*

Affinities. In this order we have the nearest approach, except in Pistiaceæ, to the division of flowerless plants. The perianth is reduced to a few imperfect scales, and there is in some of the genera either a total absence of spiral vessels, or that form of tissue exists in a very rudimentary state. Pollini asserts, according to De Candolle (*Org. Veg.* 40), that spiral vessels do exist in them; but Amici, on the other hand, maintains that there is no trace of them, at least in Caulinia. *Ann. des Sc.* 2. 42. The manifest affinity of Fluviales to Juncaginaceæ determines a relation on the part of the former to Araceæ, which is confirmed by the tendency to produce a rudimentary spathe in some of them, and by their undoubted resemblance to Pistiaceæ, which may be understood as reduced Araceæ. It is remarkable that Adanson was aware of this relationship between Araceæ and Fluviales, to which, however, Jussieu, whose Naiades are a very heterogeneous assemblage, did not assent. They are generally translucent cellular plants, destitute of stomates, having no epidermoidal layer, and perishing rapidly upon exposure to air. Amici has seen the sap circulate in the transparent joints of Caulinia fragilis, which he states is the unknown plant upon which Corti made observations relating to the same subject. See Amici in *Ann. des Sc.* 4. 42. Agardh refers to this order both Ceratophyllum and Sparganium.

Geography. Common in extra-tropical countries, but also found near the equator. Potamogetons are in every ditch and swamp as far north as Iceland.

Properties. Very unimportant. The root of Potamogeton natans is said to be eaten in Siberia. Zostera, or Sea wrack, is a common material for packing, and for stuffing cottagers' cushions.

GENERA.

Najas, L.	Posidonia, Kœn.	Zannichellia, L.	Potamogeton, L.
Caulinia, Willd.	*Kernera*, Willd.	Alteinia, Petit.	*Peltopsis*, Rafin.
Fluvialis, Pers.	*Caulinia*, DC.	*Bellevalia*, Del.	Cymodocea, Kœn.
Zostera, L.	Halophila, Pet. Thou.	Ruppia, L.	*Phucagrostis*, Cav.
Thalassia, Banks.	Barkania, Ehrenb.	Graumüllera, Reich.	Epigynanthus, Bl.

Order CCLXV. JUNCAGINACEÆ.

Juncagineæ, *Rich. Anal. Fr.* (1808); *Mém. Mus.* 1. 364. (1815); *Lindl. Synops.* 252. (1829); *DC. and Duby*, 438. (1828), *a sect. of* Alismaceæ.

Essential Character.—*Sepals* and *petals* both herbaceous, rarely absent. *Stamens* 6. *Ovaries* 3 or 6, superior, cohering firmly; *ovules* 1 or 2, approximated at their base, erect. *Fruit* dry, 1- or 2-seeded. *Seeds* erect; *albumen* wanting; *embryo* having the same direction as the seed, with a lateral cleft for the emission of the plumule.—*Herbaceous* bog-plants. *Leaves* ensiform, with parallel veins. *Flowers* in spikes or racemes, inconspicuous.

Affinities. The plumule lying within a cleft on one side of the embryo fixes these plants nearer Araceæ than Alismaceæ, to which they are sometimes referred, principally on account of their want of albumen; and the depauperated state of their floral envelopes confirms the relationship. Juncaginaceæ are most nearly allied to Fluviales, which are readily distinguished by their floating habit and pendulous ovules. The genus Scheuchzeria is a transition from Juncaginaceæ to Juncaceæ.

Geography. Marshy places in most parts of the world may be expected to indicate traces of this order, which is found in Europe, Asia, and North America, the Cape of Good Hope, and equinoctial America.

Properties. Unknown. Triglochin has a salt taste.

GENERA.

Triglochin, L.	Tetroncium, W.
Scheuchzeria, L.	Lilæa, H. et B.

Order CCLXVI. PISTIACEÆ. The Duckweed Tribe.

Pistiaceæ, *Rich. in Humb. et Bonpl. N. G. et Sp.* 1. 81. (1815); *Lindl. in Hooker's Fl. Scot.* 2. 191. (1821); *Synops.* 251. (1829).—Lemnaceæ, *DC. and Duby*, 532. (1828).

Essential Character.—*Flowers* 2, naked, enclosed in a spathe. *Male: Stamens* definite. *Female: Ovary* 1-celled, with 1 or more erect *ovules; style* short; *stigma* simple. *Fruit* membranous or capsular, not opening, 1- or more-seeded. *Seeds* with a fungous testa, and a thickened indurated foramen; *embryo* either in the axis of fleshy albumen, and having a lateral cleft for the emission of the *plumule*, or at the apex of the nucleus.

—*Floating* plants, with very cellular, lenticular, or lobed *stems* and *leaves* confounded. *Flowers* appearing from the margin of the stems.

Affinities. These are plants of a still simpler organisation than Fluviales, like them apparently destitute of spiral vessels, and not producing any separate stem or leaves, but a body formed out of both, from within the substance of which proceeds a membranous spathe containing one naked male and one naked female flower; a stem and two flowers thus constituting the whole of the plant. But if an abstraction be made of the simplicity of this structure, and the organisation be considered as if it belonged to plants of a more highly developed character, it will be found that these are really nothing but Araceæ, the spadix of which is reduced to two flowers of different sexes. But while the accuracy of this view of the nature of Pistiaceæ is not likely to be questioned, it must be borne in mind that this very reduction of parts is inconsistent with the notion of Araceæ, properly so called; and hence the necessity of constituting a particular order. I find from an examination of seeds of Pistia, most kindly procured from India for me by Dr. Wallich, that the embryo is a minute body lying at the apex of the albumen; in Lemna it occupies the axis; in both there is a fungous testa, with a remarkable induration of the foramen of the secundine. The embryo of Pistia is very minute, and perhaps solid; but in Lemna there is the slit on one side for the emission of the plumule, just as in Araceæ. In Hooker's *Botanical Miscellany*, part 2, is an account of the germination of Lemna, by Wilson of Warrington, which is worth consulting. See for an elaborate account of the seed, &c. of Lemna, the *Arch. de Botanique, vol.* 1. *p.* 200, by Richard, and the same work *vol.* 2. *p.* 97, by Adolphe Brongniart. Both should be examined as these two learned Botanists are not agreed as to what the structure really is.

Geography. Lemna inhabits the ditches of the cooler parts of the world; Pistia the tropics.

Properties. Pistia Stratiotes grows in water-tanks in Jamaica, where, according to Browne, it is acrid, and in hot dry weather impregnates the water with its particles to such a degree as to give rise to the bloody flux. *Hist. of Jam.* 330. A decoction of the same plant is considered by the Hindoostanees as cooling and demulcent, and they prescribe it in cases of dysuria. The leaves are also made into a poultice for the piles. *Ainslie.*

GENERA.

Pistia, L. Lemna, L.

Group VI. Glumaceæ.

Essential Character.—*Perianth* usually 0, in its room herbaceous or scarious bracts, imbricated over each other; if present surrounded by such bracts.

These are distinctly characterised by the want of a true perianth, in the room of which the floral envelopes are formed by imbricated bracts. The paleæ of Grasses approach the nature of a calyx; but as they do not originate from the same plane, they cannot, practically, be confounded with a calyx, however near such an organ they may, upon theoretical principles, be considered to approach. The same may be said of the hypogynous setæ of Cyperaceæ, which, although probably of the nature of a perianth, exist in so rudimentary a state as not to form a real exception to the character of Glumaceæ. Restiaceæ and Palms connect petaloideous Monocotyledons with Gluma-

ceæ; the former by approaching Cyperaceæ, the latter Grasses. Where, as in Xyridaceæ, there is a distinct coloured perianth, the imbricated glumaceous bracts that surround it sufficiently point out this group.

Order CCLXVII. GRAMINEÆ, or GRAMINACEÆ. } The Grass Tribe.

Gramina, *Juss. Gen.* 28. (1789).—Gramineæ, *R. Brown Prodr.* 168. (1810); *Palisot de Beauv. Agrostog.* (1812); *Kunth in Mem. Mus.* 2. 62. (1815); *Id. in N. G. et Sp. Humb. et Bonpl.* 1. 84. (1815); *Turpin in Mém. Mus.* 5. 426. (1819); *Trinius Fundam. Agrostol.* (1820); *Agardh Aphor.* 143. (1823); *Kunth Synops.* 1. 163. (1823); *Dumortier Agrost. Belg.* (1823); *Trinius Diss. de Gram. Unifl. et Sesquif.* (1824); *De la Harpe in Ann. Sc.* 5. 335. 6. 21. (1825); *Ruspail in Ann. des Sc.* 4. 271. 422. 5. 287. 433. 6. 224. 384. (1825), 7. 335. (1826); *Link Hortus Botanicus* 1. (1827); *Lindl. Synops.* 223. (1829); *Nees v. Esenbeck Agrostog. Brasil.* (1829); *Kunth Enum. pl. vol.* 1 *et* 2. (1833-4); *Nees v. Esenbeck in Linnæa*, 9. 461. (1835).

Essential Character.—*Flowers* usually hermaphrodite, sometimes monœcious or polygamous; consisting of imbricated bracts, of which the most exterior are called *glumes*, the interior immediately enclosing the stamens *paleæ*, and the innermost at the base of the ovarium *scales*. *Glumes* usually 2, alternate; sometimes single, most commonly unequal. *Paleæ* 2, alternate; the lower or exterior simple, the upper or interior composed of 2 united by their contiguous margins, and usually with 2 keels, together forming a kind of dislocated calyx. *Scales* 2 or 3, sometimes wanting; if 2, collateral, alternate with the paleæ, and next the lower of them; either distinct or united. *Stamens* hypogynous, 1, 2, 3, 4, 6, or more, 1 of which alternates with the 2 hypogynous scales, and is therefore next the lower palea; *anthers* versatile. *Ovary* simple; *styles* 2, very rarely 1 or 3; *stigmas* feathery or hairy. *Pericarp* usually undistinguishable from the seed, membranous. *Albumen* farinaceous; *embryo* lying on one side of the albumen at the base, lenticular, with a broad cotyledon and a developed plumula; and occasionally, but very rarely, with a second cotyledon on the outside of the plumula, and alternate with the usual cotyledon.—*Rhizoma* fibrous or bulbous. *Culms* cylindrical, usually fistular, closed at the joints, covered with a coat of silex. *Leaves* alternate, with a split sheath. *Flowers* in little spikes called *locustæ*, arranged in a spiked, racemed, or panicled manner.

Affinities. This family is one which offers more singularities in its organisation than any other among flowering plants, although it is one in which, formerly, botanists the least suspected anomalies of organisation to exist. They found calyx and corolla and nectaries here with the same facility as they found them in a Ranunculus; and yet it may be doubted whether such organs exist in any one genus of Grasses.

Before I advert to the affinities of this tribe, it is indispensable that the real nature of this organisation should be understood. I shall, therefore, without occupying myself with the views of Linnæus and his school, first cite Brown's account of the structure of Grasses, and then proceed to offer some observations upon the views that other botanists have taken of the subject.

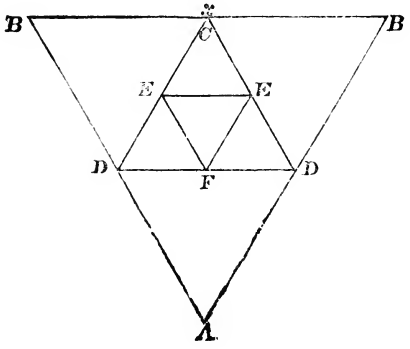
Brown's statement is this:—

"The natural or most common structure of Gramineæ is to have their sexual organs surrounded by the floral envelopes, each of which usually consist of two distinct valves; but both of these envelopes are, in many genera of the order, subject to various degrees of imperfection or even suppression of their parts. The outer envelope, or gluma of Jussieu, in most cases containing several flowers with distinct and often distant insertions on a common receptacle, can only be considered as analogous to the bracteæ or involucrum of other plants. The tendency to suppression in this envelope

appears to be greater in the exterior or lower valve; so that a gluma consisting of one valve may, in all cases, be considered as deprived of its outer or inferior valve. In certain genera with a simple spike, as Lolium and Lepturus, this is clearly proved by the structure of the terminal flower or spicula, which retains the natural number of parts; and in other genera not admitting of this direct proof, the fact is established by a series of species shewing its gradual obliteration, as in those species of Panicum which connect that genus with Paspalum. On the other hand, in the inner envelope, or calyx of Jussieu, obliteration first takes place in the inner or upper valve; but this valve having, instead of one central nerve, two nerves equidistant from its axis, I consider it as composed of two confluent valves, analogous to what takes place in the calyx and corolla of many irregular flowers of other classes; and this confluence may be regarded as the first step towards its obliteration, which is complete in many species of Panicum, in Andropogon, Pappophorum, Alopecurus, Trichodium, and several other genera. With respect to the nature of this inner or proper envelope of Grasses, it may be observed, that the view of its structure now given, in reducing its parts to the usual ternary division of Monocotyledones, affords an additional argument for considering it as the real perianthium. This argument, however, is not conclusive, for a similar confluence takes place between the two inner lateral bracteæ of the greater part of Irideæ; and with these, in the relative insertion of its valves, the proper envelope of Grasses may be supposed much better to accord than with a genuine perianthium. If, therefore, this inner envelope of Grasses be regarded as consisting merely of bracteæ, the real perianthium of the order must be looked for in those minute scales, which, in the greater part of its genera are found immediately surrounding the sexual organs. These scales are, in most cases, only two in number, and placed collaterally within the inferior valve of the proper envelope. In their real insertion, however, they alternate with the valves of this envelope, as is obviously the case in Ehrharta and certain other genera; and their collateral approximation may be considered as a tendency to that confluence which uniformly exists in the parts composing the upper valve of the proper envelope, and which takes place also between these two squamæ themselves, in some genera, as Glyceria and Melica. In certain other genera, as Bambusa and Stipa, a third squamula exists, which is placed opposite to the axis of the upper valve of the proper envelope, or, to speak in conformity with the view already taken of the structure of this valve, opposite to the junction of its two component parts. With these squamæ the stamina in triandrous Grasses alternate, and they are consequently opposite to the parts of the proper envelope; that is, one stamen is opposed to the axis of its lower or outer valve, and the two others are placed opposite to the two nerves of the upper valve. Hence, if the inner envelope be considered as consisting of bracteæ, and the hypogynous squamæ as forming the perianthium, it seems to follow, from the relation these parts have to the axis of inflorescence, that the outer series of this perianthium is wanting, while its corresponding stamina exist, and that the whole or part of the inner series is produced while its corresponding stamina are generally wanting. This may, no doubt, actually be the case; but as it would be, at least, contrary to every analogy in Monocotyledonous plants, it becomes in a certain degree probable that the inner or proper envelope of Grasses, the calyx of Jussieu, notwithstanding the obliquity in the insertion of its valves, forms in reality the outer series of the true perianthium, whose inner series consists of the minute scales, never more than three in number, and in which an irregularity in some degree analogous to that of the outer series generally exists. It is necessary to be aware of the tendency to suppression existing, as it were, in opposite directions in the two floral envelopes of Grasses, to comprehend the real structure of many irre-

gular genera of the order, and also to understand the limits of the two great tribes into which I have proposed to subdivide it. One of these tribes, which may be called Paniceæ, comprehends Ischæmum, Holcus, Andropogon, Anthistiria, Saccharum, Cenchrus, Isachne, Panicum, Paspalum, Reimaria, Anthenantia, Monachne, Lappago, and several other nearly related genera; and its essential character consists in having always a locusta of two flowers, of which the lower or outer is uniformly imperfect, being either male or neuter, and then not unfrequently reduced to a single valve. Ischæmum and Isachne are examples of this tribe in its most perfect form, from which Anthenantia, Paspalum, and Reimaria, most remarkably deviate, in consequence of the suppression of certain parts: thus Anthenantia (which is not correctly described by Palisot de Beauvois) differs from those species of Panicum that have the lower flower neuter and bivalvular, in being deprived of the outer valve of its gluma; Paspalum differs from Anthenantia in the want of the inner valve of its neuter flower, and from those species of Panicum whose outer flower is univalvular, in the want of the outer valve of its gluma; and Reimaria differs from Paspalum in being entirely deprived of its gluma. That this is the real structure of these genera may be proved by a series of species connecting them with each other, and Panicum with Paspalum. The second tribe, which may be called Poaceæ, is more numerous than Paniceæ, and comprehends the greater part of the European genera, as well as certain less extensive genera peculiar to the equinoctial countries; it extends also to the highest latitudes in which Phænogamous plants have been found; but its maximum appears to be in the temperate climates, considerably beyond the tropics. The locusta in this tribe may consist of 1, 2, or of many flowers; and the 2-flowered genera are distinguished from Paniceæ by the outer or lower flower being always perfect, the tendency to imperfection in the locusta existing in opposite directions in the two tribes. In conformity with this tendency in Poaceæ, the outer valve of the perianthium in the single-flowered genera is placed within that of the gluma, and in the many-flowered locusta the upper flowers are frequently imperfect. They are, however, some exceptions to this order of suppression, especially in Arundo Phragmites, Campulosus, and some other genera, in which the outer flower is also imperfect: but as all of these have more than two flowers in their locusta, they are still readily distinguished from Paniceæ." *Brown in Flinders*, 580.

According to this view, in a locusta of several florets, the scales at its base, or glumes, are bracts, and each floret consists of a calyx formed of one sepal remote from the rachis, and two cohering by their margins and next the rachis; the little hypogynous scales are the rudiments of two petals, and the stamens alternate with these in the normal manner. This may be rendered more clear by the following diagram,



in which the triangle A B B represent the outer series, or paleæ, or calyx, A being the inferior valve, and B B the superior, formed of two sepals united by their contiguous margin at *x*. If the triangle C D D be understood to represent the next series, the position of the parts will be at the three angles; and in reality the two scales that are usually developed do occupy the places D D; while the third, whenever it is superadded, is stationed at C. The triangle E E F indicates by its angles the normal position of the first series of stamens, which are actually so situated, the stamen F which is opposite the sepal A alternating with the rudimentary petals D D.

The principal objection to this is, that the parts of the supposed calyx or paleæ are not inserted upon the same plane, or truly verticillate, and consequently do not answer exactly to what is required in a floral envelope; and it is on this account that Turpin rejects Brown's opinion, giving the paleæ the name of spathelle, and considering them bracts of a second order. But after all, this is a question of words rather than of facts; for what are sepals but bracts of a second order? and what difficulty is there in identifying bracts having the near approach to a verticillate state, and the perfect symmetry of position that those of Grasses possess, with a kind of dislocated calyx?

Kunth entertains a somewhat different view of the nature of the floral envelopes, considering the hypogynous scales to be analogous to the ligula, and the normal state of Grasses to be hexandrous. See *Enumeratio*, vol. 1. p. 3. 4.

Raspail, in a memoir upon the structure of Gramineæ, hazards a theory, that the midrib of the bracts of Grasses is an axis of developement in cohesion with the bracts, and that when it separates, as in Phleum, Bromus, or Corynephorus, it is attempting to revert to the functions of ulterior developement, for which it is more especially destined. Among other things he states (*Ann. des Sc.* 4. 276. E.) that he should not be surprised one day to find some Grass in which the midrib of the lower palea actually became a new axis bearing other florets. I mention this for the sake of remarking that such a case is known, without however admitting that it is any confirmation of Rapsail's views, which are at variance with the laws of vegetable developement, for reasons which are so obvious, as to render it altogether unnecessary to give them here. I have a monstrous Barley, the Hordeum Ægiceras of Royle, cultivated as Wheat in the Himalayeh mountains, specimens of which I communicated in 1830 to Kunth and others, in which the midrib of the lower palea actually becomes saccate towards the apex, *bearing an imperfect floret, with stamens, ovary, and hypogynous scales, in its cavity*. What we know of the tendency to a special developement of buds in the margins of certain leaves, in Ferns, and according to the observations of Turpin, in the whole substance of certain monocotyledonous leaves, there is nothing in this fact to excite surprise or to give rise to new theories; but it is worth mentioning as the only instance upon record of a flower-bud with sexual apparatus being developed under such circumstances.

The embryo is here described in conformity with the views that are most commonly taken of its nature; that is to say, it is considered to consist of a dilated lenticular cotyledon applied to the albumen on one side, and bearing a naked plumule on the other side, next the testa. It is proper, however, to remark, that the opinion of the late L. C. Richard, that the part commonly called cotyledon is a peculiar process, and that the plumule is a body contained within the apparent plumule, has been lately adopted by Nees v. Esenbeck, in his *Agrostologia Brasiliensis*, but with some difference. Richard considered the cotyledon to be a part of the radicle, to which he gave the name of macropodal, in consequence of its great supposed enlargement in Grasses

and some other families; Nees v. Esenbeck, on the contrary, seems to entertain the opinion that this cotyledon is a special organ, for which he retains Richard's name of hypoblastus, although he does not adopt the view that botanist took of its nature. But I think if we consider the improbability of any special organ being provided for Grasses, which is not found elsewhere, and if we consider how nearly alike are the embryos of Grasses and certain Araceæ, in which the plumule lies within a cleft of the cotyledon, it is impossible to doubt the identity of the hypoblastus of Richard and Nees v. Esenbeck, and the cotyledon of other Monocotyledons. Indeed, the latter himself appears, in one place, to hesitate about the accuracy of distinguishing them, when he says (p. 9), "Tum vero hypoblastus pars quædam habenda est cotyledoni analoga, magisque ad interiora seminis quam ad externam corculi evolutionem spectans."

The structure of the stem of Grasses is so much at variance, apparently, with that of other Endogenous plants, as to have led Agardh to remark, that it is the least monocotyledonous of all Monocotyledonous plants. It is probable, however, that its peculiarity does not depend so much upon any specific deviation from the ordinary laws of growth in Endogens, as upon a separation of the parts at an early period of their growth. The stem of a Grass, it must be remembered, exists in two different states,—that of the rhizoma, and of the culm: the rhizoma, which is the true trunk; and the culm, which may be considered a ramification of it. The rhizoma grows slowly, and differs in no respect from the stem of other Monocotyledons, as is evident in that of the Bamboo. The culm, on the contrary, which grows with great rapidity, is fistular, with a compact impervious diaphragm at each articulation; a fact which must be familiar to every one who has examined a straw, or the joint of a Bamboo. In the beginning, when this culm was first developed, it was a solid body like the rhizoma, only infinitely smaller; but in consequence of the great rapidity of its developement, the cellular tissue forms more slowly that the woody vascular bundles which it connects, and in consequence a separation takes place between the latter and the former, except at the articulations, where, by the action of the leaves and their axillary buds, is formed a plexus of vessels, which grows as rapidly as the culm distends, and therefore never separates in the centre. Something analogous to this occurs in the flowering stem of the common Onion among Monocotyledons, and in Umbelliferæ among Dicotyledons.

The strict relation that exists between Palms and Grasses has been already adverted to in speaking of the former order: hence Nees v. Esenbeck considers Grasses to be a sort of Palms of a lower grade. In reality, the habit of the genera Calamus and Bambusa is nearly alike; the inflorescence of Grasses may be considered to be the same as that of Palms, the floral envelopes of the latter taken away, and only their bracts remaining; and, finally, their leaves are formed upon exactly the same plan, with this difference only, that those of Grasses are undivided. With Cyperaceæ, however, it is that Grasses are most properly to be compared: while a manifest tendency, at least to the degree of verticillation requisite to constitute a calyx, evidently takes place in the paleæ of Grasses, Cyperaceæ are destitute of all trace of such a tendency, unless the opposite connate glumes of the female flowers of Carex, or the hypogynous scales of certain Schœni and others, be considered an approach to the production of a perianth. For this reason, Grasses are to be considered plants in a higher state of evolution than Cyperaceæ. Independently of this difference, the orders are readily known by the stems of Grasses being round, those of Cyperaceæ angular; the leaves of Grasses having a ligula at the apex of their sheath, which is split, while the sheath of Cyperaceæ is not split, and

is destitute of this ligula; and, finally, the embryo of the two is at variance both in structure and position. With Asphodeleæ their relationship consists in nothing more than the tendency to branch which is observable in part of that order.

Geography. As nothing can be uninteresting which is connected with the habits of a tribe of such vast importance to man, I extract the following account of the geographical distribution of Grasses by Schouw, from Jameson's *Philosophical Journal for April* 1825:—

"The family is very numerous: Persoon's *Synopsis* contains 812 species, 1-26th part of all the plants therein enumerated. In the system of Rœmer and Schultes there are 1800; and, since this work, were it brought to a conclusion, would probably contain 40,000 in all, it may be assumed that the Grasses form a 22d part. It is more than probable, however, that in future the Grasses will increase in a larger ratio than the other phanerogamic plants, and that perhaps the just proportion will be as 1 to 20, or as 1 to 16. Greater still will be their proportion to vegetation in general, when the number of individuals is taken into account; for, in this respect, the greater number, nay, perhaps the whole, of the other classes are inferior.

With regard to *locality* in such a large family, very little can be advanced. Among the Grasses there are both land and water, but no marine, plants. They occur in every soil, in society with others, and alone; the last to such a degree as entirely to occupy considerable districts. Sand appears to be less favourable to this class; but even this has species nearly peculiar to itself.

"The *diffusion* of this family has almost no other limits than those of the whole vegetable kingdom. Grasses occur under the equator; and Agrostis algida was one of the few plants which Phipps met with on Spitzbergen. On the mountains of the south of Europe, Poa disticha and other Grasses ascend almost to the snow-line; and, on the Andes, this is also the case with Poa malulensis and dactyloides, Deyeuxia rigida and Festuca dasyantha.

The greatest differences between tropical and extra-tropical Grasses appear to be the following:—

"1. The tropical Grasses acquire a much greater height, and occasionally assume the appearance of trees. Some species of Bambusa are from 50 to 60 feet high.

"2. The leaves of the tropical Grasses are broader, and approach more in form to those of other families of plants. Of this the genus Paspalus affords many examples.

"3. Separate sexes are more frequent in the tropical Grasses. Zea, Sorghum, Andropogon, Olyra, Anthistiria, Ischæmum, Ægilops, and many other genera, which only occur in the torrid zone, and are there found in perfection, are monœcious, or polygamous. Holcus is perhaps the only extra-tropical genus with separate sexes.

"4. The flowers are softer, more downy, and elegant.

"5. The extra-tropical Grasses, on the contrary, far surpass the tropical in respect of the number of individuals. That compact grassy turf, which, especially in the colder parts of the temperate zones, in spring and summer, composes the green meadows and pastures, is almost entirely wanting in the torrid zone. The Grasses there do not grow crowded together, but, like other plants, more dispersed. Even in the southern parts of Europe, the assimilation to the warmer regions, in this respect, is by no means inconsiderable. Arundo donax, by its height, reminds us of the Bamboo; Saccharum Ravennæ, S. Teneriffæ, Imperata arundinacea, Lagurus ovatus, Lygeum spartum,

and the species of Andropogon, Ægilops, &c. by separate sexes, exhibit tropical qualities. The Grasses are also less gregarious, and meadows seldomer occur, in the south than in the north of Europe.

"As to what relates to the distribution of individuals, the generality of species are social plants.

"A detailed representation of the distribution of the cultivated Gramina would certainly be very interesting. Here we must restrict ourselves to a short and general outline. We shall endeavour to specify those Gramina which are the prevailing ones in the large zones and continents, mentioning, in passing, those plants of other families which either supply the place of, or are associated with, the different kinds of grain, as the chief article of food. The distribution is determined, not merely by climate, but depends on the civilisation, industry, and traffic of the people, and often on historical events.

"Within the northern polar circle, agriculture is found only in a few places. In Siberia grain reaches at the utmost only to 60°, in the eastern parts scarcely above 55°, and in Kamtchatka there is no agriculture even in the most southern parts (51°). The polar limit of agriculture on the north-west coast of America appears to be somewhat higher; for, in the more southern Russian possessions (57° to 52°), barley and rye come to maturity. On the east coast of America it is scarcely above 50° to 52°. Only in Europe, namely, in Lapland, does the polar limit reach an unusually high latitude (70°). Beyond this, dried fish, and here and there potatoes, supply the place of grain.

"The grains which extend farthest to the north in Europe are barley and oats. These, which in the milder climates are not used for bread, afford to the inhabitants of the northern parts of Norway and Sweden, of a part of Siberia and Scotland, their chief vegetable nourishment.

"Rye is the next which becomes associated with these. This is the prevailing grain in a great part of the northern temperate zone, namely, in the south of Sweden and Norway, Denmark, and in all the lands bordering on the Baltic; the north of Germany, and part of Siberia. In the latter another very nutritious grain, buck-wheat, is very frequently cultivated. In the zone where rye prevails, wheat is generally to be found; barley being here chiefly cultivated for the manufacture of beer, and oats supplying food for the horses.

"To these there follows a zone in Europe and western Asia, where rye disappears, and wheat almost exclusively furnishes bread. The middle, or the south of France, England, part of Scotland, a part of Germany, Hungary, the Crimea and Caucasus, as also the lands of middle Asia, where agriculture is followed, belong to this zone. Here the vine is also found; wine supplants the use of beer; and barley is consequently less raised.

"Next comes a district where wheat still abounds, but no longer exclusively furnishes bread, rice and maize becoming frequent. To this zone belong Portugal, Spain, part of France on the Mediterranean, Italy, and Greece; further, the countries of the East, Persia, northern India, Arabia, Egypt, Nubia, Barbary, and the Canary Islands; in these latter countries, however, the culture of maize or rice towards the south, is always more considerable, and in some of them several kinds of Sorghum (Doura) and Poa Abyssinica come to be added. In both these regions of wheat, rye only occurs at a considerable elevation; oats, however, more seldom, and at last entirely disappear; barley affording food for horses and mules.

"In the eastern parts of the temperate zone of the Old Continent, in China and Japan, our northern kinds of grain are very unfrequent, and rice is found to predominate. The cause of this difference between the east and the west

of the Old Continent appears to be in the manners and peculiarities of the people. In North America, wheat and rye grow as in Europe, but more sparingly. Maize is more reared in the Western than in the Old Continent, and rice predominates in the southern provinces of the United States.

"In the torrid zone, maize predominates in America, rice in Asia, and both these grains in nearly equal quantity in Africa. The cause of this distribution is, without doubt, historical; for Asia is the native country of rice, and America of maize. In some situations, especially in the neighbourhood of the tropics, wheat is also met with, but always subordinate to these other kinds of grain. Besides rice and maize, there are, in the torrid zone, several kinds of grain, as well as other plants, which supply the inhabitants with food, either used along with them, or entirely occupying their place. Such are, in the New Continent, Yams (Dioscorea alata), the Manihot (Jatropha manihot), and the Batatas (Convolvulus batatas), the root of which, and the fruit of the Pisang (Banana, Musa), furnish universal articles of food. In the same zone, in Africa, Doura (Sorghum), Pisang, Manihot, Yams, and Arachis hypogæa. In the East Indies, and on the Indian Islands, Eleusine coracana, E. stricta, Panicum frumentaceum; several Palms and Cycadeæ, which produce the Sago; Pisang, Yams, Batatas, and the Bread-fruit (Artocarpus incisa). In the islands of the South Sea, grain of every kind disappears, its place being supplied by the Bread-fruit tree, the Pisang, and Tacca pinnatifida. In the tropical parts of New Holland there is no agriculture, the inhabitants living on the produce of the Sago, of various Palms, and some species of Arum.

"In the high lands of South America there is a distribution similar to that of the degrees of latitude. Maize, indeed, grows to the height of 7200 feet above the level of the sea, but only predominates between 3000 and 6000 of elevation. Below 3000 feet it is associated with the Pisang, and the above-mentioned vegetables; while, from 6000 to 9260 feet, the European grains abound: wheat in the lower regions, and rye and barley in the higher; along with which Chenopodium Quinoa, as a nutritious plant, must also be enumerated. Potatoes alone are cultivated from 9260 to 12,300 feet.

"To the south of the tropic of Capricorn, wherever agriculture is practised, considerable resemblance with the northern temperate zone may be observed. In the southern parts of Brazil, in Buenos Ayres, in Chile, at the Cape of Good Hope, and in the temperate zone of New Holland, wheat predominates; barley, however, and rye, make their appearance in the southernmost parts of these countries, and in Van Diemen's Land. In New Zealand the culture of wheat is said to have been tried with success; but the inhabitants avail themselves of the Acrostichum furcatum as the main article of sustenance.

"Hence it appears, that, in respect of the predominating kinds of grain, the earth may be divided into five grand divisions, or kingdoms. The kingdom of Rice, of Maize, of Wheat, of Rye, and lastly of Barley and Oats. The first three are the most extensive; the Maize has the greatest range of temperature; but Rice may be said to support the greatest number of the human race."

Properties. The uses of this most important tribe of plants, for fodder, for food, and for clothing, require little illustration. The abundance of wholesome fæcula contained in all their seeds renders them peculiarly well adapted for the sustenance of man; and if the Corn tribe only, such as Wheat, Barley, Oats, Maize, Rice, and Guinea Corn, are the kinds commonly employed, it is because of the large size of their seeds compared with those of other Grasses, for none are unwholesome in their natural state, with the single exception of Lo-

lium temulentum, a common weed in many parts of England, the effects of which are undoubtedly deleterious, although perhaps much exaggerated. In this respect an approach seems to be naturally made to the properties of half-putrid Wheat, which are known to be dangerous. The grain of Eleusine coracana is cultivated as corn, under the name of Natchenny, upon the Coromandel Coast. *Ainslie*, 1. 245. Independently of their nutritive fæcula, Grasses contain a large proportion of two other principles which deserve especial mention, viz. sugar and silex. The abundance of the former in the Sugar-cane is the cause of its extensive cultivation; but a large quantity exists in many other Grasses, some of which, such as Holcus saccharatus, have actually been grown as substitutes for the Sugar-cane in Italy; its presence in the nascent embryo of Barley is the cause of that grain being employed under the name of malt in the preparation of beer and of ardent spirits. Chisholm says, that the juice of the Sugar-cane is the best antidote to arsenic. *Ed. P. J.* 4. 221. That the cuticle of Grasses contains a large proportion of silex, is proved by its hardness, and by large masses of vitrified matter being found whenever a hay-stack or heap of corn is accidentally consumed by fire. In the joints of some Grasses a perfect siliceous deposit is found, particularly in a kind of jungle Grass mentioned in a letter from Dr. Moore to Dr. Kennedy of Edinburgh. *Ibid.* 2. 192. It is also said that Wheat-straw may be melted into a colourless glass with the blow-pipe, without any addition. Barley-straw melts into a glass of a topaz yellow colour. *Ibid.* 2. 194. The siliceous matter of the Bamboo is often secreted at the joints, where it forms a singular substance called tabasheer, of which see a very interesting account in Brewster's *Journal*, 8. 268. It was found by Turner that the tabasheer of India consisted of silica containing a minute quantity of lime and vegetable matter. A coarse soft paper, of excellent quality, is manufactured in India from the tissue of the Bamboo. A cooling drink is prepared in India from the roots of Cynodon Dactylon. *Ainslie*, 2. 27. The fragrance of some Grasses, such as Anthoxanthum odoratum and Holcus odoratus, depends, according to Vögel, upon the presence of Benzoic acid. *Ed. P. J.* 14. 170. Sulphur exists, in combination with different bases, in Wheat, Barley, Rye, Oats, Maize, Millet, and Rice. *Ibid.* 172. The Arundo arenaria is an invaluable species for keeping together the blowing sands of the sea-coast, by its creeping suckers and tough entangled roots. It is employed in the Hebrides for many economical purposes, being made into ropes for various uses, mats for pack saddles, bags, hats, &c. *Ibid.* 6. 155. Some of the Reeds of Brazil, called Taquarussa, are living fountains: they grow from 30 to 40 feet high, with a diameter of six inches, form thorny impenetrable thickets, and are exceedingly grateful to hunters; for, on cutting off such a reed below the joint, the stem of the younger shoots is found to be full of a cool pleasant liquid, which immediately quenches the most burning thirst. *Pr. Max. Trav.* 81. The roasted leaves of Andropogon Schœnanthus are used in India, in infusion, as an excellent stomachic. An essential oil of a pleasant taste is extracted from the leaves in the Moluccas; and the Javanese esteem the plant much as a mild aromatic and stimulant. *Ainslie*, 2. 58. The former is the Grass oil of Nemaur, called in India Ivarancusa, and described in *Brewster's Journal*, 9. 333. Many others, such as Andropogon citratum and nardus, and Anthoxanthum odoratum, partake of the same qualities. The gluten of Wheat yields the two chemical principles called gliadine and zimome. *Ann. of Phil.* no. 89. p. 390. De Candolle truly remarks, that the dangerous effects of the ergot of Corn is no exception to the generally wholesome properties of the order, because in this the whole grain is in a state of disease. The ergot of Rye has been lately found to exercise a decidedly powerful stimulant effect upon the uterus, on which account it is now frequently and successfully employed by European practitioners in cases

of difficult parturition. The ergot of Maize is, according to Roulin, very common in Colombia, and the use of it is attended with a shedding of the hair, and even the teeth, of both man and beast. Mules fed on it lose their hoofs, and fowls lay eggs without shell. Its action upon the uterus is as powerful as that of Rye ergot, or perhaps more so. *Ann. des Sc.* 19. 279. The country name of the Maize thus affected is Maïs peladero. The best fodder Grasses of Europe are usually dwarf species, or at least such as do not rise more than 3 or 4 feet above the ground, and of these the larger kinds are apt to become hard and wiry; the most esteemed are Lolium perenne, Phleum, and Festuca pratensis, Cynosurus cristatus, and various species of Poa and dwarf Festuca, to which should be added Anthoxanthum odoratum for its fragrance. But the fodder Grasses of Brazil are of a far more gigantic stature, and perfectly tender and delicate. We learn from Nees von Esenbeck, that the Caapim de Angola of Brazil, Panicum spectabile, grows 6 or 7 feet high: while other equally gigantic species constitute the field crops on the banks of the Amazons.

I am deeply indebted to Professor C. G. Nees v. Esenbeck for the following list of the Genera of Grasses, Dec. 12, 1835:—

GENERA.

Tribus graminearum commodè in tres series dividuntur, quarum singulæ partes recta via a se invicem discendentes, analogia quadam collaterali sibi vicissim respondent.

1. Familiæ heteroclinæ.	2. Familiæ homoclinæ.	
	a. Unifloræ.	*b. Multifloræ.*
§ 1. Phalarideæ.	§ 7. Phleoideæ.	§ 11. Pappophoreæ.
§ 2. Paniceæ.	Sub-tribus. *Perotidæ.*	§ 12. Chlorideæ.
§ 3. Tristegineæ.	§ 8. Agrostideæ.	§ 13. Aveneæ.
§ 4. Sacchareæ.	§ 9. Stipeæ.	§ 14. Arundineæ.
§ 5. Rottboellieæ.		§ 15. Triticeæ.
§ 6. Olyreæ.		Sub-tribus. *Hordeæ.*
	§ 10. Oryzeæ.	§ 16. Festuceæ.
	§ 17. Bambuseæ.	

Sub-tribus 1. *Streptochæteæ.*	Sub-tribus 2. *Arundinariæ.*	Sub-tribus 3. *Bambuseæ veræ.*
§ 1. Phalarideæ.	Regnaudia, Kunth.	Milium, L.
Ehrharta, Thunb.	*Polypogonis* sp. Spr.	Amphicarpum, Kunth.
Trochera, P. de B. Rich.	§ 2. Paniceæ.	*Milii* sp. Pursh.
Tetrarrhena, R. Br.	Reimaria, Fl.	Urochloa, P. de B.
Ehrhartæ sp. La Billard.	Paspalus, Fl.	*Panici* sp. Burm. L.
Microlæna, R. Br.	Helopus, Tr.	*Oplismeni* sp. R. et Sch.
Ehrhartæ sp. La Billard.	*Oedipachne*, Link.	*Paspali* sp. auct.
Digraphis, Tr.	*Piptatheri* sp. P. de B.	*Helopodis* sp. N. ab E.
Baldingera, Dum.	*Paspali* sp. Fl.	Rhynchelythrum, N. ab E. (70)
Phalaridis sp. Lin.	*Eriochloa*, H. et K.	Thrasya, H. et K.
Arundinis sp. Ait.	*Monachne*, P. de B.	Echinolæna, Desv.
Calamagrostidis sp. Sibth.	Leptocoryphium, N. ab E.	*Panici* sp. auct.
Phalaris, Lin. (ex parte)	*Paspali* sp. H. et K.	Isachne, R. Br. Tr.
Holcus, Lin. (ex parte)	*Milii* sp. R. et Sch.	*Panici* sp. auct.
Hierochloa, Gmel. R. Br.	Trichachne, N. ab E.	Otachyrium, N. ab E.
Torresia, P. de B.	*Acicarpha*, Raddi.	Ichnanthus, P. de B.
Disarrhenum, La Bill.	*Andropogonis* sp. Lin.	*Navicularia*, Raddi.
Holci sp. Lin. et auct.	*Milii* sp. Sw.	*Panici* sp. Spr. N. ab E.
Avenæ sp. Pers.	Tricholæna, Schrad.	Bluffia, N. ab E. in Lehm. cat. sem. Hamb. a. 1835. (71)
Melicæ sp. Desrouss.	*Anthenanthia*, P. de B.	Hymenachne, P. de B.
Airæ sp. Liljebl.	Coridochloa, N. ab E. in Edinb. Phil. Journ.	Panicum, Lin. (in sect. x.)
Poæ sp. Web. Spr.	*Panici* sp. Retz.	1. Digitaria, Willd.
Ataxia, R. Br. (an sub-divisio Hierochloes?)	*Urochloæ* sp. Kunth.	2. Loliacea.
Anthoxanthum, Lin.	*Axinopodis* sp. P. de B.	3. Paspaloidea.
		4. Perforata.

5. Paniculigera.
Virgata, Fl. Bras.
6. Capillaria.
Effusa, Fl. Bras.
7. Curviflora.
8. Setaria.
Setaria, P. de B.
Pennisetum, Rich.
9. Plicata.
10. Echinochloæ.
Echinochloa, P. de B.
Orthopogon, R. Br.
Oplismeni spp. H. et K.
Oplismenus, P. de B.
Berchtoldia, Presl.
Chætium, N. ab E.
Chamæraphis, R. Br.
Spinifex, L.

Stenotaphrum, Tr.
Panici sp. L.
Rottbœlliæ sp. L. Sw.
Thouarea, Pet. Th. Pers.
Trachys, Pers.
Panici sp. Retz.
Cenchri sp. L.
Tragus, Hall.
Lappago, Schreb.
Cenchri sp. L.
Phalaris sp. Forsk.
Latipes, Kunth.
Tragus, Gay.
Penicillaria, Willd.
Penniseti sp. Kunth.
Panici sp. Roxb.
Alopecuri sp. L.
Pennisetum, P. de B.
Cenchri sp. L. Sw. Willd.
Panici sp. L. et aliorum.
Setariæ sp. R. et Sch.
Phalaridis sp. Forsk.
Gymnothrix, P. de B.
Cataterophora, Steud.
Alopecuri sp. L.
Cenchri sp. Thunb.
Penniseti sp. Spr.
Panici sp. Thunb.
Cenchrus, L. (ex parte)
Anthephora, Schreb.
Colladoa, Pers.
Cenchri sp. Tr.
Tripsaci sp. L.
Pariana, Aubl.

§ 3. TRISTEGINÆ.
Arundinella, Raddi.
Goldbachia, Tr.
Riedelia, Tr.
Acratherum, Linn.
Brandtia, Kunth.
Thysanachne, Presl.
Ischæmi sp. Kunth.
Andropogonis sp. Willd. Spr.
Airæ sp. Spr.
Melinis, P. de Br.
Suardia, Schrank.
Tristegis, N. ab. E.
Agrostis sp. Fischer.

§ 4. SACCHARINÆ.
Sub-Trib. 1. Sorgha.
Sorghum, Pers.
Holci sp. L.
Andropogonis sp. Kunth. Scop.
Trachypogonis sp. N. ab E.
Arthropogon, N. ab E. h.
Chrysopogon, Host. Tr.
Raphis, Lour. N. ab E.
Pollinia, Link.
Polliniæ sp. Spr.
Andropogonis sp. L. et auct.
Sub-Trib. 2. Andropogones.
Dimeria, R. Br.
Haplachne, Presl.
Pogonatherum, P. de B.
Homoplitis, Tr.
Polliniæ sp. Spr.
Perotis sp. Willd.
Sacchari sp. Lam.
Andropogonis sp. Thunb.
Imperata, Cyr.
Sacchari sp. Retz. et auct.
Laguri sp. L.
Saccharum, P. de B. L. (ex parte)
Eriochrysis, P. de B.
Andropogonis sp. Rich.
Plazerium, Willd. Mspt.
Microstegium, N. ab E. Herb. Willd. (72)
Panici sp. Hb. Willd.
Pleuroplitis, Tr.
Lucæa, Kunth.
Batratherum, N. ab E. in Wight et W. Arn. Prodr.
Andropogonis sp. Roxb.
Schizachyrium, N. ab E.
Andropogonis sp. Kunth.
Deyeuxiæ sp. Spr.
Lipeocercis, Tr.
Andropogonis sp. L. Kunth.
Homœatherum, N. ab E. in Herb. Lindl. (75)
Elionurus, Willd. Kunth.
Anatheri sp. Spr.
Heteropogon, Pers.
Andropogonis sp. L. et auct.
Trachypogon, Tr.
Trachypogonis sp. N. ab E.
? Pogonopsis, Presl.
Hologamium, N. ab E. in W. et W. A. Prodr.
Andropogonis sp. Willd. Kunth.
Polliniæ sp. Spr.
Erianthus, Rich.
Ripidium, Tr.
Sacchari sp. Lin. Pers.
Andropogonis sp. L. Link.
Anthoxanthi sp. Walth.
Eulaliæ sp. Tr.
Eulalia, Kunth. Tr.
Erianthi sp. P. de B.
Sacchari sp. Spr.
Andropogonis sp. Bory.
Spodiopogon, Tr.
Meoschii sp. P. de B.
Arthraxon P. de B.
Ischæmi sp. Retz. Kunth. Roxb.
Hypogynium, N. ab E.
Anatheri sp. Spr.
Agenium, N. ab E. Suppl. Flor. Bras. ex Herb. Willd. (73)
Andropogon, L. (ex parte) N. ab E. in Wight. et W. A. Prodr.
A. Trachypogon, N. ab E. (ex parte)
B. Anatherum, P. de B.
C. Cymbopogon, Spr.
Anthistiria, L.
Andropogonis spp. L.
Androscepia, Brong.
Anthistiriæ sp. Cav.
Apludæ sp. Spr.
Calaminæ sp. R. et Sch.
Perobachne, Presl.
Diectomis, Kunth. N. ab E. (nec P. de B.)
Polliniæ sp. Spr.
Andropogonis sp. Sw.
Apluda, L.
Calamina, P. de B.
Diectomis, P. de B.
? Zeugites, Browne, Willd.
Apludæ sp. L.
? Xerochloa, R. Br.
? Alloteropsis, Presl.
Sub-Trib. 3. Rottboellieæ (Ischaema).
Ischaemum, P. de B.
Ischaemi spp. L.
Rottboelliæ sp. Spr.
Meoschium, P. de B. (ex parte.)
Ischaemi sp. Tr.
Lodicularia, P. de B.
Rotboelliæ sp. Lam.
Lepturi sp. Tr.
Hemarthriæ sp. Kunth.
Hemarthria, R. Br.
Rottboelliæ sp. L.
Thyridostachyum, N. ab E. in W. et W. A. Prodr.
Mnesithea, Kunth.
Rottboelliæ sp. Retz. Roxb.
Hemarthriæ sp. Kunth.
Ophiurus, Gærtn.
Rottboelliæ sp. Lin. Retz.
Aegilopis sp. Lin.
Rottboellia, L. (ex parte).
Coelorachis, Brongn.
Aegilopis sp. Retz.
Rottboelliæ sp. Kunth.
Ratzeburgia, Kunth.
Aikinia, Wall.
Prionachne, N. ab E. (Fl. Cap.) (74)
? Thelepogon, Roth.

Peltophorus, P. de B.
Manisuri sp. L. Tr. Roxb.
Manisuris, Sw. P. de B.
Cenchri sp. L.
Lepturus, R. Br.
Rottboelliæ sp. L.
Aegilopis sp. L.
Ophiuri sp. P. de B.
Agrostis sp. Scop.
Pholiurus, Tr.
Monerma, P. de B.
Rottboelliæ sp. Willd. Savi.
Lepturi sp. Kunth.
Oropetium, Tr.
Rottboelliæ sp. L. et auctt.
Psilurus, Tr.
Nardi sp. Lin.
Rottboelliæ sp. Gouan.
Monermae sp. P. de B.
Asprellæ sp. Host.
Nardus, L. (ex parte).
Zoysia, Willd.
Agrostis sp. L.

§ 6. Olyreæ.

Strephium, Schrad.
Lithachne, P. de B.
Raddia, Bert.
Olyra, L.
Caryochloa, Tr.
Arrozia, Schrad. Kunth.
Luziola, Juss.
Zizania, L. (ex parte).
Hydropyrum, Link.
Potamophila, R. Br.
Leptaspis, R. Br.
Phari sp. Spr.
Pharus, Browne.

Euchlaena, Schrad.
Zea, L.
Despretzia, Kunth.
Coix, L.
Lithagrostis, Gærtn.
Tripsacum, L. (ex parte).
Ischaemi sp. Walth.
Coicis sp. Mill.
Hexarrhena, Presl.
Hilaria, Kunth.
? Pleuraphis, Torr.

§ 7. Phleoideæ.

Sub-Trib. 1. Alopecuri.

Lygeum, L.
Cornucopiæ, L.
Tozzettia, Savi.
Alopecuri sp. Auct.
Phalaridis sp. L.
Cornucopiæ sp. L.
Crypsis, Ait.
Heleochloa, Host.
Antitragus, Gærtn.
Pethea, Pourr.
Anthoxanthi sp. L.
Phlei spp. L.
Schæni sp. L.
Phalaridis sp. Forsk. Sm. Link.
Spartinæ sp. Roth.
Agrostis sp. Scop.
Chamagrostis, Borkhn.
Knappia, Sm.
Sturmia, Hoppe.
Mibora, P. de B.
Agrostis sp. Lin.
Alopecurus, L.
Colobachne, P. de B.
Alopecuri sp. Sibth. Tr. Kunth.
Polypogonis sp. Willd.
Phlei sp. Scop. All.
Limnas, Tr.
Fingerhuthia, N. ab E. in Lehm. Cat. Sem. Hort. Hamb. a. 1835. (76)
Chilochloa, P. de B.
Phlei spp. Auct.
Phalaridis spp. L. Retz. Ait.
Crypsidis sp. Desf.
Phleum, L. (ex parte).
Achnodon, P. de B. Link.
Phalaridis sp. L. et Auct.
Beckmannia, Host.
Joachimia, Tenore.
Bruchmannia, Nutt.
Phalaridis sp. L.
Cynosuri sp. Ait.
Paspali sp. Mœnch.

Sub-Trib. 2. Perotideæ.

Holboellia, Wall. Kunth.
Perotis, Ait. R. Br.
Xystidium, Tr.
Anthoxanthi sp. L.
Sacchari sp. L.
Agrostidis sp. L.
Leptothrium, Kunth.
Hygroryza, N. ab E. in Edinb. Phil. Journ.
Phari sp. Retz.
Zizaniæ sp. Spr. W.
? Neurachne, R. Br.

§ 8. Agrostideæ.

Sub-Trib. 1. Agrosteæ.

Aegopogon, Willd.
? *Hymenothecium*, Lag.
? *Cynosuri* sp. Cav.
Pleuraphis, Torrey.
Lycurus, H. et K.
Chæturus, Link.
Polypogonis sp. Willd. Pers.
Agrostis sp. Brot. Poir.
Polypogon, Desf.
Alopecuri sp. L. et Auctt.
Agrostidis sp. Willd.
Phlei sp. Schreb.
Phalaridis sp. Forsk.
Chaetotropis, Kunth.
Vilfæ sp. Presl.
? Nowodworskia, Presl.
Raspailia, Presl.
Epicampes, Presl.
Pentapogon, P. de B.
Agrostis sp. Kunth.
Avenæ sp. La Bill.
Calamagrostis sp. Spr.
Gastridium, P. de B.
Milii sp. Lin.
Agrostis sp. L.
Calamagrostis sp. Spr.
Arundinis, sp. R. et Sch.
Sporobolus, R. Br.
Vilfa, Tr. N. ab E.
Agrostis spp. Auct.
? Schmidtia, Sternb.
Coleanthus Seidel. R. et Sch. Kunth.
Colpodium, Tr.
Agrostis sp. R. Br. Steven.
Vilfæ sp. Tr.
Phippsia, R. Br.
Agrostis sp. Wahlenb.
Trichodii sp. Svensk. Bot.
Vilfæ et Colpodii sp. Tr.
Agrostis, L. P. de B.
Vilfa P. de B.
Trichodium Schrad.
Cornucopiæ Walth.
Anemagrostis, Tr.
Apera, P. de B. Reichenb.
Agrostis spp. L. Kunth.

Sub-Trib. 2. Calamagrosteæ.

Pereilema, Presl.
Echinopogon, P. de B. Tr.
Agrostis, sp. Forster, Willd. R. Br.
Pentapogon, R. Br.
Clomena, P. de B.
Cleomena, R. et Sch.
Muhlenbergiæ sp. Kunth.
Agrostis sp. Spr.
Muhlenbergia, Schreb. Tr.
Dilepyrum, Mich.
Cinna, L.
Muhlenbergiæ spp. Tr.
Agrostis spp. Lam. Willd.
Dactylogramma, Link. (An potius inter Paniceas?)
Podosemum, Link. H. et K.
Trichochloa, Tr.
Cinnæ spp. Link.
Vilfæ Aperæ et Achnatheri spp. P. de B.
Agrostis spp. Willd. Spr.
Muhlenbergiæ spp. Tr.
Calamagrostis spp. H. et K.
Arundinis sp. R. et Sch.
Polypogonis spp. Spr. Nutt.
Alopecuri sp. Poir.
Stipæ sp. Walth. Lam. Poir.
Lachnagrostis, Tr.
Deyeuxiæ spp. Kunth.
Agrostis spp. Nutt.
Avenæ sp. Labill.
Calamagrostis, Adans. Del. Schrad. Kunth.
Deyeuxiæ spp. Kunth.
Arundinis spp. L.
Agrostis spp. R. et Sch.
Deyeuxia, Kunth. (Species exoticæ).
Ammophila, Host. Link.
Psamma, R. et Sch.

Arundinis sp. L.
Calamagrostis sp. Roth. Tr.
Phalaridis sp. Linn.
§ 9. STIPEÆ.
Streptachne, R. Br. H. et K.
Aristidæ sp. Kunth.
Lasiagrostis, Linn. Kunth.
Calamagrostis DC. Host. Schrad.
Agrostis sp. Lin.
Arundinis spp. Schrad. Willd.
Stipæ sp. Tr.
Oryzopsis, Rich.
Dilepyrum, Rafinesque.
Urachnes sp. Link.
Milii sp. Sm.
Piptatheri sp. Torrey,
Piptatherum, P. de B.
Oryzopsis, Nuttall.
Piptochaetium, Presl.
Urachnes sp. Tr.
Milii sp. L. Cav.
Agrostis spp. L.
Stipa, L. (ex parte).
Macrochloa, Kunth.
Stipæ spp. L. Brot. Tr.
Avenæ sp. Lagasca.
Stipagrostis, N. ab E.
Aristidæ sp. Delile.
Aristida, P. de B.
Aristidæ sp. L.
Arthratherum, P. de B.
Aristidæ sp. L. et Auctt.
Cyrtopogon, P. de B.
Aristidæ sp. Tr. Kunth.
Chætaria, P. de B.
Aristidæ sp. L. Kunth, Tr.
Chæturi sp. DC.
Atheropogonis sp. Spr.
§ 10. ORYZEÆ.
Leersia, Soland. Sw.
Homalocenchrus, Poll.
Asprella, Lam.
Phalaridis sp. L.
Ehrhartia, Wigg.
Maltebrunia, Kunth.
Oryza, L.
§ 11. PAPPOPHOREÆ, Kunth.
Echinaria, Desf.
Panicastrella, Mœnch.
Cenchri sp. K.
Sesleriæ sp. Host.
Amphipogon, R. Br.
Aegopogon, P. de B.
Diplopogon, R. Br.
Cathestecum, Presl.
Opitzia, Presl.
Pommereulla, L. fil.
Enneapogon, Desv.
Pappophori spp. Kunth.
Eurhaphis, Tr.
Pappophorum, Schreb. R. Br.
Pappophori spp. Kunth.
Polyrhaphis, Tr.
Cottea, Kunth.
Triraphis, R. Br.
Pappophori sp. Tr.
Sesleriæ sp. Sp.
§ 12. CHLORIDEÆ.
Melanocenchris, N. ab E. in Royle Himalay.
Polischistis, Presl.
Eutriana, Tr. Kunth. (ex parte.)
Heterostega, Desv.
Dinebræ sp. H. et K.
Dineba, Presl.
Eutrianæ spp. Kunth.
Atheropogonis spp. R. et Sch.
Bouteloues spp. Lag.
Chloridis spp. Mich.
Cynosuri sp. Pursh.
Actinochloæ? sp. R. et Sch.
Aristidæ sp. Poit.
Polyodon, H. et K.
Pentarhaphis, H. et K.
Triathera, Desv.
Triæna, H. et K.
Enteropogon, N. ab E. in W. et W. Arn.—Prodr. (77)
Ischæmum melicoides, Koen. Willd.
Chondrosium, Desv.
Actinochloa, Willd.
Atheropogonis sp. Spr.
Chloridis sp. Poir.
Bouteloues sp. Lag.
Dinebræ sp. H. et K.
Spartinæ sp. Willd. Link.
Ctenium, Panz.
Campuloa, Desv. N. ab E.
Campulosus, P. de B.
Monocera, Elliott.
Monathera, Rafinesque.
Nardi sp. Lam.
Aegilopis sp. Walth.
Monerma? R. et Sch.
Harpechloa, Kunth.
Campuloæ sp. Desv.
Campulosi sp. P. de B.
Dactyloctenii sp. Willd.
Chloridis sp. Sw.
Eleusines sp. Spr.
Cynosuri sp. Thunb.
Melicæ sp. Lin.
Chloris, Sw.
Rhabdochloæ P. de B.
Eustachys sp. R. et Sch.
Eleusines sp. Spr.
Agrostis sp. L.
Andropogonis spp. L.
Cynosuri sp. Lam. Vahl.
Tetrapogon, Desf.
Ctenii sp. Spr.
Cynodon, Rich.
Fibigia, Koel.
Digitaria, Schrad.
Chloridis sp. Tr.
Panici spp. L.
Paspali spp. Lam. Walth.
Agrostis sp. Retz.
Melicæ sp. Roxb.
Microchloa, R. Br.
Nardi sp. L.
Rottboelliæ sp. Roxb.
Eustachys, Desv.
Schultesia, Spr.
Chloridis sp. Thunb.
Cynosuri sp. Vahl.
Agrostidis sp. Ait.
Andropogonis sp. Houtt.
Paspali sp. Spr.
Dactyloctenium, Willd.
Eleusines sp. Pers. Lam.
Chloridis sp. Michx.
Cenchri sp. L.
Cynosuri sp. L.
Aegilopis sp. Walth.
Rhabdochloæ? sp. P. de B.
Acrachne, W. et W. Arn.
Eleusine verticillata, Roxb.
Eleusine, Gaertn.
Cynosuri sp. L. Willd. Lam.
Panici sp. Forsk.
Tritici sp. Spr.
Agropyri sp. R. et Sch.
Leptochloa, P. de B.
Leptostachys, Meyer.
Rhabdochloæ spp. P. de B.
Eleusines spp. Pers.
Chloridis sp. H. et K.
Cynodontis sp. Willd.
Poæ sp. Pers.
Cynosuri sp. Willd. Jacq.
Bromi sp. Mœnch.
Festucæ sp. Lam.
Oxydeniæ sp. Nutt.
Polliniæ sp. Spr.
Dactylidis sp. Willd.
Dinebæ sp. Jacq.
Diplachne, P. de B.
Festucæ sp. Michx. Lam.
Bromi sp. Spr.
Uralepis, Nuttall, Kunth (ex parte).
Diplocea, Rafinesque.
Triodiæ spp. H. et K.
Koeleriæ spp. Spr.
Airæ sp. Walth. Muhlenb. Pursh.
Gymnopogon, P. de B.
Alloiatheros, Elliott.
Anthopogon, Nuttall.
Andropogonis sp. Mich.
Chloridis sp. Kunth.
? Schoenefeldia, Kunth.
Spartina, Schreb.
Limnetis, Rich.
Ponceletia, Du Pet. Thouars.
Trachynotia, Michx.
Cynodontis sp. Tr.
Dactylidis sp. Löfl. Lin. Ait.
Rottboelliæ sp. Tenore.
Paspali sp. Brot.

§ 13. AVENACEÆ.
Agraulus, P. de B. (ex parte).
Chamæcalamus, N. ab E.
Agrostis spp. Kunth. Tr.
Triplachne, Link.
Agrostidis sp. Guss.
Corynephorus, P. de B.
Weingartneria, Bernh.
Airæ spp. L. Tr.
Avenæ sp. Web.
Deschampsia, P. de. B.
Campella, Link.
Airæ spp. L. et Auct.
Schismus, Tr.
Dupontia, R. Br.
Aira, L. (ex parte).
Avenæ spp. M. et K. P. de B. Link.
Milii sp. R. et Sch.
Airopseos sp. R. et Sch.
Deschampsiæ sp. Tr. R. et Sch.
Eriachne, R. Br.
Airæ spp. Spr.
Airopsis, N. ab E. in Lin.
Lagurus, L.
Danthonia, DC.
A. Danthoniæ veræ.
Triodia, P. de B.
Sieglingia, Bernh.
Festucæ sp. L.
Poæ spp. With. Schrad.
Bromi sp. Koel.
Melicæ sp. Web. Wib.
Avenæ sp. Forsk. L. Willd. Schrad. Thunb.
Triseti sp. P. de B.
Deschampsiæ sp. Spr.
B. Pentaschistis, N. ab E. Gr. Eckl.
Pentameris, N. ab E. in Linn.
Avenæ et Holci spp. Thunb. et Auctt.
? *Xenochloa*, Lichtenst.
Pentameris, P. de B.
Danthoniæ sp. Tr. Kunth.
Avenæ spp. Thunb.
Holci spp. Thunb.
Sorghi sp. R. et Sch.
Andropogonis? sp. Kunth.
Trichopterya, N. ab. E. Gram. Cass (80.)
Anisopogon, R. Br. } Tristeginis adsociandæ, sententia Trinii.
Deyeuxiæ sp. Spr. }
Danthoniæ sp. Tr. }
Tristachya, N. ab E. }
Monopogon, Presl. }
Triraphis, R. Br.
Trisetaria, Forsk.
Avenæ sp. Spr.
Triseti sp. La Bill.
Trichæta, Link. P. de B.
Triseti sp. Pers.
Bromi sp. Cav.
Psilathera, Link.
Sesleriæ sp. Host. Kunth.
Cynosuri sp. Hoffm.
Arrhenatherum, P. de B.
Avenæ sp. L.
Holci sp. L.
Chaetobromus, N. ab E. Gr. Cap. (78).
Danthoniæ sp. Schrad.
Pentameridis sp. N. ab E.
Trisetum, Pers.
Avenæ spp. L. et Auct.
Airæ spp. L. et Auct.
Koeleriæ sp. Link.
Festucæ spp. Savi.
Arundinis sp. Spr.
Avena, L. (ex parte).
Gaudinia, P. de B.
Arthrostachya, Link.
Avenæ spp. L. et Auct.
Bromi sp. Hornem.
§ 14. ARUNDINEÆ.
Phragmites, Tr.
Czernya, Presl.
Arundinis sp. L. et Auctt.
Scolochloa, Link.
Arundinis sp. Willd.
Donacis sp. P. de B.
Graphephorum, Desv. P. de B.
Airæ sp. Michx.
Triodiæ sp. Spr.
Ampelodesmos, Link. Brong.
Donacis sp. P. de B.
Arundinis spp. L. et Auctt.
Calamagrostidis sp. Gm.
Donax, P. de B. (ex parte).
Arundinis spp. L. et Auctt.
Calamagrostidis sp. Gm.
Amphidonax, N. ab E. in W. et W.—A. Prod. (79).
Arundinis sp. Retz. Roxb. Kunth.
Gynerium, H. et K.
Arundinis sp. Pers.
Sacchari sp. Aubl.
§. 15. TRITICEÆ.
Sub-Trib. 1. Hordeæ.
Hordeum, Lin.
Sub-Trib. 2. Triticeæ Propriæ.
Lolium, L.
Triticum, L. (ex parte).
Aegilops, L.
Tritici sp. P. de B.
Agropyrum, P. de B.
Tritici spp. L. et Auctt.
Elymi sp. L. et Auctt.
Bromi sp. Sc.
Festucæ sp. Mœnch.
Secales sp. Pall.
Secale, L.
Hordei sp. Bess.
Elymus, L.
Cuviera Koel.
Tritici sp. Salisb.
Secalis sp. Huds.
Hordei? sp. Schrank. Willd. Vest.
Asprella, Humb. Willd.
Gymnostichum, Schreb.
Hystrix, Mœnch.
Elymi sp. L.
§ 16. FESTUCEÆ.
Sub-Trib. 1. Poeæ.
Bryzopyrum, Link.
Brachypodii sp. Link.
Tritici sp. Ait.
Poæ sp. Jacq.
Uniolæ sp. Willd.
Festucæ sp. Michx.
Oreochloa, Link.
Poæ sp. Wulff. Willd.
Cynosuri sp. Hoffm.
Sesleriæ sp. Hall. Kunth. M. et K.
Lasiochloa, Kunth.
Dactylidis et Alopecuri spp. Thunb. Schrad.
Festucæ sp. Spr.
Wangenheimia, Mœnch.
Cynosuri sp. L.
Dinebræ sp. P. de B.
Chondrachyrum, N. ab E. Suppl. Flor. Br. ex Herb. Willd. (81)
Airopsis, Desv.
Airæ sp. Thore et Loisel.
Milii sp. Cav.
Paspali, Sp. Rasp.
Poæ sp. DC.
Catabrosæ sp. Presl.
Poidium, N. ab E. Suppl. Fl. Br. ex Herb. Willd. (82)
Cœlachne, R. Br.
Poa, L. (ex parte) P. de B.
Poæ legitimæ, Kunth.
Eragrostis, P. de B.
Megastachya, P. de B.
Poæ spp. L. Kunth.
Brizæ sp. L. Thunb.
Uniolæ sp. L.
Cynosuri sp. Forsk.
Briza, L.
Chascolythrum. Desv.
Brizæ spp. auctt.
Calothecæ spp. N. ab E. in Fl. Br.
Bromi sp. H. et K.
Festucæ sp. Spr.
Calotheca. P. de B. (ex parte).
Bromi sp. Lam.
Brizæ sp. N. ab E. in Mart. Fl. Br.
Antochloa, N. et Meyen. (83)
Rhombolythrum, Link.
Melica, L.
Beckera, Bernh.
Schismus, P. de B.
Hemisacris, Steud.
Electra, Panz.
Festucæ sp. L.
Kœleriæ sp. DC.

Sub-Trib. 2. Glycerieæ.
Catabrosa, P. de B.
Airæ sp. L.
Moliniæ sp. Web.
Poæ sp. Koel.
Hydrochloæ sp. Hartm.
Glyceriæ sp. Sm. Reichenb.
Colpodii sp. Tr.
Molinia, Mœnch. Koel.
Enodium, Gaud.
Airæ et Melicæ sp. L.
Agrostis et Festucæ sp. L.
Hydrochloæ sp. Hartm.
Bromi sp. Scop.
Schedonori sp. R. et Sch.
Diplachnes sp. Link.
Eatonia, Rafin.
Reboulea, Kunth.
Airæ sp. Mich. Spr.
Koeleriæ sp. DC.
Triseti? sp. Tr.
Poæ? sp. P. de B.
Glyceria, R. Br.
Festucæ sp. L. et auct.
Hydrochloa, Link. Hartm.
Glyceriæ sp. Kunth. M. et K.
Poæ sp. L.
Sclerochloa, P. de B. Link.
Cynosuri, Poæ, Tritici spp. L. et auct.
Megastachyæ sp. R. et Sch.
Schedonori sp. R. et Sch.
Brachypodii sp. R. et Sch.
Pleuropogon, R. Br.
Centotheca, Desv. P. de B.
Cenchri sp. Lin.
Poæ sp. L. Forst.
Uniolæ sp. Tr.
Hierochloæ sp. Kunth.
Torresiæ? sp. de B.
Oplismeni (?) sp. R. et Sch.
Holci sp. Host.
Diarrhena, P. de B.
Diarina, Rafin.
Corycarpus, Zea.
Roemeria, Schult.
Festucæ sp. Mich.
Orthoclada, P. de B. N. ab E.
Airæ sp. Rich.
Poæ, R. et Sch.
Chasmanthium, Link.
Uniolæ sp. Michx.
Holci sp. Willd.
Uniola, Michx. Link.
Windsoria, Nuttall.
Tridens, R. et Sch. N. ab E.
Triodia, Jacq.
Tricuspis, P. de B.
Poæ sp. Michx. Pursh. Poir.
Eragrostidis sp. Tr.
Triodia, R. Br.
Tripogon, Roth. N. ab E. in W. et W. A. Prodr.
Plagiolythrum, N. ab E. in litt.

Sub-Trib. 3. Cynosureæ.
Sesleria, Ard.
Cynosuri sp. L. Koel.
Koeleriæ sp. Ten.
Airæ sp. Wulff.
Phlei sp. Sc.
Airochloa, Link.
Köleriæ sp. et auct.
Airæ spp. L.
Poæ sp. With.
Dactylidis spp. M. a B.
Festucæ spp. Vill. Roth. Poir.
Koeleria, Link. Kunth. (ex parte)
Airocholæ spp. Link.
Lophochloa, Reich.
Rostraria, Tr.
Ægilitis, Tr.
Ægilina, R. et Sch.
Triseti sp. Tr.
Phalaridis spp. Lam.
Alopecuri sp. All.
Holci sp. All.
Airæ spp. Vahl.
Poæ spp. Lam.
Dactylidis sp. Hcrn.
Festucæ spp. L. Presl.
Bromi sp. Roth. Savi. Spr.
Æluropus, Tr.
Dactylidis sp. L.
Poæ sp. Kunth.
Dactylis, L. et auctt.
Festucæ sp. All.
Lamarckia, Mönch.
Chrysurus, Pers.
Cynosuri sp. L.
Cynosurus, L. (ex parte)
Cynosuri et Chrysuri spp. P. de B.
Elytrophorus, P. de B.
Echinalysium, Tr.
Dactylidis sp. Willd.
Sesleriæ sp. Spr.
Ectrosia, R. Br.
Lophatherum, Brongn.
Sub-Trib. 4. Bromeæ.
Brachypodium, R. et Sch.
Bromi sp. L. et auct.
Festucæ spp. L. Mönch.
Tritici sp. Web. Kunth.
Schedonori sp. R. et Sch.
Catopodium, Link.
Catapodium, Reichenb.
Tritici spp. Pers. Vill.
Brachypodii spp. R. et Sch.
Agropyri sp. Reichenb.
Festucæ sp. Loffl. L. Kunth.
Poæ sp. Huds.
Trachynia, Link.
Bromi sp. L. Lam.
Festucæ sp. Schrad.
Brachypodii spp. R. et Sch.
Tritici sp. DC. Kunth.
Arthrostachya, Link.
Bromi sp. Hornem.

Vulpia, Link.
Mygalurus, Link.
Festucæ spp. L. et auct.
Bromi sp. All.
Stipæ sp. L.
Festuca, L.
Schedonori sp. P. de B. R. et Sch.
Poæ spp. quorundam.
Ceratochloa, DC.
Schedonori sp. R. et Sch.
Festucæ spp. Spr.
Bromi spp. Kunth.
Libertia, Lej. Link.
Michelaria, Dum.
Calothecæ sp. Lej.
Bromi sp. Kunth. et auctt.
Bromus, L. P. de B.
Schedonori sp. P. de B.
Festucæ spp. Schreb. M. et K. DC.
Streptogyna, P. de B.

§ 17. Bambuseæ.

Sub-Trib. 1. Streptochæteæ.
Streptochæta, Schrad.
Lepideilema, Tr. Kunth.
Sub-Trib. 2. Arundinariæ.
Merostachys, Spr.
Chusquea, Kunth.
Platonia, Kunth.
Nasti sp. H. et K.
Rettbergia, Raddi.
Arundinariæ sp. N. ab E. in Mart. Fl. Br.
Arundinis sp. Poir.
Nastus, Juss.
Stemmatospermium, P. de B.
Bambusæ sp. Blume. N. ab E.
Arundinaria, Michx.
Miegia, Pers.
Ludolfia, Willd.
Triglossum, Fisch.
Macropax, Rafinesque.
Arundinis sp. Walth. Michx.
Nasti spp. Raspail.
Panici sp. L. Lam.
Sub-Trib. 3. Bambuseæ veræ.
Beesha, Rheed.
Melocanna, Roep. Tr.
Nasti sp. Rasp.
Bambusæ sp. Roxb. R. et Sch. Poir.
Schizostachyum, N. ab E.
Nasti sp. Schult.
Dendrocalamus, N. ab E. in Schlechtend. Linn.
Bambusæ sp. Roxb.
Nasti sp. Sm.
Bambusa, L. (ex parte)
Guadua et Bambusa, Kunth.
Nastus, P. de B. Sm. Spr.
Arundinis spp. L.
Arundarbor. Rumph.

Genera incertæ sedis.
Pterium, Desv.
Rhytachne, Desv.

Order CCLXVIII. CYPERACEÆ. The Sedge Tribe.

Cypercideæ, *Juss. Gen.* 26. (1789); *Link. Hort. Botanic.* 1. (1827).—Cyperaceæ, *R. Brown Prodr.* 212. (1810); *Lestiboudois Essai; DC. and Duby*, 483. (1828); *Lindl. Synops.* 278. (1829); *Nees von Esenbeck in Linnæa*, 9. 273. (1835).

Essential Character.—*Flowers* hermaphrodite or unisexual, consisting of imbricated solitary bracts, very rarely enclosing other opposite bracts at right angles with the first, called *glumes*. *Perianth* none, unless the glumes, when present, be so considered, or the hypogynous setæ. *Stamens* hypogynous, definite, 1, 2, 3, 4, 5, 6, 7, 10, 12; *anthers* fixed by their base, entire, 2-celled. *Ovary* 1-seeded, often surrounded by bristles called hypogynous setæ, probably constituting the rudiments of a perianth; *ovule* erect; *style* single, trifid, or bifid; *stigmas* undivided, occasionally bifid. *Nut* crustaceous or bony. *Albumen* of the same figure as the seed; *embryo* lenticular, undivided, enclosed within the base of the albumen; *plumule* inconspicuous.—*Roots* fibrous. *Stems* very often without joints, 3-cornered, or taper. *Leaves* with their sheaths entire. The lowermost bracts often sterile.

Affinities. These so nearly resemble the last tribe in appearance, that the one may be readily mistaken for the other by incurious persons; they are, however, essentially distinguished by many important points of structure. In the first place, their stems are solid and angular, not round and fistular; there is no diaphragm at the articulations; their flowers are destitute of any other covering than that afforded them by a single bract, in the axil of which they grow, with the exception of Carex, Uncinia, and Diplacrum, in which 2 opposite glumes are added; and, finally, the seed has its embryo lying in one end of the albumen, within which its cotyledonar extremity is enclosed, and not on the outside, as in Grasses; a very important fact, which it is the more necessary to point out, as Brown describes it (*Prodr.* 212) as lenticular and placed on the outside of the albumen. The additional glumes above adverted to form what Linnæan botanists call the nectary or aril! Brown mentions a case where these glumes, which he calls a capsular perianth, included stamens instead of a pistil. According to Turpin, rudiments of them sometimes appear in different species of Mariscus. The close affinity of Cyperaceæ, on the one hand, to Grasses, is sufficiently apparent; on the other, they approach Juncaceæ and Restiaceæ, in the glumaceous state of the perianth, and in general habit. They are at once known from Restiaceæ by the sheaths of the leaves not being slit. The species are extremely difficult to determine, and the distinctive characters of the genera were unsatisfactory, until Professor Nees v. Esenbeck skilfully rearranged the order in the place above quoted.

Geography. Found in marshes, ditches, and running streams, in meadows and on heaths, in groves and forests, on the blowing sands of the sea-shore, on the tops of mountains, from the arctic to the antarctic circle, wherever Phænogamous vegetation can exist. Humboldt remarks, that in Lapland Cyperaceæ are equal to Gramineæ, but that thence, from the temperate zone to the equator, in the northern hemisphere, the proportion of Cyperaceæ to Gramineæ very much diminishes. As we approach the line, the character of the order also changes: Carex, Scirpus, Schœnus, and their allies, cease to form the principal mass of the order, the room of which is usurped by Cyperus, Kyllinga, Mariscus, and the like, genera comparatively unknown in northern regions, or at least not forming any marked feature in the vegetation. A few species are common to very different parts of the world, as Scirpus triqueter and capitatus, and Fuirena umbellata, to New Holland and South America, and several Scirpuses to Europe and the southern hemisphere.

Properties. While Grasses are celebrated for their nutritive qualities, and for the abundance of fæcula and sugar they contain, Sedges are little less

remarkable for the frequent absence of those principles: hence they are scarcely eaten by cattle. The roots of Carex arenaria, disticha, and hirta, have diaphoretic and demulcent properties, on which account they are called German Sarsaparilla. Those of Cyperuses are succulent, and filled with a nutritive and agreeable mucilage. In Cyperus longus a bitter principle is superadded, which gives its roots a tonic and stomachic quality. *DC.* The tubers of Cyperus rotundus are said by General Hardwicke to be administered successfully in cases of cholera by Hindoo practitioners, who call the plant Mootha. Those of C. perennis, or Nagur-Mootha, are when dried and pulverised, used by Indian ladies for scouring and perfuming their hair. *Trans. M. and P. Soc. Calc.* 2. 400. The root of Cyperus odoratus has a warm aromatic taste, and is given in India, in infusion, as a stomachic. *Ainslie*, 2. 58. Cyperus Hydra is said by Hamilton to be a pest to the sugar-cane plantations in the West India Islands, overrunning them and rendering them barren. The planters call it Nut Grass. *Prodr. Fl. Ind.* p. 13. The root of Scleria lithosperma is supposed, upon the Malabar coast, to have antinephritic virtues. *Ainslie*, 2. 121. The papyrus of the Egyptians was obtained from a plant of this order, Cyperus Papyrus. Various Scirpi and similar plants are applied to domestic purposes, such as making the bottoms of chairs, the wicks of candles, the stuffing of cushions, &c.

GENERA.

§ 1. Cypereæ, Nees.
Acrolepis, Schrad.
Hemichlæna, Schrad.
Dulichium, Rich.
Comostemum, Nees.
Pycreus, P. de B.
Cyperus, L.
Papyrus, W.
Mariscus, Vahl.
Kyllingia, L.
Courtoisia, Nees.
Remirea, Aubl.
§ 2. Hypolytreæ, Nees.
Anosporum, Nees.
Melancranis, Vahl.
Hemicarpha, Nees.
Lipocarpha, R. Br.
Tunga, Roxb.
Hypolytrum, Rich.
Albikia, Presl.
Diplasia, Rich.
Fuirena, Rottb.
§ 3. Chrysitricheæ, Nees.
Chondrachne, R. Br.
Chorizandra, R. Br.
Chrysithrix, V.
§ 4. Scirpeæ, Nees.
Dichostylis, P. de B.
Abildgaardia, Vahl.
Gussonea, Presl.
Chætocyperus, Nees.
Pterotheca, Presl.
Echinolytrum, Desv.
Fimbristylis, Vahl.
Trichelostylis, Lestib.
Isolepis, R. Br.
Dichromena, Rich.
Heleogiton, Link.
Schœnidium, Nees.
Ficinia, Schrad.
Sickmannia, Nees.
Malacochæte, Nees.
Pterolepis, Schrad.
Hymenochæte, P. de B.
Blysmus, Panz.
Trichophorum, Rich.
Eriophorum, L.
Scirpus, P. de B.
Scirpidium, Nees.
Eleogenus, Nees.
Eleocharis, R. Br.
Limnochloa, P. de B.
§ 5. Rhynchosporeæ, Nees.
Morisia, Nees.
Haplostylis, Nees.
*Pterorhynchium, Nees.
Mitrospora, Nees.
Calyptrostylis, Nees.
Cephaloschœnus, Nees.
Diplochæte, Nees.
Ceratoschœnus, Nees.
Spermodon, P. de B.
Haloschœnus, Nees.
Echinoschœnus, Nees.
Zosterospermum, P. de B.
Rhynchospora, Vahl.
§ 6. Cladieæ, Nees.
Baumea, Gaudich.
Chapelliera, Nees.
Elynanthus, P. de B.
Schœnopsis, P. de B.
Schœnus, P. de B.
Lepisia, Presl.
Trasi, P. de B.
Machærina, Vahl.
Pleurachne, Schrad.
Ecklonia, Schrad.
Chætospora, R. Br.
Pleurostachys, Brongn.
Nomochloa, P. de B.
Streblidia, Link.
Carpha, R. Br.
Asterochæte, Nees.
Cyathocoma, Nees.
Buekea, Nees.
Oreobolus, R. Br.
Arthrostylis, R. Br.
Cladium, Browne.
Gahnia, Forst.
Lamprocarya, R. Br.
Melachne, Schrad.
Morelotia, Brongn.
Evandra, R. Br.
Caustis, R. Br.
Sclerochætium, Nees.
Lepidosperma, Labill.
§ 7. Scleriæ, Nees.
Scleria, Berg.
Cylindropus, Nees.
Hypoporum, Nees.
Becquerela, Brongn.
Lagenocarpus, Nees.
Diplacrum, R. Br.
Calyptrocarya, Nees.
§ 8. Elyneæ, Nees.
Elyna, Schrad.
Kobresia, W.
Trilepis, Nees.
Aulacorhynchus, Nees.
§ 9. Cariceæ, Nees.
Schœnoxyphium, Nees.
Carex, L.
Uncinia, Pers.

Mapania, Aubl.
Tetraria, P. de B.
Catagyna, P. de B.
Diaphora, Lour.
Opetiola, Gærtn.
Didymonema, Presl.
Epiandria, Presl.

Order CCLXIX. DESVAUXIACEÆ.

Desvauxieæ, *Nixus Plantarum, p.* 23. (1833); *a* § *of* Restiaceæ; *Bartl. Ord. Nat. p.* 36. (1830); *Martius Conspectus, No.* 38. (1835).—Centrolepideæ, *Desvaux in Ann. des Sc.* 13. 36. (1828).

Essential Character.—*Perianth* 0, except sometimes a 2-valved glume. *Stamen* 1; *anther* simple. *Ovaries* from 3-18 attached to a common axis. *Fruit* as many 1-seeded utricles, opening longitudinally.—Little tufted *herbs*, resembling small scirpi. *Leaves* setaceous, sheathing at the base. *Scapes* filiform, undivided, naked. *Flowers* enclosed in a terminal spathe.

Affinities. Next Restiaceæ, from which they are separated chiefly on account of their numerous carpels, which dehisce when ripe, and their spathaceous inflorescence. Brown and Bartling have between them furnished the foregoing character.

Geography. New Holland herbs.

Properties. Unknown.

GENERA.

Desvauxia, R. Br.
Centrolepis, La B.
Alepyrum, R. Br.

Order CCLXX. RESTIACEÆ.

Restiaceæ, *R. Brown Prodr.* 243. (1810); *Kunth in Humb. N. G. et Sp.* 1. 251. (1815); *Agardh Aph.* 156. (1823) *a* § *of* Junceæ; *Ach. Rich. Nouv. Elém.* ed. 4. 424. (1828); *Lindl. Synops.* 272. (1829); *Nees v. Esenbeck, in Linnæa,* 5. 627. (1830) *et* 7. 614. (1832).—Elegieæ, *Beauv. in eod. loc.* (1828).

Essential Character.—*Perianth* inferior, 2-6-parted, seldom wanting. *Stamens* definite, 2-6; when they are from 2 to 3 in number, and attached to a perianth of 4 or 6 divisions, they are then opposite the inner segments *(petals)*; *anthers* usually unilocular. *Ovary* 1- or more celled, cells monospermous; *ovules* pendulous. *Fruit* capsular, or nucamentaceous. *Seeds* inverted; *albumen* of the same figure as the seed; *embryo* lenticular, on the outside of the albumen, at that end of the seed which is most remote from the hilum.—*Herbaceous* plants or *under-shrubs*. *Leaves* simple, narrow, or none. *Culms* naked, or more usually protected by sheaths, which are slit, and have equitant margins. *Flowers* generally aggregate, in spikes or heads, separated by bracts, and most frequently unisexual. *R. Br.* (1810); a little altered.

Affinities. The principal character distinguishing this family from Juncaceæ and Cyperaceæ consists in its pendulous seed and lenticular embryo being placed at the extremity of the seed opposite to the umbilicus. From Juncaceæ it also differs in the order of suppression of its stamina, which, when reduced to 3, are opposite to the inner segments of the perianth; and most of its genera are distinguishable from both these orders, as well as from Commelinaceæ, by their simple or unilocular anthers. *Brown in Flinders,* 579. To this may be added, that the habit is rather that of Cyperaceæ. From all the orders with spadiceous characters, the glumaceous nature of its perianth, when it is present, distinguishes this order. If the perianth is absent, it is then only to be known from Cyperaceæ by the position of the embryo, and by the sheaths of its leaves being slit. While I adopt the opinion of Eriocauloneæ being a part of this natural order, I cannot doubt that the tripetaloid flower and polyspermous fruit of Xyris, characters indicating a far superior degree of evolution, are sufficient to separate that genus as the representative

of a peculiar order; a measure which Brown appears to to have anticipated when he remarked (*Prodr.* 244.), that the genus Xyris, although placed by him at the end of Restiaceæ, is certainly very different from the other genera, in the inner segments of the perianth being petaloid, with the stamens proceeding from the top of their ungues, and in their numerous seeds.

Geography. All, with the exception of Eriocaulon, extra-European; chiefly found in the woods and marshes of South America, and in New Holland and southern Africa.

Properties. None, except that the tough wiry stems of some species are manufactured into baskets and brooms. Willdenowia teres is employed for the latter purpose, and Restio tectorum for thatching.

For the following arrangement I am indebted to my excellent friend Professor Nees v. Esenbeck.

GENERA.

§ 1. Spicula fæminea polycarpa. Fructus capsularis. Capsula v. trilocularis v. abortu unilocularis, rima dehiscens aut prorsus indehiscens, coriacea.

Restio, L. (ex parte)	Leptocarpus, R. Br.	Chætanthus, R. Br.	Calorophus, Lab.
Elegia, Thunb.	*Restionis* sp. Forst.	Anarthria, R. Br.	Lyginia, R. Br.
Thamnochortus, Brg.	W.	Lepyrodia, R. Br.	*Schænodi* sp. Lab.
	Schænodi sp. Lab.		

§ 2. Spicula ♀ submonocarpa. Fructus nucamentaceus, monospermus, durus, indehiscens, basi sæpe perigynio lobato lacerove cinctus.

Rhodocoma, N. ab E. (84)	Ceratocaryum, N. ab E. (87)	Cucullifer, N. ab E. (88)	Lepidanthus, N. ab E.
			Loxocarya, R. Br.
Hypodiscus, N. ab E. (85)	Willdenovia, Thunb.	Mesanthus, N. ab E. (89)	Antochortus, N. ab E. (90)
	Nematanthus, N. ab E.		
Leucoplocus, N. ab E. (86)		Hypolæna, R. Br.	Aphelia, R. Br.*

Sub-Order. ERIOCAULONEÆ.

Eriocauloneæ, *L. C. Richard in H. B. K. Nov. Gen. et Sp. Pl.* 1. 251. (1815); *Desvaux in Ann. Sc.* 13. 36. (1828); *Martius in Act. Acad. Cæs. Nat. cur.* 17. (1833).

Essential Character.—*Flowers* capitate, bracteate, unisexual. *Calyx* 3-leaved with 2 of the leaves anterior, or 2-leaved. *Ovary* superior 3- or 2-celled. Dehiscence of the capsule loculicidal. *Seeds* solitary, pendulous, with series of hairs. *Embryo* lying upon the albumen at the end of the seed most remote from the hilum.—*Herbs* with parallel-veined sheathing leaves. *Martius.*

Affinities. Usually combined with Restiaceæ, from which, however, Von Martius separates it on the following grounds:—

Restiaceæ. Flowers in spikes. Calyx glumaceous ∇. Stamens in a single row, 1-3, opposite the petals; anthers generally 1-celled. Seeds without rows of hairs.

Eriocauloneæ. Flowers in heads, unisexual. Calyx sepaloideous Δ. Stamens 3, 6, 2, 4; if in two rows with the inner row most developed; anthers 2-celled. Seeds solitary, with rows of hairs.

An elaborate account of the order is given by Von Martius, and many remarkable species of Eriocaulon are figured by Bongard in *Memoirs of the Imperial Academy of St. Petersburgh, 6th series*, 1. *p*, 601.

Geography. Found in marshes in most parts of the world.

Properties. Unknown.

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* This genus is omitted from his list by Professor Nees von Esenbeck, who probably refers it, with Bartling, to Desvauxiaceæ.

GENERA.

Eriocaulon, L.
Symphachne, Desv.
*Nasmythia, Huds.
*Pæpalanthus, Mart.
Tonina, Aubl.
Hyphydra, Schreb.
Philodice, Mart.
Leucocephala, Roxb.

Order CCLXXI. XYRIDACEÆ.

Xyrideæ, *Kunth in Humb. N. G. et Sp.* 1. 255. (1815) *a sect. of* Restiaceæ; *Agardh Aphorism.* 158. (1823); *Desvaux in Ann. des Sc.* 13. 49. (1828).

Essential Character.—*Calyx* glumaceous, 3-leaved ∇. *Corolla* petaloid, 3-petalled. *Fertile stamens* 3, inserted upon the claws of the petals; *anthers* turned outwards, 2-celled; *sterile stamens* alternate with the petals. *Ovary* single; *style* trifid; *stigmas* obtuse, multifid or undivided. *Capsule* 1-celled, 3-valved, many-seeded, with parietal placentæ. *Seed* with the embryo on the outside of the albumen, and at the end most remote from the hilum.—*Herbaceous* plants with fibrous roots. *Leaves* radical, ensiform, with dilated equitant scarious bases. *Flowers* in terminal, naked, imbricated heads.

Affinities. United with Restiaceæ by Brown and others, separated as a distinct order by Agardh and Desvaux, this appears to me to be essentially distinguished by the higher development of its floral envelopes, a character which I cannot but regard as more important than the mere accordance in the structure of the seed, in consequence of which chiefly it has been retained in Restiaceæ. Those who have distinguished this order have referred to it several genera which by no means enter into the idea I have of the limits that should be prescribed to it, particularly Aphyllanthes, which is surely a Juncacea. Brown remarks, that the anomalous genus Philydrum, and even Burmannia, are related to Xyris; and that these plants agree in some respects with Orchidaceæ in the structure of the seed and stamen (*Prodr.* 264). To me it seems that the relation of Xyridaceæ is very great with Commelinaceæ, in which I find Von Martius concurs.

Geography. All natives of the hotter parts of the world, chiefly in the tropics of America, Asia, and Africa. Two or three species of Xyris are found in the southern states of North America,

Properties. The leaves and root of Xyris indica are employed against itch and leprosy. *Agardh.*

GENERA.

Xyris, L.
Abolboda, H. B. K.

Class IV. RHIZANTHS.

Rhizantheæ, *Blum. Fl. Javæ*, (1828); *Endlicher Meletemata*, p. 10. (1832).

Essential Character.—Parasitical leafless plants. *Stem* homogeneous. Vascular system scarcely present. *Flowers* propagated by the agency of sexes. *Seeds* having no embryo, but consisting of a homogeneous sporuliferous mass.

At this point in the Vegetable Kingdom, we have reached the limit between sexuality and asexuality at a different but similar road by which we arrive at it through Gymnosperms. The latter resembling Exogens in all the organs of their vegetation, gradually passed into the *higher* Acrogens through Equisetum, Cycadaceæ, and certain Coniferæ, Here we have another most curious assemblage, which, with many of the peculiarities of Endogens, seems to be an intermediate form of organisation between them and the *lower* Acrogens. They agree with Endogens in the presence of sexes, and sometimes in the ternary structure of their flower; but they have scarcely any spiral vessels (vascular system), and their seeds appear, as far as they have been examined, to consist of a mass of spores, and not to have any special embryo. In their succulent texture, in their colour, often in their putrid odour when decaying, in the sporuliferous seeds, and in their parasitical habits, these plants resemble Fungaceæ; while in their flowers and their sexes they accord with Araceæ or similar Endogens.

Brown, however, values these circumstances differently. In the first place he looks upon Rafflesiaceæ to be at least closely allied to Aristolochiaceæ, by which it would seem as if he considered the approach of these plants was to Exogens, and not to Endogens; and secondly, he attaches no importance to the homogeneity of the embryo, because the same structure he says exists in Orobanche and Orchidaceæ. But with regard to *Orobanche*, that plant has a slightly 2-lobed embryo lying in a mass of albumen, so that I do not see how it can be brought into comparison with that of Rhizanths; and as to Orchidaceæ, I do not know that we have any right to say that it is homogeneous; we ought rather to say that its structure is unknown. Supposing, however, that it was homogeneous, yet one could hardly consider it analogous to a "nucleus compositus e telâ cellulosâ, corpusculis sporidiiformibus e cellulis angulatis conflatis et massulis grumosis immixtis, filis tenuissimis earundem particulas connectentibus, farctâ," which Endlicher describes in Scybalium fungiforme, and which is taken as the type of the structure of the seeds of Rhizanths. I know not whether this is right or not, and it must always be remembered that it is at variance with the elder Richard's description of the seed of Cynomorium; but supposing it to be wholly erroneous, still it seems to me necessary to admit the distinctness of Rhizanths from all other classes. For although they have to a certain extent a vascular structure, yet it exists in the smallest conceivable degree. Brown says he has found spiral vessels in Rafflesia (*in which he had at first denied their existence*), and in several other cases. Martius also found them in Langsdorffia, in the form of bundles lying in the rhizoma, stem and branches, and Mohl in similar parts of Helosis, but in such small quantity compared to the mass of the plants, as to form a fact of no importance. For it is not here a question about the presence or absence of spiral vessels, but about their abundance. In Exogens or Endogens *equally developed* they would be most copious, and would exist in all the foliaceous

organs ; and it would in my mind be no argument against the importance of this circumstance, to say that they have no existence in certain Endogens, as Lemna, for instance ; for in that and similar cases the small degree in which such plants are developed, may be considered to account for the absence of spiral vessels ; just as in a common Exogen, the spiral system does not make its appearance until the general development of the individual has made some progress.

So, indeed, in Ferns and other Acrogens of high degree, we have no right to say that the vascular system is absent ; on the contrary, in the centre of the stem of Lycopodiaceæ, and in the soft parts of that of Ferns, either spiral or scalariform vessels exist in abundance ; but they never make their appearance in the foliaceous organs as in more perfect plants.

There is an excellent account of Rhizanths by Endlicher in his Meletemata, from which, as it contains a summary of all that was in 1832 known concerning them, I extract the following matter ; not, however, literally, but in a more condensed form than the original. For further information the reader is referred to the *Meletemata*, Blume's *Flora Javæ*, Martius' *Nova Genera, &c. vol.* 3., Brown's *Observations on Rafflesia in the* 13*th volume of the Linnean Society's Transactions ;* and the various works quoted at the head of the following natural orders.

Rhizanths all agree in being of a fungus-like consistence, and in their habits of living parasitically on the roots of other plants. Their forms are, however, exceedingly diversified ; some have the aspect of a pileate Fungus (a Mushroom), or develope a head like that of a Bullrush (Typha) : others push forth a thyrse of flowers, or an elegant panicle ; while others have their bloom in a head like that of some cynarocephalous plant. In Helosis and Langsdorffia the rhizoma, which is horizontal and branched, and which at intervals throws up perpendicular flowering stalks, is very much analogous to the spawn of Fungi. In Cynomorium, Scybalium and Balanophora this part is wanting, and in its room the roots of those genera emit roundish deformed tubers collected in a circle round the roots of other plants, and rooting into them by some unknown process. Blume says, "that at the period of germination of Balanophoreæ there is produced from the roots of the Fig on which they grow, an intermediate body of a fleshy nature, and intimately combined with its superficial woody layers, and that this intermediate body is penetrated by their spiral vessels which render it woody." He, moreover adds, that "several seeds of Balanophoreæ germinate on nearly the same points of the Fig-root, hence this woody body or luxuriant product of the juices that are sucked out, has generally an irregular form, and the plants proceeding from such tubers grow out in different directions, much in the same manner as the tubers of a Potatoe generate their offsets, with this difference, however, that in a Potatoe the eyes of the plant are in the circumference, while in Balanophora they are placed in the centre, and on that account the intermediate body where the offsets break out, has necessarily a conical extension." Something of the same kind occurs in Scybalium, whose tubers are expanded in an irregular form about the root of some unknown tree, are fleshy, and composed even in the substance of the stalk of somewhat irregular cells and no spiral vessels. In the room of leaves these plants have scales, which chiefly differ from true leaves in the want of colour, a character so common to those and all other plants parasitical on roots. A vertical stalk (stipes) sometimes terminated by a solitary head of flowers, sometimes bearing several heads variously arranged upon the stalk, is common to all the genera of Balanophoreæ ; which moreover agree in this, that the flower-heads which at first are sessile on the rhizoma, and concealed by many rows of imbricated scales, resemble the leafy rosette of a Sempervivum without colour, or rather the very small bud of a Rafflesia. The ge-

nuine species of Helosis shew on their rhizoma roundish conical buds seated on a very short stalk, or altogether sessile, enclosing the rudiments of the future head within a very thin involucre, as a fungus within the volva; this latter after a time splits into 3 or more segments, and emits the flower-head enlarged, and furnished with a stalk which is altogether naked except at the base, where it is surrounded by the scale-like segments of the withering involucre. This is the most simple form of involucre, which in the other genera becomes more and more complicated, and finally runs into numerous series of imbricated scales which clothe the stipes more or less completely. The more important circumstances in the organs of fructification will be found in the characters of the orders of Rhizanths.

In those genera such as Rafflesia, Apodanthus, &c. which grow upon the bark of the stems of trees there are some diversities of structure in the organs of vegetation that are very remarkable. Blume tells us that Rafflesia Patma appears upon the creeping roots or stems of Cissus scariosa in the form of solitary or clustered hemispherical dilations which look like excrescences or expansions of the root. These excrescences are something of the nature of leaf-buds, consisting of layers of scales and a more solid centre. As the latter increase in size they burst through the wrapper by tearing it irregularly from the apex towards the base, and develope themselves in the form of numerous scales, at first flesh-coloured, then brownish, and finally deep purple, which surround the flowers. As soon as these parts are exposed, richly nourished as they are by the humid air that surrounds them, they grow with such rapidity that it is reported that Rafflesia, which when full blown, is a yard across, and when unexpanded, is as large as a middle-sized cabbage, only takes about three months for its complete formation. Brugmansia has a similar mode of developement.

The seeds of Balanophoreæ have already been noticed, in the words of Endlicher. Blume describes those of Brugmansia Zippelii as containing 1° a grumous substance which under a powerful microscope exhibits a lax cellular tissue, formed of roundish cells, which become angular by mutual pressure, and are filled with grumous matter; among these are dispersed 2° threads or tubes, very numerous, very tender, long, entangled without order, usually forked, sometimes irregularly branched. Upon these threads Blume makes the following remarks:—"The tender tubes, principally visible in the ripe spores of Rhizanths, may be considered analogous to those lowest forms of vegetation which belong to the genus *Mycoderma* Pers. of the family *Hydronemateæ* Carus. The parietes of the fruit of Brugmansia are seldom covered with spores when the pericarp is closed up, but they constantly are when the plant is decaying, a circumstance which is attributable to the facility with which the spores separate from their stalks, and to the cellulo-gelatinous matter in which the fruit abounds. It is worthy of remark, however, that the spores are attached in the same manner as the seeds of more perfect plants, although they are altogether different from them in structure. They are, indeed, to be compared only to the unfecundated ovules of Phænogamous plants, which in the latter are more completely evolved after impregnation, but in Rhizanths, as in other Cryptogamous plants, only after germination. That the ovules of Rhizanths, while inclosed in the pericarp of their mother ever arrive at the developement of an embryo, seems to be altogether untrue. For I have over and over again examined numerous specimens at different stages of formation; the observations have been repeated under the eyes of Reinwardt, and the brothers Nees von Esenbeck; as also by Meyer, so celebrated as an anatomist, upon specimens preserved in spirits of wine, so that I can deny the possibility of any error. How, indeed, can we suppose Rhizanths to be plants furnished with an embryo, when they exhibit only the simplest form of cellular organization in all their parts. *Fl. Javæ Rhizantheæ*, p. 23.

Order CCLXXII. RAFFLESIACEÆ.

Rafflesiaceæ, *Endlicher Meletemata, p.* 14. (1832).

Essential Character.—*Flowers* hermaphrodite, or by abortion dicœcious. *Perianth* superior, globose or campanulate; the limb 5-parted, with the segments imbricated or doubled inwards in æstivation; the throat surrounded by calli, which are either distinct or run together into an entire ring. *Column* (synema) hypocrateriform or sub-globose, adhering to the tube of the perianth; *anthers* numerous, distinct, or somewhat connate, adhering by the base, in one row; 2-celled, with the cells opposite, and each opening by a vertical aperture, or concentrically many-celled with a common pore. *Ovary* inferior, 1-celled, with many many-seeded parietal placentæ; *styles* conical, equal in number to the placentæ, run together within the column, but projecting beyond it, and then distinct.—*Stemless* plants. *Flowers* solitary, immersed among scales. *Endlicher.*

Affinities. These curious plants are all parasitical, with scales in room of leaves. Among them is the very remarkable species described by Brown in the 13th vol. of the Linnean Society's Transactions, under the name of Rafflesia, to which I refer those who are desirous either of knowing what is the structure of one of the most anomalous of vegetables, or of finding a model of botanical investigation and sagacity, or of consulting one of the most beautiful specimens of botanical analysis which Mr. Bauer has ever made. The most interesting circumstance in the organisation of these plants, is that they exhibit in some degree the structure both of flowering and flowerless, or of vascular and cellular plants. Like flowering or vascular plants, they have a distinct floral envelope, and distinct sexual organs, not essentially, or in fact very different from those of ordinary vegetables. Like flowerless or cellular plants, they have slender traces of spiral vessels, and their seeds appear to be composed of a homogeneous mass of grumous matter, in which no radicle or cotyledons, no ascending or descending extremity, no definite points of vegetation, can be distinguished. Kunth considers Pilostyles to be a morbid alteration of the flower of an Adesmia, see *Ann. Sc. N. Ser. vol.* 4. p. 223; an opinion which Guillemin strenuously controverts.

Geography. Natives of the East Indies.

Properties. Probably all astringent. Rafflesia is used in Java as a powerful astringent, for certain purposes.

GENERA.

Brugmansia, Bl.	Hæmatostrobus, S. et E.
Rafflesia, R. Br.	Pilostyles, Guill.

Order CCLXXIII. CYTINACEÆ.

Cytineæ, *Adolphe Brongn. in Ann. des Sc. Nat.* 1. 29. (1824): *Endlicher Meletemata*, p. 13. (1832).—Pistiaceæ, *Agardh. Aphor. Bot.* p. 240. (1826).—Aristolochiæ, § Cytineæ, *Link Handb.* 1. 368. (1829).

Essential Character.—*Flowers* monœcious at the top of a stalk covered with imbricated scales, the males uppermost, the females lowermost, in the axil of a bract, and supported on each side by a bractlet. *Males: Perianth* tubular-campanulate, with a spreading 4-6-lobed limb, the segments imbricated, the exterior alternating with the bractlets. *Column* fleshy, protruded beyond the tube, thickened at the point, covered by anthers, and terminated by (8) somewhat conical tubercles. *Anthers* 8, sessile, 2-celled; their cells distinct, opening longitudinally. Four dissepiment-like membranes alternate with the segments of the perianth, and join its tube with the column. *Females: Perianth* as in the

males, but epigynous. *Ovary* inferior, 1-celled, with 8 parietal placentæ. *Style* cylindrical, simple, joined to the tube of the perianth by septiform processes; *stigma* capitate, thick, with 8 furrows. *Endlicher.*

Affinities. Kunth asserts that Apodanthes is not a parasitical plant, but a morbid state of a Casearia flower. *Ann. Sc. N. Ser.* 4. 223. For an account of Hydnora see Meyer in *Act. Acad. Nat. Cur.* 16. 778.

Geography. South of Europe, the Cape of Good Hope, and Guiana.

Properties. Cytinus contains gallic acid, and, according to Pelletier (*Bull. Pharm.* 1331, d. 290), it has the singular property of precipitating gelatine without containing tannin.

GENERA.

Cytinus, L.
Hypocistis, Tourn.

Hypolepis, Pers.
Phelypæa, Thunb.
? Hisbanche, Sparrm.

Aphyteia, L.
Hydnora, Th.

Apodanthes, Poit.
?? Gonyanthes, Bl.

Order CCLXXIV. BALANOPHOREÆ.

Balanaphoreæ, *Rich. in Mém. Mus.* 8. 429. (1822); *Endlicher Meletemata*, p. 10. (1832).

Essential Character.—*Flowers* monœcious, collected in dense heads, which are roundish or oblong, usually bearing both male and female flowers, but occasionally having the sexes distinct; the receptacle covered with scales or setæ variable in form, here and there bearing also peltate thick scales; rarely naked. *Male flowers* pedicellate; *calyx* deeply 3-parted, equal, spreading, with somewhat concave segments. *Stamens* 1-3 (seldom more), epigynous, with both united filaments and anthers; the latter 3. *Female flowers: Ovary* inferior, 1-2-celled, 1-2-seeded, crowned by the limb of the calyx, which is either marginal and nearly inverted, or consists of from 2 to 4 unequal leaflets; *ovule* pendulous. *Style* 1, seldom 2, filiform, tapering; *stigma* simple, terminal, rather convex. *Fruit* 1-celled, containing numerous spores collected in a bag resembling a solitary seed. *Endl.* [*albumen* globose, fleshy-cellular, whitish, very large. *Embryo* very minute in proportion to the albumen, roundish, whitish, enclosed in a superficial excavation, undivided, according to *Richard.*]—Fungus-like plants, parasitical upon roots; *roots* fleshy, horizontal, branched; *stem* naked, or covered by imbricated scales.

Geography. A small tribe, consisting entirely of leafless plants, parasitical upon roots, found in the West Indies, South America, the Indian Archipelago, some of the South Sea Islands, and the Cape of Good Hope.

Properties. Unknown.

GENERA.

§ 1. Helosieæ, Endl.
Helosis, Rich.
Caldasia, Mut.
Scybalium, Endl.

§ 2. Langsdorffieæ, Endl.
Langsdorffia, Mart.
Balanophora, Forst.

Order CCLXXV. CYNOMORIACEÆ.

Cynomorieæ, *Agardh Aph.* 203. (1825) *a* § *of* Urticeæ ; *Endl. Meletem. p.* 11. (1832) *a* § *of* Balanophoraceæ.

Essential Character—Only known from Balanophoraceæ by their stamens being distinct, and the perianth of the male flowers imperfect.

Properties. Cynomorium, the old Fungus Melitensis is an astringent.

GENERA.

§ 1. Lophophyteæ, Endl.
Lophophytum, Endl.
Sarcophyte, Sparrm.
Ichthyosma, Schl.
§ 2. Cynomorieæ, Endl.
Cynomorium, Mich.

Class V. ACROGENS, or FLOWERLESS PLANTS.

Acotyledones, *Juss. Gen.* 1. (1789).—Exembryonatæ *or* Arhizæ, *Rich. Anal. du Fr.* (1808).—Cellulares, *DC. Fl. Fr.* 1. 68. (1815); *Lindl. Synops.* p. 3. (1829).—Acotyledoneæ *and* Pseudocotyledoneæ, *Agardh. Aph.* 72. (1821).—Agamæ, Cryptogamous *or* Ætheogamous Plants *of authors; Ad. Brongniart in Dict. Class.* 5. 155. (1824).—Nemea, *Fries. Syst. Orb. Veg.* 1. 30. (1825).

Essential Character.—Substance of the plant usually composed of cellular tissue chiefly, either in a spheroidal or elongated state; spiral vessels or ducts only present in the highest orders. *Stem* either increasing by an extension of its point, or by a regular or irregular developement in all directions from one common point; not increasing perceptibly in thickness or density when once formed. *Cuticle* generally destitute of stomates. *Sexual organs*, and consequently *flowers* absent. *Reproduction* taking place either by *spores* or *sporules*, which are enclosed in cases called *thecæ*, or imbedded in the substance of the plants; or else by a mere dissolution of the utricles of cellular tissue; *germination* occurring at no fixed point, but upon any part of the surface of the spores.

Such are the characters by which this class of the vegetable kingdom is distinguished from the last; characters of so marked a kind as to render it impossible to refer individuals of one to the other. The universal want of flowers, and of all kinds of perfect sexual apparatus; the general absence of spiral vessels, the place of which is occasionally supplied by annular or scalariform ducts; the non-existence of a true trunk (for the stipes of Ferns, composed only of the united bases of the leaves or fronds, is scarcely analogous to the trunk of Vascular plants); and, finally, the near approach in the most simple tribes, such as Arthrodieæ and Chaodineæ, to the nature of infusorial animalcules, are all facts, the accuracy of which is undisputed, and which have no parallel in flowering plants. With regard to their stem, instead of its increasing by the deposition of matter originating in the leaves, it appears to be a mere extension of some common vegetating point, which becomes cylindrical and long, when it is capable of being acted upon by the influence of light, as in Ferns, Lycopodiaceæ, &c.; which expands irregularly and remains flat and foliaceous in such orders as Hepaticæ and many Algæ; which developes in straggling threads in some of the latter; and which collects these threads into masses of reproductive matter in Fungi. It is true that sexual apparatus has been described by various authors in many of the tribes of Acrogens; but it is equally certain, that if such a provision for propagation ever exists, it is in a most imperfect state, and by no means analogous to what we call the sexes in flowering plants; and it is even conjectured that the simplest forms of Lichens, Fungi, and Algæ, are produced by a kind of equivocal generation, from a common form of matter having no inherent special tendency to control its mode of developement, but appearing as a Lichen, Alga, or Fungus, according to the peculiar conditions of soil and atmosphere under which it is called into action. Upon this subject more will be said, in speaking of those orders hereafter.

Flowerless may be said to approach Flowering plants by Ferns, which have a certain relation to Cycadaceæ, by Lycopodiaceæ, which may be compared in many respects to Coniferæ, and by Equisetaceæ, which have a great external resemblance to Casuarina.

The subject of Cryptogamic botany is not less obscure than extensive; it is usually among botanists, an object of separate attention, especially in the lower tribes; and I think I shall best consult the interest of readers of

this work, by stating the opinions of those who have given the greatest attention to particular tribes, rather than by offering any thing novel myself. I trust, however, I may, without incurring the charge of presumption from those great cryptogamists whose lives have been devoted to the study of the subject, offer here and there a few remarks upon the analogy that exists between the more anomalous forms of Acrogens and those of Flowering Plants: I venture to do this with the more confidence, because the truth of any opinions I may advance will have to be tried by the general laws of vegetable organisation, and upon principles which do not depend upon an extensive acquaintance with species.

There has not been any very satisfactory arrangement of the orders of Acrogens. De Candolle refers Ferns and their immediate allies to Endogenous plants, and separates the remainder of Acrogens into *Foliaceæ*, or plants with leafy expansions, and *Aphyllæ*, or those destitute of leaves: but to the first of these there are grave objections; the second nearly corresponds with the arrangement here adopted.

Agardh, in 1821, divided them thus:—Acotyledoneæ, or leafless plants, with all the parts confluent, the colour not herbaceous, with no sexes, and propagated by sporidia. (Sporidium est corculum nudum, radiculâ, cotyledone et hilo destitutum. *Aph.* 71.) Pseudocotyledoneæ, or leafy plants, the parts of which are sometimes confluent, the colour green, with an attempt at producing sexes, and propagated by sporules enclosed in capsules. (Spora est corculum perispermio (?) et membranâ simplici hilo destitutâ inclusum, germinatione cotyledonidium (analogon cotyledoni folium) explicans. *Ibid.* 71,) To Acotyledoneæ he refers only Fungi, Lichens, and Algæ, and comprehends the remainder in Pseudocotyledoneæ. This arrangement is undoubtedly natural, but it is liable to objection, on the ground, that although the two groups are distinct, yet it is extremely uncertain whether the characters assigned to each are founded upon accurate observation. For instance, the distinction drawn between their modes of reproduction or germination is altogether arbitrary. It is well known that Mosses and Confervæ are so similar when germinating, that young plants of the former have been described as belonging to the latter tribe (see Drummond's paper in the *Transactions of the Linnean Society*, 15. p. 20.); and yet one is said to increase by sporules, and the other by sporidia. The confluence of all the parts in Acotyledoneæ, and the separation of them in Pseudocotyledoneæ, will not distinguish them; witness Marchantia, Riccia, &c. in the latter, and such species as Caulerpa hypnoides in the former. Colour is a still less satisfactory difference: for example, what green have we in Mosses or Ferns, or other Pseudocotyledoneæ, more intense than in Ulva and numerous Algæ among Acotyledoneæ? As to a supposed tendency to developement of sexes in one and not in the other, this may possibly be the case; but it is no character of the two groups; for what better proof have we of any such tendency existing in Lycopodiaceæ or Hepaticæ, than in Lichens.

Fries, in his *Plantæ Homonemeæ*, adopts these divisions, but assigns them new names and characters. He calls the Acotyledoneæ of Agardh Homonemea, and Pseudocotyledoneæ he terms Heteronemea, with the following characters:—Heteronemea. Germinating filaments, combining in a heterogeneous body. Some analogy to the difference of sexes. Tissue consisting of cellules regularly united. Homonemea. Germinating filaments, either distinct or combining in a homogeneous body. No trace of sexual differences. Tissue consisting of anomalous, somewhat filamentous cellules. —I scarcely know whether to consider these definitions more satisfactory than those of Agardh; perhaps they are: but their fault is evidently that

of being too hypothetical, and of not distinctly deciding the position of Hepaticæ.

Struck, perhaps, with this objection, Adolphe Brongniart has more recently proposed a triple division of cellular plants, in the following manner:—I. Neither vessels nor foliaceous appendages; no trace of sexual organs; sporules contained in indehiscent capsules, or bursting irregularly, with no kind of proper integument. These answer to the Acotyledones of Agardh and the Homonemea of Fries. II. No vessels, but foliaceous appendages; sexual organs doubtful; sporules contained in great numbers in capsules that burst regularly, and have a proper integument. Ex. Hepaticæ and Mosses. III. Vessels present, and foliaceous appendages; sexual organs certainly existing in some: sporules contained in polyspermous and dehiscent, or monospermous indehiscent capsules. Ex. Ferns and their allies, with Chara.—To the definitions of these, several objections might be taken, particularly to all that part which relates to the supposed presence of sexual organs; but the divisions themselves appear less exceptionable than any of the others. They are moreover in conformity with the view that has been taken of the subject by Theodore Nees v. Esenbeck in his and Ebermaier's excellent *Medical Botany*.

Without exactly adopting any of the foregoing divisions, I have endeavoured to seize the best points of each in framing the following alliances; of which Filicales and Lycopodales may be considered to correspond with the first section, Muscales and Charales with the second, and Fungales with the third.

Alliance I. *FILICALES.*

Filices, *Juss. Gen.* 14. (1789); *Swartz Synops. Filicum* (1806); *Willd. Sp. Pl.* vol. 5. (1810); *R. Brown Prodr.* 145. (1810); *Agardh Aph.* 115. (1822); *Kaulfuss Enum.* (1824); *Spreng. Syst. Veg.* vol. 4. (1827); *Hooker and Greville Icones Filicum* (1827—1829); *Blume, Fl. Javæ* (1828). *Schott's Genera Filicum* (1835); *Mohl et Martius Plantæ Cryptogamicæ Brasilienses, p.* 40. (1834).

Essential Character.—*Leafy* plants, producing a *rhizoma*, which creeps below or upon the surface of the earth, or rises into the air like the trunk of a tree; this trunk consists of a hollow cylinder, of equal diameter at both ends, growing at the point only, containing a loose cellular substance which often disappears; it is coated by a hard, cellular, fibrous rind, which is much thicker next the root than at the apex, and it is itself composed of the united bases of the leaves. *Wood* when present, consisting almost exclusively of large scalariform or dotted ducts, imbedded in hard plates of thick sided elongated cellular tissue. *Leaves* (or *fronds*) coiled up in vernation, with annular ducts in the vascular tissue of their petiole, either simple or divided in various degrees, traversed by dichotomous veins of equal thickness, which are composed of elongated cellular tissue, with occasional ducts; *cuticle* frequently with stomates. *Reproductive organs* consisting of *thecæ* or semitransparent cases arising from the veins upon the under surface of the leaves or from their margin. *Thecæ* either pedicellate, with the stalk passing round them in the form of an elastic ring, or sessile and destitute of such a ring; either springing from beneath the cuticle, which they then force up in the form of a membrane (or *indusium*), or from the actual surface of the leaves. *Sporules* usually triangular, arranged without order within these thecæ. Sometimes the leaves are contracted about the thecæ, so as to assume the appearance of forming a part of the reproductive organs, and sometimes the place of theca is supplied by the depauperated lobes of the leaves.

Affinities. These, which are by far the most gigantic of Acrogens sometimes having trunks 40 feet high, approach the nearest to the Flowering classes by Cycadaceæ, which may be considered to have much affinity with them, on account of the imperfect degree in which their vascular

system is developed, of their pinnate leaves with a gyrate vernation, and their naked ovules borne upon the margin of contracted leaves, as the thecæ of Ferns are upon the fronds of Osmunda. Their affinity with Equisetum, to which they were formerly joined, consists more in their want of flowers, and in the presence of annular ducts, than in any similarity of habit. Lycopodiaceæ are readily known by their axillary thecæ dehiscing by two regular valves. Marsileaceæ are so very different, that it is difficult to find points of comparison between them.

The organ in Ferns which deserves the most particular attention is the theca, or case that contains the reproductive matter. By many it is named capsule; but as that kind of pericarp is essentially connected with the power of conveying fertilisation from the male apparatus to the ovules, and implies the existence of a certain definite relation between the various parts that it contains, nothing of which kind is found in the theca of Ferns, it is not necessary to insist upon the impropriety of applying such a name to any sporule-case in Acrogens. Easy as it is to shew that the theca is not analogous to a capsule, it is far less so to demonstrate with what organs or modifications of organs it really has an analogy. I am not, indeed, aware that this had been attempted, all botanists seeming to consider it a special organ, until, in the *Outlines of the First Principles of Botany*, I ventured to hazard the following theory (par. 533): "The thecæ may be considered minute leaves, having the same gyrate mode of developement as the ordinary leaves of the tribe; their stalk the petiole, the annulus the midrib, and the theca itself the lamina, the edges of which are united." I was led to this opinion, first, by the persuasion that there was no special organ in Ferns to perform a function which in flowering plants is executed by modifications of leaves; and, secondly, by the examination of viviparous species. I need not here remark, that observation has shewn us that the leaves of Flowering plants have the power of producing leaf-buds from their margin or any point of their surface; and the instance I have adduced in Grasses of a monstrous Barley shews that they can produce flower-buds also. I found in Ferns, which are exceedingly subject to become viviparous, that the young plants often grow from the same places as the thecæ, or from the margin; and I was particularly struck with a viviparous Fern, of which a morsel was given me by Dr. Wallich, where the young plants form little clusters of leaves in the place of sori. Upon examining these young plants, I saw that the more perfect, though minute, fronds were preceded by still more minute primordial leaves or scales, the cellular tissue of which had nearly the same arrangement as the cellules of the theca; and I was most especially struck with the resemblance between the midrib of one of these scales and the annulus of a Polypodium. A view of the thecæ of various annulate Ferns produced a conviction of the truth of the theory I had formed. which I now submit with much deference to the consideration of the botanical world. It is, however, necessary that I should here add what is only implied in the little work from which the foregoing extract is taken, that this explanation applies only to the gyrate Ferns. With regard to those with striated thecæ, or with what is called a broad tranverse ring, they may either be considered not to have the midrib of the young scale, out of which the theca is formed, so much developed; or the theca may be with still more probability considered a nucleus of cellular tissue, separating both from that which surrounds it and also from its internal substance, which latter assumes the form of sporules, in the same way as the internal tissue of an anther separates from the valves under the form of pollen. This conjecture is, I think, very much confirmed by the anatomical structure of those striated thecæ which consist of a cluster of sporule-like areolæ of cellular tissue at the base and apex, connected by extended cellules of the same description, as in

Gleichenia, and is far from being weakened by such thecæ as those of Parkeria. In Ophioglossum another kind of provision is made for the production of sporules, which in that genus seem to have no theca whatever beyond the involute contracted segments of the frond which bears them. What are called the thecæ in Ophioglossum are improperly so termed, and are much more analogous to the involucre of Marsilea.

The stems of Ferns, when arborescent, are objects of great interest to the botanist, partly on account of their rarity, secondly, because of their singular structure, and especially because they offer the highest form of developement in Flowerless Plants. It has not been till lately that they have been well understood; they have now, however, received full illustration from Mohl in Martius's beautiful *Icones plantarum cryptogamicarum*.

Bory de St. Vincent elevates Ferns to the rank of a class intermediate between Monocotyledons and Acotyledons; but at the same time he attaches no importance to the descriptions of those writers who, having seen the germination of the sporules, have attempted to prove an identity between them and Monocotyledons in that respect. He justly observes, that the irregular unilateral scale which has been seen to sprout forth upon the first commencement of their growth is extremely different from the cotyledon of Monocotyledons, which pre-exists in the seed and never quits it, but swells during germination, and acts as a reservoir of nutriment for the young plantlet. He most properly regards it as an imperfectly developed primordial leaf. Without, however, adopting this view, I think it may not be inexpedient to consider Ferns as a collection of genera equivalent to the alliances of Flowering Plants, and consequently divisible into different natural orders; and accordingly that course has been adopted here. But as it would be inconvenient to separate the general observations upon them, I have merely characterized the orders and placed the genera that belong to them under each. In doing this I have been most essentially aided by Dr. Hooker, who has kindly furnished me with a list of the genera belonging to the whole of what constitutes the *Filices* of Linnæus.

Geography. The following proportions borne by Ferns to other plants in different latitudes will serve to give some idea of the manner in which they are geographically distributed. There is an enormous disproportion between Ferns and the rest of the Flora in certain tropical islands, such as Jamaica, where they are 1-9th of the Phænogamous plants; New Guinea, where D'Urville found them as 28 to 122; New Ireland, where they were as 13 to 60; and in the Sandwich Islands, where they were as 40 to 160; and it is clear, from the collections of Wallich, that Ferns must form a most important feature in the Indian Archipelago. Upon continents, however, they are far less numerous: thus, in equinoctial America Humboldt does not estimate them higher than 1-36th; and in New Holland Brown finds them 1-37th. They decrease in proportion towards either pole: so that in France they are only 1-63d; in Portugal, 1-116th; in the Greek Archipelago, 1-227th; and in Egypt, 1-971st. Northwards of these countries their proportion again augments, so that they form 1-31st of the Phænogamous vegetation of Scotland; 1-35th in Sweden; 1-18th in Iceland; 1-10th in Greenland; and 1-7th at North Cape. (See a very good paper upon this subject by D'Urville, in the *Ann. des Sc. Nat.* 6. 51.; also *Brown's Appendix to the Congo Voyage*, 461). Brown has observed (*Flinders*, 584), that it is remarkable, that although arborescent Ferns are found at the southern extremity of Van Diemen's Island, and even at Dusky Bay in New Zealand, in nearly 46° south latitude, yet they have in no case been found beyond the northern tropic. For an excellent account of the geographical distinctions of Tree Ferns see *Martius Icones plantarum cryptogamicarum*, *p.* 81.

Properties. The leaves generally contain a thick astringent mucilage,

with a little aroma, on which account many are considered pectoral and lenitive, especially Adiantum pedatum and Capillus Veneris; but almost any others may be substituted for them. Capillaire is so called from being prepared from the Adiantum Capillus Veneris, a plant which is considered to be undoubtedly pectoral and slightly astringent; though its decoction, if strong, is, according to Ainslie, a certain emetic. The Peruvian Polypodium Calaguala, Acrostichum Huacsaro, and Polypodium crassifolium, are said to be possessed of important medicinal properties, especially the former; their effects are reported to be solvent, deobstruent, sudorific, and antirheumatic; antivenereal and febrifugal virtues are also ascribed to them. See the *Pharmacopœia Madritensis*, 1792, and Lambert's *Illustration of the Genus Cinchona*, 114. The leaves of Adiantum melanocaulon are believed to be tonic in India. *Ainslie*, 2. 215. The tubes of the pipes of the Brazilian negroes are manufactured from the stalk of Mertensia dichotoma, which they call Samanbaya. *Pr. Max. Trav.* 96. The bruised fronds of the fragrant Angiopteris evecta are employed in the Sandwich Islands to perfume the Cocoa-nut oil. Polypodium phymatodes is also used for the same purposes. *D'Urv.* The stem is, on the contrary, both bitter and astringent; whence that of many species, such as Aspidium Filix Mas, and Pteris aquilina, has been employed as an anthelmintic. They have also been given as emmenagogues and purgatives. Osmunda regalis has been employed successfully, in doses of 3 drachms, in the rickets. The rhizoma of Aspidium Filix Mas has been analysed, and found by Morin to contain, 1st, volatile oil; 2d, a fat matter composed of elaine and stearine; 3d, gallic and acetic acids; 4th, uncrystallisable sugar; 5th, tannin; 6th, soap; 7th, a gelatinous matter insoluble in water and in alcohol. It contains also the subcarbonate, sulphate, and hydrochlorate of potash, carbonate and phosphate of lime, alumine, silex, and oxyde of iron. *Brewster*, 2. 176. The roots of Nephrodium esculentum are eaten in Nipal, according to Buchanan. *Don Prodr.* 6. Those of Angiopteris evecta are used for food in the Sandwich Islands, under the name of Nehai. Diplazium esculentum, Cyathea medullaris, Pteris esculenta, and Gleichenia dichotoma, are also occasionally employed for food in different countries. Pteris aquilina and Aspidium Filix Mas have even been used in the manufacture of beer, and Aspidium fragrans as a substitute for tea. *Agdh.*

Order CCLXXVI. POLYPODIACEÆ.

Gyratæ, *Swartz Synopsis Filicum*, (1806).—Filices veræ, *Willd. Sp. Pl.* 5. 99. (1810).—Polypodiaceæ, *R. Brown Prodr.* 145. (1810); *Agardh Aph.* 116. (1822); *Kaulfuss Enumeratio*, 55. (1824); *Bory in Dict. Class.* 6. 586. (1824); *Endlicher Prodr. Norf.* 7. (1833); *Martius in Pl. Crypt.* 83. (1834).—Cyatheaceæ, *Kaulf. enum.* (1824); *Endl. l. c.*; *Martius, Ic. pl. crypt.* 62. (1834).

Differential Character.—*Thecæ* furnished with a vertical, usually incomplete, annulus; bursting irregularly and transversely.

GENERA.

(A. *Nudæ*, Hooker.)
§ 1. Polypodiaceæ.
¶ Acrosticheæ, Freyc. et Kaulf.
Acrostichum, L.
Polybotrya, Humb.
Olfersia, Raddi.
Bolbitis, Schott.
Platycerium, Desv.
Nemoplatyceros, Pluk.
¶ Polypodieæ, Bory.
Polypodium, Sw.
Marginaria, Bory.
Psilopodium, Neck.
Lastræa, Bory.
Drynaria, Bory.
Dipteris, Reinw.
Anaxetum, Schott.
? Llavea, Lga.
Adenophorus, Gaud.
Amphradenium, Desv.
Niphobolus, Kaulf.
Cyclophorus, Desv.
Candollea, Mirb.?
Pyrrhosia, Mirb.

Lecanopteris, Bl.
Onychium, Rnwdt.
¶ Hemionitideæ, Freyc. et Kaulf.
Hemionitis, L.
Gymnogramma, Desv.
Ceterach, W.
Grammitis, Swz.
Cochlidium, Kaulf.
Selliguea, Bory.
Xiphopteris, Kaulf.
Micropteris, Desv.
Antrophyum, Kaulf.
Meniscium, Schreb.
Tænitis, Sw.
Polyætnium, Desv.
? Pteropsis, Desv.
Notholæna, R. Br.

(B. *Indusiatæ*, Hook.)
¶ Aspidieæ, Bory.
Pleopeltis, H. B. K.
Polystichum, Roth.
Hypopeltis, Mirb.
Neuronia, Don.
Ophiopteris, Reinw.
Rumohria, Raddi.
? Hypoderris, R. Br.
Matonia, R. Br.

Aspidium, Swz.
Tectaria, Cav.
Nephrodium, Mich.
Lastrea, Bory.
Cyclosorus, Link.
Didymochlæna, Desv.
Tegularia, Rnwdt.
Monochlæna, Gaud.
Nephrolepis, Schott.
¶ Asplenieæ, Freyc. et Kaulf.
Asplenium, L.
Darea, Juss.
Cenopteris, Bernh.
Diplazium, Swz.
Callipteris, Berg.
Athyrium, Roth.
Stegnogramma, Bl.
Allantodea, Br.
Cistopteris, Bern.
Cystea, Sm.
Scolopendrium, L.
¶ Pterideæ, Freyc. et Kaulf.
Pteris, L.
Nemopteris, Desv.
Onychium, Kaulf.
Jamesonia, Hook. et Gr.
Lonchitis, L.

Monogramma, Schkr.
Allosorus, Bernh.
Cheilanthes, Swz.
Cryptogramma, Br.
Phorobolus, Desv.
¶ Schizolomeæ, Freyc. et Gaud.
Lindsæa, Dryand.
Schizoloma, Gaud.
Vittaria, Sm.
Leptochilus, Kaulf.
¶ Adianteæ, Freyc. et Kaulf.
Adiantum, L.
Cassebeeria, Kaulf.
¶ Doodieæ, Freyc. et Kaulf.
Woodwardia, Sm.
Doodia, R. Br.
¶ Blechneæ, Freyc. et Kaulf.
Blechnum, L.
Lomaria, W.
Stegania, R. Br.
? Leptostegia, Don.
Hymenolepis, Kaulf.
Sadleria, Kaulf.
¶ Onocleæ, Hooker.
Onoclea, L.
Struthiopteris, W.

¶ Cyatheæ, Freyc. et Kaulf.
Cyathea, Sm.
? Hypodematium, Kze.
Sphæropteris, Bernh.
Peranema, Don.
Alsophila, R. Br.
Deparia, Hook. et Gr.
? Thyrsopteris, Kze.
Chnoophora, Kaulf.
Gymnosphæra, Bl.
Arachniodes, Bl.
Trichopteris, Presl.
Woodsia, R. Br.
? Hymenocystis, Mey.
Diacalpe, Bl.
¶ Dicksonieæ, Freyc. et Kaulf.
Dicksonia, L'Herit.
Dennstädtia, Bernh.
? Stobolium, Desv.
Balantium, Kaulf.
Saccoloma, Kaulf.
Cibotium, Kaulf.
Pinonia, Gaud.
? Davallia, Sm.
Humata, Cav.

Physematium, Kaulf.

Order CCLXXVII. GLEICHENIACEÆ.

Schismatopterides, *Willd. l. c.* 69. (1810).—Gleicheneæ, *R. Br. l. c.* 160. (1810); *Kaulfuss l. c.* 36. (1824); *Bory, l. c.* (1824).—Pleurogyratæ, *Bernh.*—Gleicheniaceæ, *Mart. ic pl. crypt.* 105. (1834).—Parkeriaceæ, *Hooker Exot. Fl.* t. 147. (1825); t. 231. (1827); *Hooker et Greville Icones Filicum*, t. 97. (1828).—Trichomanoideæ, *Kaulf. Kunze.*—Cnemipterides, *Willd.* (1810).—Hymenophylleæ, *Endl. Prodr. Norf.* 16. (1833); *Mart. Ic. Pl. Crypt.* 102. (1834).

Essential Character.—*Thecæ* furnished with a transverse, occasionally oblique annulus, nearly sessile, and bursting lengthwise internally.

GENERA.

§ 1. Gleichenieæ, R. Br.
Gleichenia, Sm.
Dicranopteris, Bernh.
Mertensia, W.
Platyzoma, R. Br.

§ 2. Parkerieæ, Hooker.
Parkeria, Hooker.
Ceratopteris, Brong.
Teleozoma, R. Br.
Ellebocarpus, Kaulf.
Furcaria, Desv.

§ 3. Hymenophylleæ, Bory.
Hymenophyllum, Sm.
Trichomanes, L.
Didymoglossum, Desv.
Feea, Bory.
Hymenostachys, Bory.

Order CCLXXVIII. OSMUNDACEÆ.

Osmundaceæ, *R. Br. l. c.* 161. (1810); *Agardh, l. c.* 115. (1822); *Kaulfuss l. c.* 42. (1824); *Bory l. c.* (1824).—Acrogyratæ, *Bernh.*—Schizæaceæ, *Mart. Ic. Pl. Crypt.* 113. (1834).

Essential Character.—*Thecæ* with an operculiform annulus, or without any, reticulated, striated with rays at the apex, bursting lengthwise, and usually externally.

GENERA.

§ 1. Osmundeæ, Hooker.
Osmunda, Sw.
Aphyllocalpa, Cav.
Todea, Swz.
Angiopteris, Hoffm.
Clementea, Cav.
§ 2. Aneimieæ, Hook.
Aneimia, Swz.
Ornithopteris, Bernh.
Schizæa, Swz.
Lophidium, Rich.
Ripidium, Bernh.
Lygodium, Swz.
Ugena, Cav.
Odontopteris, Bernh.
Vallifilix, Pet. Th.
Gisopteris, Bernh.
Ramondia, Mirb.
Hydroglossum, W.
Cteisium, Rich.
Mohria, Swz. §

Order CCLXXIX. DANÆACEÆ.

Agyratæ, *Swartz Synops.* (1806).—Poropterides, *Willd. l. c.* 66. (1810).—Danæaceæ, *Agardh l. c.* 117. (1822).—Marattiaceæ, *Kaulf. l. c.* 31. (1824); *Bory l. c.* (1824); *Mart. ic. pl. crypt.* 119. (1834).

Essential Character—*Thecæ* sessile, without any ring, concrete into multilocular sub-immersed masses, opening at the apex.

GENERA.

Danæa, Sm.
Marattia, Swz.
Myriatheca, Juss.
Celanthera, Thouin.
Kaulfussia, Bl.

Order CCLXXX. OPHIOGLOSSACEÆ.

Ophioglosseæ, *R. Br. l. c.* 163. (1810); *Agardh Aph.* 113. (1822); *Kaulfuss l. c.* 24. (1824); *Bory, l. c.* (1824); *Mart. ic. pl. crypt.* 39. (1834).

Essential Character.—*Thecæ* single, roundish, coriaceous, opaque, without ring or cellular reticulation, half 2-valved. *Vernation* straight.

GENERA.

Ophioglossum, L.
Helminthostachys, Kaulf.
Botryopteris, Presl.
Ophiala, Desv.
Botrychium, Swz.
Botrypus, Mich.

Alliance II. *LYCOPODALES.*

Essential Character.—*Stems* solid vascular. *Reproductive organs* growing on the stem.

These plants are known from true ferns by the following most important characters. Their stem is solid with a central axis composed of spiral or annular vessels, not hollow, and without sinuous woody plates; their leaves are in most case sundivided and veinless, and instead of bearing the thecæ on the leaves, they bear them in the axils of the leaves. Lycopodales are just intermediate between Mosses and an extinct race of trees called Lepidodendra which connected them with Coniferæ. See *Fossil Flora*, vol. 2. p. 51.

Order CCLXXXI. LYCOPODIACEÆ. The Club-Moss Tribe.

Lycopodineæ, *Swartz Synopsis Filicum* (1806); *R. Brown Prodr.* 164. (1810); *Agardh Aph.* 112. (1822); *Greville Flor. Edin.* xii. (1824); *Martius Ic. pl. crypt.* 37. (1834).—Lycopodiaceæ, *DC. Fl. Fr.* 2. 257. (1815); *Ad. Brongn. in Dict. Class.* 9. 561. (1826).—Iroetræ, *Bartl. Ord. Nat.* 16. (1830).

Essential Character.—Usually moss-like plants, with creeping stems and imbricated leaves, the axis abounding in annular ducts; or stemless plants, with erect subulate leaves, and a solid cormus. *Organs of reproduction* axillary sessile thecæ, either bursting by distinct valves, or indehiscent, and containing either minute powdery matter, or sporules, marked at the apex with three minute radiating elevated ridges upon their proper integument.

Affinities. Intermediate as it were between Ferns and Coniferæ on the one hand, and Ferns and Mosses on the other; related to the first of those tribes in the want of sexual apparatus, and in the abundance of annular ducts contained in their axis; to the second in the aspect of the stems of some of the larger kinds; and to the last in their whole appearance, Lycopodiaceæ are distinctly characterised by their organs of reproduction. These are generally considered to be of two kinds, both of which are axillary and sessile, and have from 1 to 3 regularly dehiscing valves, the one containing a powdery substance, the other bodies much larger in size, which have been seen to germinate. In conformity with the theory, that all plants have sexes, the advocates of that doctrine have found anthers in the former, and pistils in the latter; but, as in other similar cases, this opinion is entirely conjectural, and founded upon no direct evidence: all that we really know is, that the larger bodies do germinate, and, if we are to credit Willdenow, the powdery particles grow also. He says he has seen them. I think it is hardly to be doubted that the latter are the abortive state of the former. According to Salisbury, in the *Linnean Transactions*, vol. 12. tab. 19, Lycopodium denticulatum emits two cotyledons upon germinating; but, supposing this observation, which requires confirmation, to be exact, it is much more probable that the two little scales so emitted are primordial leaves than analogous to cotyledons. The genus Isoetes is by some referred to Marsileaceæ, to which it forms a transition. I follow De Candolle and Brongniart in referring it here. Delile has published an account of the germination of Isoetes setacea, from which it appears that its sporules sprout upwards and downwards, forming an intermediate solid body, which ultimately becomes the stem, or cormus; but it is not stated whether the points from which the ascending and descending axes take their rise are uniform; as no analogy in structure is discoverable between these sporules and seeds, it is probable that they are not. Delile points out the great affinity that exists between Isoetes and Lycopodium, particularly in the relative position of the two kinds of reproductive matter. In Lycopodium, he says the pulverulent thecæ occupy the upper ends of the shoots, and the granular thecæ the lower parts: while, in Isoetes, the former are found in the centre, and the latter at the circumference. If this comparison is good, it will afford some evidence of the identity of nature of these thecæ, and that the

pulverulent ones are at least not anthers, as has been supposed; for in Isoetes the pulverulent inner thecæ have the same organisation, *even to the presence of what has been called their stigma*, as the outer granular ones; so that, if Isoetes has sexes, it will offer the singular fact of its anther having a stigma.

Geography. In geographical distribution these follow the same laws as Ferns, being most abundant in hot humid situations in the tropics, and especially in small islands. As they approach the north they become scarcer; but even in the climate of northern Europe, in Lapland itself, whole tracts are covered with Lycopodium alpinum and Selaginoides.

Properties. Lycopodium clavatum and Selago excite vomiting; the powder contained in the thecæ is highly inflammable, and is employed in the manufacture of fireworks. According to Vastring, they are likely to become of importance in dyeing. He asserts, that woollen cloths boiled with Lycopodiums, especially with L. clavatum, acquire the property of becoming blue when passed through a bath of Brazil wood. Lycopodium Phlegmaria is reputed an aphrodisiac.

GENERA.

Lycopodium, L. *Plananthus*, Beauv. *Stachygynandrum*, Beauv. *Diplostachyum*, Beauv. *Gymnogynum*, Beauv. *Lepidotis*, Beauv. *Selaginella*, Beauv. Psilotum, Swz. *Bernhardia*, W. *Hoffmannia*, W. Tmesipteris, Bernh. Isoetes, L.

Order CCLXXXII. MARSILEACEÆ.

The Pepperwort Tribe.

Rhizocarpæ, *Batsch. Tab. Aff.* (1802); *Agardh Aph.* 111. (1822).—Rhizospermæ, *Roth. DC. Fl. Fr.* 3. 577. (1815).—Hydropterides, *Willd. Sp. Pl.* 5. 534. (1810).—Marsileaceæ, *R. Brown Prodr.* 166. (1810); *Grev. Fl. Edinens.* xii. (1824); *Ad. Brongn. in Dict. Class.* 10. 196. (1826; *DC. and Duby*, 542. (1828); *Martius, Ic. Pl. Crypt.* 121. (1834).

Essential Character.—Creeping plants. *Leaves* petiolate and divided (or petioles destitute of lamina), rolled up in vernation. *Reproductive organs* enclosed in leathery involucres, and of two kinds, the one consisting of membranous sacs, containing a body or bodies, which germinate, the other of similar sacs, containing loose granules.—[*Stem* and leafstalks filled with longitudinal cells. A central simple fascicle of vessels composed of scalariform ducts and prosenchyma, enclosing in the middle a quantity of elongated cells containing starch. *Leaves* with nerves, veins and stomates. *Martius.*]

Affinities. The tribe to which Pilularia and Marsilea belong consists of creeping plants, having the circinate vernation of Ferns, with their reproductive organs in close leathery cases, called involucres, springing either from the root, or from the petioles of the leaves. These involucres are separated internally by membranous partitions, and contain oval bodies of two kinds, one of which has been called anther, and the other capsule.

Beautiful figures of Marsilea vestita and polycarpa have been published by Hooker and Greville, at t. 159 and 160 of their noble *Icones Filicum*. From these it is clear that the involucre of the genus consists of an involute frond, of the same degree of analogy to the true frond as a carpellary leaf to a true leaf. It further appears that the reproductive bodies arise from the veins of this involute frond, and are therefore analogous, as to position, to the sori of Ferns. What the nature of these bodies may be, is not so obvious. They are represented as being of two kinds; the first, called the capsule (?), being an oval stalked case, having two integuments, of which the outer is reti-

culated and hyaline, the inner oval, white, and opaque, with an apiculate tubercle at its base, and containing corpuscles of two kinds, the one angular and very minute, the other much larger and roundish; the second, much smaller bodies, called the anthers (?), being little sacs filled with yellowish roundish granules, and attached by fours to the stalk of the capsule.

The structure of Pilularia is of an analogous kind. The exact nature of the parts called anthers is unknown; from the name that has been given them, it has been supposed that they were similar to the male apparatus of flowering plants; but this opinion is altogether gratuitous, and has not been taken from any direct evidence. It seems more probable that they are abortive sacs, analogous to the larger bodies. With regard to the latter, Brongniart has the following passage:—"Experiments made upon the germination of Salvinia and Pilularia have long since shewn that in these plants the larger globules were true seeds; and analogy permitted us to entertain the same belief in regard to Marsilea and Azolla; but it remained to be proved that the other bodies were really male organs, the action of which is necessary to fertilise the seeds. This, Professor Savi, of Pisa, had appeared to have demonstrated. Salvinia grows abundantly near that city, and there was no difficulty in procuring fresh plants for the purpose of experiment. He put into different vessels, 1st, the seeds alone; 2d, the male globules alone; and 3d, both mixed. In the first two vessels nothing appeared; in the 3d, the seeds rose to the surface of the water and fully developed. But Duverney has since published a dissertation upon this plant, in which he states that, having repeated the experiments of Savi, he has not obtained the same results, and that the seeds, when separated from the supposed male organs, developed perfectly." I am not acquainted with the particulars of these experiments, nor do I know with what degree of care the exact mode of germination in Salvinia has been observed; but it appears more consonant to the analogical structure of other plants, particularly of Ferns and Azolla, to consider the larger bodies, called seeds by these observers, as thecæ; in which I am the more confirmed, by finding it to be the view taken of their nature by Brown, Hooker and Greville.

Geography. All are inhabitants of ditches or inundated places, in various parts of the world. They do not appear to be affected by climate so much as by situation, whence they have been detected in various parts of Europe, Asia, Africa, and America; chiefly, however, in temperate latitudes.

Properties. Unknown.

GENERA.

Marsilea, L.
Pilularia, L.

Order CCLXXXIII. SALVINIACEÆ.

Salviniæ, *Juss. in Mirb. Elém.* 853. (1815).—Salviniaceæ, *Bartl. Ord. Nat.* 15. (1830); *Martius, Ic. Plant. Crypt.* 123. (1834).

Essential Character.—*Stems* rooting and floating. *Leaves* sessile, entire, somewhat ovate, imbricated, usually, especially the upper ones, papillose. *Receptacles* globose, on the same individual, of two forms, attached to the stem near the base of the leaves and the roots, closed, valveless; some filled with angular corpuscles confusedly enclosed, and by some taken for anthers; others 1-celled, comprehending numerous small stalked many-spored bags inserted on a central column or on a tubercle of the base. *Bartl.*

Affinities. In Salvinia and Azolla, the only known genera of this order; the vegetation is that of Mosses, or of Jungermannia, but the organs of reproduction are quite different. The latter consist of two sorts of membranous bags, of which one contains bodies analogous to the larger bodies, or thecæ of Marsilea, and the other what have been considered male organs. These, in Salvinia, have been described by Brongniart as spherical grains, attached by long stalks to a central column, and much smaller than what he calls the seeds: their surface is reticulated in a similar manner, and they only burst by the action of water. In Azolla, Ferdinand Bauer represents, and Brown describes, them as from 6 to 9 in number, angular and inserted upon a central body, occupying the upper half of the involucrum, the lower being filled with a turbid fluid. If the real nature of these parts in Pilularia and Marsilea is involved in obscurity, that of the reproductive organs of Salvinia and Azolla is still more mysterious. Brown, who had good opportunities of studying Azolla in New Holland, with Ferdinand Bauer's acuteness and profound knowledge of structure to assist him, could arrive at no certain conclusion. Martius, in whose work on the Cryptogamic Plants of Brazil, Azolla is beautifully illustrated, is of opinion that there is no ground for considering one of the reproductive bodies male and the other female; on the contrary, he suspects that the so called male body is an organ intended for developing the rudiment of a new plant; *l. c.* 127. The involute vernation of the leaves of some of these plants and their involucre being formed out of the involute frond, as in Ophioglossum, indicate a close affinity to Ferns; but the habit of Azolla is rather that of some Hepaticæ. Marsileaceæ may be considered to occupy an intermediate position between these tribes. Authors have not stated whether ducts are to be found in Pilularia, Salvinia, and Azolla; they are present in abundance in Marsilea, where I have seen them; but they are so minute as to require to be magnified 200 times to be distinctly observed.

GENERA.

Salvinia, Guett.
Azolla, Lam.

Alliance III. *MUSCALES.*

Cellulares foliaceæ, *DC. Théor. Elém.* 249. (1819).—Pseudocotyledoneæ, Class I. *Agardh. Aph.* 103. (1822).—Heteronemea, *Fries Syst. Orb. Veg.* 33. (1825) *in part.*—Acotyledones, Class 2. *Ad. Brongniart in Dict. Class.* 5. 159. (1824).—Cryptogamicæ, 2d Circle, *T. F. L. Nees v. Esenbeck and Ebermaier Handb. der Med. Bot.* 1. 18. (1830).

Essential Character.—*Flowerless* plants, with a distinct stem having no vascular system, but frequently furnished with leaves; their *sporules* having a proper integument, and contained in distinct axillary, terminal, or superficial thecæ. *Germinating processes* uniting into a heterogeneous body.

These are altogether intermediate between the two first and the fifth alliances, and are distinguishable essentially by their having a distinct axis of growth without any vascular system; they are connected with Marsileaceæ by Jungermannia, and with Lichens by Riccia and Marchantia; to Algæ the transition is by Characeæ, which have the evascular axis of Muscales, with the habit and propagating matter of Algæ.

Order CCLXXXIV. MUSCI, or BRYACEÆ. } The Moss Tribe.

Musci, *Juss. Gen.* 10. (1789); *Hedwig Descr. et Adumb.* (1787-1797); *Bridel Muscolog. recentiorum* (1797-1803); *Hedw. Species Muscor. Frondos.* (1801); *Palisot Prodrome des 5 et 6 Fam. de l'Ætheogam.* (1805); *Bridel Suppl.* (1806-1819); *Weber Tabul. Musc. Frondos.* (1813); *DC. Fl. Fr.* 2. 438. (1815); *T. F. L. Nees de Muscor. Propag.* (1818); *Hooker and Taylor Musc. Brit.* (1818); *Hooker Musci Exotici* (1818-1820); *Agardh Aphor.* 105. (1822); *Greville and Arnott in Wern. Trans.* 4. 109. *&c.* (1822); *Nees v. Esenbeck, Hornschuch, and Sturm, Bryolog. Germ.* (1823); *Grev. Fl. Edin.* xiii. (1824); *Ad. Brongn. in Dict. Class.* 11. 248. (1827); *Hooker. Brit. Fl.* 1. 459. (1830).

Essential Character.—Erect or creeping, terrestrial or aquatic, cellular plants, having a distinct axis of growth, destitute of a vascular system, and covered with minute imbricated, entire, or serrated leaves. *Reproductive organs* of two kinds, viz. 1. *Axillary bodies*, cylindrical or fusiform stalked sacs, containing a multitude of spherical or oval particles, which are emitted upon the application of water; 2 *Thecæ*, hollow urn-like cases seated upon a seta or stalk, covered by a membranous calyptra, closed by a lid or operculum, within which are one or more rows of cellular rigid processes, called collectively the peristome, and separately teeth, which are always some multiple of four, and combined in various degrees; the centre of the theca is occupied by an axis or columella, and the space between it and the sides of the theca is filled with sporules. *Sporules* in germination protruding confervoid filaments, which afterwards ramify, and form an axis of growth at the point of the ramifications.

Affinities. These little plants, which form one of the most interesting departments of Cryptogamic Botany, are distinctly separated from all the other tribes by the peculiar structure of their reproductive organs, in which they resemble no others, except Jungermanniaceæ, which, however, approach them in this respect more in appearance than in reality. In their organs of vegetation they are strikingly similar to many Lycopodiums, which are always to be known by their vascular axis. The reproductive organs have been described above as of two kinds. Those which are called axillary bodies have been supposed to be anthers; with how little reason will be clear from the following extract from Greville and Arnott's excellent memoir, published in the 4th volume of the *Transactions of the Wernerian Society*, to which I refer those who are desirous of minute information upon the structure and history of Mosses.

"What the organs really are, in the plants under review, which the accurate Hedwig so well figured and described under the name of stamens, we leave to others to decide; but we cannot help entering our protest against those bodies called Stamina and Pistilla (the young thecæ) being regarded in a similar light with the same organs in more perfect plants. 'Though,' says Sprengel, 'I have formerly been a zealous advocate for Hedwig's *Theory of the Fructification of Mosses*, it has nevertheless appeared to me an insurmountable objection, that the supposed anther can again produce buds and strike roots, which is certainly the case with regard to the disks of Polytrichum commune, Bartramia fontana, Bryum palustre, undulatum, cuspidatum, punctatum, and with those of Tortula ruralis. In Bryum argenteum we see the buds containing the supposed anthers constantly drop off, strike root, and produce new plants; this I have observed myself times out of number. Still more in point is the experiment first made by David Meese, of sowing the stellulæ of Polytrichum commune, containing merely club-shaped bodies, when he found that plants came up, which in their turn produced fruit. Another excellent naturalist, Dr. Roth, has made similar observations with regard to Hypnum squarrosum and Bryum argenteum.' He afterwards adds,—'It is more

probable, therefore, that these supposed anthers are mere gemmæ, produced by the superabundance of the juices, and hence surrounded by succulent filaments.'"

It is not necessary to adopt the exact conclusion at which the learned botanist, whose opinions are thus quoted, arrived, to decide that these axillary bodies are not stamens. He has not expressed himself in regard to their nature very clearly, or perhaps he has been mistranslated; but this is of little consequence compared with the ascertained fact, that, be they what they may, they are not anthers. Fries also in his *Plantæ homonemeæ*, 31. expresses himself thus,—Musci sunt esexuales et in dicta organa masculina meras esse gemmas vix dubium videatur. Nevertheless, in the face of this evidence, Adolphe Brongniart retains a belief in the sexuality of Mosses, and in the male functions of the axillary bodies; and he says, with justice, that it appears from Brown's mode of describing Mosses, that he entertains a similar opinion. It is to be hoped that these distinguished botanists will some day favour us with a statement of the evidence upon which their decision has been taken; for it is to be presumed that something beyond the conjectures advanced in the article Mousses in the *Dictionnaire Classique*, weighs down the positive testimony of those who have seen the germination of the powder in the axillary bodies. Whether or not they can be called gemmæ, will depend upon the sense in which that term is employed. According to Unger (*Ann. des Sc. n. s.* 2. 188.), the supposed anthers of Sphagnum are filled with minute animalcules of the genus *Spirillum* or *Vibrio*.

With regard to the theca there is now no difference of opinion, either as to its containing sporules, or as to the general nature of its organisation. But I am not aware that any one has ever attempted to explain the analogy of its structure until I ventured to introduce the subject very briefly into my *Outline of the First Principles of Botany*. That perfect unity of design, which is visible in all parts of the vegetable creation, and the constant adherence to the construction of every organ of plants, except the stem, out of modified leaves, seemed to be deviated from in the Cryptogamic class generally, and in Mosses in particular. An uninitiated person, reading the definition of a genus of Mosses, might suppose that it was in that tribe that the approach to the animal creation, of which so much has been said, takes place. Unacquainted with the exact meaning of the Latin words employed by Bryologists, he might understand by the peristomium a jaw, by the calyptra a nightcap, and by the struma a kind of goitre; and when he saw that teeth belonged to this jaw, he would naturally conclude that it was really a vegeto-animal of which he was reading. Struck with the evident absurdity of giving such names to parts of plants, without at the same time explaining their real nature, I ventured to call the attention of naturalists to the subject by the following paragraph in the little book above referred to.

"539. The calyptra may be understood to be a convolute leaf; the operculum another; the peristomium one or more whorls of minute flat leaves; and the theca itself to be the excavated distended apex of the stalk, the cellular substance of which separates in the form of sporules."

It is now time to shew upon what evidence and reasoning this hypothesis may be sustained. Every one agrees in describing the calyptra as a membrane arising from between the leaves and the base of the young theca, and as enveloping the latter, but having no organic connexion with it: when the stalk of the theca lengthens, no corresponding extension of the parts of the calyptra takes place; so that it must be either ruptured at its apex (as in Jungermannia), or at the base; and in the latter case it would necessarily be carried up upon the tip of the theca, which it originally enveloped. Now, what can be more reasonable than that such an organ, situated as I have de-

scribed it to be, should be one of the last convolute leaves of the axis which the theca terminates, bearing the same relation to the latter as the convolute bractea to the flower of Magnolia, or, to speak more precisely still, as the calyptriform bracteæ to the flower of Pileanthus? If the calyptra be anatomically examined, especially in such genera as Tortula and Dicranum, no difference in its tissue and that of the leaves will be observable; and that very common tendency to dehisce on one side only as the diameter of the theca increases, which characterises the dimidiate calyptra, may not unreasonably be understood to be the separation at the line where the margins of the supposed leaf united; in the mitriform calyptra this separation at a given line does not take place, and the consequence is an irregular laceration of its base. The analogy of the calyptra being of this nature, the next inference would naturally be, that the part it contains corresponds with a flower-bud. Upon this supposition, the external series of parts belonging to this supposed bud would be the operculum; the adhesion of this to the theca, which would answer to the apex of the axis, or to the tube of the calyx of flowering plants, would be analogous to that which obtains in Eucalyptus, or perhaps more exactly to that of Eschscholtzia; but it would remain to determine of how many parts, in a state of cohesion, it was made up. In the paragraph above quoted, it is stated to be one only; but I confess I have no better reason to offer for this than the absence of any trace of division upon its surface or in the substance of its tissue, and also perhaps the apparent identity of nature between it and the calyptra when both are young, in the Tortula and Dicranum genera already cited. With regard to the peristomium, I would beg attention to the following particulars:—The teeth, as they are called, occupy one or more whorls; they are evidently not mere lacerations of a membrane, because they are in a constant and regular number in each genus, and that number is universally some multiple of 4, as the floral leaves of flowering plants are ordinarily of 3, 4, or 5; they have the power of contracting an adhesion with each other by their contiguous margins, as the floral leaves of flowering plants; they alter their position from being inflexed with their points to the axis, to being recurved with their points turned outwards,—exactly what happens in flowering plants; the teeth of the inner peristomium often alternate with those of the outer, thus conforming to the law of alternation prevalent in the floral leaves of flowering plants; and, finally, if we compare the various states of the leaves of Buxbaumia aphylla with the teeth of Mosses, it is impossible not to be struck with the great similarity in the anatomical structure of the two. These are the considerations which have led me to the conclusion, that the calyptra, the operculum, and the teeth of Mosses, are all modified leaves; and hence that the theca is to be considered more analogous to a flower than to a seed-vessel. With regard to the membrane, or epiphragma, which occasionally closes up the orifice of the theca, it may be considered as formed by the absolute cohesion of the leaves of the peristome, just as the operculum of Eudesmia is formed by the cohesion of the petals; and this is confirmed, first, by Calymperes, in which the membrane ultimately separates into teeth, and by the fact that the horizontal membrane exists most perfectly in such genera as Polytrichum and Lyellia, in which there is no distinct peristome. It now remains to explain the internal structure of the theca consistently with the theory that has been advanced of the peristomium, operculum, and calyptra. I consider the theca to be merely the thickened apex of the axis, the sporules to be a partial dissolution of its cellular tissue, and the columella to be the unconverted centre. That the end of the axis or *growing point* of plants frequently becomes much more incrassated than the theca of Mosses, requires no illustration for those who are acquainted with the spongy receptacle of Nelumbium, Rubus, and Fragraria, the dilated disk of Ochna, the curious genus Eschscholtzia, or Rosa, or Calycanthus, or, finally, the spadix of Arums. That the tissue is

frequently separated by nature for particular purposes, is proved by the production of pollen out of the cellular tissue of an anther, and by the general law of propagation that seems to prevail in flowerless plants, as Ferns, Lichens, Algæ, and Fungi; the same phenomenon may be therefore expected in Mosses. That the columella should be left in this dissolution of the tissue might be expected, from its being a continuation of the seta or axis of developement, the tissue of which is more compact, and of course less liable to separation, than the looser tissue that surrounds it; this is analogous to the separation of the pollen from the connectivum of most plants, or from parts only of the anther of all those genera which, like Viscum, Ægiceras, or Rafflesia, have what are called cellular anthers; and to the very common separation of the placenta, or a portion of it, from the dissepiments, as in Bignoniaceæ, Ericeæ, and many others. That it is presumptuous in me, who lay no claim to reputation as a Cryptogamic botanist, to offer any opinion upon plants I have only occasionally studied, I am fully sensible; but I hope for the indulgence of the skilful Cryptogamist, in consideration of this having been the first attempt to call his attention to the inquiry.

Geography. Mosses are found in all parts of the world where the atmosphere is humid: but they are far more common in temperate climates that in the tropics. They are among the first vegetables that clothe the soil with verdure in newly-formed countries, and they are the last that disappear when the atmosphere ceases to be capable of nourishing vegetation. The first green crust upon the cinders of Ascension was minute Mosses, they form more than a quarter of the whole Flora of Melville Island, and the black and lifeless soil of New South Shetland is covered with specks of Mosses struggling for existence. How they find their way to such places, and under what laws they are created, are mysteries that human ingenuity has not yet succeeded in unveiling. About 800 species are known.

Properties. The slight astringency of Polytrichum and others caused them to be formerly employed in medicine, but they are now disused. In the economy of man they perform but an insignificant part; but in the economy of nature, how vast an end!

For the following list of genera I am indebted to the kindness of Dr. Hooker:—

GENERA.

§ 1. Bryaceæ, Hook. (*Seta terminalis.*)

¶ 1. Sphagneæ, Brid.
Sphagnum, L.

¶ 2. Phascoideæ, Arn.
Phascum, L.
Physedium, Brid.
Pleuridium, Brid.
Archidium, Brid.
Voitia, Hornsch.
Bruchea, Nestl.
Saproma, Brid.

¶ 3. Gymnostomeæ, Arn.
Gymnostomum, Hedw.
Hyophila, Brid.
Hymenostylium, Brid.
Röttleria, Brid.
Entosthymenium, Brid.
Pyramidium, Brid.
Pyramidula, Brid.
Hymenostomum, Brid.

¶ 4. Grimmieæ, Arn.
Grimmia, Hedw.
Schistidium, Brid.
Helicophyllum, Brid.
Hydropogon, Brid.
Dryptodon, Brid.
Scouleria, Hook.
Trichostomum, Hedw.
Racomitrion, Brid.
? Olomitrium, Brid.
Leucoloma, Brid.
Cinclidotus, Beauv.

¶ 5. Splachneæ, Arn.
Splachnum, L.
Aplodon, Br.
Systylium, Hornsch.
Tayloria, Hook.
Orthodon, Bory.
Cyrtodon, Br.
Eremodon, Brid.
Dissodon, Grev. et Arn.
Œdopodium, Schw.

¶ 6. Orthotricheæ, Arn.
Orthotrichum, Hedw.
Ulota, Mohr.
Brachypodium, Brid.
Macromitrion, Brid.
Leiotheca, Brid.
Schlotheimia, Brid.
Syrrhopodon, Schw.
Trachymitrion, Hedw.
Calymperes, Sw.
Octoblepharum, Hedw.
Leucophanes, Brid.
Glyphomitrion, Brid.
Drummondia, Hook.
Zygodon, Hooker et Tayl.
Codonoblepharum, Schw.
? Tetraphis, Hedw.
Tetrodontium, Schw.

¶ 7. Weissieæ, Brid.
Weissia, Hedw.
Coscinodon, Spreng.
Oreas, Brid.
Discelium, Brid.
Catoscopium, Brid.
Didymodon, Schw.
Ceratodon, Brid.
Pilopogon, Brid.
Plaubelia, Brid.

¶ 8. Dicraneæ, Arn.
Dicranum, Hedw.
Orthotheca, Brid.
Oncophorus, Brid.
Trematodon, Mich.
Campylopus, Brid.
Thysanomitrion, Schw.

¶ 9. Tortuleæ, Hook.
Tortula, Hedw.
Barbula, Hedw.
Syntrichia, Brid.
Zygotrichia, Brid.
Desmatodon, Brid.

Encalypta, Hedw.
¶ 10. Bryeæ, Arn.
Bryum, L. et Hook.
Webera, Hedw.
Pohlia, Hedw.
Macranchenium, Brid.
Hemisynapsium, Brid.
Cladodium, Brid.
Orthodontium, Schw.
Peromnion, Schw.
Macrothecium, Brid.
Cynodontium, Hedw.
Afzelia, Ehrh.
Cynodon, Brid.
Ptychostomum, Nees et Hornsch.
Leptostomum, Br.
Brachymenium, Hook.
Leptotheca, Schw.
Cinclidium, Sw.
Minum, L.
Arrhenopterum, Hedw.
Meesia, Hedw.
Diplocomium, Web. et Mohr.
Timmia, Hedw.
Grevillea, Beck.
Acidodontium, Schw.
Paludella, Brid.

Aulacomnion, Schw.
Gymnocephalus, Schw.
Funaria, L.
Entosthodon, Schw.
¶ 11. Bartramieæ, Schw.
Bartramia, Hedw.
Philonotis, Brid.
Plagiopus, Brid.
Glyphocarpus, Brid.
Conostomum, Sw.
Cryptopodium, Brid.
? Spiridens, Nees.
¶ 12. Polytrichæ, Arn.
Polytrichum, L.
Catharinea, Ehrh.
Pogonatum, Beauv.
Psilopilum, Brid.
Lyellia, Br.
Dawsonia, Br.
¶ 13. Buxbaumieæ, Arn.
Buxbaumia, L.
Diphyscium, Web. et Mohr.
¶ 14. Filiceæ, Brid.
Schistostega, Web. et Mohr.
Drepanophyllum, Rich.

Fissidens, Hedw.
Octodiceras, Brid.
Skitophyllum, LaPyl.
§ 2. Hypnaceæ, Hook. *Seta lateralis.*)
¶ 1. Hypneæ, Arn.
†*Peristomium duplex.*
Hypnum, L.
Stercodon, Brid.
Pylaisæa, La Pyl.
Isothecium, Brid.
Omalia, Brid.
? Haplohymenium, Schw.
Racopilum, Brid.
Leskea, Hedw.
Helicodontium, Schw.
Climacium, Web. et Mohr.
Neckera, Hedw.
Anacamptodon, Brid.
Leptohymenium, Schw.
Regmatodon, Schw.
Pilotrichum, Beauv.
Lepidopilum, Brid.
Daltonia, Hook.
Cryphæa, Mohr.
Esenbeckia, Brid.
Hookeria, Sm.
Chætophora, Brid.

Pterigophyllum, Brid.
Distichiæ pars. Brid.
Hypopterigium, Brid.
Cyathophorum, Beauv.
Anomodon, Hook. et Tayl.
Antitrichia, Brid.
Isothecii pars. Brid.
Actinodontium, Schw.
Astrodontium, Schw.
††*Peristomium duplex.*
Fabronia, Raddi.
Leptodon, Web.
Cleistostoma, Brid.
Pterigynandrum, Hedw.
Phyllogonium, Brid.
Lasia, Beauv.
Campylodontium, Schw.
Leucodon, Schw.
Sclerodontium, Schw.
Dicnemon, Schw.
†††*Peristomium nullum.*
Anæctangium, Hedw.
¶ 2. Fontinaliæ, Brid.
Fontinalis, L.

Order CCLXXXV. ANDRÆACEÆ.

Andræeæ, *Schwægr. Bridel.*—Andræaceæ, *Nixus Pl.* 24. (1833).

Essential Character.—Branching moss-like plants, with imbricated ribbed or ribless leaves. *Theca* with a calyptra, seated on a fleshy apophysis, splitting longitudinally into four equal valves whose summits are always bound together by the persistent operculum. *Peristome* 0. *Spores* attached to a *central* columella.

Affinities. Linnæus considered the only genus of which this order consists, the same as Jungermannia; more recent observers have withdrawn it to associate with Mosses. It hardly however belongs more to the one than the other; if it agrees with Mosses in having a calyptra and operculum, it disagrees in having a valvular theca; and if it accords with Jungermanniaceæ in the latter circumstance, it differs from them in the former. No Muscologist seems to know what to do with the genus, which appears best placed as the type of a distinct natural order.

GENUS.

Andræa, Ehr.

Order CCLXXXVI. JUNGERMANNIACEÆ.

Hepaticarum, § § Jungermanniaceæ *et* Lejeuniaceæ, *Dumort. comment. Botan.* 112. (1822).—Jungermanniaceæ et Anthocerineæ, *Id. Syllog. Jungerm.* 6. (1831).—Hepaticarum § *of most other Authors.*— Jungermanniaceæ, *Nixus Pl.* 24. (1833).—*Nees v. Esenb. Naturgeschichte der Europæischen Lebermoose, vol.* 1. (183[illegible]).

Essential Character.—Creeping moss-like plants, either with imbricated very cellular leaves surrounding a central axis, or with the leaves and axis all fused into one common leafy expansion. *Thecæ* without an operculum, 4-parted, or 2-4-valved, with or without a central columella. *Spores* mixed with elaters.

Affinities. It seems to me that the §§, as they are usually considered, of Hepaticæ, in which the theca separates into valves, ought to be considered a distinct order from such plants as Marchantia and Riccia. The latter approach very nearly to Lichens and Algæ; but the former, that is to say the capsular Hepaticæ, are little more than a slight deviation from the type of Mosses, agreeing with those plants even in the presence of a calyptra, only not having the power of carrying it up on the theca. The arrangement of the Muscal alliance would then be as stated in my Nixus and Key, viz.

Bryaceæ, or Musci. Theca valveless with an operculum.
Andræaceæ. Theca opening by valves and having an operculum.
Jungermanniaceæ. Theca opening by valves, without an operculum.
Marchantiaceæ, or Hepaticæ. Theca with neither valves nor operculum.

As, however, this is not the view taken of the subject by those botanists who have paid the most attention to Hepaticæ, I shall content myself with the foregoing observations, and give a view of the genera of Jungermanniaceæ under the next order, of which they constitute the first, second, and third tribes.

Order CCLXXXVII. HEPATICÆ, or MARCHANTIACEÆ. } The Liver-wort Tribe.

Hepaticæ, *Juss. Gen.* 7. (1789); *DC. Fl. Fr.* 2. 415. (1815); *Agardh Aph.* 104. (1822); *Greville Flora Edin.* xv. (1824); *Fée in Dict. Class.* 8. 131. (1825).—*Nees ab Esenb. in Martius, Fl. Bras.* 1. 295. (1833); *Hooker's British Flora, vol.* 2. *p.* 97. (1833); *Bischoff de Hepaticis in Act. Acad. Nat. Cur. xvii. pars* 2. (1836); *Ann. des Sc.* 2. *ser.* 4. 309. (1836).

Essential Character.—Plants growing on the earth or trees in damp places, composed entirely of cellular tissue, emitting roots from their under-side, and consisting of an axis or *stem*, which is leafless, and bordered by a membranous expansion; such expansions sometimes unite at their margins, so as to form a broad lobed thallus. *Reproductive organs* consisting either of a peltate stalked receptacle, bearing thecæ on its under surface; or of sessile naked thecæ, either immersed or superficial. Besides these there are in Marchantia, "peltate receptacles, plane on the upper surface, and having oblong bodies imbedded in the disk;" and also "little open cups, sessile on the upper surface, and containing minute green bodies (gemmæ) which have the same power of producing new plants, as sporules;" and in Anthoceros, "small cup-shaped receptacles, containing minute, spherical, pedunculated, reticulated bodies."

Affinities. I stated in the last order that contrary to my own opinion, I should here speak of the various forms of Hepaticæ as if they really did all belong to the same order.

The structure of the reproductive organs of this order is so exceedingly variable that no common character seems deducible from them; nor has it been found possible either to determine what analogy exists between the organs, or even to decide what their respective functions are. What are here called the thecæ are considered to be the cases of the sporules, properly so called, but the other bodies are of a more doubtful kind. Those who have sought for sexual organs in Cryptogamous plants have naturally taken the imbedded oblong bodies of Marchantia, and the pedunculated reticulated ones of Jungermannia, for anthers; but Hooker, in his beautiful *Monograph* of the latter genus, and also in his *British Flora*, (p. 459.) is evidently unsatisfied as to their nature. Greville, in the *Flora Edinensis*, is clearly in a similar state of uncertainty; and Agardh admits nothing more in them than a resemblance to male organs, adopting the opinion that they are a particular form of gemmules. Mirbel considers the cups or baskets of Marchantia to be filled with little buds, and the peltate receptacles to be male flowers, while the stalked receptacles are masses of pistils. See his most admirable Memoir, tt. 6 et 7. The bodies lying in the cup-shaped receptacles of Anthoceros have been said to be anthers, but upon no good evidence. In Jungermannia there is a third kind of reproductive matter, consisting of heaped clusters of little amorphous bodies, growing from the surface of the leaves, and called gemmæ.

The most remarkable point of structure in Hepaticæ is the spiral filament, as it is called, lying among the sporules within the theca. This consists of a single fibre, or of two, twisted spirally in different directions, so as to cross each other, and contained within a very delicate, transparent, perishable tube. They have a strong elastic force, and have been supposed to be destined to aid in the dispersion of the sporules,—a most inadequate end for so curious and unusual an apparatus. It is more probable that they are destined to fulfil, in the economy of these plants, some function of which we have no knowledge. Hepaticæ are intermediate between Mosses and Lichens, agreeing with the former in the presence of a distinct axis of growth. Fée says they have no calyptra, which must have been an oversight. They differ from Mosses in the want of an operculum, by which Andræa, which forms the link between Hepaticæ and Mosses, is usually referred to the latter. Lichens are distinguished by their want of a distinct axis of growth, by their texture and colour, never assuming the rich lucid green of Hepaticæ, and by their sporules not being contained in distinct thecæ, but lying in membranous tubes or asci in the substance of the thallus. Riccia and Endocarpus form the connexion between them.

The germination of this order takes place by an universal increase and enlargement of the spore, which becomes lobed as it were by the swelling of the cellules, and afterwards nourished by the emission of a radicular fibre. The original developement of Ferns and Hepaticæ is much the same. *Fl. Bras.* 1. 299.

Geography. Natives of damp shady places in all climates; two were found in Melville Island. The only atmospheric condition to which they cannot submit is excessive dryness; thus of the 237 species enumerated by Sprengel, 6 only are found in Africa, while 50 are cited from Java alone.

Properties. Nothing is known of them. De Candolle thinks it probable that the larger kinds will be found to resemble foliaceous Lichens in their qualities. A few are slightly fragrant.

The following list was kindly furnished by Professor Nees von Esenbeck, December 1, 1835.

GENERA.

Trib. 1. JUNGERMANNIEÆ, N. ab E.
*A. Succubæ.
Sub-Trib. 1. GYMNOMITRIA, N. ab E.
Schisma, Dumort.
Haplomitrium, N. ab E.
Mniopsis, Dumort.
Gymnomitrion, Corda.
Acolea, Dumort.
Sarcoscyphus, Corda.
Marsupia, Dumort.
Sub-Trib. 2. JUNGERMANNIÆ PROPRIÆ.
Alicularia, Corda. Dumort.
Jungermannia, N. ab E.
Plagiochila, N. ab E. (91)
Radula § *Plagiochila*, Dumort.
Radula § *Scapania*, Dumort.
Candollea, Raddi.
Jung. aspl. § 1. N. ab E. *leberm. I.*
Lophocolea, N. ab E.
Jungerm. § 8. *Lophocolea*, Dumort.
Harpanthus, N. ab E.
Chiloscyphus, Corda.
Gymnoscyphus, Corda.
Sub-Trib. 3. GEOCALYCEÆ, N. ab E.
Sarcogyna, Dumort.
Syckorea, Corda.
Geocalyx, N. ab E.
Calypogia, Dumort.
Gongylanthus, N. ab E.
Calypogeiæ sp. Raddi.
*B. Incubæ.
Sub-Trib. 4. TRICHOMANIDEÆ, N. ab E.
Calypogia, N. ab E.
Cincinnulus, Dumort.
Sub-Trib. 5. FLAGELLIFERÆ, N. ab E.
Herpetium, N. ab E.
Pleuroschisma sp. Dumort.
Sub-Trib. 6. PTILIDIA, N. ab E.
Mastigophora, N. ab E.
Ptilidium, N. ab E.
Jung. § *Blepharozia*, Dumort.
Tricholea, Dumort.
Sub-Trib. 7. JUBULEÆ, N. ab E.
Radula, N. ab E.
Jubula, Dumort.
Phragmicoma, Dumort.
Lejeunia, Lib.
Madotheca, Dumort.
*C. Frondescentes.
Sub-Trib. 8. CODONIEÆ, Dumort.
Codonia, Dumort.
Sub-Trib. 9. DIPLOLÆNEÆ, N. ab E.
Diplolæna, Dumort.
Diplomitrium, Corda.
Cordæa, N. ab E.
Blasia, L.
Sub-Trib. 10. HAPLOLÆNEÆ, N. ab E.
Symphyogyna, N. et M. (92)
Pellia, Raddi.
Scopulina, Dumort.
Metzgeria, Raddi.
Fasciola, Dumort.
Echinogyna, Dumort.
Echinomitrium, Corda.
Aneura, Dumort.
Römeria, Raddi.
Metzgeria, Corda.
Sarcomitrium, Corda.

Trib. 2. MONOCLEÆ, N. ab E.*
Calobryum, N. ab E.
Monoclea Blumii, Hep. jav.
Monoclea, Hook.
? Trichostylium, Corda.

Trib. 3. ANTHOCEROTEÆ, N. ab E.
Anthoceros, L.

Trib. 4. MARCHANTIEÆ, N. ab E.
Sub-Trib. 1. MARCHANTIEÆ PROPRIÆ.
Lunularia, Raddi.
Staurophora, W.
Marchantia, Corda.
Chlamidium, Corda.
Preissia, Corda.
Chomiocarpus, Corda.
Grimaldia, Raddi.
Duvalia, N. ab E.
Syndonisce, Corda.
Rhakiokarpus, Corda.
Pleurochiton, Corda.
Otiona, Corda.
Plagiochasma, L. et L.
Rebouillia, Raddi.
Achiton, Corda.
Mesoregma, Corda.
Hypenantron, Corda. (93)
Fimbriaria, N. ab E.
Dictyochiton, Corda.
Dumortiera, N. ab E.
Fegatella, Raddi.
Conocephalus, Dumort.
Sub-Trib. 2. TARGIONIEÆ, N. ab E.
Targionia, Michel. (94)
Cyathodium, Kze. et L.
Trib. 4. RICCIEÆ, N. ab E.
Sedgwickia, Bowd.
Corsinia, Raddi.
Guentheria, Trev.
Brissocarpus, Bisch.
Oxymitra, Bisch.
Rapinia, Corda.
Sphærocarpus, Mich.
Riccia, L.
Ricciella, Braun.
Lemna, Raf.
Ricciocarpus, Corda.
Salviniella, Hueben.

ALLIANCE IV. *CHARALES.*

ESSENTIAL CHARACTER.—Vascular system wholly wanting. Germinating processes uniting into a heterogeneous body. *Reproductive organs* axillary globules. *Tissue* tubular.

* Per Monocleas Hepaticæ ad Podostemeas accedunt, Blandovia Podostemeis conjungenda est. *N. ab E.*

Order CCLXXXVIII. CHARACEÆ. The Chara Tribe.

Characeæ, *Rich et Kunth in Humb. et Bonpl. N. G. Pl.* 1. 45. (1815); *A. Brong. in Dict. Class.* 3. 474. (1823); *Grev. Fl. Edin.* xvii. (1824); *DC. and Duby*, 533. (1828); *Hooker Brit. Fl.* 459. (1830).

Essential Character.—Plants composed of an axis, consisting of parallel tubes, which are either transparent or encrusted with carbonate of lime, and of regular whorls of tubes, which may be either considered as leaves or branches. Organs of reproduction, round succulent *globules*, containing filaments and fluid; aud axillary *nucules*, formed of a few short tubes, twisted spirally around a centre, which has the power of germinating.

Affinities. The two genera of which this little order is composed are among the most obscure of the vegetable kingdom, in regard to the nature of their reproductive organs; and accordingly we find them, under the common name of Chara, placed by Linnæus among Cryptogamous plants near Lichens; then referred by the same author to Phænogamous plants, in Monœcia Monandria; retained by Jussieu and De Candolle among Naiades, by Brown at the end of Hydrocharaceæ, and by Leman in Haloragеæ; referred to Confervæ by Von Martius, Agardh, and Wallroth; and finally admitted as a distinct order, upon the proposition of Richard, by Kunth, De Candolle, Adolphe Brongniart, Greville, Hooker, and others. Such being the uncertainty about the place of these plants, it will be useful to give rather a detailed account of their structure, in which I avail myself chiefly of Ad. Brongniart's remarks in the place above referred to, and of Agardh's observations in the *Ann. des Sciences*, 4. 61. I have not seen Professor Nees v. Esenbeck's monograph of Characeæ in the *Transactions of the Ratisbon Society*, quoted by the latter author.

Characeæ are aquatic plants, found in stagnant fresh or salt water; always submersed, giving out a fetid odour, and having a dull greenish colour. Their stems are regularly branched, brittle, and surrounded here and there by whorls of smaller branches. In Nitella the stem consists of a single transparent tube with transverse partitions, and, as Agardh remarks, so like the tubes of some Algæ, as to offer a strong proof of the affinity of the orders. In Chara, properly so called, there is, in addition to this tube, many other external ones, much smaller, which only cease to cover the central tube towards the extremities. In the axillæ of the uppermost whorls of these branchlets the organs of reproduction take their origin; they are of two kinds, one called the nucule, the other the globule; the former has been supposed to be the pistillum, the latter the anther.

The nucule is described by Greville as being "sessile, oval, solitary spirally striated, having a membranous covering, and the summit indistinctly cleft into 5 segments; the interior is filled with minute sporules." *Fl. Edinb.* xvii. This is the general opinion entertained of its structure. But Brongniart describes it thus:—Capsule unilocular, monospermous; pericarp composed of two envelopes: the outer membranous, transparent, very thin, terminated at the upper end by 5 spreading teeth; the inner hard, dry, opaque, formed of 5 narrow valves, twisted spirally." *Dict. Class.* l. c. He founds his opinion of the nucule containing but one germinating body upon the experiments of Vaucher, of Geneva, who ascertained that if ripe nucules of Chara, which have fallen naturally in the autumn, are kept through the winter in water, they will germinate about the end of April; at that time a little body protrudes from the upper end between the 5 valves, and gradually gives birth to one whorl of branches, which produce a second. Below these whorls the stem swells, and little tufts of roots are emitted. The nucule adheres for a long time to the base of the stem, even when the latter has

itself begun to fructify. Hence it is reasonable to conclude that the nucule is really monospermous. Brongniart remarks, that it is true, when a fresh nucule of Chara is cut across, an infinite number of little white grains are squeezed out; but if these were really all reproductive particles, how would they ever find their way out of the nucule, which is indehiscent? he considers them rather of the nature of albumen. And he is the more confirmed in his opinion, because in Pilularia, the thecæ of which also contain many similar grains, but one plant is produced by each theca. Finally, Amici, has described (*Ann. des Sc.* 2.) the nucule in another way. He admits it to be monospermous, but he considers the points of the 5 valves to be stigmata, and the valves themselves to be at once pericarp and style. It is not worth entering into any discussion upon the reasonableness of such a supposition, as it is not likely to find any advocates among botanists; but I may observe, that Amici's observations seem to shew that the 5 valves of the nucule, as they are called, are a verticillus of leaves, straight at first, and twisted afterwards; and that the nucule itself is, therefore, analogous to the bud of flowering plants.

The globule is described by Greville as "a minute round body, of a reddish colour, composed externally of a number of triangular (always?) scales, which separate and produce its dehiscence. The interior is filled with a mass of elastic transversely undulate filaments. The scales are composed of radiating hollow tubes, partly filled with minute coloured spherical granules, which freely escape from the tubes when injured." Vaucher describes them as "tubercles formed externally of a reticulated transparent membrane, containing, in the midst of a mucilaginous fluid, certain white articulated transparent filaments, and some other cylindrical bodies, closed at one end, and appearing to open at the other. These latter are filled with the red matter to which the tubercles owe their colour, and which disappears readily and long before the maturity of the nucule." The account of the globule by Agardh is at variance with both these. "Their surface," he remarks, "is hyaline, or colourless; under this membrane is observed a red and reticulated or cellular globe, which has not, however, always such an appearance; often, instead of this reticulated aspect, the globe is colourless, but marked by rosettes or stars, the rays of which are red or lanceolate. In the figures given by authors, one finds sometimes one of these forms, sometimes the other. I have myself found them both on the same species; and I am disposed to believe that the last state is the true kernel of the globule, concealed under the reticulated scale. (When the globule is very ripe, one may often succeed, by means of a slight degree of pressure, in separating it into several valves, as is very well shewn in Wallroth's figures, tab. 2. f. 3. and tab. 5. These valves are rayed, and no doubt answer to the stars, of which mention has been made.) The kernel contains some very singular filaments; they are simple (I once thought I saw them forked), curved and interlaced, transparent and colourless, with transverse striæ, parallel and closely packed, as in an Oscillatoria or Nostoc; but what is very remarkable, they are attached, several together, to a particular organ formed like a bell, which is itself also colourless, but filled with a red pigment. This bell, to the base of which on the outside they are fixed, differs a little in form in different species. It is slender and long in Chara vulgaris, thicker in C. firma, shorter in C. delicatula, and shorter still in C. collabens. I have not succeeded in determining the exact position of these bells in the kernel. I have often thought they were the same thing as the rays of the rosettes or stars upon the globule above mentioned; whence it would follow that they are placed near the surface, while the filaments have a direction towards the centre. The bells are not numerous; they often separate from the filaments, and readily part with their pigment, which renders it diffi-

cult to observe them, and has caused them to be overlooked." That these globules, whatever their nature may be, have no sort of analogy in structure with anthers, is clear from these descriptions, whichever may be eventually admitted. Wallroth, indeed, says he has sown them, and that they have germinated; but this observation requires to be verified.

It does not appear from the preceding descriptions that Chara has a marked affinity to any other plants. I incline to the opinion of those who consider it near Confervæ, chiefly on account of the organisation of the stem; for it does not seem that the reproductive organs of flowerless plants are of the same degree of importance in deciding affinities as the fructification of flowering plants. Its total want of vascular system renders it impossible to adopt the opinion of those who would place it near Ferns next to Marsileaceæ, and the regularity with which all the parts are formed round a common axis renders it equally impossible to refer it absolutely to the leafless orders. I therefore place it on the limits of the latter.

There are two other points deserving of attention in Characeæ: 1st, the calcareous incrustation of some species; and 2dly, the visible and rapid motion of the sap in the articulation of the stem.

Of the two genera, Nitella is transparent and free from all foreign matter; but Chara contains, on the outside of its central tube, a thick layer of calcareous matter, which renders it opaque. This incrustation appears, from the observations of Greville (*Fl. Edin.* 281), not to be a deposit upon the outside, and of an adventitious nature, but the result of some peculiar economy in the plant itself; and according to Brewster, it is analogous to the siliceous deposit in Equisetum, exhibiting similar phenomena.

Whatever is known of the motions of the fluids of vegetables has been necessarily a matter of inference, rather than the result of direct observation; for who could ever actually see the sap of plants move in the vessels destined to its conveyance? It is true that it was known to botanists that a certain Abbé Corti of Lucca, had, in 1774, published some remarkable observations upon the circulation of fluid in some aquatic plants, and that the accuracy of this statement had been confirmed by Treviranus so long ago as 1817; but the fact does not seem to have attracted general attention until the publication, by Amici, the celebrated professor at Modena, of a memoir in the 18th volume of the *Transactions of the Italian Society*, which was succeeded by another in the 19th. From all these observers it appears, that if the stems of any transparent species of Chara, or of any opaque one, the incrustation of which is removed, are examined with a good microscope, a distinct current will be seen to take place in every tube of which the plant is composed, setting from the base to the apex of the tubes, and returning at the rate, in Chara vulgaris, of about two lines per minute (*v. Ann. des Sc.* 2. 51. line 9); and according to Treviranus this play is at any time destroyed by the application of a few drops of brandy, by pressure, or by any laceration of the tube. This is the nature of the singular phenomena that are to be seen in Characeæ. Those who are anxious to become acquainted with the details of Amici's observations will find his paper translated in the *Annales de Chimie*, 13. 384, and his second in the *Ann. des Sc.* 2. 41.; that of Treviranus is to be found in the latter work, 10. 22. According to the last-named author, these facts lead to the conclusion that there is a primitive vitality in amorphous organic matter, which is antecedent to the formation of all organic beings, and is in its turn produced by them, to serve, according to circumstances, either for the support or enlargement of the individual, or for the production of a new organisation. This vitality is manifested in movements which may appear to take place without rule or object, but which are differently modified according to the differences of organic bodies; all which seems to show that the vital principle is originally

susceptible of a variety of modifications, without having occasion for the assistance of organs of various forms or structure. The observations made upon Chara circulation by the foregoing authors have been much extended by the careful enquiries of Messrs. Solly, Slack, and Varley, whose remarks are to be found in the Transactions of the Society of Arts, *vol.* 49. *p.* 177. and *vol.* 50. *p.* 171.

GEOGRAPHY. The creation of plants of this order would appear to have been of a very recent date, compared with that of Ferns and Palms, or even Algæ, if we are to judge by their fossil remains, which are found for the first time in the lower fresh-water formation, along with numerous Dicotyledonous plants resembling those of our own times. In the recent Flora of the world they make their appearance every where in stagnant waters, in Europe, Asia, and Africa, in North and South America, in New Holland, and in either India. They are most common in temperate countries.

PROPERTIES. Unknown.

GENERA.

Chara, L.
Nitella, Ag.

ALLIANCE V. *FUNGALES.*

ACOTYLEDONEÆ, *Agardh Aph.* 72. (1821).—HOMONEMEA, *Fries. Syst. Orb. Veg.* 33. (1825).—ACOTYLEDONES, Class I. *Ad. Brong. in Dict. Class.* (1824).—CRYPTOGAMICÆ, 3d Circle, *T. F. L. Nees v. Esenbeck und Ebermaier Handb. der Med. Bot.* 1. 18. (1830).—APHYLLÆ, or LEAFLESS FLOWERLESS PLANTS, *Ed. Pr.*

ESSENTIAL CHARACTER.—Flowerless leafless plants, destitute of vascular tissue, with no distinct axis of growth. *Sporules* simple and lying naked in the substance of the plant. *Germinating processes* either wholly distinct or confluent in a homogeneous body.

In this place we have arrived at the limits which separate the vegetable from the animal kingdom. We have not only passed beyond the dominion of the sexes, but we have no longer any trace, however ambiguous, of more than one form of reproductive matter. It is even uncertain whether this matter will reproduce its like, and whether it is not a mere representation of the vital principle of vegetation, capable of being called into action either as a Fungus, an Alga, or a Lichen, according to the particular conditions of heat, light, moisture, and medium, in which it is placed; producing Fungi upon dead or putrid organic beings; Lichens upon living vegetables, earth, or stones: and Algæ where water is the medium in which it is developed. Kutzing, (*Ann. des Sc. n. s. vol.* 2. *p.* 225.), endeavours to maintain the following propositions connected with the subject: 1st, the formation of organic matter can only take place by means of the previously dissolved elements of other organic principles; 2d, simple globules, such as Cryptococcus, Palmella, and Protococcus, can give birth to different formations according to the influence of light, air, and temperature; 3d, we must regard all the forms of lower Algæ as vegetations of a very simple structure, and distinguish them from each other, notwithstanding that in certain circumstances they may raise themselves to vegetations of a higher form; for in other circumstances they can exist and multiply independently; 4th, the same superior formation may be produced by primitive formations of altogether different kinds.

The nearest approach to animals is in the tribes of Algæ called Arthrodieæ

and Chaodineæ, where it is perhaps impossible to decide whether some of the species are not actually animalcules.

It is not easy to settle the limits of the orders of this part of vegetation. Linnæus and Jussieu had but two divisions, viz., Algæ, including Lichens and Fungi; and they have been followed by some modern botanists, particularly Fries and Wahlenberg. Others have been satisfied with separating the Lichens from Algæ, which, indeed, was virtually done by most of those who acknowledged but two divisions; and with admitting three equally distinct groups. Some, on the contrary, have sought to multiply the orders, as De Candolle and others, by introducing a tribe called Hypoxyla; Greville by adopting the latter, Gastromyci, Byssoideæ, and Epiphytæ, and proposing a new group under the name of Chætophoroideæ; and finally, Adolphe Brongniart, who carries the number of groups in this division of Acotyledones as far as 12, viz. Lichens, Hypoxyla, Fungi, Lycoperdaceæ, Mucedineæ, Uredineæ, Fucaceæ, Ulvaceæ, Ceramiaceæ, Confervæ, Chaodineæ, and Arthrodieæ; part of which have originated with himself, and others with Bory de St. Vincent. I think, however, in the present state of our knowledge, it will be more prudent to admit only the three principal groups adopted by Agardh and Hooker; and even these are distinguishable by their general habit rather than by any very positive character of structure. Thus, Lichens are aerial plants, with distinct spaces upon their surface, in which their sporules are contained; Fungi differ from Lichens only in their fugacity and want of external receptacles of sporules; while Algæ are all aquatic.

The structure of these plants is among the most important subjects of contemplation for those who wish to become acquainted with the exact laws of vegetation. They represent the organised matter, of which all other plants are composed, both in its simplest state and when it begins to enter into a state of high composition. In short, it is here that the physical properties of elementary vegetable matter can be most usefully studied.

Order CCLXXXIX. FUNGI, or FUNGACEÆ. } The Mushroom Tribe.

Fungi, *Juss. Gen.* 3. (1789); *DC. Fl. Fr.* 2. 65. (1815); *Nees das System der Pilze und Schwämme*, (1817); *Fries Syst. Mycolog.* (1821); *Syst. Orb. Veg.* (1825); *Elench. Fung.* (1828); *Adolphe Brongn. in Dict. Class.* 5. 155. (1824); *Grev. Scott. Crypt. Fl.* 6. (1828); *Hooker British Flora*, 457. (1830); *Id. vol.* 2. *pt.* 2. (1835).—Epiphytæ, *Link*; *Grev. Fl. Edin.* xxv. (1824).—Gasteromyci, *Grev. Fl. Edin.* xxiv. (1824).—Mycetes, *Spreng. Syst.* 4. 376. (1827).—Uredineæ, Mucedineæ, *and* Lycoperdaceæ, *Ad. Brongn. in Dict. Class. l. c.* (1824).

Essential Character.—*Plants* consisting of a congeries of cellules, among which filaments are occasionally intermixed, increasing in size by addition to their inside, their outside undergoing no change after its first formation, chiefly growing upon decayed substances, frequently ephemeral, and variously coloured. *Sporules* lying either loose among the tissue, or enclosed in membranous cases called sporidia.

Affinities. These are only distinguished from Lichens by their more fugitive nature, their more succulent texture, their want of a thallus or expansion independent of the part that bears the reproductive matter, and by the latter being contained within their substance and not in hard distinct nuclei originating in the centre and breaking through a cortical layer. From Algæ there is no absolute character of division, except their never growing in water;

in fact, it is, as has been before stated, rather the medium in which Fungi and Algæ are developed that distinguishes them, than any peculiarity in their own organisation; for instance, the aerial Byssaceæ are nearly the same in structure as the aquatic Hydronemateæ. While there is so near an approximation of these families to each other, particularly in the simplest forms, it is important to remark that no spontaneous motion has been observed in Fungi, which, therefore, cannot be considered so closely allied to the animal kingdom as Algæ, notwithstanding the presence of azote in them, and the near resemblance of the substance by chemists called Fungin, to animal matter.

Fungi are almost universally found growing upon decayed animal or vegetable substances, and scarcely ever upon living bodies of either kingdom; in which respect they differ from Lichens, which very commonly grow upon the living bark of trees. They are, however, not confined to dead or putrid substances, as is shown by their attacking various plants when in a state of perfect life and vigour. In their simplest form they are little articulated filaments, composed of simple cellules placed end to end; such is the mouldiness that is found upon various substances, the mildew of the Rose-bush, and, in short, all the tribes of Mucor and Mucedo; in some of these the joints disarticulate, and appear to be capable of reproduction; in others sporules collect in the terminal joints, and are finally dispersed by the rupture of the cellule that contained them. In a higher state of composition, Fungi are masses of cellular tissue of a determinate figure, the whole centre of which consists of sporules either lying naked among filaments, as in the Puff-balls, or contained in membranous tubes or sporidia, like the thecæ of Lichens, as in the Sphærias. In their most complete state they consist of two surfaces, one of which is even and imperforate, like the cortical layer in Lichens; the other separated into plates or cells, and called the hymenium, in which the sporules are deposited.

Upon this kind of difference of structure, Fungi have not only been divided into distinctly marked tribes, but it has been proposed to separate certain orders from them under the name of Byssaceæ, Gasteromyci, and Hypoxyla: the first comprehending the filamentous Fungi found in cellars, and similar plants; the second Lycoperdons and the like; and the third species which approach Lichens in the formation of a distinct nucleus for the sporules, such as Sphæria. But Fries refers the first to Lichens, and the two last to Fungi.

Some writers have questioned the propriety of considering Fungi as plants, and have proposed to establish them as an independent kingdom, equally distinct from animals and vegetables; others have entertained doubts of their being more than mere fortuitous developements of vegetable matter, called into action by special conditions of light, heat, earth, and air—doubts which have been caused by some remarkable circumstances connected with their developement, the most material of which are the following: they grow with a degree of rapidity unknown in other plants, acquiring the volume of many inches in the space of a night, and are frequently meteoric, that is, spring up after storms, or only in particular states of the atmosphere. It is possible to increase particular species with certainty, by an ascertained mixture of organic and inorganic matter exposed to well-known atmospheric conditions, as is proved by the process adopted by gardeners for obtaining Agaricus campestris, a process so certain, that no one ever saw any other kind of Agaricus produced in Mushroom-beds; this could not happen if the Mushroom sprang from seeds or sporules floating in the air, as in that case many species would necessarily be mixed together; Fungi are often produced constantly upon the same kind of matter, and upon nothing else, such as the species that are parasitic upon leaves: all which is considered strong evidence of the production of Fungi being accidental, and not analogous to that of perfect plants. Fries, how-

ever, whose opinion must have great weight in all questions relating to Fungi, argues against these notions in the following manner: "The sporules are so infinite (in a single individual of Reticularia maxima I have counted above 10,000,000), so subtile (they are scarcely visible to the naked eye, and often resemble thin smoke), so light (raised, perhaps, by evaporation into the atmosphere), and are dispersed in so many ways (by the attraction of the sun, by insects, wind, elasticity, adhesion, &c.), that it is difficult to conceive a place from which they can be excluded." I give his words as nearly as possible, because they may be considered the sum of all that has to be urged against the doctrine of equivocal generation in Fungi; but without admitting, by any means, so much force in his statement as is required to set the question at rest. In short, it is no answer to such arguments as those just adverted to. It seems to me that a preliminary examination is necessary into the existence of an exact analogy between all the plants called Fungi; a question which must be settled before any further inquiry can be properly entered upon. That a number of the fungus-like bodies found upon leaves are mere diseases of the cuticle, or of the subjacent tissue, is by no means an uncommon opinion; that many more are irregular and accidental expansions of vegetable tissue in the absence of light, is not improbable; and it is already certain that no inconsiderable number of the Fungi of botanists are actually either, as various Rhizomorphas, the deformed roots of flowering plants growing in cellars, clefts of rocks, and walls; or mere stains upon the surface of leaves, as Venularia grammica; or the rudiments of other Fungi, as many of Persoon's Fibrillarias. Those who are anxious to inquire into these and other points, are referred to Fries' works generally, to the various writings of Nees von Esenbeck, and to the Scottish Cryptogamic Flora of Greville. In the ensuing list of genera, I have chiefly availed myself of the writings of Fries; but I must confess that in the Gasteromycetes and Coniomycetes the opinions of that learned Botanist are so unsteady, that I cannot but view the whole subject as being still in want of much more investigation. That it must be a matter of extreme difficulty to form any precise opinion concerning Fungi, without long experience, will be apparent from the observations of Fries upon the genus Thelephora. (*Elenchus, p.* 158). He asserts that out of mere degenerations or imperfect states of Th. sulphurea, the following genera, all of which he has identified by means of unquestionable evidence, have been constructed; viz., Athelia of Persoon, Ozonium of Persoon, Himantia of Persoon, Sporotrichum of Kunze, Alytosporium of Link, Xylostroma, Racodium of Persoon, Ceratonema of Persoon, and some others. Th. Nees von Esenbeck also assures us that the same fungoid matter which produces Sclerotium Mycetospora in the winter, developes Agaricus volvaceus in the summer. It would thus seem that the opinions of those who have asserted that the species or genus of a Fungus depends not upon the seed from which it springs, but upon the matrix by which it is nourished, are correct; especially if we take the above fact in connection with the experiments of Dutrochet, who obtained different genera of Mouldiness at will, by employing different infusions. He says that certain acid fluids constantly yield Monilias, and that certain alkaline mixtures equally produce Botrytis. *Ann. des Sc.* 2. *ser.* 1. 30. For a description of the gradual developement of an Agaric, see this ingenious observer's memoir in the *Nouv. Ann. du Mus.* vol. 3 p. 76. For the views of Unger upon spurious fungi, which are nothing but morbid conditions (eruptions) of vegetable matter, see the *Ann. des Sc. vol.* 2. *n. s.* 209; and Berkley's remarks thereupon, in *Hook. Brit. Fl. vol.* 2. *pt.* 2. *p.* 361.

Geography. The Fungi by which most extra-tropical countries are inhabited are so numerous, that no one can safely form even a conjecture as to the number that actually exists. If they are ever fortuitous productions, the

number must be indeterminable; if many are mere diseases and the remainder fixed species, then the knowledge of their nature must be reduced to a more settled state before any judgment upon their number can be formed. According to Fries, he discovered no fewer than 2000 species within the compass of a square furlong in Sweden; of Agaricus alone above 1000 species are described; and of the lower tribes the number must be infinite. Sprengel, however, does not enumerate in his *Systema Vegetabilium* more than between 2700 and 2800; but when we consider that his genus Agaricus does not go beyond number 646, although 1000 at least are described, it is not improbable that the rest of his enumeration is equally defective, and that the number of described Fungi perhaps amounts to between 4 and 5000. Of tropical species we know but little; their fugitive nature, the difficulty of preserving them, and perhaps the incuriousness of travellers, as well as their scarcity in the damp parts of equinoctial countries, have been the causes of the proportion in such climates between Fungi and other plants being unknown.

Properties. A large volume might be written upon the qualities and uses of Fungi, but in this place they can only be briefly adverted to in a very general way. They may be said to be important, either as food or as poison, or as parasites destructive to the plants upon which they grow. As food, the most valuable are the Agaricus campestris, or common Mushroom, the various species of Helvella or Morel, and Tuber or Truffle; but a considerable number of other kinds are used for food in various parts of the world, of which a useful account will be found in De Candolle's excellent *Essai sur les Propriétés Médicales des Plantes*, in Persoon's work *Sur les Champignons comestibles*, and in a paper by Greville in the 4th volume of the *Transactions of the Wernerian Society*.

It is necessary to exercise the utmost care in employing Fungi, the nature of which is not perfectly well ascertained, in consequence of the resemblance of poisonous and wholesome species, and the dreadful effects that have followed their incautious use. It is true that many kinds are named by Pallas as being commonly used by the Russians, which are plentiful in countries where they are not employed for food; but, in the first place, it is not perhaps quite certain that poisonous and wholesome species are not confounded under the same name; in the next place, climate may make a difference; and lastly, much depends upon the mode in which they are cooked. Upon this subject Delile observes, that it was ascertained by Paulet, in 1776, that salt and vinegar removed every deleterious principle from that most poisonous plant the Agaricus bulbosus; that it is the universal practice in Russia to salt the Fungi, and that this may be the cause of their harmlessness, just as the pickling and subsequent washing of the poisonous Agaric of the Olive renders it eatable in the Cevennes; but that nevertheless it is much wiser to run no risk with unknown Fungi, even taking such precautions; a remark to which he was led by the lamentable death of a French officer and his wife, in consequence of breakfasting off some poisonous Agarics, which were nevertheless eaten by other persons in the same house with impunity. It was probable that in that case a difference in the cooking was the cause of the difference in the effect of the Fungi; but it was a sufficient ground for distrusting all Fungi except the cultivated ones. So strongly did the late Professor L. C. Richard feel the prudence of this, that although no one was better acquainted with the distinctions of Fungi, he would never eat any except such as had been raised in gardens in mushroom beds. One of the most poisonous of our Fungi is the Amanita muscaria, so called from its power of killing flies when steeped in milk. Even this is eaten in Kamchatka, with no other than intoxicating effects, according to the following account by Langsdorff, as translated by Greville, from whom I borrow it.

"This variety of Amanita muscaria is used by the inhabitants of the north-eastern parts of Asia in the same manner as wine, brandy, arrack, opium, &c. is by other nations. Such Fungi are found most plentifully about Wischna, Kamchatka, and Wilkowa Derecona, and are very abundant in some seasons, and scarce in others. They are collected in the hottest months, and hung up by a string in the air to dry: some dry of themselves on the ground, and are said to be far more narcotic than those artificially preserved. Small deep-coloured specimens, thickly covered with warts, are also said to be more powerful than those of a larger size and paler colour. The usual mode of taking the Fungus is, to roll it up like a bolus, and swallow it without chewing, which, the Kamchatkadales say, would disorder the stomach. It is sometimes eaten fresh in soups and sauces, and then loses much of its intoxicating property: when steeped in the juice of the berries of Vaccinium uliginosum, its effects are those of strong wine. One large, or two small Fungi, are a common dose to produce a pleasant intoxication for a whole day, particularly if water be drank after it, which augments the narcotic principle. The desired effect comes on from one to two hours after taking the Fungus. Giddiness and drunkenness result in the same manner as from wine or spirits; cheerful emotions of the mind are first produced; the countenance becomes flushed; involuntary words and actions follow, and sometimes at last an entire loss of consciousness. It renders some remarkably active, and proves highly stimulant to muscular exertion: by too large a dose, violent spasmodic effects are produced. So very exciting to the nervous system in many individuals, is this Fungus, that the effects are often very ludicrous. If a person under its influence wishes to step over a straw or small stick, he takes a stride or a jump sufficient to clear the trunk of a tree; a talkative person cannot keep silence or secrets; and one fond of music is perpetually singing. The most singular effect of the Amanita is the influence it possesses over the urine. It is said that, from time immemorial, the inhabitants have known that the Fungus imparts an intoxicating quality to that secretion, which continues for a considerable time after taking it. For instance, a man moderately intoxicated to-day will, by the next morning, have slept himself sober, but (as is the custom), by taking a teacup of his urine he will be more powerfully intoxicated than he was the preceding day. It is, therefore, not uncommon for confirmed drunkards to preserve their urine as a precious liquor against a scarcity of the Fungus. The intoxicating property of the urine is capable of being propagated; for every one who partakes of it has his urine similarly affected. Thus, with a very few Amanitæ, a party of drunkards may keep up their debauch for a week. Dr. Langsdorf mentions, that by means of the second person taking the urine of the first, the third of the second, and so on, the intoxication may be propagated through five individuals."

Of parasitical Fungi, the most important are those which are called dry rot, such as Polyporus destructor, Merulius lacrymans and vastator &c., which are the pest of wooden constructions: next to these come the blight in corn, occasioned by Puccinia graminis; the smut and ergot, if they are really any thing more than the diseased and disorganised tissue of the plants affected; the rust, which is owing to the ravages of Æcidiums; and finally, in this class is to be included what we call mildew, minute simple articulated Mucors, and Mucedos. The genus Rhizomorpha, which vegetates in dark mines far from the light of day, is remarkable for its phosphorescent properties. In the coal mines near Dresden the species are described as giving those places the air of an enchanted castle; the roof, walls, and pillars, are entirely covered with them, their beautiful light almost dazzling the eye. The light is found to increase with the temperature of the mines. *Ed. P. J.* 14.

178. It is a most remarkable circumstance, and one which deserves particular inquiry, that the growth of the minute Fungi, which constitute what is called mouldiness, is effectually prevented by any kind of perfume. It is known that books will not become mouldy in the neighbourhood of Russia leather, nor any substance, if placed within the influence of some essential oil. *Ibid.* 8. 34. Boletus igniarius is used in India as a styptic, as well as for Amadou. *Ainslie*, 1. 5. The Boleti, when wounded, heal much in the same manner as the flesh of animals. *Edin. Philosoph. Journ.* 14. 369.

GENERA.

Cohors I. HYMENOMYCETES, Fr.

Ord. 1. Pileati, Fr.
Sub-Ord. i. Agaricini, Fr.
Agaricus, L.
*Amanita, Fr.
*Lepiota, Fr.
*Limacium, Fr.
*Tricholoma, Fr.
*Clytocybe, Fr.
*Omphalia, Fr.
*Collybia, Fr.
*Mycena, Fr.
*Pleurotus, Fr.
*Clitopilus, Fr.
*Eccilia, Fr.
*Leptonea, Fr.
*Nolanea, Fr.
*Telamonia, Fr.
*Phlegmacium, Fr.
*Inoloma, Fr.
*Dermocybe, Fr.
*Inocybe, Fr.
*Pholiota, Fr.
*Hebeloma, Fr.
*Flammula, Fr.
*Naucoria, Fr.
*Galera, Fr.
*Tapinia, Fr.
*Crepidotus. Fr.
*Pratellarius, Fr.
*Volvaria, Fr.
*Psalliota, Fr.
*Gomphus, Fr.
*Hypholoma, Fr.
*Psilocybe, Fr.
*Psathyra, Fr.
Coprinus, Pers.
Galorrheus, Fr.
Russula, Pers.
Favolus, P. B.
Lentinus, Fr.
Xerotus, Fr.
Cantharellus, Fr.
Nyctalis, Tr.
Schizophyllum, Fr.
Sub-Ord. ii. Polyporei, Fr.
Boletus, Dill.
Ceriomyces, Batt.
Hypodrys, Pers.
Suillus, Mich.
Polyporus, Mich.
*Polysticta, Fr.
Dædalea, Pers.
Cyclomyces, Klotzch.
Merulius, Hall.
Porotheleum, Fr.
Sub-Ord. iii. Hydnei, Fr.
Fistulina, Bull.
Hydnum, L.
Manina, Scop.
Hericium, Pers.
Odontia, Pers.
Systotrema, Fr.
Irpex, Fr.
Radulum, Fr.
Sub-Ord. iv. Auricularini. Fr.
Thelephora, Ehr.
*Merisma, Fr.
*Phylacteria, Fr.
Auricularia, Bull.
Phlebia, Fr.
Ozonium, Pers.
Himantia, Pers.
Sporotrichum, Kze.
Alytosporium, Lk.
Xylostroma, *Ceratonema*, Pers.
Rhizomorpha, Pers.
Fibrillaria, Pers.
Richnophora, Pers.
Athelia, Pers.
Coniophora, DC.
Stereum, Lk.
Ord. 2. Elvellacei, Fr.
Morchella, Dill.
Helvella, L.
Verpa, Sw.
Leotia, Hill.
Rhizina, Fr.
Peziza, Dill.
Ascobolus, Pers.
Bulgaria, Fr.
Vibrissea, Fr.
Sarea, Fr.
Ditiola, Fr.
Stictis, Pers.
Solenia, Hoffm.
Chætocyphe, Corda.
Ord. 3. Clavati, Fr.
Gomphora, Fr.
Hericium, Fr.
Sparassis, Fr.
Spathulea, Fr.
Mitrula, Fr.
Geoglossum, Pers.
Clavaria, Vaill.
Typhula, Fr.
Phacorhiza, Pers.
Pterula, Fr.
Calocera, Fr.
Crinula, Fr.
Crinium, Fr.
Pistillaria, Fr.
Ord. 4. Tremellini, Fr.
Helotium, Tod.
Cyphella, Fr.
Guepinia, Fr.
? Gyrocephalus, Pers.
Hirneola, Fr.
Lemilis, Fr.
Exidia, Fr.
Tremella, Dill.
Næmatelia, Fr.
Dacrymyces, Nees.
Pyrenium, Tod.
Phyllopta, Fr.
Agyrium, Fr.
Hymenula, Fr.

Cohors II. PYRENOMYCETES, Fr.

Ord. 1. Sphæriacei, Fr.
Hypocrea, Fr.
*Cordyceps, Fr.
*Hypomyce, Fr.
*Nectria, Fr.
Hypoxylon, Bull.
*Xylaria, Fr.
*Poronia, Fr.
*Diatrypa, Fr.
Valsa, Fr.
Variolaria, Bull.
Sphæria, L.
Dichæna, Fr.
Hypospila, Fr.
Ostropa, Fr.
Gibbera, Fr.
Corynelia, Fr.
Strigula, Fr.
Meliota, Fr.
Vermicularia, Tod.
Dothidea, Fr.
Ascospora, Fr.
Ord. 2. Phacidiacei, Fr.
Stegia, Fr.
Patellaria, Fr.
Tympanis, Tod.
Dermea, Fr.
Cenangium, Fr.
*Sclerodermis, Fr.
*Triblidium, Fr.
*Clithris, Fr.
*Heterosphæria, Grev.
Glonium, Muhl.
Lophium, Fr.
Artidium, Fr.
Cliostomum, Fr.
Rhytisma, Fr.
Placidium, Fr.
Hysterium, Fr.
Hypodrome, DC.
Excipula, Fr.
Ord. 3. Cytisporei, Fr.
Zythia, Fr.
Sphæronema, Fr.
Cytispora, Fr.
Hercospora, Fr.
Septoria, Fr.
Ceuthospora, Fr.
Phoma, Fr.

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* Those marked * are sub-genera.

Ord. 4. Xylomacei, Fr.
Sphinctrina, Fr.
Schizoxylon, Pers.
Prosthemium, Kze.
Labrella, Fr.
Actinothyrium, Kze.
Leptostroma, Fr.
Leptothyrium, Kz.
Sacidium, Fr. Nees.

Cohors III. GASTEROMYCETES, Fr.

Ord. 1. Angiogastres, Fr.
Simblum, Kltzch.
Phallus, Mich.
Hymenophallus, Nees.
Dictyopeplos, V. Hass.
Battarrea, Pers.
Lysurus, Fr.
Ascröe, Lab.
Colus, Cav. et Sech.
Sophronia, Gaud.
Clathrus, Mich.
Laternea, Turp.
Clethria, S. Br.
Tuber, Mich.
Rhizopogon, Fr.
Polygaster, Fr.
Endogone, Lk.
Nidularia, Bull.
Cyathia, P. Br.
Granularia, W.
Arachnion, Schw.
Myriococcum, Fr.
Polyangium, Lk.
Atractobolus, Tod.
Thelebolus, Tod.
Sphærobolus, Tod.
Pilobolus, Tod.
Ord. 2. Trichospermi, Fr.
Enerthenema, Bowman.
Elaphromyces, Nees.
Phymatium, Chev.
Ceraunion, Theophr.
Hypogæum, Pers.
Hyperrhiza, Fr.
Uperrhiza, Bosc.
Polysaccum, DC.
Pisolithus, Alb. et Schw.
Pisocarpium, Lk.
Pisomyces, Fr.
Polypera, Pers.
Scleroderma, Pers.
Diploderma, Link.
Cauloglossum, Grev.
Herculea, Fr.
Mitremyces, Nees.
Calostoma, Desv.
Gyropodium, Hitchk.
Geaster, Mich.
Actinodermium, Nees.
Sterrebeckia, Link.
Myriostoma, Desv.
Plecostoma, Desv.
Bovista, Pers.
Lycoperdon, Mich.
Podaxon, Desv.
Tulostoma, Pers.
Rimella, Raf.
Lycogala, Mich.
Diderma, Pers.
Leangium, Lk.
Leocarpus, Lk.
Didymium, Schr.
Physarum, Pers.
Cionium, Lk.
Conioderma, Fr.
Craterium, Trentep.
?*Sphærocarpa*, Schum.
Perichæna, Fr.
Licea, Schr.
Dermodium, Lk.
?*Phelonitis*, Chev.
Trichia, Hall.
Goniospora, Pers.
Arcyria, Pers.
Diachea, Fr.
Mesenterica, Tod.
Phlebomorpha, Pers.
Stemonitis, Gled.
Dictydium, Schr.
Cribraria, Schr.
Cirrholus, Mart.
Ord. 3. Trichodermacei, Fr.
Spumaria, Pers.
?*Endoconia*, Raf.
Œthalium, Lk.
Fuligo, Pers.
Pittocarpium, Lk.
Reticularia, Bull.
Strongylium, Dittm.
Diphtherium, Ehr.
Lignidium, Lk.
Trichoderma, Pers.
Enteridium, Ehrenb.
Lachnobolus, Fr.
Hyphelia, Fr.
Amphisporium, Lk.
Ostracoderma, Fr.
Institale, Fr.
Asterophora, Dittm.
Hypochæna, Fr.
Pilacre, Fr.
Spadonia, Fr.
Onygena, Pers.
Piligena, Schum.
Ecchyna, Fr.
Dichosporium, Nees.
Myrothecium, Tod.
Tipularia, Chev.
Trichoderma, Pers.
Ord. 4. Sclerotiacei, Fr.
Pachyma, Fr.
?*Gemmularia*, Raf.
Mylitta, Fr.
Antennaria, Lk.
Myxothecium, Kze.
Anixia, Fr.
Rhizoctonia, DC.
Thanatophyta, Nees.
Chætomium, Kze.
Apiosporium, Kze.
Coniosporum, Lk.
Illosporium, Mart?
Periola, Fr.
Chætostroma, Cord.
Acinula, Fr.
Acrospermium, Tod.
Xyloglossum, Pers.
Scleroglossum, Pers.
Sclerotium, Tod.
Coccopleum, Ehrenb.
Erysiphe, DC.
Alphitomorpha, Wall.
Erysibe, Schlecht.
Podosphæria, Kunz.
Lasiobotrys, Kunz.
Perisporium, Fr.

Cohors IV. CONIOMYCETES, Fr.

Ord. 1. Tuberculari, Fr.
Isaria, Pers.
Amphichorda, Fr.
Anthina, Fr.
Ceratonema, Rth.
Cephalotrichum, Lk.
Peribotryon, Fr.
Triclinium, Fee.
Sporocybe, Fr.
Pachnocybe, Berkl.
Doratomyces, Corda.
Scorias, Fr.
Ceratium, Alb. et Sch.
Byssocaulon, Mont.
Epichysium, Tod.
Dacrina, Fr.
?*Dacridium*, Lk.
Dermosporium, Lk.
Ægerita, Pers.
Sclerococcum, Fr.
Epicoccum, Lk.
Tubercularia, Tod.
Volutella, Tod.
Atractium, Lk.
Fusarium, Lk.
Ord. 2. Mucorini, Fr.
Chordostylum, Tod.
Stilbum, Tod.
Hydrophora, Tod.
Pilobolus, Tod.
Ascophora, Tod.
Periconia, Tod.
Phycomyces, Kze.
Aerophyton, Eschw.
Diamphora, Mart.
Didymocrater, Mart.
Cephaleuros, Kze.
Mucor, Mich.
Rhizopus, Ehrenb.
Thamnidium, Lk.
Thelactis, Mart.
Melidium, Eschw.
Eurotium, Lk.
Clisosporium, Fr.
Syncollesia, Fr.
Stachylidium, Fr.
Spondylocladium, Mart.
Sceptromyces, Corda.
Botryosporium, Cord.
Acremonium, Lk.
Mycogone, Lk.
Azygites, Fr.
Syzygites, Ehr.
Bactridium, Kz.
Ord. 3. Mucedines, Fr.
Helminthosporium, Lk.
Exosporium, Lk.
Sarcopodium, Corda.
Helicosporium, Nees.
Helicotrichum, Nees.
Œdemium, Link.
Myxotrichum, Kze.
Campsotrichum, Ehrenb.
Oncidium, Fr. Nees.
Gonytrichum, Nees.
Actinocladium, Ehr.
Macrosporium, Fr.
Circinotrichum, Nees.
Trichothecium, Lk.
Dimera, Fr.
Diplosporium, Lk.
Coremium, Fr.
Dactylium, Nees.
Cladobotryon, Nees.
Monilia, Hill.
Briarea, Corda.
Penicillium, Lk.
Floccaria, Grev.
Aspergillus, Mich.
Sporodinia, Lk.
Botrytis, Mich.
Spicularia, Pers.

Sporocephalum, Chev.
Virgaria, Nees.
Verticillium, Nees.
Polyactis, Lk.
Haplaria, Lk.
Sporendonema, Desm.
Oidium, Lk.
Acrosporium, Nees.
Alysidium, Kze.
Sporotrichum, Lk.
Byssocladium, Nees.
Alytosporia, Nees.
Aleurisma, Lk.
Collarium, Lk.
Coccotrichum, Lk.
Sepedonium, Lk.
Tuburcina, Fr.
Epochnium, Lk.
Scolicotrichum, Kze.
Fusisporium, Lk.
Fusidium, Lk.
Dendrina, Fr.

Sporisporium, Ehrenb.
Psilonia, Fr.
Circinotrichium, Nees.
Conoplea, Pers.
Gliotrichum, Eschw,
Haplotrichum, Eschw.
Arthrinium, Kze.
Camptoum, Lk.
Goniosporium, Lk.
Sporophlæum, Nees.
Polythrincium, Kze.
Farinaria, Sowerb.
Dematium, Pers.
Chloridium, Link.
Chætopsis, Grev.
Cælosporium, Lk.
Trichostroma, Corda.
Cladosporium, Link.
Acladium, Lk.

Ord. 4. ENTOPHYTI, Fr.

Gymnosporangium, DC.

Posidoma, Lk.
Phragmotrichum, Kz.
Coryneum, Nees.
Sporidesmium, Lk.
Exosporium, Lk.
Seiridium, Nees.
Astrosporium, Kunz.
Stilbospora, Pers.
Didymosparium, Nees.
Melanconium, Lk.
Cryptosporium Kze.
Cylindrosporium, Grev.
Schizoderma, Kze.
Hypodermium, Lk.
Uredinaria, Chev.
Sorosporium, Rudolph.
Næmaspora, Pers.
Myxosporium, Lk.
Septoria, Fr.
Fusidium, Fr.
Bullaria, DC.

Papularia, Fr.
Phylloedium, Fr.
Torula, Pers.
Alternaria, Nees.
Hormiscium, Ehrenb.
Syncollesia, Agh.
Tetracolium, Lk.
Xenodochus, Schlecht.
Puccinia, Pers.
Cæoma, Nees.
Dicæoma, Nees.
Triphragmium, Lk.
Phragmidium, Lk.
Aregma, Fr.
Epitea, Fr.
Æcidium, Pers.
Cronantium, Fr.
Uredo, Pers.
Ustilago, Fr.
Spilocæa, Fr.

Actinonema, Pers.
Capillaria, Lk.

SPURIOUS GENERA.

Xyloma.
Ectostroma.
Asteroma.
Depazea.
Amphisporium?
Dichosporium?
Spermodermium.
Mucilago, Vet.
Embolus, Hoffm.
Mesenterica, Tode.
Phlebomorpha, Pers.

FUNGOUS EXCRESCENCES OR DISEASES.

Spermoedia, Fr.
Fusidium, Nees.
Strumella, Fr.
Phlæoconis, Fr.
Nosophlæa, Fr.
Mycomater, Fr.
Dacrymyces.
Taphrina, Fr.
Erineum, Pers.
Phyllerium, Fr.

Also, according to Unger,

Uredo, Pers.
Uromyces, Lk.
Puccinia, Lk.
Phragmidium, Lk.
Peridermium, Lk.
Æcidium, Lk.
Röstellia, Lk.
Cronartium, Fries.
Protomyces, Unger.

ORDER CCXC. LICHENES, or LICHENACEÆ. } THE LICHEN TRIBE.

ALGÆ, § 3. LICHENES, *Juss. Gen.* 6. (1789).—LICHENES, *Hoffm. Enumerat. Lichenum*, (1784); *Acharius Prodr. Lichen.* (1798); *Id. Methodus*, (1803); *Id. Lichenogr. Univers.* (1810); *DC. Fl. Fr.* 2. 321. (1815); *Fries in Act. Holm.* (1821); *Agardh Aph.* 89. (1821); *Eschweiler Syst. Lich.* (1824); *Wallroth Naturgesch. der Flechten.* (1824); *Grev. Flora Edin.* xix. (1824); *Meyer über die Entwickelung, &c. der Flecht.* (1825); *Fée Méth. Lich.* (1825); *Fries Syst. Orb. Veg.* 224. (1825); *Martius in Bot. Zeitung*, 193. (1826); *Fée in Dict. Class.* 9. 360. (1826); *Fries Lichenogr. Europæa.* (1831); *Eschw. in Mart. Fl. Bras.* 1. 51. (1833); *Hooker Brit. Fl. vol.* 2. *pt.* 1. 129. (1833).—BYSSOIDEÆ, *Grev. Fl. Edin.* 25. (1824); *Fries Syst. Orb. Veg.* (1825); *Grev. Scott. Crypt. Fl.* 6. (1828)—HYPOXLA, in part, *DC. Fl. Fr.* 2. 280. (1815); *Grev. Fl. Edin.* xx. (1824).—GRAPHIDEÆ, *Chevallier Hist. des Graphidées.* (1824, &c.)

ESSENTIAL CHARACTER.—*Perennial* plants, often spreading over the surface of the earth, or rocks or trees in dry places, in the form of a lobed and foliaceous, or hard and

crustaceous, or leprous substance, called a thallus. This *thallus* is formed of a cortical and medullary layer, of which the former is simply cellular, the latter both cellular and filamentous; in the crustaceous species the cortical and medullary layer differ chiefly in texture, and in the former being coloured, the latter colourless; but in the fruticulose or foliaceous species, the medulla is distinctly floccose, in the latter occupying the lower half of the thallus, in the former enclosed all round by the cortical layer. *Reproductive* matter of two kinds; 1, *sporules* lying in membranous tubes (*thecæ*) immersed in nuclei of the medullary substance, which burst through the cortical layer, and colour and harden by exposure to the air in the form of little disks called shields; 2, the separated cellules of the medullary layer of the thallus.

Affinities. According to Fries, Lichens are types of Algæ born in the air, interrupted in their developement by the deficiency of water, and stimulated into forming a nucleus (or receptacle of sporules) by light. No Lichen is ever submersed; there is none of which the vegetation is not interrupted by the variable hygrometrical state of the atmosphere; and, finally, none that ever develope in mines, caverns, or places deprived of light. On this account, their shields are more rare in the fissures of mountains, or in shady groves, than in places fully exposed to light. In wet places, also, their shields are not produced; for so long as they are under the influence of water they are hardly distinguishable from Hydrophycæ (forms of Algæ); as, for instance, Collema, &c. But these plants, when exposed to the sun, do perfect their shields, as is found by Nostoc lichenoides, foliaceum, &c., which, when dry, are ascertained to be Collema limosum, flaccidum, &c., surcharged with water. By being acquainted with this rule, the same author says, he has succeeded in discovering many Swedish Lichens with shields, which have for many years been constantly found sterile; as Parmelia conoplea, lanuginosa, gelida, &c.; and he even asserts that he has succeeded artificially in inducing sterile Lichens to become fruitful, as Usnea jubata, and others. *Plant. Hom.* 224. Lichens consist, according to Eschweiler, of a medullary and a cortical layer of tissue, of which the former is imperfectly cellular or filamentous, and bursts through the latter in the form of shields (apothecia), which contain a nucleus, consisting of a flocculose-gelatinous substance, among which lie the cases of sporules. These cases (thecæ) are transparent membranous tubes, either simple or composed of several placed end to end, which either lie free in the nucleus, or are themselves contained in other membranous cases (asci). In the beginning Lichens are stated to be in all cases developed in humidity, and to be, in fact, at that time, mere Phyceæ or Confervæ; but as soon as the humidity diminishes, the under part dies. and an inert leprous crust is formed, which ultimately becomes the basis of the plant. Hence Lichens consist of two distinct sorts of tissue,—living cellules forming the vegetating part, and dead cellules the cohesion of which is lost; when separate, the former is Palmella botryoides, and the latter Lepraria. Of these two sorts of matter, the leprous is incapable of perpetuating the Lichen, while every part of the living stratum has been ascertained to become reproductive matter. See Fries, as above quoted, and Meyer *Ueber die Entwickelung, &c., der Flechten.* The investigations of the latter are exceedingly interesting. By sowing Lichens, he arrived at some curious conclusions, the chief of which are, that, like other imperfect plants, they may owe their origin either to an original elementary, or to a reproductive generation—the latter by the creation of parts capable of developement in conformity to the plant by which they are borne: that decomposed vegetable, and some inorganic, matter, are equally capable of assuming organisation under the influence of water and light; and that the pulverulent matter of Lichens is that which is subject to this kind of indefinite propagation, while the sporules lying in the shields are the only part that will really multiply the species. He further says, that he has ascertained, by means of experiments from seed, that supposed species and even some genera

of Acharius, are are all forms of the same; as, for instance, Lecanora cerina, Lecidea luteo-alba, and others of the common Parmelia parietina. As these remarks have not been, as far as I know, contradicted, they may now be considered established facts.

Agardh considers Lichens more nearly allied to Fungi than to Algæ: he remarks, that if Sphærias or Pezizas had a thallus, they would be Lichens, and that the same part is all that determines such genera as Calycium, Verrucaria, or Opegrapha to be Lichens, and not Fungi. He adds, that all the transitions from Algæ to to the state of Lichens, which have been detected by modern inquirers, are mere degenerations into the form of the Lichen tribe, and by no means into Lichens themselves.

With regard to the arrangement of the genera of Lichens, that of Acharius has been adopted by lichenologists of this country and of most others: but, which is remarkable, not in Sweden; and it seems probable, from the investigations that have lately been instituted, that this celebrated system will, like the more general one of Linnæus, be wholly abandoned. In its room every writer upon Lichens has proposed a new one of his own; Meyer, Eschweiler, Wallroth, Agardh, Fries, Chevalier, Fée, have each brought forward methods of arrangement, of which it may be said, without disparagement to any of them, that it is impossible at present to say which will be eventually adopted. I have taken that of Fries as explained in his *Syst. Orb. Veg. p.* 233, making such additions as I have been able. There are some important remarks by Fée upon the thecæ of these plants, and the principles on which their genera are to be formed, in the *Botanische Zeitung* for 1835, p. 81.

Fries refers Byssaceæ to Lichens with the following short character:— "Aerial, perennial, constantly growing, with a filamentous texture; consisting of solid fibres (either few or several glued together with a common bark), unchanged and permanent. Fructification homogeneous, growing externally, and naked." *Syst. Orb. Veg.* 291. Some of these plants appear to be meteoric productions; on one occasion they are said to have suddenly overrun all the leaves of pines on the side next the wind in the neighbourhood of Dresden; on another, on the 29th of Aug. 1830, to have in an instant spread over the sails and masts of a ship at Stockholm; and Fries is disposed to consider the cobweb-like matter that overruns the grass in the mornings of spring and autumn, of this nature, and not of an animal origin. See *S. O. Veg.* 318.

The only point to which it is further necessary to advert, is the separation of the tribe called Hypoxyla from Lichens. In part, this is composed of Opegrapha and other Lichenoid, and of Sphæria and various Fungoid, genera; its character is to discharge a sporuliferous pulp from the nucleus. But it seems to be a prevalent opinion that this character is uncertain and unimportant, and consequently the supposed tribe will fall back in part into Lichens, and in part into Fungi, from which it sprung. Greville, however, adheres to the distinction.

Geography. Pulverulent Lichens are the first plants that clothe the bare rocks of newly-formed islands in the midst of the ocean, foliaceous Lichens follow these, and then Mosses and Hepaticæ. *D'Urville Ann. Sc.* 6. 54. About 800 species are described by Acharius, the number of which is perhaps capable of some reduction; 200 are added by Fée, and great numbers are, no doubt, still undiscovered. They are found upon trees, rocks, stones, bricks, pales, and similar places; and the same species seem to be found in many different parts of the world: thus, the Lichens of North America differ little from those of Europe. Fée estimates the number actually known, either in herbaria or in books, at 2400.

Properties. Lichens have been remarked by De Candolle to possess two distinct classes of characters, the one rendering them fit for being employed as dyes after maceration in urine, the other making them nutritive and medicinally useful to man. Braconnot has ascertained that oxalate of lime, or oxalic acid, exists in great abundance in Lichens, particularly in those which are granular and crustaceous. The common Variolaria, which is found upon almost every old beech-tree, contains rather more than 29 per cent. *Ed. P. J.* 13. 194. Lichens that grow on the summit of fir-trees have been found by John, of Berlin, to contain an uncommon proportion of oxide of iron, which may be viewed as illustrative of the formation of iron by the vegetable process. *Ibid.* 2. 394. Of those used in dyeing, the principal crustaceous kinds are, Lecanora perella, the Orseille de terre, or Perelle d'Auvergne of the French, Lecanora tartarea, or Cudbear, hæmatomma and atra, Variolaria lactea, Urceolaria scruposa and cinerea, Isidium Westringii, Lepraria chlorina; of the foliaceous species, Parmelia saxatilis, omphalodes, encausta, conspersa, and parietina, Sticta pulmonacea, Solorina crocea, and Gyrophora deusta and pustulata; but the most important are Roccella tinctoria and fusiformis, the dye of which is so largely used by manufacturers under the name of Orchall, or Archill, or Orseille des Canaries; there are other species capable of being employed in a similar manner, as Usnea plicata, Evernia prunastri, Alectoria jubata, Ramalina scopulorum, and several Cenomyces. The nutritive properties of Lichens probably depend upon the presence of an amylaceous substance analogous to gelatine, which, according to Berzelius, exists in the form of pure starch or amylaceous fibre, to the amount of 80.8 per cent. in Cetraria islandica. This plant, which is the Iceland Moss of the shops, is slightly bitter as well as mucilaginous, and is frequently used as tonic, demulcent, and nutrient; Cetraria nivalis, Sticta pulmonacea, and Alectoria usneoides, will all answer the same purpose. Tripe de Roche, on which the Canadian hunters are often forced to subsist is the name of various species of Gyrophora; the Rein Deer Moss, which forms the winter food of that animal, is Cenomyce rangiferina. Parmelia parietina, Borrera furfuracea, Evernia prunastri, Cenomyce pyxidata and coccifera, are reputed astringents and febrifuges, and Peltidea aphthosa an anthelmintic; Sticta pulmonacea is used in Siberia for giving a bitter to beer; Evernia vulpina, called Ulfmossa by the Swedes, is believed by that people to be poisonous to wolves; but this requires confirmation. See *De Cand. Essai Méd.* 318, and *Agardh Aph.* 94.

GENERA.

Ord. 1. Hymenothalami, Fr.
Trib. 1. Usneaceæ, Fr.
Usnea, Dill.
Alectoria, Ach.
Evernia, Ach.
Neuropogon, Nees.
Bryopogon, Nees.
Cornicularia, Ach.
Ramalina, Ach.
Roccella, DC.
Siphula, Fr.
Dufourea, Ach.
Cetraria, Ach.
Trib. 2. Parmeliaceæ, Fr.
Solorina, Ach.
Peltigera, Hoffm.
*Nephroma, Ach.
*Peltidea, Ach.
Sticta, Schreb.
Borrera, Ach.
Parmelia, Ach.
Lecanora, Ach.
Lobaria, Hoffm.
Imbricaria, Hoffm.
Physcia, Ach.
Xantheria,
Amphiloma,
Placodium, Ach.
Psoroma, Ach.
Rinodina, Ach.
Patellaria, DC.
Squamaria, DC.
Plcetocarpon, Fée.
Delisea, Fée.
Dirina, Fr.
Zeora, Fr.
Gyalecta, Ach.
Trib. 3. Lecidinæ, Fr.
Stereocaulon, Schreb.
Cladonia, Hoffm.
Pyxidium, Hill.
Pyxidaria, Mich.
Scyphophorus, Vent.
Helopodium, DC.
Pycnothelia, Desf.
Cenomyce, Ach.
Bæomyces, Pers.
Biatora, Fr.
Lecidea, Ach.
Rhizocarpon, DC.
Circinaria, Fée.
Trib. 4. Collemaceæ, Fr.
Leptogium, Fr.
Collema, Hoffm.
Lemniscium, Wallr.
Geissodia, Vent.
Ephebe, Fr.
Micaræa, Fr.
Ord. 2. Gasterothalami, Fr.
Trib. 1. Sphærophoreæ, Fr.
Sphærophoron, Pers.
Plocaria, Eschw.
Isidium, Ach.
Trib. 2. Endocarpeæ, Fr.
Endocarpon, Hedv.
Dermatocarpon, Esch.
Sagedia, Ach.
Ascidium, Fée.
Porina, Ach.
Pertusaria, Lam.
Porophora, Meyer.
Trib. 3. Trypetheliaceæ, Fr.
Porothelium, Eschw.
Mycoporon, Meyer.
Porodothion, Fr.
Segestria, Fr.

Trypethelium, Spr.
Ophthalmidium, Esch.
Bathelium, Afz.
Astrothelium, Eschw.
Trib. 4. VERRUCARINÆ, Fr.
Verrucaria, Pers.
Pyrenula, Ach.
Stigmatidium, Mey.
Ocellularia, Meyer.
Nematora, Fée.
Phyllocharis, Fée.
Craspedon, Fée.
Melanophthalmum, Fée.
Thrombium, Wallr.
Strigula, Fr.
? Racoplæa, Fr.
Pyrenastrum, Eschw.
Parmentaria, Fée.
Tricharia, Fée.
Pyrenothea, Fr.
Ord. 3. IDIOTHALAMI, Fr.
Trib. 1. PYXINEÆ, Fr.
Umbilicaria, Hoffm.
Pyxine, Fr.
Trib. 2. LIMBORINÆ, Fr.
Gyrophora, Ach.
Gyrostomum, Fr.
Limboria, Ach.
Urceolaria, Ach.
Thelotrema, Ach.
Anthrocarpum, Mey.
Trib. 3. GLYPHIDEÆ, Fr.
Chiodecton, Ach.
Glyphis, Ach.
Asterica, Meyer.
Sarcographa, Meyer.
Conioloma, Flörke.
Trib. 4. GRAPHIDEÆ, Fr.
Graphis, Ach.
Opegrapha, Pers.
Allographa, Chev.
Oxystoma, Eschw.
Leiogramma, Eschw.
Leioreuma, Eschw.
Medusula, Eschw.
Lecanactis, Eschw.
Hysterina, Ach.
Oxystoma, Eschw.
Scaphis, Eschw.
Sclerophyton, Eschw.
Arthonia, Eschw.
Ustalia, Fr.
Pyrochroa, Eschw.
Coniangium, Fr.
Diorygma, Eschw.
Fissurina, Fée.
Ord. 4. CONIOTHALAMI, Fr.
Coniocybe, Ach.
Calicium, Pers.
Trachylia, Fr.
? Coniocarpon, DC.
Ord. 5. BYSSACEÆ,
Rhizomorpha, Roth.
Thamnomyces, Ehren.
Synalissa, Fr.
Cœnocarpus, Reb.
Melidium, Eschw.
Phycomyces, Kunze.
Ascophora, Schw.
Periconia, Tode.
Lichina, Ag.
Cora, Fr.
Cilicia, Fr.
Cœnogonium, Ehrenb.
Thermutis, Fr.
Gausapia, Fr.
Dictyonema, Ag.
Dichonema, Fr.
Hypochnus, Ehrenb.
Colletosporium, Lk.
Racodium, Lk.
Tophora, Fr.
Trichosporum, Fr.
Amphitrichum, Nees.
Byssus, L.
Nematogonium, Desm.

Spurious Genera.

Isidium, Ach.
Variolaria, Pers.
Arthonia, Ach.
Nævia, Fr.
Incillaria, Fr.
Arthronaria, Fr.
Fumago, Pers.
Mycinema, Fr.
Lepraria, L.
Protonema, Ag.
Herpotrichum, Fr.
Plegmatium, Fr.
Lanosa, Fr.
Hypha, Pers.

ORDER CCXCI. ALGÆ, or ALGACEÆ. } THE SEA-WEED TRIBE.

ALGÆ, *Juss. Gen.* 5. (1788); *Roth. Catalecta Botanica* (1797); *DC. Fl. Fr.* 2. 2. (1815); *Agardh Synops. Alg.* (1817); *Species Alg.* (1821-1828); *Syst. Alg.* (1824); *Greville Alg. Brit.* (1830); *Hooker, Brit. Fl. vol.* 2. *pt.* 1. (1833).—PHYCEI, *Acharius* (1807?).—THALASSIOPHYTA, *Lamouroux Ann. Mus.* 20. (1812); *Gaillon in Dict. des Sc.* 53. 350. (1828).—HYDROPHYTA, *Lyngb. Tentam.* (1819).—ARTHRODIEÆ, *Bory in Dict. Class.* 1. 591. (1822).—HYDRONEMATEÆ, *Nees in Nov. Act. Nat. Cur.* 11. 509. (1823); *Ann. des Sc.* 13. 439. (1828).—CHAODINEÆ, CONFERVÆ *and* CERAMIARIEÆ, *Bory in Dict. Class.* 3. *and* 4. (1823).—CHÆTOPHOROIDEÆ, *Greville Fl. Edin.* 321. (1824).—HYDROPHYCÆ, *Fries Syst. Orb. Veg.* 320. (1825).—NEMAZOAIRES, *Gaillon in Ann. Sc. Ser.* 2. 1. 44. (1834).

ESSENTIAL CHARACTER.—Leafless flowerless plants, with no distinct axis of vegetation, growing in water, frequently having an animal motion, and consisting either of simple vesicles lying in mucus, or of articulated filaments, or of lobed fronds, formed of uniform cellular tissue. *Reproductive matter* either altogether wanting, or contained in the joints of the filaments, or deposited in thecæ of various form, size, and position, caused by dilatations of the substance of the frond. *Sporules* with no proper integument, in germination elongating in two opposite directions.

AFFINITIES. Whatever ingenuity may be employed in determining the relative degree of dignity in the vegetable creation between Fungi, Lichens, and Algæ, it seems to me that the conclusion which is constantly arrived at is, that Algæ are absolutely distinguishable from the two others only by their living in water, and that, except for the influence which that medium exercises on them, they would be identical with Lichens on the one hand, and with Fungi on the other. Those who wish to make the order a special study will do well to take the excellent *Species Algarum* of Agardh for their guide, and

to study the papers of Bory de St. Vincent, and Fries, for general ideas, the various articles cited at the head of this article, and that most beautiful of all books, the *Algæ Britannicæ* of Greville, together with the second volume of Hooker's British Flora, for the application of them to the Flora of this country.

Those who have ever examined the surface of stones constantly moistened by water, the glass of hothouses, the face of rocks in the sea, or of walls where the sun never shines, or the hard paths in damp parts of gardens after rain, cannot fail to have remarked a green mucous slime with which they are covered. This slime consists of Algæ in their simplest state of organisation, belonging to the genera Palmella, Nostoc, Red Snow, and the like, the Nostochinæ of Agardh, or Chætophoroideæ of Greville; they have been called Chaodineæ by Bory de St. Vincent, whose account of them is to the following effect:—The slime resembles a layer of albumen spread with a brush; it exfoliates in drying, and finally becomes visible by the manner in which it colours green or deep brown. One might call it a provisional creation waiting to be organised, and then assuming different forms, according to the nature of the corpuscles which penetrate it or develope among it. It may further be said to be the origin of two very distinct existences, the one certainly animal, the other purely vegetable. This matter lying among amorphous mucus consists in its simplest state, of solitary, spherical corpuscles, (such as are figured by Turpin in the *Mémoires du Muséum*, vol. 18. t. 5.; and as may be easily seen in the common green crust upon old pales, Palmella botryoides); these corpuscles are afterwards grouped, agglomerated, or chained together, so producing more complex states of organisation. Sometimes the mucus, which acts as the basis or matrix of the corpuscles, when it is found in water, which is the most favourable medium for its developement, elongates, thickens, and finally forms masses of some inches extent, which float and fix themselves to aquatic plants. These masses are at first like the spawn of fish, but they soon change colour and become green, in consequence of the formation of interior vegetable corpuscles. Often, however, they assume a milky or ferruginous appearance; and if in this state they are examined under the microscope, they will be found completely filled with the animalcules called Navicularіæ, Lunulinæ, and Stylariæ, assembled in such dense crowds as to be incapable of swimming. In this state the animalcules are inert. Are they developed here, or have they found their way to such a nidus, and have they hindered the developement of the green corpuscles? Is the mucus in which they lie the same to them as the albuminous substance in which the eggs of many aquatic animals are deposited? At present we have no means of answering these questions. According to Gaillon, many of these simple plants are certainly nothing but congeries or rows of the singular and minute animalculæ called Vibrio tripunctatus and bipunctatus by Muller, strung end to end. See Ferussac's *Bulletin, Feb.* 1824. He there particularly applies this remark to Monema comoides; in his paper on Nemazoaires in the Ann. des Sc. new series, 1. 44., he enumerates a number of genera to which he ascribes this property.

Another form of Algæ, one which may be considered a higher degree of developement of the last, is that in which they assume a tubular state, containing pulverulent or corpuscular matter in the inside, and become what are called Confervæ, or, as Bory styles them, Arthrodieæ. These, which comprehend true Confervæ, Oscillatorias, and many Diatomeæ, are thus spoken of by the botanist last mentioned:—The general character of Arthrodieæ consists in filaments, generally simple, and formed of two tubes, of which one, which is exterior and transparent, offers no trace of organisation to the most powerful eye, so that it might be called a tube of glass, and contains an inner articulated filament filled with colouring matter, often almost imperceptible, but

at other times very intense green, purple, or yellowish; these compound filaments present to the astonished eye the strangest and most different phenomena, all of which have the plainest characters of animal life, supposing that animal life is to be inferred from motions indicating a well-marked power of motion. The Arthrodia tribe usually inhabits either fresh or sea-water, and several species are common to both. One of them, but a species referred to the tribe with some uncertainty, the Conferva ericetorum, grows on the ground, but in places that are very damp, and often inundated; others among the Oscillating species cover the humid surface of rocks or earth, and the interstices in the pavement of cities; some even grow in hot springs of a very high temperature. (Ulva thermalis lives in the hot springs of Gastein in a temperature of about 117° Fahrenheit. *Ed. P. J.* 4. 206.) The most remarkable are, 1st. The Fragillarias, to which Diatoma and Achnanthes belong; these, when combined in the little riband-like threads which are natural to them, have no apparent action; but as soon as the separation of the joints takes place, a sort of sliding or starting motion may be seen between them. 2dly. The Oscillarias, some of which have an oscillatory movement, extremely active and perceptible; and the Ulva labyrinthiformis and Anabaina, which, with all the appearance of a plant, has, according to Vauquelin and Chaptal, all the chemical characters of an animal. 3dly. The Conjugatæ, the filaments of which separate at one period, and unite again at another, and finally, by a mode of coupling completely animal, resolve themselves into a single and uniform being: and, 4thly, the Zoocarpeæ, most extraordinary productions, in which the animal and vegetable natures follow each other in the same individual; vegetables in the earlier period of their existence, but producing, in the room of sporules or buds, little microscopic animalcules, which become filamentous vegetables after a certain length of time. Greville, in his *Flora Edinensis*, adopted an opinion of Fleming and others, that many of the species referred to this group possess an animal structure; such as Diatoma flocculosum, tenue, arcuatum, and obliquatum, and Fragillaria striatula and pectinalis; and he believed Conferva stipitata, Biddulphiana and tæniæformis of Eng. Bot., together with the whole genus Echinella, to be equally dubious. But he altered this opinion after two or three years, if we are to judge from his *Cryptogamic Flora*, in which are beautiful figures of some of the very beings the animal nature of which is so much to be suspected. For example, Diatoma tenue, a little Confervoid plant with parallelogramic articulations, at first attached by their longest sides, and afterwards separating at their alternate extremities, so as to form a filiform tube. "The filaments," according to an interesting observation of the Rev. Mr. Berkley, "at a certain period seem to lose the squareness of their figure, to be attenuated at the extremities and dilated in the centre, to become cylindrical and opaque, and in short, metamorphosed into a moniliform filament, with elliptical or oblong purple joints and colourless articulations." (Vol. vi. 354.) Agardh is of opinion that we have among these rudimentary Algæ not only a distinct passage to the animal, but even to the mineral kingdom: for he states that some of his Diatomeæ include vegetable crystals bounded by right lines, collected into a crystalliform body, and with no other difference from minerals than that the individuals have the power of again separating. *System*, xiii. The observations above quoted are those of naturalists of so high a reputation for accuracy, that they may safely be accepted as certain; but I do not know what to say of such as the following, by Meyen, unless that they require to be verified by others, especially because those who have sought for the phenomena he mentions have not succeeded in finding them. This writer states that he has seen, very often, a spontaneous motion in Zygnema nitidum; and its filaments contract from the length of 10 inches to that of 4-6 lines; that the Oscillatorias move in a circle; that the glo-

bules contained in the filaments of Zygnema have a life partly vegetable, partly animal, and procreate similar globules, some of which become animals endowed with motion. See Agardh's *Species Algarum*, 2. 48., from which this account is extracted. Certain supposed Confervæ, called Bacillarias, are rejected from plants by Bory de St. Vincent, and placed in the lowest grade of the animal creation. See *Dict. Class.* 2. 128.

Other Algæ approach nearly to the structure of Lichens, lose entirely their animal properties, and become broad flat expansions, or finely divided vegetables, such as are seen in the ordinary state of Sea-weeds, Fuci, or marine Confervæ. Of the British species of these, and their general nature, an excellent account has been given by Greville in his *Algæ Britannicæ*, from which the greater part of the following remarks are extracted. While the two first groups consist of microscopic objects inhabiting obscure places, shady paths, or half-immersed surfaces of stones and banks, the more complete Algæ comprehend species forming subaqueous forests of considerable extent in the vast ocean, emulating in their own gigantic dimensions the boundless element that enfolds them. Chorda filum, a species common in the North Sea, is frequently found of the length of 30 or 40 feet. In Scalpa Bay, in Orkney, according to Mr. Neill, this species forms meadows, through which a pinnace with difficulty forces its way. Lessonia fuscescens is described by Bory de St. Vincent as 25 or 30 feet in length, with a trunk often as thick as a man's thigh. But all these, and indeed every other vegetable production, is exceeded in size by the prodigious fronds of Macrocystis pyrifera. "This appears to be the sea-weed reported by navigators to be from 500 to 1500 feet in length: the leaves are long and narrow, and at the base of each is placed a vesicle filled with air, without which it would be impossible for the plant to support its enormous length in the water; the stem not being thicker than the finger, and the upper branches as slender as common packthread."

These remarks may be concluded by a reference to the following works, in which further information relating to the animal nature of certain Confervæ may be found: Nees von Esenbeck *Die Algen des Sussen Wassers* (1814); Treviranus in *Ann. des Sc.* 10. 22. (1817); Gruithuisen in *Nov. Act. Acad. Leopold. Curios.* 10. 437.; Carus in *the same*, 11. 491. (1823); Gaillon in *Ann. Sc. Nat.* 1. 309. (1823); and *Ser. Nov.* 1. 44. (1834); Desmazières in *the same*, 10. 42. (1825), and 14. 206. (1828); Unger in *the same*, 13. 431. (1828); Kutzing in *the same, Ser. Nov.* 2. 129. 217. and 361. (1834); Link in *the same*, p. 321., where the authorities to prove that many reputed Zoophytes are Algæ with a calcareous incrustation; all of which should be carefully consulted by those who wish to form any accurate judgment upon this most curious and interesting subject.

Geography. This has been treated upon carefully by Lamouroux in the *Annales des Sciences Naturelles*, vol. 7, and by Greville in the *Algæ Britannicæ*. Algæ are most important in the economy of nature for forming the commencement of soil by their deposit and decomposition. The basin of the ocean is said to be continually rising by the deposit of such plants, particularly of Conferva chthonoplastes, the closely aggregated slimy fibres of which form dense beds. *Ed. P. J.* 2. 392. The same circumstance occurs in lakes and ditches: the bottoms of some of the former, in this country, are no doubt increased by the curious production called Conf. ægagropila. To the peculiar distribution of phænogamous plants into certain botanical regions, a fact familiar to all botanists, there is something analogous in the submersed Flora of the ocean. We find latitude, depth, currents, influencing the forms of Algæ in nearly the same way as latitude, elevation, and station, affect those plants which are more perfect; and as many of the latter are confined to small extent of country, so do several of the Algæ extend but to short distances in the

sea. Thus Odonthalia dentata and Rhodomenia cristata are confined to the northern parts of Great Britain, while many others are peculiar to the southern parts; and, on the contrary, many are cosmopolites of an unbounded range, such as Codium and Ulvaceæ. The latter thrive best in the polar and temperate zones, Dictyoteæ increase as we approach the equator, Fuci particularly flourish between the parallels of 55° and 44°, and, according to Lamouroux, rarely approach the equator nearer than 36°. The articulated or imperfectly formed fresh-water Algæ are nearly confined to the temperate and northern parts of the world, being almost unknown or undescribed from within the tropics. The number of species is scarcely capable of being estimated.

Properties. For what wise purpose the Creator has filled the sea and the rivers with countless myriads of these plants, so that the Flora of the deep waters is as extensive as that of dry land, we can only conjecture; the uses to which they are applied by man are, doubtless, of but secondary consideration; and yet they are of no little importance in the manufactures and domestic economy of the human race. Greville describes them thus (*Algæ Britannicæ* xix.) :—

"Rhodomenia palmata, the dulse of the Scots, dillesk of the Irish, and saccharine Fucus of the Icelanders, is consumed in considerable quantities throughout the maritime countries of the north of Europe, and in the Grecian Archipelago; Iridæa edulis is still occasionally used, both in Scotland and the south-west of England. Porphyra laciniata and vulgaris is stewed, and brought to our tables as a luxury under the name of Laver; and even the Ulva latissima, or green Laver, is not slighted in the absence of the Porphyræ. Entesomorpha compressa, a common species on our shores, is regarded, according to Gaudichaud, as an esculent by the Sandwich Islanders. Laurentia pinnatifida, distinguished for its pungency, and the young stalks and fronds of Laminaria digitata (the former called Pepperdulse, the latter Tangle), were often eaten in Scotland; and even now, though rarely, the old cry, 'Buy dulse and tangle,' may be heard in the streets of Edinburgh. When stripped of the thin part, the beautiful Alaria esculenta forms a part of the simple fare of the poorer classes of Ireland, Scotland, Iceland, Denmark, and the Faroe Islands.

"To go further from home, we find the large Laminaria potatorum of Australia furnishing the aborigines with a proportion of their 'instruments, vessels, and food.' On the authority of Bory de St. Vincent, the Durvillea utilis and other Laminarieæ constitute an equally important resource to the poor on the west coast of South America. In Asia, several species of Gelidium are made use of to render more palatable the hot and biting condiments of the East. Some undetermined species of this genus also furnish the materials of which the edible swallows' nests are composed. It is remarked by Lamouroux, that three species of swallow construct edible nests, two of which build at a distance from the sea-coast, and use the sea-weed only as a cement for other matters. The nests of the third are consequently most esteemed, and sold for nearly their weight in gold. Gracillaria lichenoides is highly valued for food in Ceylon and other parts of the East, and bears a great resemblance to Gracillaria compressa, a species recently discovered on the British shores, and which seems to be little inferior to it; for my friend Mrs. Griffiths tried it as a pickle and preserve, and in both ways found it excellent.

"It is not to mankind alone that marine Algæ have furnished luxuries, or resources in times of scarcity. Several species are greedily sought after by cattle, especially in the north of Europe. Rhodomenia palmata is so great a favourite with sheep and goats, that Bishop Gunner named it Fucus ovinus. In some of the Scottish islands, horses, cattle, and sheep, feed chiefly upon

Fucus vesiculosus during the winter months; and in Gothland it is commonly given to pigs. Fucus serratus also, and Chorda Filum, constitute a part of the fodder upon which the cattle are supported in Norway.

"In medicine we are not altogether unindebted to the Algæ. The Gigartina helminthocorton, or Corsican Moss, as it is frequently called, is a native of the Mediterranean, and held once a considerable reputation as a vermifuge. The most important medical use, however (omitting minor ones), derived from sea-weeds, is through the medium of Iodine, which may be obtained either from the plants themselves, or from kelp. French kelp, according to Sir Humphrey Davy, yields more Iodine than British; and, from some recent experiments made at the Cape of Good Hope by M. Ecklon, Laminaria buccinalis is found to contain more than any European Algæ. Iodine is known to be a powerful remedy in cases of goitre. The burnt spunge formerly administered in similar cases, probably owed its efficacy to the Iodine it contained; and it is also a very curious fact, that the stems of a sea-weed are sold in the shops, and chewed by the inhabitants in South America, wherever goitre is prevalent, for the same purpose. This remedy is termed by them Palo Coto (literally, goitre-stick); and, from the fragments placed in my hands by my friend Dr. Gillies, to whom I am indebted for this information, the plant certainly belongs to the order Laminarieæ, and is probably a species of Laminaria.

"Were the Algæ neither 'really serviceable either in supplying the wants or in administering to the comforts of mankind' in any other respect, their character would be redeemed by their usefulness in the arts; and it is highly probable that we shall find ourselves eventually infinitely more indebted to them. One species (and I regret to say that it is not a British one) is invaluable as a glue and varnish to the Chinese. This is the Gracilaria tenax, the Fucus tenax of Turner's *Historia Fucorum*. Though a small plant, the quantity annually imported at Canton from the provinces of Fokien and Tchekiang is stated by Mr. Turner to be about 27,000lbs. It is sold at Canton for 6*d*. or 8*d*. per pound, and is used for the purposes to which we apply glue and gum-arabic. The Chinese employ it chiefly in the manufacture of lanterns, to strengthen or varnish the paper, and sometimes to thicken or give a gloss to silks or gauze. In addition to the above account, the substance of which I have extracted from Mr. Turner's work, Mr. Neill remarks that it 'seems probable that this is the principal ingredient in the celebrated gummy matter called Chin-chon, or Hai-tsai, in China and Japan. Windows made merely of slips of Bamboo, crossed diagonally, have frequently their lozenge-shaped interstices wholly filled with the transparent gluten of the Hai-tsai.'

"On the southern and western coast of Ireland, our own Chondrus crispus is converted into size, for the use of house-painters, &c.; and, if I be not erroneously informed, is also considered as a culinary article, and enters into the composition of blanc-mange, as well as other dishes. In the manufacture of kelp, however, for the use of the glass-maker and soap-boiler, it is that the Algæ take their place among the most useful vegetables. The species most valued for this purpose are, Fucus vesiculosus, nodosus, and serratus, Laminaria digitata and bulbosa, Himanthalia lorea, and Chorda Filum."

I am extremely obliged to Dr. Greville for the following list of the genera of Algæ, which although it does not indicate the synonyms of the numerous §§, gives a more extensive view of the classification of the genera than any list hitherto published. The few names in brackets have been added by myself.

GENERA.

§ 1. Fucoideæ, Ag.
Sargassum, Ag.
Turbinaria, Lamour.
Carpophyllum, Grev.
Cystoseira, Ag.
Halidrys, Lyngb.
Carpodesmia, Grev.
Seirococcus, Grev.
Scytothalia, Grev.
Coccophora, Grev.
Fucus, L. Ag.
Himanthalia, Lyngb.
Lorea, Lamour.
Moniliformia, Lamour.
Splachnidium, Grev.
Polyphacum, Ag.
Osmondaria, Lamour.
Scaberia, Grev.
§ 2. Lichineæ, Grev.
Lichina, Ag.
§ 3. Laminarieæ, Bory.
Durvillæa, Bory.
Lessonia, Bory.
Macrocystis, Ag.
Laminaria, Lamour.
Agarum, Bory.
Alaria, Grev.
Costaria, Grev.
§ 4. Sporochnoideæ, Grev.
Desmarestia, Lamour.
Desmia, Lyngb.
Dichloria, Grev.
Trinitaria, Bory.
Sporochnus, Ag.
Arthrocladia, Dub.
§ 5. Chordarieæ, Grev.
Chordaria, Lk.
Nemalion, Dub.
§ 6. Dictyoteæ, Lamour.
Chorda, Stackh.
Scytosiphon, Ag.
Asperococcus, Lamour.
Encœbium, Ag.
Stilophora, Ag.
Hydroclathrus, Bory?
Punctaria, Grev.
Striaria, Grev.
Carmichelia, Grev.
Dictyosiphon, Grev.
Dictyota, Lamour.
Zonaria, (ex parte) Ag.
Cutleria, Grev.
Padina, Adans.
Zonaria, (ex parte) Ag.
Haliseris, Tozz. Ag.
Dictyopteris, Lamr.
Neurocarpus, W. et M.
[Gymnogongrus, Martius.]
§ 7. Furcellarieæ, Grev.
Furcellaria, Lamour.
§ 8. Spongiocarpeæ, Grev.
Polyides, Ag.
Spongiocarpus, Grev.
§ 9. Florideæ, Lamr.
Claudea, Lamour.
Oneillia, Ag.
Delesseria, Lamour.
Wormskioldia, Spr.
Nitophyllum, Grev.
Dawsonia, Bory.
Hymenena, Grev.
Rhodomenia, Grev.
Botryocarpa, Grev.
Thanophora, Ag.
Plocamium, Lamour.
Microcladia, Grev.
Odonthalia, Lyngb.
Dictyomenia, Grev.
Volubilaria, Lamour.
Amansia, Lamour.
Rytiphlæa, Ag.
Rhodomela, Ag.
Alsidium, Ag.
Bonnemaisonia, Ag.
Delisea, Lamour.
Laurencia, Lamour.
Chondria, (ex parte) Ag.
Chylocladia, Grev.
Chondria, (ex parte) Ag.
Corallopsis, Grev.
Acanthophora, Lam.
Chondrus, Stackh.
Phyllophora, Grev.
Sphærococcus, Ag.
Coronopifolia, Stack.
Calocladia, Grev.
Bowiesia, Grev.
Gelidium, Lamour.
Gigartina, Lamour.
Gracilaria, Grev.
Grateloupia, Ag.
Hypnea, Lamour.
Chætospora, Ag.
Ptilota, Ag.
Champia, Lamour.
Mertensia, Roth.
Digenia, Ag.
Liagora, Lam. (Zooph?)
§ 10. Thaumasieæ, Grev.
Thaumasia, Ag. (Zooph?)
§ 11. Gastrocarpeæ, Grev.
Iridea, Bory.
Halymenia, Ag.
Dumontia, Lamour.
Catenella, Grev.
§ 12. Caulerpeæ, Grev.
Caulerpa, Lamour.
Chauvinia, Bory.
§ 13. Ulvaceæ, Lamr.
Anadyomene, Lamour.
Porphyra, Ag.
Ulva, L.
Phylloma, Lk.
Tetraspora, Lk.
Tetrasporella, Gaill.
Phycomyces, Kunze.
Enteromorpha, Lk.
Solenia, Ag.
[*Hydrosolen*, Mart.]
Ilea, Fries.
Fistularia, Grev.
Bangia, Lyngb.
Bangiella, Gaill.
Sphæroplethia, Dub.
Valonia, Ag.
Alysium, Ag.
§ 14. Siphoneæ, Grev.
Codium, Stackh.
Flabellaria, Lamour.
Spongodium, Lamr.
Agardhia, Cabr.
Lamarckia, Oliv.
Bryopsis, Lamour.
[Merizomyria, Poll.]
Vaucheria, DC.
Vaucheriella, Gaill.
Ectosperma, Vauch.
Botrydium, Wallr.
Hydrogastrum, Desv.
Rhizococcum, Desm.
Desmazierella, Gaill.
§ 15. Lemanieæ, Ag.
Lemania, Bory.
Lemanella, Gaill.
Nodularia, Lyngb.
Chantransia, (ex parte) DC.
Polysperma, (ex parte) Vauch.
§ 16. Ectocarpeæ, Ag.
Cladostephus, Ag.
Dasytrichia, Lamr.
Dasycladus, Ag.
Sphacellaria, Lyngb.
Delisella, Bory.
Elachistea, Dub.
Ectocarpus, Lyngb.
Lyngbya, Gaill.
Carpsicarpella, Bory.
Audouinella, Bory.
Botrytella, Bory.
Pylaylla, Bory.
Myriotrichia, Harv.
§ 17. Ceramieæ, Ag.
Polysiphonia, Grev.
Hutchinsia, Ag.
Grateloupella, Bory.
Brongniartella, Bory.
Dicarpella, Bory.
Grammita, Bonnem.
[Carradoria, Mart.]
Dasya, Ag.
Gaillona, Bonnem.
Rhodonema, Martens.
Asperocaulon, Grev.
Thorea, Bory.
Thorella, Gaill.
Ceramium, Roth.
Boryna, Gratel.
Spyridia, Harv.
Griffithsia, Ag.
Wrangelia, Ag.
Calidictyon, Grev. (95)
Calithamnion, Lyngb.
§ 18. Conferveæ, Ag.
Bulbochæte, Ag.
Bulbochætella, Gaill.
Conferva, L. Ag.
Ingenhouzella, Gaill.
Agardhinella, Gaill.
Rothella, Gaill.
Dictyonema, Ag.
Hydrodictyon, Roth.
Hydrodictyonella, Gaill.
Mougeotia, Ag.
Mougeotella, Gaill.
Tyndaridea, Bory.
Zygnema, Ag.
Salmacisella, Gaill.
Salmacis, Bory.
Conjugata, Vauch.
Nodularia, Mert.
Sphæroplea, Ag.
Cadmus, Bory.
Tiresias, Bory.
Saprolegnia, Nees?
§ 19. Oscillatorieæ, Harv.
Stigonema, Ag.
Scytonema, Ag.
Calothrix, Ag.
Desmarestella, Bory.
Dillwynella, Bory.
Lyngbya, Ag.
Rosaria, Carm.
Oscillatoria, Vauch.
Oscillatoriella, Gaill.
Anabainella, Gaill.
Anabaina, Bory.
Microcoleus, Desm.
Vaginaria, Bory.
Oscillaria, Bosc.
Petalonema, Berkel.
Belonia, Carm.

§ 20. Byssoideæ, Ag.
Byssocladium, Ag.
Byssocladiella, Gaill.
Alysphæria, Turp.
Mycinema, Ag.
Amphiconium, Nees.
Chroolepus, Ag.
Trentepohlia, Ag.
Protonema, Ag.
Hygrocrocis, Ag.
Chamænema, Kutz.?
Leptomitus, Ag.
Pythium, Nees.
Achlya, Nees.
Pusillina, Bory.
§ 21. Batrachospermeæ, Ag.
Mesogloia, Ag.
Helminthora, Fries.
Ægira, Fries.
Batrachospermum, Roth.
Charospermum, Lk.
Draparnaldia, Bory.
Draparnaldiella, Gaill.
Myxonema, Fries.
Chætophora, Ag.
Chætophorella, Gaill.
Corynephora, Ag.
Myrionema, Grev.
§ 22. Rivularieæ, Harv.
Rivularia, Roth.
Linkia, Michel.
Linkiella, Gaill.
[Anhaltia, Schwabe.]
§ 23. Nostochineæ, Ag.
Cryptococcus, Kutz.
Micraloa, Biasol.
[*Sphærothrombium*, Kutz.]
Protococcus, Ag.
Hæmatococcus, Ag.
Microcystis, Kutz.
Palmella, Lyngb.
Coccochloris, Spr.
Stereococcus, Kutz.
Hydrococcus, Kutz.
Echinella, Ach.
Nematococcus, Kutz.
Nostoc, Vauch.
Nostochium, Lk.
Nostocella, Gaill.
Hydrocoryne, Schwab.
Appendix.
Scythymenia, Ag.
Inoderma, Kutz.
§ 24. Desmidieæ, Grev.
Meloseira, Ag.
Gaillonella, Bory.
Leda, Bory?
Lysigonium, Lk.
Desmidium, Ag.
§ 25. Fragillarieæ, Ag.
Fragillaria, Lyngb.
Nematoplata, Bory.
Achnanthes, Bory.
Achnantella, Gaill.
Diatoma, Ag.
Candollella, (ex parte) Gaill.
Frustulia, Ag.
§ 26. Styllarieæ, Ag.
Styllaria, Ag.
Licmophora, Ag.
Meridion, Ag.
Lunulina, (ex parte) Bory.
§ 27. Cymbelleæ, Ag.
Gomphonema, Ag.
Hydrurus, Ag.
Cluzella, Bory.
Gloiodictyon, Ag.
Homæocladia, Ag.
Berkeleya, Grev.
Micromega, Ag.
Schizonema, Ag.
Monema, Grev.
Spermogonia, Bonn.
Girodella, Gaill.
Cymbella, Ag.
Navicula, Bory?
Bacillaria, (ex parte) Nitsch.

In the 14th vol. of *Nov. Act. Acad. Cæs. Leop. Cur.* are four new genera of minute Algæ, proposed by Dr. F. I. F. Meyen:—Pediastrum, Scenedesmus, Sphærastrum and Staurastrum. They are so obscure that I cannot decide upon their affinities, and the author himself declines to assign them a place in the system. *R. K. Grev.*

In order to complete the foregoing list of genera as far as is in my power, I have added the following names, which I do not find in Dr. Greville's letter.

Sphærotilus, Kutz.
Ulothrix, Kutz.
Exilaria, Grev.
Aristella, Kutz.
Isthmia, Ag.
Encyonema, Kutz.
Trochiscia, Kutz.
Closterium, Nitzsch.
Heterocarpella, Turp.
Micrasterias, Ag.
Biddulphia, Gray.
Geminella, Turp.
Glcionema, Ag.

GENERA

IMPERFECTLY KNOWN AND NOT YET REFERRED TO ANY NATURAL ORDER.

Deinbollia, Thonn.
Daphniphyllum, Bl.
Strombosia, Bl.
Bischoffia, Bl.
Adenilema, Bl.
Leucoxylum, Bl.
Hagenia, Lam.
Lithophila, Swz.
Sacellium, H. B. K.
Sellowia, Rth.
Winterlia, Spr.
Symmetria. Bl.
Phyla, Lour.
Stixis, Lour.
Baitaria, R. et P.
Brossæa, Plum.
Cerium, Lour.
Cyrta, Lour.
Dasus, Lour.
Ehrenbergia, Spr.
Hydropyxis, Raf.
Matthissonia, Raddi.
Apactis, Thunb.
Augea, Thunb.
Lindera, Thunb.
Blepharistemma, Benth.
Diplanthera, Thouars.
Isopteris, Wall.
Peronia, Wall.
Platystigma, R. Br.
Tusaccia, W.
Adenia, Forsk.
Byrsocarpus, Thonn.
Visnea, L.
Mocanera, J.
Kugia, Bert.
Dupratzia, Raf.
Bulowia, Thonn.
Poraqueiba, Aubl.
Barreria, Scop.
Ropourea, Aubl.
Camax, Schreb.
Rochefortia, Swz.
Ananthopus, Raf.
Floscopa, Lour.
Wolfia, Horkel.
Horkelia, Rchb.
Acharia, Thunb.
Argophyllum, Forst.
Calispermum, Lour.
Dichroa, Lour.
Euclea, L.
Callibrachoa, Lexarz.
Trujanoa, Lexarz.
Casimiroa, Lexarz.
Jalambicea, Lexarz.
Lennoa, Lexarz.
Didymomeles, Thouars.
Lasianthera, Beauv.
Macarisia, Thouars.
Nageia, Gærtn.
Octas, Jack.
Cœlopyrum, Jack.
Noltia, Thonn.
Schousbœa, Thonn.

CHARACTERS OF THE NEW GENERA

INTRODUCED IN THE PRECEDING WORK;

WITH

OCCASIONAL NOTES UPON SOME OF THE OLD GENERA.

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1. Macrocapnos. *Royle MSS.*

Distinguished from Dactylicapnos by its dry fruit, in Royle's Illustrations. The name has been since communicated to me by the author.

2. Hyalostemma. *Wall. in Herb. no.* 6434.

Involucrum 6-phyllum, uniflorum; foliolis duplici serie insertis lineari-lanceolatis. Flores dioeci. Calyx 3-lobus, æstivatione valvata. Cor. 0. [♂ Stamina indefinita, in torum glomerata. ♀ Carpella plurima; ovulo solitario erecto; stylus brevis; stigma recurvum, magnum, obtusum. Baccæ pisiformes pedicellatæ. Albumen ruminatum; *ex Roxb.*] —Uvaria dioica, *Roxb.*

3. Actinidia.

Sepala 5, bracteâ parvâ proxime suffulta. Petala totidem. Stamina indefinita, antheris innatis extrorsis. Carpella 22 in ovarium solidum loculis totidem connata, stigmatibus liberis clavatis radiantibus; placenta magna centralis fibroso-cellularis; loculi tot quot stigmata, ovulis serie duplici insertis.—Sp. 1. Actinidia callosa (Dilleniacearum ordinis? callosa Wallich cat. no. 6634.)

4. Gravenhorstia. *N. ab E.*

Calyx ovario semiadhærens. Petala basi in tubum cohærentia et corollam infundibuliformem exhibentia. Antheræ in fauce tubi subsessiles; locellis basi divergentibus. Stylus simplex. Fructus dicoccus.—Differt a *Berardia* imprimis antheris subsessilibus, et stylo singulo cum fructu basi dehiscente apice semper continuo.—Gr. fastigiata; C. B. Sp. Ecklon. *N. ab Esenbeck in litteris.*

5. Gomphandra. *Wall. in Herb. no.* 3718, 7204?

Calyx 4-dentatus. Petala 4, inappendiculata, apice inflexa et pilis clavatis obsita. Stamina 4, clavata, carnosa; anthera loculis parallelis, contiguis, in apice filamenti immersis, dorso et sub loculis pilis inæqualibus clavatis cristata. Ovarium (verosimiliter abortivum).

6. Lhotskya. *C. Schauer.*

Calycis tubus oblongus, 5-costatus, omnino adhærens; *limbus* patulus 5-lobus, lobis brevibus scariosis obtusis. *Petala* 5, calycis limbum longe excedentia, deciduа, æstivatione imbricata. *Stamina* inæqualia, corolla breviora, numero indefinita (plura quam 10) omnia fertilia!; *filamenta* capillaria; *antheræ* subglobosæ, dorso medio insertæ. *Stylus* filiformis, imberbis, stamina superans; *stigma* punctiforme. Fructus maturus; *Pericarpium* capsulare tubo calycis arcte adnatum idemque 5-costatum. Semen 1 oblongum, erectum, pericarpii totam fere cavitatem implens ejusque costis intrans, hinc pariter 5-costatum; *epispermium* tenuissime-membranaceum; *perispermium* nullum; *embryo* orthotropus semini conformis; *cotyledones* minimæ vix discernendæ; *radicula* crassa, recta.—Frutex australasicus habitu *Genetyllidi* accedens. Folia conferta acerosa tetragona glabra. Flores rite axillares solitarii sessiles, bracteolis binis inæqualibus persistentibus paleaceis carinatis inferne altero latere connatis in brevem pedicellum abeuntibus basi stipati.

1. *L. ericoides C. Schauer.* Hab. frequens in collibus circa sinum Regis Georgii III. in Novæ Hollandiæ ora australi-occidentali, ubi florentem legit Decembri M. 1821. *All. Cunningham*, qui sicca specimina benigne mecum communicavit. (Dixi in honorem cl.

Lhotsky Med. Dr. Vindobonensis, botanici in Nova-Hollandia peregrinatoris.) *Schauer MSS.*

7. Homoranthus. *A. Cunningh.*

Flores in apicibus ramulorum axillares, breviter pedicellati, complures plerumque fasciculati. *Alabastra* bracteis binis suboppositis membranaceis naviculari-cucullatis inclusa, quarum altera alteram ita omni margine amplectitur ut calyptram efficiunt ambæ alabastrum plane abscondentem; ut vero flos magis evolvitur calyptram, in apice pedicelli ad basin calycis insertam, tollit et abjecta ea nudus dein apparet. *Calycis tubus* ovatus, turgidus, 5-costatus, a medio deorsum ovario arcte adhærens, sursum liber membranaceus; *limbi* lobi 5 e basi latiore in cuspidem capillarem petala excedentem abeuntes. *Petala* 5, membranacea, suborbicularia, calycis limbo basi accreta, subpatentia. *Stamina* 20 ita disposita, ut singula sepalis, terna petalis superposita sint, sed harum laterales plerumque steriles sunt; *filamenta* brevissima complanata, sterilia fertilibus conformia; *antheræ* globoso-pyriformes, basi insertæ, biloculares, loculis tumidis. *Stylus* exsertus, subulatus, apice barbatus. Fructus maturus: *Pericarpium* capsulare calyce accreto inclusum itemque 5-costatum, stylo coronatum. *Semen* subglobosum, $\frac{2}{3}$ cavitatis pericarpii implens sulcis ejus impressum, ergo 5-costatum; *epispermium* tenuissimum; *perispermium* nullum; *embryo* semini conformis orthotropus, massam homogeneam referens.—Frutices Australasici glabri, foliis acerosis. Genus ad *Darwiniam* accedens calycis tubo, stigmate barbato et staminibus; sepalis capillaribus *Calytricha* spectat, sed ab utroque longe differt. Bracteolarum denique fabrica ad *Pileanthum* transitum facit, in quo genere bracteolæ illæ omnino concretæ veram constituunt calyptram. (Ab ὅμορος: affinis, conterminus, et ἄνθος: flos, quia floris fabrica characteres generum quorundam conjungit. *Enosanthes* Cunningh. MSS.) *Schauer MSS.*

8. Actinodium. *C. Schauer.*

Flores capitato-aggregati basi bractea stipati; bracteæ extimæ seriei capituluin cingentes latiores; pedicelli ex harum axillis prodeuntes steriles, elongati, bracteolis 3-compluribus auctis terminati et sic radio quasi capitulum circumdantes. *Flores fertiles* discoidei, minimi, breviter pedicellati, intra bracteolas 2 distinctas in apice pedicelli subsecundas sessiles, tetrameri. *Calycis tubus* alato tetragonus, ultra $\frac{2}{3}$ deorsum ovario adnatus, superne sub sepalis constrictus; *limbi* laciniæ 4 lineares angustissimæ. *Petala* totidem, ovata sepalaque conniventia membranacea persistentia. *Stamina* 8, per paria approximata, nulla sterilia; *filamenta* corolla breviora, subulata; antheræ globosæ, basi insertæ. *Stylus* exsertus, capillaris, glaber; *stigma* punctiforme. Fructus . . .

Genus *Genetyllidi* quodammodo affine, sed perinsigne. Frutex Australasicus, pumilus, gracilis, *Diosmæ virgatæ* haud absimilis, foliis imbricatis lanceolatis mucronato-acutis punctatis.

1. *A. Cunninghami C. Schauer.* Hab. in ora Australi Novæ Hollandiæ: R. Br. 1802. *W. Baxter*, 1829. (v. s. sp. in herb. cl. Allan Cunningham.) (Ab ἀκτινώδης: radiosus, a capitulis radiosis.) *Schauer MSS.*

9. Touroulia.

This genus appears allied to Lecythidaceæ, from which it is principally distinguished, according to the account of Aublet, by its regular flowers and opposite stipulate leaves.

10. Eriudaphus. *N. ab E.*

Calycis tubus brevis, ovario non adhærens; limbus decemfidus; lobis alternis angustioribus; latioribus basi glanduloso-incrassatis. Fundus calycis lana densa pulvinata vestitus. Stamina numerosa (40 pluribus ordinibus), quorum exteriora plurima laciniis angustioribus, interiora bina v. terna latioribus opposita. Stylus crassus, stigmatibus binis truncatis lunatim excavatis. Ovarium uniloculare; ovula 4, per paria costis 2 parietalibus adhærentia, infera.—Eriudaphus (ab ἔριον lana et ἔδαφος sedes, fundus) Ecklonii C. B. Sp. Arbor. *N. ab Esenbeck in litteris.*

11. Eupetalum.

This is *Begonia petaloides, Bot. Reg. t.* 1757.

12. Ceratiosicyos, *N. ab E.*

Flores diclini. Perianthium campanulatum, 5-fidum, persistens. ♂ Perianthium latius, ad basin calyce (aut involucro) setaceo 4-5-phyllo patulo præditum. Stamina 3, libera; antheris erectis linearibus apice retusis ex utroque latere rima dehiscentibus. Coronula centralis staminibusve interjecta e processibus 6-8 brevibus subulatis subcarnosis acutis coloratis (stigmatibus abortivis). ♀ Perianthium angustius, basi nudum. Ovarium longe

stipitatum; stigmata 4 bifida. Coronula e processibus 3-4 subulatis brevibus luteis, fundo perianthii in ambitu podogynii insertis (staminibus imperfectis). Capsula siliquiformis, longe stipitata, tetragona, quadrivalvis; valvis basi apiceque cohærentibus. Semina valvarum medio inserta, subcylindrica, truncata, arillo integro testæ inflatæ adhærente. Flores racemosi, racemis geminis fæmineo flore solitario longe pedunculato interjecto.—*C. Ecklonii*, C. B. Sp. Herba annua.(?) *N. ab Esenbeck in litteris.*

13. Anisotes.

Lythrum anomalum. *Aug. de St. H. in Ann. des Sc. 2. ser.* 1. 6.

14. Phaleria. *Jack.*

In many respects this seems to agree with Rhamnaceæ; but the stamens are 8, petals 0, and albumen 0.

15. Olinia. *Thunberg.*

Referred here upon Mr. Arnott's authority.

16. Plottzia. *Arnott.*

Calyx fere ad basin 5-fidus; tubus brevis cupulatus intus membrana tenui albida tectus; segmentis conniventibus linearibus 3-nerviis dorso sub apice cucullato in cornu spinescens desinente. Petala nulla. Stamina 5; filamenta subulata summo calycis tubo inserta. Stylus filiformis unicus et stigma simplex. Capsula evalvis 1-sperma ovata calyce indurato tecta glabra. Caules simplices e basi decumbente suffruticosa erecti, ex eadem radice lignosa plures, alii annotini floriferi, alii hornotini dimidio breviores, floribus carentes. Folia opposita subulata rigidiuscula mucronata utrinque bistriata erecta, internodiis longiora. Stipulæ membranaceæ lanceolatæ plus minusve fissæ vel aceræ foliis dimidio breviores. Cymæ terminales dichotomæ. Calyces flavidi.—Paronychia dichotoma. *Nuttall.—Arnott in litt.*

17. Schizonotus. *Lindl. in Wall. Cat.*—Spiræa sorbifolia, &c.

18. Lupinus, L.

Referred hither upon the authority of Mr. *Agardh, Jun.*

19. Synædrys.

Arbor, folia, flores, et cupula, plane ignota; in foro Cantonensi vulgo venditatur fructus, qui *glans* est depressa, maxima pro parte cupula immersa, ossea, apice depresso medio subtomentoso; intus semiquinquelocularis. *Semen* abortu solitarium cotyledonibus in tot lobos divisis quot loculi, more Juglandis.—*Sp.* 1. *Synædrys ossea.*

20. Scepa.

♂ Stam. 2. ♀ Sepala 4-6 serie duplici. Stigmata 4, fimbriata. Ovula apice villis immersa. Tot laminæ arillaceæ quot ovula.—Sp. 1. *S. villosa*=Lepidostachys villosa, *Wall. Cat.* 7298.—Sp. 2. *S. stipulacea*; sepalis fæmineis interioribus trilobis, foliis petiolatis oblongo-lanceolatis acuminatis glabris, stipulis oblongis acutis membranaceis petioli longitudine. In regno Burmano, *Griffith.*

21. Lepidostachys. *Wall. Cat. No.* 6816.

♂ Stamina 5. ♀ Sepala 4-6 serie duplici. Stigmata 2, emarginata, integerrima. Ovula apice nuda. Lamina arillacea una ovulorum pari cuique.—Sp. 1. L. Roxburghii, Wall. l. c.=Alnus dioica, *Roxb. Fl. Ind.* 3. 580=Commia? arillata, *Hamilt. MSS.*

22. Hymenocardia. *Wall. Cat. No.* 3549.

Florus dioici? monoici? ♂ *Amenta* sessilia. *Calyx* 2-sepalus. *Stamina* 5, monadelpha, antheris oblongis basi acutis. ♀ *Flores* fasciculati, gemmacei, Coryli modo. *Calyx* 5-partitus. *Ovarium* superum biloculare, *stigmatibus* 2 setaceis sessilibus. *Ovula* gemina, collateralia, appensa, basi attenuata et dilatata post fæcundationem. *Fructus* juvenis membranaceus, compressus, 2-locularis, bialatus—*Folia* oblonga, integerrima; juniora villosa, adulta glabriuscula.—Sp. 1. Hymenocardia punctata. *Wall. l. c.* I have not seen the ripe fruit of this, and am therefore doubtful as to its true station. No satisfactory trace of aril is visible in the young ovules, nor does the fruit look as if it

were dehiscent; hence my uncertainty as to whether it belongs to Scepaceæ; and yet there is no better station; for it differs from Betulaceæ in its female flowers not being amentaceous, and in its 2-leaved calyx; its compound pistil separates it from Urticaceæ and its amentaceous unisexual flowers with monadelphous stamens from Ulmaceæ.

23. Mourera.

For this, the original name of Aublet, both Bongard and Chamisso have preferred the spurious one, Lacis, of Schreber; I trust however, that in this, as in other cases, botanists will not hesitate to repudiate a term which has no pretensions for preservation, and will do justice to the memory of Aublet. The excellent descriptions of Bongard and Chamisso have thrown much light upon the true structure of the genus; but I cannot concur with the former author in referring to one genus all the species assembled under the name of Lacis.—In the first place there is the original Mourera, with a rudimentary calyx and separate stamens surrounding the ovary on all sides; to this genus, of which *Marathrum* appears to be a species, and to which are to be referred Lacis aspera, membranacea, &c. the name Mourera may be preserved.—Secondly, there is Lacis monadelpha Bong. which has no rudimentary calyx, and monadelphous stamens surrounding the ovary on all sides; for the sake of avoiding a new name that of Lacis may be continued to this type.—Thirdly, there are various species with the rudiments of a calyx and (generally two) unilateral stamens; these constitute the genus Podostemon, which I see no advantage in suppressing.

24. Aquilaria.

Perianthium turbinatum, coriaceum, tubo intus squamis descendentibus hirsutis tecto. Stamina fertilia 10; filamenta breviuscula. Ovarium sessile, obovatum, obtusum. Stigma sessile, convexum. Capsula sessilis, lignosa.—Ophispermum *Lour.* forte huc pertinet, teste Brown, at stylus dicitur elongatus et bifidus, verosimiliter per incuriam: hujus etiam perianthium dicitur 6-partitum, at cæteræ descriptionis partes hanc errorem typographicam esse probant. *Arnott in litt.*

25. Gyrinops.

Perianthium longe tubulosum, tenue coloratum; tubo intus glabro. Antheræ 5, perianthii lobis oppositæ, sessiles. Ovarium longe stipitatum oblongum, apice in stylum conico-filiformem attenuatum. Stigma compresso-globosum. Capsula longe stipitata, coriacea. —Tota planta colore aurantiaco suffusa. Cortex valde tenax, omnino ut in Thymeleis. Folia elliptico-oblonga, subito et obtuse acuminata. Perianthium (in sicco) aurantiacum novem lineas longum, vix semilineam latum. *Arnott in litt.*

26, Evonymodaphne. *N. ab Esenbeck.*

Hermaphrodita. Stamina perfecta 3 tertii ordinis, in columnam angulatam contigua; 6 exteriora laminiformia, alterna sessilia unguiculataque. Antheræ apice poro gemino horizontali dehiscentes, valvula introrsum adscendente erecta. Fructus ignotus.—Laurus armeniaca *Pöppig.*. Ad Tochache in Peruvia. *N. ab Esenbeck in litt. Dec.* 1835.

27. Pleurothyrium. *N. ab E.*

Hermaphroditum. Perianthium 6-fidum tubo obconico-trigono, laciniis patentibus oblongis subæqualibus crassiusculis deciduis. Glandulæ 6, triangulares; introrsum carinatæ cum laciniis perianthii alternantes, persistentes. Stamina 9, subconformia; antheræ subcubicæ, quadrilocellatæ locellis omnium lateralibus, parallelis, ovatis; altero, retro altero introrsum spectante; filamentis brevibus. Staminodia parva dentiformia, basi a tergo biglandulosa. Bacca (juvenilis) tubo perianthii suburceolato repando immersa. Inflorescentia: thyrsi axillares. Folia costata. *Pleuroth. Chrysophyllum et bifidum.* (Ocotea) Pöpp. Peruvia.

28. Blepharolepis. *N. ab E.*

Hermaphrodita. Calycis loco bracteolæ 2. Petala 4, membranacea, tenuissima, apice ciliato-lacera. Stamina 4, libera, petalis alterna. Antheræ bilocellatæ. Stylus bipartitus. Utriculus monospermus, compressus, non dehiscens.—Flores axillares conferti ramos undique tegentes et amentum longum fingentes. Folia parva. Tota planta amentum ramosum exhibit. ♄ parvus. Bl. *Zeyheriana* C. B. Sp. An inter Illecebreas? *N. ab Esenbeck in litteris.*

29. Centropodium.

Nomen compositum a κεντέω pungo et ποῦς, ποδος pes; quia fructus tribuliformes obambulantium pedes pungunt. Genus est monoicum, ex ordine Polygonearum.—Rumex spinosus. *Thunb. Burchell's Travels*, 1. 340.

30. Oxygonum alatum.

Planta annua monoica. Folia lanceolata, incisa, et integra. Flores spicati pedunculati; plures in spicæ articulis. Flores masculi incarnati quadrifidi, laciniis patentibus obovatis petaloideis. Filamenta elongata octo. Antheræ ovatæ. Fructus oblongus, angulis 3 membranaceo-alatis. *Burchell's Travels*, 1. 548.

31. Pilitis.

Calyx foliaceus, pungens. Corolla calyptræformis, transversim dehiscens, basi truncata persistente. Stamina hypogyna, persistentia. Squamæ hypogynæ bilobæ.—Frutex ramis annulatim cicatrizatis. Folia glaberrima basi cucullata acerosa. Capitula florum terminalia ovata, bracteis ovatis imbricatis pungentibus.—Sp. 1. Pilitis acerosa. In Insula Van Diemen. *Gunn* (No. 307.)

32. Desfontainia. *R.* et *P.*

This is more nearly related to these than to any other plants with which I am acquainted. It obviously differs in the great developement of its corolla and its indefinite seeds—as it also may in the structure of the latter, but these are at present unknown. It has surely no kind of relation to Gentianaceæ, to which Don has referred it.

33. Cantua quercifolia. *Juss.*

This is a different genus from the remainder of the species.

34. Cyananthus. *Wall.*

Placed here at the suggestion of Mr. Bentham.

35. Diapensia. *L.*

Sepala foliacea, duobus interioribus duplo minoribus. Antheræ valvulis muticis. Semina indefinita.

36. Pyxidanthera. *Michx.*

Sepala membranacea subæqualia. Antheræ valvulis inferioribus aristatis. Semina cuique loculo 7.

37. Pogonetes.

Est Scævola spinescens. *R. Br.*

38. Scalesia. *Arnott.* (Heliantheæ Heliopsideæ).

Capitulum homogamum. Antheræ nigricantes, exsertæ, ecaudatæ, alis cordato-oblongis. Stylus Tagetis. Achenium compressum, obcordatum, omnino calvum, conforme, glabrum, disco epigyno inconspicuo.—Frutex. Involucrum biseriale. Capitula basi intrusa axillaria, brevi-pedunculata. Folia lineari-lanceolata, utrinque attenuata, alterna, supra scabriuscula, subtus pubescentia, integerrima. Sp. 1. Sc. atractyloides in insulis Gallipagos. *Arnott. in litt.*

39. Eriopappus. *Arnott,*

Styli disci rami elongati pubescentes cono brevi terminati; Pappus radii deest; disci e paleis 9-12, uniserialibus lineari-longeacuminatis obsolete uninerviis serrulatis basi extus longepilosis intusque villoso-lanatis. Near to Allocarpus.—Blepharipappus glandulosus *Hooker. Arnott in litt.*

40. Uncaria.

Genus est Martyniæ affine; a quo capsulæ forma, (vide iconem magnitudine naturali, in pag. 529.) satis differt.

Uncaria procumbens, B. Catal. Geogr. 1970. Caules plures prostrati parum ramosi. Calycis foliola 5 linearia acuta. Corolla infundibuliformis, tubo basi angustato, limbi laciniis rotundatis æqualibus. Stamina 4 didynama, pistillumque corolla duplo breviora. Capsula bilocularis lignosa, angulis lobato-alatis, lobis uncinatis. Semina numerosa oblonga angulata rugosa. Tota planta, sub lente visa, punctulis numerosis albis conspersa est. *Burchell's Travels*, 1. 536.

41. Rhigozum.

Frutex 6-pedalis. Ramuli alterni horizontales. Folia obovata. The name of Rhigozum is

compounded of ῥιγόω and ὄζος; from the rigid branches which the species are found to have. It is a true Bignoniaceous genus, and distinguished in its order by five fertile stamens, sometimes varying to seven. In all the species, *simple*, *trifoliate* and *fasciculate* leaves are found on the same plant. The flowers are yellow and handsome. *Burchell's Travels*, 1. 389.

42. Thunbergia.

Species Ind. or. corolla infundibuli-aut hypocrateriformi et antheris ciliatis basique calcaratis genus diversum efficere puto. *N. ab. E. in litt. Dec.* 2, 1835.

43. Gymnacanthus. *N. ab. E.*

Calyx grandis, coriaceus, ultra medium quinquefidus, imbricatione contorta. Corolla infundibuliformis, limbo æquali quinquefido. Stamina quatuor, circa basin tubi inserta, didynama. Antheræ bilocellatæ, sagittatæ, locellis æqualibus. Stigma compresso-bilamellatum, spirale. Ovarium basi annulo cinctum, biloculare loculis tetraspermis. Ovula depresso-subrotunda, retinaculis, (uti videbatur) carentia. Inflorescentia: flores absque bracteis bracteolisque, brevi-pedicellati e foliorum in caulis ramorumque apice approximatorum axillis oppositi, solitarii, pedicellis petiolisque basi connatis.—G. petiolaris Regn. Mexic. Hænke. *N. ab E. in litt.*

44. Chætacanthus. *N. ab E.*

Capsula oblonga, depresso-tetragona, rigidula, in medio tetrasperma. Calyx profunde quinquefidus, laciniis longis setaceis rigidis. Corolla infundibuliformis, tubo hinc gibboso, limbo æquali. Antheræ cordatæ, locellis sub-parallelis basi muticis. Flores axillares sessiles, basi bracteolis duabus subulatis. Genus proximum Dyschoristæ N. ab E. in *Wall.* Pl. As. rar. III. p. 75. n. 11., diversum capsula in medio nec basi seminifera, calycis laciniis longissimis setaceis demum magis rigescentibus et pallentibus staminibus duobus, reliqua ut taceam.—Ch. (Ruellia setigera) Per. C. b. Sp. *N. ab E. in litt.*

45. Aphragmia. *N. ab E. in Rel. Hænk.*

Calyx ad basin usque quinquepartitus, laciniis inæqualibus, duabus angustioribus. Corolla infundibuliformis, quinquefida, limbo æquali obtuso. Stamina quatuor didynama. Antheræ angustæ, bilocellatæ, locellis æqualibus parallelis. Stigma bifidum. Capsula basi attenuata compressa valvis contiguis asperma, sursum subunilocularis, di-tetrasperma. Semina retinaculis subulatis suffulta. Inflorescentia: Pedunculi axillares dichotomi, floribus in dichotomia sessilibus. Bracteæ divisionum foliaceæ, foliis dissimiles; bracteolæ nullæ.—A. Haenkei, in Mexico. Hænke. *N. ab E. in litt.*

46. Stenandrium. *N. ab E.*

Character Strobilanthæ.—Corolla infundibuliformis; tubus cylindricus; limbus subæqualis, brevis, laciniis oblongis obtusis. Stamina fauces æquantia, brevia. Antheræ lineares, unilocellatæ, dorso et apice hirtæ. Stigma simplex. Capsula oblonga ad basin bilocularis septo completo adnato, paulo infra medium tetrasperma. Semina echinata, retinaculis suffulta. Inflorescentia Strobilanthæ.—St. mandioccanum. Beyrich. *N. ab E. in litt.*

47. Corythacanthus. *N. ab E.*

Calyx bilabiatus, labiis integris æqualibus. Corolla ringens; labio inf. amplo trilobo. Stamina duo, antheris bilocellatis locellis parallelis basi sagittatis subæqualibus. Capsula ad basin tetrasperma. Semina compressa, retinaculis latis subtensa. Infl. pedunculi axillares, furcatim pauciflori, bracteis divisionum exiguis, bracteolis nullis.—Cor. speciosus. Serra de Estrella, in umbrosis sylvarum. Beyrich. *N. ab E. in litt.*

48. Blepharacanthus. *N. ab E.*

Staminum minorum locellus in connectivo recto elongato styliformi lateralis, stipitatus, connectivi longitudine. Spicæ terminales aut, propter ramulos brevissimos, ad speciem axillares, bracteis imbricatis spinosis tectæ, a basi florentes. Bracteolæ oppositæ, lineares. Perianthii laciniæ superior et inferior, oblongo-lineares, truncatæ, laterales duplo breviores. Corollæ labium quinquelobum.—Bl. (Acanthus Capensis Thbg. et procumbens Thbg.) *N. ab E. in litt.*

49. Rhytiglossa. *N. ab E.*

Stamina duo. Antherarum locelli oblique unus super altero positi, discreti, mutici. Labium inferius fornicatum, breviter trifidum, rugosum, limbo depresso. Capsula basi compressa, superne bilocularis, fundo tetraspermo. Spicæ axillares vel terminales brac-

teolis parvis, bracteis majoribus persistentibus. Differt a Gendarussa antherarum locellis muticis magis transversis et palato labii regulariter rugoso ; a Beloperone labio superiore incurvo palatoque.—Rh. origanoides, Eckloniana, ciliata. Cap. B. Sp. *N. ab E. in litt.*

50. Chamæranthemum. *N. ab E.*

Character Eranthemi. Stamina minora anthera unilocellata acuta. Spica floribus oppositis parvi-bracteatis.—*Ch. Beyrichii.* Serra de Estrella. Beyrich. *N. ab E. in litt.*

51. Sphenandra. *Benth.*

Calyx profunde 5-fidus. Corolla tubo brevi subrotata, laciniis 5 rotundatis subæqualibus. Stamina 4 leviter declinata. Filamenta glabra, apice incrassata in antheras terminales uniloculares adnatas. Stylus simplex, stigmate elongato incrassato. Capsula 4-valvis dissepimento bipartibili.

This genus comprises the Buchnera viscosa Ait. and perhaps some other Cape plants which have been hitherto placed in Buchnera, without corresponding at all to any character given of that genus. It only differs from Nefflea in the glabrous stamina, and from my section Chænostoma of Manulea, in the very short tube of the corolla and longer exserted stamina, thus forming the link that connects the Verbasceæ with the Buchnereæ. *Bentham, MSS.*

52. Microcarpæa. *R. Br.*

This genus must be confined to the *M. muscosa, Br.* The *M. spathulata, Hook*, must either be united to Peplidium or be considered as a separate genus. *Bentham, MSS.*

54. Sophronanthe. *Benth.*

Calyx 5-sepalus sepalis parum inequalibus. Corollæ tubus elongatus tenuis, post anthesin recurvus, limbus planus sub-bilabiatus. Stamina fertilia 2. Antheræ biloculares. Capsula 4-valvis.—Species unica S. hispida: Herba perennis humilis rigida, foliis subpaniculatis margine revolutis, floribus axillaribus sessilibus. The genus is intermediate between Gratioleæ and Buchnereæ. The plant was gathered by Drummond at Apalachicola. *Bentham MSS.*

54. Adenostegia. *Bentham.*

Calyx bifidus. Corollæ labia suæbqualia, superius oblongum galeatum erectum breviter bifidum. Stamina didynama. Antherarum loculi disjuncti altero medifixo terminali, altero filamento infra affixo.—Species unica A. rigida ; Herba Novo-californica tenuiter glanduloso-pubescens, foliis anguste linearibus sæpius trifidis, floribus ad apices ramorum paucis capitatis, bracteis appressis trifidis obtusis glandulosis ciliatis, calycinis lobis integris acutis corollam subsuperantibus, filamentis antherisque villosis. Capsula Castilleiæ et Orthocarpi quibus generibus Adenostegia affinis est. *Bentham, MSS.*

55. Roussea.

The specimens in Smith's herbarium have the leaves by no means strictly opposite, and it appears doubtful whether the stipules that are assigned to this genus really exist.

56. Fabiana. *R. and P.*

Referred here at the suggestion of Mr. Bentham.

57. Systrepha filiforme.

Radix fasciculata, tuberibus fusiformibus succulentis albis. Caulis volubilis filiformis. Pedunculus axillaris biflorus. Calyx 5-phyllus foliolis subulatis. Corolla tubulosa basi globoso-inflata, apice 5-fida, laciniis longissimis, erectis elegantissime in forma coronæ imperialis contortis. Tubus cylindricus nigro-purpureo punctatus. Nectaria 5 bifida, erecta, linearia, obtusa. Filamenta 5 nectariis longiora, apice conniventia et germen orbiculatum depressum tegentia. Antheræ 5 ad basin filamentorum, stylus et stigma inconspicua. Nomen a *συστρέφω*, contorqueo, ob apices laciniarum corollæ in funiculo contortos. Genus ex ordine Apocynearum. *Burchell's Travels*, 1. 546.

58. Monocystis=Hellenia abnormis. *Lindl. Trans. Soc. Hort. vol. 7. p. 60.*

Est Hellenia ovario uniloculari monospermo.

Calyx longitudine tubi albus, apice constrictus limbo brevissimo trilobo reflexo. Corollæ labiatæ limbus exterior 3-partitus, laciniis æqualibus linearibus albis apice cucullatis erecto-patentibus. Limbus interior laciniis superioribus nanis dentiformibus ad basin laciniæ su-

perioris exterioris cui adnascuntur; labello subrotundo complicato apice emarginato, margine crispulo, basi, ut et dentes, sanguineo guttato. Anthera erecta oblonga integra inappendiculata, loculis duobus arcuatim convergentibus stylum retinentibus. Stylus filiformis glaber in sulco filamenti quo longior. Stigma trigonum carnosum cucullatum. Glandulæ hypogynæ duæ, breves, carnosæ. Ovarium spongiosum, uniloculare, ovulo unico erecto.

59. Phæomeria=Alpinia magnifica. *Bojer in Bot. Mag. t.* 3192.

60. Peperidium=Alpinia tubulata. *Bot. Reg. t.* 777.

61. Eustephia, diagnosi pessima falsò delineata, delenda est; nunquam talis reperietur. *W. H.*

62. Bryobium.

Genus novum Octomeriæ affine, floribus parvis herbaceis, pseudobulbis, foliis carnosis, columna nana, polliniis ♂♂ ♂♂; anthera 2-loculari diversum.

63. Cladobium.

Planta habitu Isochili proliferi. Flores fasciculati, purpurei. Folia emarginata. Sepala conniventia, lateralia basi paulo producta cum pede columnæ connata labello supposita, supremum lineare convexum. Petala conformia sed paulo breviora. Labellum oblongum canaliculatum cum pede paululum producto columnæ continuum eique parallelum, margine leviter repandum. Columna marginata. Pollinia 4. teretia glandulæ cuneatæ sessilia. Sp. 1. C. violaceum e Demerara.

64. Mormodes.

Sepalum superius subfornicatum, angustum; lateralia conformia reflexa. Petala latiora, conformia, erecta. Labellum sellæforme, ascendens, trilobatum, subcuneatum, apiculatum, cum columna articulatum. Columna semiteres, mutica; gynizus longus angustus; clinandrium postice acuminatum. Pollinia 4, per paria connata, caudiculæ crassæ affixa, glandulæ carnosæ crassæ adhærenti.—Habitus Cataseti. Sp. 1. Mormodes atropurpurea. In Antillis.

65. Mesoclastes. *Lindl. g. and sp. orch. p.* 44.

This was described from imperfect specimens. I now know it to be the same as Luisia of Gaudichaud; it probably is a genus distinct from Cymbidium. The name Mesoclastes must give way to that of Luisia.

66. Trichopilia.

Sepala et petala æqualia, patentia, angusta. Labellum magnum, petaloideum, convolutum, c. columna parallelum, trilobum, lobo intermedio sub-bilobo planiusculo; intus nudum. Columna teres, clavata. Clinandrium cucullatum, 3-lobum, villoso-fimbriatum. Anthera 1-locularis, compressa, antice convexa. Pollinia 2, postice sulcata, caudiculæ tenui cuneatæ adhærentia; glandulâ minimâ.—Pseudobulbi carnosi vaginis maculatis supertecti, monophylli, coriacei. Flores solitarii axillares. Sp. 1. Trichopilia tortilis.—Mexico.

67. Monadenia. *Lindl. G. et Sp. Orch. p.* 257=Disa rufescens W.

68. Penthea, *Lindl. l. c. p.* 258=Disa patens W. filicornis Thunb.; mela leuca W.; tenuifolia W.

69. Crybe.

Sepala et petala similia, lanceolata, conniventia; lateralibus basi obliquis. Labellum multo majus, membranaceum, cucullatum, nunquam expansum, cum columna clavata marginata semi-connatum.—Sp. 1. *Crybe rosea.* In Mexico. Loddiges.

70. Rhynchelythrum. *N. ab E.*

Spiculæ homogeneæ, polygamæ, a pedicellis caducæ. Glumæ duæ; inferior minima, superior e basi ventricosa tuberculataque et hirsuta abrupte attenuata, bidentata, inter dentes breviseta, rigida, chartacea. Flosculus inferior masculus, bivalvis; valvula inferior glumæ superiori simillima et æqualis; superior minor, angustior, binervis, dorso profunde canaliculata. Lodiculæ membranaceæ, glabræ, inæqualiter et obtuse bidentatæ. Stamina

tria, antheris brevibus utrinque bifidis luteis. Superior hermaphroditus, minor, lævis, muticus, bivalvis, valvulis cum fructu durescentibus. Lodiculæ acute bifidæ. Stamina tria ut in masculo. Ovarium glabrum, in stylum rostriformem attenuatum; stigmata longa, dense plumulosa, violacea. Caryopsis compressa, valvulis induratis tecta. Inflorescentia: panicula, ramis gracilibus.—Genus singulare, nulli, quod sciam, Panicearum propinquum, Holco aut Hierochloæ quodammodo confine. — R. Dregeanum, N. ab E. C. b. Sp. *N. ab Esenb. in litt.*

71. Bluffia. *N. ab E.*

Spiculæ geminatæ, biforæ, homogamæ, polygamæ, cum rudimento flosculi tertii mucroniformi. Glumæ duæ, membranaceo-herbaceæ, subulato-acuminatæ; inferior minor (trinervis, superior 5-nervis). Flosculus inferior masculus, bivalvis; valvula inferior figura gluma superioris, paulo rigidior, subulato-acuminata, mutica; superior bipartita, membranacea, brevior, laciniis acuminatis antrorsum auriculatis et genitalia amplectentibus. Lodiculæ duæ, breves, rotundatæ, repandæ, membranaceæ, planæ, antice contiguæ. Stamina tria; antheræ fulvæ, bifurcatæ. Flosculus superior hermaphroditus; valvulæ chartaceo-coriaceæ, subæquales, apice attenuatæ; inferior convexa acumine aristiformi; superior dorso concava acumine mucroniformi, basi utrinque auriculata, auricula membranacea genitalia amplectente. Lodiculæ et stamina ut in masculo. Styli duo; stigmata plumosa. Inflorescentia: racemi digitati, rhachi angusta. Bracteola ad basin pedicelli alterius spiculæ, spiculam abortientem indicans, lanceolato-subulata, caduca, sub singulo florum pari.—Bl. Eckloneana, C. b. Sp. *N. ab Esenb. in litt.*

72. Microstegium. *N. ab E.*

Spiculæ in axi articulata fragilique geminæ, cum axi glabræ, muticæ, altera pedicellata, homogamæ, hemigamæ conformes. Glumæ duæ, chartaceæ, muticæ; inferior dorso planiuscula, ad latera bi-trinervis, superior carinata, trinervis. Flosculus uterque univalvis; inferior neuter, valvula ovato-lanceolata brevi, quandoque truncata, superior hermaphroditus, valvula brevissima truncata genitalia amplectente ovario vix longiori. (An potius lodiculæ connatæ? in nonnullis enim bipartitam vidi hanc partem.) Lodiculæ nullæ? Stamina tria; filamentis basi dilatatis gracilibus; antheris oblongis utrinque bifidis fulvis. Ovarium lanceolatum, acuminatum, hinc sulcatum; styli duo, discreti; stigmata longa plumuloso-pilosa. Inflorescentia: spicæ subpaniculatæ, densæ, alternæ pleræque bifidæ aut dichotomæ, articulis lineari-cuneiformibus compressis facile dissolubilibus. Gramen uti videtur, humile. Culmi compressi, adscendentes, plurinodes, in nostris simplices. Vaginæ dehiscentes, glabræ, internodia æquantes, superiores iisdem longiores, purpurascentes, suprema paniculam superans. Folia lanceolata, 1-1¼ poll. longa, 2½-3 poll. lata, acuta, basi brevio spatio contracta, supra setis radicatis ad basin longissimis sparsis vestita, subtus glabra. Ligula brevis, rotundata, denticulata. Inflorescentia ad speciem lateralis, viridis, glaberrima, 1¼ poll. longa, densa, ovalis. Spiculæ lanceolatæ, 1¾ lin. longæ. Glumæ æquilongæ, acuminatæ.—M. Willdenovianum. Nepal Herb. Willd. *N. ab Esenb. in litt.*

73. Agenium. *N. ab E.*

Spiculæ in axi gracili subconformes, geminæ, hemigamæ. Glumæ duæ: inferior latior, obliqua, planiuscula, herbaceo-membranacea, apice dentata multinervis, superior angusta, membranacea, marginibus inflexa. Flosculi mutici, membranacei, tenues; inferior neuter univalvis, valvula lanceolata; superior in spicula altera sessilique bivalvis, in altera eaque brevissime pedicellata uni-bivalvis; valvula inferior lanceolata, acuta, margine inflexa, superior angusta minor quandoque truncata et obsoleta. Lodiculæ duæ, membranaceæ, glabræ, cuneiformes, apice subtruncatæ cum mucrone. Stamina 3, antheris oblongis utrinque bifidis violaceis. Pistillum spiculæ sessilis fertile, pedicellatæ autem (ut puto) abortivum; ovarium oblongum; styli capillares, discreti. Inflorescentia: spicæ alternatim fasciculatæ solitariæ, pedicellatæ. Spiculæ imbricatæ. Differt hoc genus ab Andropogonibus sect. 2 (Anathero) spiculis sub-homogamis conformibus omnique habitu.—A. nutans. *Suppl. Fl. Bras. ex Herb. Reg. Ber.*

74. Prionachne. *N. ab E.*

Spiculæ biforæ, geminatæ, homogamæ, altera pedicellata altera subsessili. Glumæ duæ, æquilongæ, cartilagineæ, complicato-cultriformes, inæqualiteræ, latere exteriori convexo tricostato, posteriori seu rachi adverso plano subenervi, marginibus membranaceis ciliatis contractis, carina muricata; superior paulo angustior. Flosculi glumis paulo breviores, sessiles, suboppositi, membranacei, mutici, bivalves, uterque hermaphroditus. Valvulæ ciliatæ: inferior major, acuta; superior linearis, bidentata. Lodiculæ subquadratæ, membranaceæ, repando-crenatæ, glabræ. Stamina tria; filamentis capillaribus; antheris bifidis luteis. Ovarium glabrum, apice papilliformi; styli breves, discreti; stig-

mata penicilliformia. Inflorescentia: spica racemosa, simplex, terminalis. Rachis undata, teretiuscula, alternatim dentata et supra dentes plana. Articulatio glumarum callosa. Gramen annuum. Radix fibrosa. Culmi plures ex eadem radice 1½-1 pedem alti, simplices, teretes, glabri, bi-trinodes, ad genicula flexi. Vaginæ arctæ, inferne lævissimæ, superne striatæ et pubescentes. Ligula in setas soluta. Folia lineari-acuminata, angusta, demum convoluta, pubescentia, 1½-3 poll. longa. Spica (seu racemus) 2-3½ poll. longa, linearis, contigua, stricta. Spiculæ modice imbricatæ lanceolatæ, obtusæ, virides, 2 lineas longæ, glabræ; murices carinarum patentes, rigidæ, apice plerumque bifidæ.—Pr. Ecklonii, C. b. sp. *Nees ab Esenb. in litt.*

75. Homœatherum. *N. ab E.*

Spiculæ in axi articulata geminæ heterogamæ; altera sessilis hemigama, altera pedicellata neutra. HEMIGAMÆ: glumæ duæ, membranaceo-chartaceæ; inferior angustior minorque canaliculata, bi-quadrinervis, nervis lateralibus in dentes setasque excurrentibus; superior cymbiformis compressa ad apicem bifidum e nervo medio longe setigera. Flosculi duo membranacei tenues: inferior univalvis, valvula lanceolata ciliata mutica aut in setulam subtilem extenuata; superior bivalvis: valvula inferiori lanceolato-cymbiformi inter lacinias apicis latiusculas ciliatas setam emittens validam inferius tortam in medio reflexam: valvula superior minor, linearis, binervis, bidentata, dorso concava lateribus inflexis. Lodiculæ subcarnosæ, coloratæ (flavæ), truncato-bidentatæ. Stamen (in una specie) unum. (Antheræ fulvæ). Styli discreti; stigmata aspergilliformia. NEUTRI: glumæ duæ: inferior subherbacea, plana, multinervis, ex apice bidentato bisetove longius setigera; superior angustior, submembranacea, margine inflexa, ex apice ciliato brevidentato setam parvam emittens. Flosculi inferioris neutriusque valvula plus minus evoluta. Flosculus superior omnino deest. Inflorescentia: spicæ geminatæ, in pedunculis vagina microphylla involutis subfasciculatæ. Rhacheos articuli cuneiformes apice oblique truncati et excavati, oblique trigoni, latere exteriori latiori convexo. Pedicelli spiculæ imperfectæ articulis rhacheos similes, hinc convexi, inde concavi. Habitus omnino Andropogonis e sectione Cymbopogonum. Est genus intermedium inter Pogonathera P. de B. et Andropogones, illis tamen revera magis propinquum. Differt a Pogonathero genere spiculis singuli paris non modo heterogamis, sed etiam forma diversis, gluma utraque spiculæ pedicellatæ setigera, inferiori quoque spiculæ sessilis sæpe biseta; tum vero lodiculis distinctis carnosisque.

1. Hom. Chinense, N. ab E.

In China circum Macao et in insulis adjacentibus a Julio in Septembrem, a. 1829, legit Rev. Vachell.

Folia et pars inferior culmi desunt. Summitas plusquam pedalis, &c. *Nees ab Esenb. in litt.*

76. Fingerhuthia. *N. ab E. et Lehm.*

Spiculæ sesquifloræ aut subtrifloræ, homogamæ. Glumæ duæ, æquales, subopositæ, carinatæ, setaceo-aristatæ, carina ciliatæ, uninerves, membranaceæ. Flosculus inferior fertilis, hermaphroditus, longitudine glumarum, bivalvis, brevi pedicellatus; pedicello glabro basi barbulato. Valvulæ rigidulæ, chartaceæ; inferior longior, carinata, latere depressa, ex apice obtuso membranaceo-marginato brevisetigera, sursum 5-7-nervis; superior paulo brevior, naviculari-compressa, obtuse bidentata, dorso anguste canaliculata, binervi. Lodiculæ nullæ. Stamina tria, antheris violaceis apice barbulatis. Ovarium obconicum glabrum, acutum; styli duo, capillares, longissimi, basi contigui; stigmata brevivillosula, pallida. Flosculus superior incompletus, brevior, pedicellatus; pedicello glabro incurvo, in canalem valvulæ superioris inferioris flosculi recepto. Valvula una, obcordata, complicata, e sinu obtuso breviseta. Ubi spicula subtriflora, accedit secundus flosculus, figura et structura inferioris, masculus. Inflorescentia: spiculæ brevissime pedicellatæ, in pedicello articulatæ, ab apice ad basin deciduæ, solitariæ, in rhachi communi recta subulata densissimis spiris consertæ, imbricatæ, spicam oblongam exhibentes Laguri æmulam, basi contractam et a rudimentis spicularum lineari-subulatis imbricatis veluti involucratam. Genus memorabile, e Phleoidearum sane tribu, sed flosculorum structura Chlorideis accedens maxime.—F. capensis C. b. Sp. *Nees ab Esenb. in litt.*

77. Enteropogon. *N. ab E.*

Spiculæ spicatæ, disticho-secundæ, subtrifloræ; flosculis in axi barbata alternis, supremo sterili unisetigero. Glumæ duæ, membranaceæ, uninerves, mucronatæ; inferior (rhachi proxima) minor; exterior flosculos subæquans. Flosculi fertiles bivalves, rigiduli; valvula inferior dorso bisulca, trinervis, ex apice acute bifido stricte setigera laciniis lateralibus subulatis brevibus; superior dorso profunde canaliculata, apice bidentata. Lodiculæ obliquæ, oblongæ, membranaceæ, glabræ. Stamina tria, antheris linearibus luteis. Styli ad basin discreti; stigmata sparse villosa; ovarium glabrum, compressum. Flosculus terminalis pedicellatus, parvus, subuniglumis; gluma bifida inter lacinias

uniseta. Spica simplex; spiculis imbricatis, disticho-alternis; rhachi angusta, continua. Gramen perenne, basi procumbens, ramosum, nodis glabris; foliis linearibus apice attenuatis; ligulæ loco villi longi. Spica longa linearis (1-6 pollices longa,) leviter sigmoidea. Differt hoc genus a Chondrosio: spiculis trifloris, flosculo supremo reliquis conformi nec nisi magnitudine diverso; ab Heterostega Desv. spiculis sessilibus nec racemosis, flosculis duobus perfectis, tertii rudimento haud triramoso; a Dineba spica simplici, nec composita e spicis partialibus brevibus; ab hisce cunctis axi inter flosculos barbato. Si vero non proprii juris stare censeas, Dinebis accensere necesse est.—E. melicoides N. ab E. Ind. Or. (Ischæmum melicoides Konig.) *Nees ab Esenb. in litt.*

78. Chætobromus. *N. ab E.*

Spicula bi-pluriflora. Glumæ flosculos superantes, dorso multinerves. Flosculos inferior sessilis, quandoque difformis, aut omnes sexu diversi; ubi plures, in rhachilla alterni. Valvula inferior obsolete æquiterque novemnervis, plerisque bifida laciniis integris setigeris, arista laciniis interjecta basi plana tortaque apice recurva. Lodiculæ obconicæ, complicatæ, membranaceæ, glabræ. Caryopsis depressa. Glumæ quam pro spicula grandiores; inferior major, convoluta, dorso 9-11-nervis, margine membranacea. Flosculi ovales, pubescentes. Valvula inferior flosculi infimi sæpe mutica aut uniseta. Nervi hujus valvulæ tenuissimi, ter terni. Ovarium obovatum, depressum. Styli distantes, breves, basi membranula conjuncti. Panicula angusta aut saltem densiflora, haud flaccida. Pedicelli plerisque ad basin barbati articulatique, ex articulo solubiles.—Ch. involucratus (Danth.) Schrad, et aff. C. b. Sp. *Nees ab Esenb. in litt.*

79. Amphidonax. *N. ab E.*

Spiculæ bi-trifloræ, geminatæ, paniculatæ, heterogamæ, polygamo-monoicæ; inferiores ramulorum omnes masculæ, superiorum, vel una cujusque paris, vel utraque feminea. Glumæ duæ, membranaceæ, carinatæ, uninerves, subæquales, flosculis breviores aut eos æquantes, patentes; superior major. Flosculi conformes, ob rhachillam subnullam sessiles, oppositi, ubi terni magis discreti bivalves; valvula inferior lanceolato-longe acuminata, subulata, convoluta, inferne hirsuta, plurinervis (5-7-nervis) membranacea; superior brevior, lanceolata, obtusa, ad latus utrumque bivalvis, basi hirsuta. Lodiculæ membranaceæ, emarginato-obcordatæ, vel apice repandæ, basi cuneatæ, glabræ. Stamina tria; filamenta brevia; antheræ longæ, lineares, luteæ; locellis superne attenuatis apice lato tractu basi parum discretis. Pistilli in masculis vestigia sat conspicua, staminum in femineis vix nulla; in spiculis neutris genitalia nulla, valvulaque unius flosculi residua. Ovarium lanceolatum, compressum glabrum; styli graciles; ad ovarium discreti, basi incrassati, sursum graciles. Stigmata ovata, crassa, dense tomentosa, aspergilliformia, pilis ramosis. Caryopsis libera. Inflorescentia: Panicula, ramis fasciculatis gracilibus citra basin alternatim divisis compositis et decompositis. Pedicelli biflori, approximati, subsecundi, altero ramulo longiori, unde spicula una supra alteram, supremi quandoque uniflori. Culmi ramosi. Folia vel lineari-angusta demum complicata et subfiliformia, vel lata et arundinacea firma. Ligula nulla, sed ejus loco pubescentia aut limbus membranaceo-herbaceus.—A. bengalensis (Or.) Roxb. *Nees ab Esenb. in litt.*

80. Trichopteria. *N. ab E.*

Spicula biflora polygama cum rudimento flosculi tertii. Glumæ flosculos superantes, inæquales, membranaceæ, trinerviæ; inferior minor. Flosculi sessiles; inferior masculus muticus, valvula inferiori glumis simili; superioris valvula inferior paulo firmior (in specie cognita utrinque barbata), apice bifida laciniis setigeris; arista interjecta rectiuscula, basi plana, subcontorta. Lodiculæ obconicæ, emarginatæ, glabræ. Stamina 3. Styli distantes; ovarium glabrum, obtusum, basi angustius, depressum. Inflorescentia: Panicula angusta. Pedicelli infra spiculas barbulati, haud articulati. Spiculæ parvæ. Folia angusta (in nostris reflexa.)—Trichopteria Dregeana. *N. ab E. Drege Cap.* 4263. ♃

81. Chondrachyrum. *N. ab E.*

Spicula subtriflora, flosculo tertio pedicellato abortivo claviformi flosculisque reliquis muticis. Glumæ duæ, flosculis paulo breviores, herbaceo-membranaceæ, subæquales, obovatæ, acutæ, carinatæ, trinerves, nervis duplicatis. Flosculi completi duo, bivalves; valvula inferior cartilaginea, dimidiato ovata, gibba, apice contracta, subenervis, margine membranaceo superne latiori prædita; superior æquilonga, plana, ovalis, obtuse bidentata, binervis, ad angulos serrulata, hinc margine tenuissimo membranaceo inferne latiori inflexo genitalia tegens. Lodiculæ duæ, latæ, ovario altiores, membranaceæ, ovatæ, acutæ, integræ, subserrulatæ. Stamina tria; antheræ luteæ, lineares, apice acutæ bidentatæ, basi bifidæ. Ovarium glabrum; stigmata duo, pilosula, in nostris ad speciem conglutinata. Flosculus tertius incompletus, oblongus, bivalvis, hinc magis gibbus, cum

pedicello gracili, valvulæ superiori superioris flosculi appressus et a margine valvulæ ejusdem inferioris circumvolutus. Inflorescentia: panicula angusta, contracta, ramis geminatis altero longiori, pedunculis racemosis bifloris. Quod ad characteres Melicæ accedit, sed longe distat vera indole, qua propius accedere videtur Graminibus Paniceis. A. Reboulea Kunth. glumarum forma, lodiculis, valvulisque cartilagineis differt.—Ch. scabrum Fl. Br. Suppl. *Nees ab Esenb. in litt.*

82. Poidium. *N. ab E.*

Spicula homogama, hermaphrodita biflora. Glumæ herbaceo-membranaceæ, subæquales, trinerves, acutæ. Flosculi sessiles, glumis paulo longiores, structura glumarum; valvula inferior subtiliter 5-nervis, apice bidentata, superior linearis, bidentata, ad latera inflexa, superioris flosculi ultra inferiorem valvulam prominens. Lodiculæ membranaceæ, lanceolatæ, acutæ. Ovarium subtruncatum, ovale; styli discreti. Inflorescentia: panicula. Habitus Airæ.—P. brasilense Suppl. Fl. Br. *Nees ab Esenb. in litt.*

83. Antochloa. *N. et Meyen.*

Spiculæ 3-4-floræ, flosculis superioribus abortivis. Glumæ et valvulæ membranaceæ; disco herbaceo. Glumæ flosculis minores; inferior paulo minor. Valvula inferior dilatata, amplissima, subrotunda; superior minor, profunde bifida, laciniis bifidis. Lodiculæ duæ, membranaceæ, ovato-lanceolatæ, acutæ. Styli brevissimi; stigmata maxima, plumosa.—Inflorescentia: panicula racemulosa, ramis fasciculatis paucifloris.—Antochloa lepidula N. et M. In Peruviæ Andibus 15,000 pedum altitudine. *Nees ab Esenb. in litt.*

84. Rhodocoma. *N. ab. E.*

Flos masculus: Spiculæ imbricatæ, squamis omnibus fertilibus. Perianthium subæquale, cartilagineo-chartaceum. Stamina tria. Antheræ peltatæ. Flos femineus: spicula uniflora, squamis perianthio brevioribus imbricatis (6-7). Perianthium hexasepalum, cartilagineum, laciniis æqualibus, interioribus paulo tenerioribus. Filamenta tria, castrata, linearia, ovario appressa. Stylus tripartitus, hirtus, retortus; ovarium obtuse trigonum, superne pilis intricatis roseis vestitum, triloculare, loculis monospermis, parietibus crassis. Fructus maturus deest. Inflorescentia (♀): spiculæ in ramulis ramorum verticillatorum brevium terminales solitariæ, rariusve geminæ. Differt a Restione (div. Elegia) spiculis in apice unifloris, ovario roseo-comato, filamentis sterilibus in ♀. Quod ad habitum accedit Restioni verticillari. *Nees ab Esenb. in litt.*

85. Hypodiscus. *N. ab E.*

Spiculæ ♂. et ♀. conformes. Flores masculi: spica communis arcte imbricata squamis plerisque florigeris. Perianthium sexpartitum, laciniis chartaceo-membranaceis lanceolatis, omnibus planis. Stamina tria; antheræ unilocellatæ, incumbentes. Flos femineus: Spica masculi, sed uniflora, squamis inferioribus omnibus vacuis; squama terminali, juxta florem, angustiore. Flosculus stipitatus. Perianthium stipitem cingens, membranaceum, sexpartitum, cum fructu increscens. Discus sub pistillo latus, orbiculatus, planus, margine elevato crenato repandove cinctus. Stylus crassus, hirsutus, ad medium bifidus aut ad discum usque bipartitus. Nux ossea, obtusa, basi disco hypogyno imposita. Spiculæ squamis rigidis acutis sæpiusve aristatis, in apice culmi aphylli paucinodis alternatim approximatæ. Vaginæ rigidæ, coloratæ, apice processu præditæ aut muticæ.—Restio aristatus L. et plures sp. confines. *Nees ab Esenb. in litt.*

86. Leucoplœus. *N. ab E.*

Spiculæ ♂. et ♀. difformes. ♂. minores, paniculatæ, squamis undique imbricatis chartaceo-membranaceis aut membranaceis, omnibus fertilibus. Perianthii hexaphylli foliola subæqualia, lanceolata, membranacea aut chartacea. Stamina tria, antheræ oblongo-lineares, unilocellatæ. Spiculæ paucæ, spicatæ, grandiores. Squamæ undique imbricatæ, longæ, chartaceæ, rigidulæ; inferiores plurimæ steriles, terminalium aliquot sæpe pistillum minimum bifidum abortivum foventes. Flos fertilis terminalis, sessilis. Perianthium parvum vel truncatum, membranaceum, plicatum, lobulatum, vel distincte hexaphyllum, foliolis parvis subæqualibus membranaceis, mucronatis; demum evanescens. Hypogynium sessile, aut pateriforme, margine repandum, extus rugosum, aut cylindricum læve, apice plicatum. Styli vel duo, ad basin discreti recti, crassi, bifidi, cruribus introrsum hirsutis, ætate contortis, vel unus, longus, ad medium bifidus, a fructu deciduus. Nux monosperma, vertice umbilicata, lævis, teres, dura, basi a hypogynio persistente spongioso-echinulata, papillis truncatis. Bracteæ inflorescentiam fulcientes rigidulæ, in femina diutius persistentes.—♂. R. argenteus Thbg. ♀ ab Ecklonio nuper inventus. *Nees ab Esenb. in litt.*

87. Ceratocaryum. *N. ab Eb.*

Spiculæ ♂. et ♀. difformes. Masculæ thyrsoideæ, confertæ, laxe imbricatæ, squamis patulis membranaceis perianthii foliolis exterioribus conformibus angustis acuminatis. Perianthii foliola membranacea, angusta, acuminata; interiora breviora. Stamina tria, perianthio breviora, antheris unilocellatis pallidis. Fæmineæ in apice culmi spicatim approximatæ, pedicello brevissimo lato rigido suffultæ, magnæ. Squamæ undique imbricatæ longæ, membranaceo-chartaceæ, acuminatæ; inferiores plurimæ steriles; extrema minor, plana. Flos terminalis. Perianthium hexaphyllum, foliolis brevibus latiusculis membranaceis persistentibus, interioribus minoribus. Hypogynium nullum aut indisi cretum. Styli duo crassi, rigidi, cornei, extus convexi læves, intus densissime spongiosdemum incurvi. Nux globosa, sessilis, vertice depressa stylisque (serius cadentibus) cornuta coriacea, in parte superiori solida et discolor, inferne bilocularis, mono-disperma, basi planiuscula, rugosa, et perianthio cincta. Plantæ simplices; culmo crasso, lævi, vaginis arctis convolutis basi lævibus herbaceis, apice scarioso-discoloribus pallidioribus nervoso-striatis acuminatis; hac parte discolore ab inferiori recta linea discreta. Bracteæ rigidæ, oblongæ, striatæ, in utroque sexu conformes; inferiores diu persistentes—. ♂. R. argenteus Herb. Willd. (nec Thbg.) ♀ ab Ecklonio nuper inventa. *Nees ab Esenb. in litt.*

88. Cucullifera. *N. ab E.*

Spicula et inflorescentia ♂ ut in Mesantho. Spicula feminea subtrifariam imbricata, compressa et ad speciem disticha; squamis arctissime imbricatis cartilagineo-rigidis convexis, penultima fertili, extrema minore longe unguiculata apice accuminata cucullatim convoluta. Perianthium hexaphyllum, ovario multo brevius, foliolis membranaceis truncatis. Stylus compressus usque ad medium bifidus. Nux compressa, biconvexa, obtusa, monosperma, basi excavata, perianthio multo breviori appresso tenui laciniis præmorso-dentatis cincta (opaca). Inflorescentia: ♂ panicula seu anthera terminalis, bracteis magnis acuminatis deciduis rigidis interstincta. Fern: Spiculæ in apice culmi alternæ, sessiles, bractea persistente spicula longiore cinctæ (duræ, magnæ, nitidæ). Differt a Mesantho: stylo uno bifido, nec binis; nuce compressa, nec depressa; perianthio ♀ brevi nec nucem vittarum ad instar vestiente. A Willdenowia differt: defectu receptaculi exterioris lobati et inflorescentia ♂. Ab utroque insuper squama suprema spiculæ ♀ petiolata cucullata.—C. durus N. ab E. Rest. Eckl. (♂ Restio accuminatus Thunb.) *Nees ab Esenb. in litt.*

89. Mesanthus. *N. ab E.*

Flos ♂. Spica imbricata, brevis, multiflora; Squamis omnibus floriferis submembranaceis. Perianthium sexpartitum, membranaceum, laciniis subæqualibus carinatis, interioribus tenerioribus. Stamina tria; antheræ peltatæ breves, ovato-suborbiculatæ. Fem. Spicula trifariam imbricata; rhachilla flexuosa, articulata, ad florum insert. acetabulis instructa; squamis coriaceis rigidis, infimis paulo minoribus sterilibus, mediarum una alterave fertili supremis femineis abortivis. Perygynium nullum nisi basis seu pedicellus ovarii adhærens, limbo libero sexfido, laciniis tenerrimis membranaceis acutis albis alternis angustioribus; ætate (ovarii incremento) sexpartitum, laciniis linearibus obtusis tenuissimis persistentibus fructui arctissime appressis et quasi agglutinatis. Styli duo lineares, compressi, epigyno umbraculiformi depresso inserti, margine interiori superius ciliati. Nux monosperma, biconvexo-plana, aut oblique truncata, lævissima, a laciniis perianthii adhærentibus quasi sex-vittata, basi obconico-appendiculata. Inflorescentia: maris paniculata, primum bracteis magnis, ut in Elegio, tecta, dein nuda multiflora. ♀, spiculæ solitariæ aut geminæ terminales, bractea squamis simili suffultæ. Culmi aphylli, ramosi, ramis semitereti-compressis. Differt. ab Hypolæna fructu haud terminali, nec tereti, sed compresso, et styli structura.—M. macrocarpus. (♂ Restio elegans Poir. ♀; Willdenovia compressa Thbg.) *Nees ab Esenb. in litt.*

90. Antochortus. *N. ab E.*

Dioicus. Flores ♂ subracemosi bracteis patentibus suffulti, nudi, racemulis parvis pauciforis laxis axillaribus. Perianthium infundibuliforme, sexpartitum, chartaceo-membranaceum; laciniæ æquilongæ, exteriores paulo angustiores. Stamina tria, laciniis interioribus opposita; filamenta brevia, basi contigua; antheræ lineares, acutæ, superne sulco medio depressæ, supra basin affixæ vacillantes (luteæ). Rudimentum pistilli nullum. Flores ♀ non noti. Culmi filiformes, tortuosi, graciles, articulati, fasciculatim ramosi. Vaginæ aphyllæ, acutæ, patulæ, membranaceo-chartaceæ. Vaginæ propriæ ad singuli rami ortum obtusæ. Racemuli breves, cernui, ex axillis vaginarum solitarii. Rhachis filiformis, flexuosa. Flores 2-6, remotiusculi, brevi-pedicellati, purpurei. Bractea propria communibus similis, minor, basi subperfoliata.—A. Ecklonii, N. ab E. Rest. Eckl. *Nees ab Esenb. in litt.*

91. Plagiochila. *N. ab E.*

Perianthium terminale, aut in ramulo brevi laterale, compressum, ore oblique truncato, ciliato aut denticulato, sæpe decurvo. Involucri folia a caulinis haud diversa. Capsula firma, quadrivalvis. Elateres mediani dispiri. Flores masculi vel spiciformes distichi ramo ex apice continuo, foliis perigonialibus minoribus arctissime imbricatis, vel in axillis foliorum superiorum conformium magisque imbricatorum. *N. ab E. in litt.*

92. Symphyogyna. *Nees et Montagne.*

Frondosa. Perianthium 0. Involucrum monophyllum squamiforme, incumbens, dentatum. Calyptra lævis, exserta, coriacea, ore a stylis sterilibus persistentibus fimbriato. Elateres dispiri, fibris arcte contortis, coloratis. Semina globosa. Flores masculi in costa frondis, squamis arcte imbricatis laceris tecti. Species: M. brasiliensis (Jungerm.) Fl. Bras.; M. Hochstetteri, n. sp.; M. difformis (Jungerm.) Fl. Bras.; M. circinata n. sp.; M. hymenophyllum (Jungerm.) Hook. et rhizobola Hook. *N. ab E. in litt.*

93. Hypenantron. *Corda.*

Receptaculum excentricum, digitaliforme subtus 2-3-loculare loculis mono- vel polycarpis. Perichætium nullum. Perianthium cum superficie infera perianthii coalitum breve, coloratum, fibris longissimis liberis coronatum. Calyptra obsoleta. Capsula operculata. Semina sphaeroidea. *N. ab E. in litt.*

94. Targionia.

Marchantia est in qua lobulus fructifer a reliqua fronde non distinguitur, parte in pedunculi formam coangustata. *N. ab E. in litt.*

95. Calidictyon. *Grev.*

Frons membranacea, rubra, quasi foliosa; foliis e reticulo nudo articulato compositis arcteque anastomozantibus. (Fructus ignotus). *Grev. MSS. in Wight and Arnott Prodr. Fl. Penins. Ind. Orient. v. 2. ined.*

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O O

APPENDIX

OF

ADDITIONS, CORRECTIONS, AND TYPOGRAPHICAL ERRORS.

Page 20, *add* Villarezia, R. et P. } *after* Schizandra.
Citronella, Don. }
— 21, *add Actæa*, Lour. *after Tigarea*.
— 23, *add* Hohenackeria, F. et M. *after Glyceria*.
Fragosa, R. et P. *after* Bolax.
Conopodium, Koch. *after* Bunium.
Pimpinella, L. } *after* Cryptotænia.
Tragium, Spr. }
Callisace, Fisch. *after Mylinum*.
Bubon, L. *after* Imperatoria.
— 33, line 15 from bottom, *for* bark, *read* back.
— 36, ONAGRACEÆ, substitute the following list of genera :—

§ 1. MONTINIEÆ, DC.
Montinia, L.
Hauya, Moç. et Sess.
§ 2. FUCHSIEÆ, DC.
Fuchsia, Pl.
Quelusia, Vand.
Dorvalia, Comm.
Nahusia, Schneev.
Brebissonia, Spach.
Lyciopsis, Spach.
Kierschliegeria, Spach.
Schufia, Spach.
Skinnera, Forst.
§ 3. ONAGREÆ, DC.
Œnothera, L.
Calylophis, Spach.
Anogra, Spach.
Baumannia, Spach.
Megapterium, Spach.
Onagra, Spach.
Pachylophis, Spach.
Lavauxia, Spach.
Hartmannia, Spach.
Kneiffia, Spach.
Xylopleurum, Spach.
Boisduvalia, Spach.
Sphærostigma, Ser.
Holostigma, Spach.
Agassizia, Spach.
Heterostemon, Nutt.
Gayophytum, A. de J.
Clarkia, Ph.
Phœostoma, Spach.
Eucharidium, F. et M.
Godetia, Spach.
? *Cratericarpium*, Spach.
Gaura, L.
Gauridium, Spach.
Schizocarya, Spach.
Stenosiphon, Spach.
Epilobium, L.
Crossostigma, Spach.
Chamænerion, Tourn.
Zauschneria, Presl.
§ 4. JUSSIÆÆ, DC.
Jussiæa, L.
Prieurea, DC.
Vanhallia, Schult.
Ceramium, Bl.
Ludwigia, L.
Isnardia, L.
Dantia, Thouars.
Lopezia, Cav.
Pisaura, Bonat.
Onosuris, Raf.
Camissonia, Lk.
Pleurostemon, Raf.
Pleurandra, Raf.

— 46, *for* LECYDITHACEÆ, *read* LECYTHIDACEÆ.
— 52, *add* Coniandra, Schrad. } *after* Bryonia.
Cyrtonema, Schrad. }
Pilogyne, Schrad. *after* Coccinia.
Citrullus, Eckl. } *after* Cucurbita.
Cephalandra, Eckl. }
— 55, *add* Asteropeia, P. Th. *after Astranthus*.
— 60, *add Jonopsidium*, Rchb. *after Kernera*.
Rhizobotrya, Tausch. *before* THLASPIDEÆ.
Diastrophis, F. et M. *after* Thlaspi.
— 64, *add Erpetion*, after Viola.
— 80, *add Eroteum*, Swz. *after* Freziera.
— 82, *add Semarillaria*, R. et P. *after* Paullinia.
— 95, *add* Hymenocalyx, Zenker. *after* Bombax.
Pachira, Aubl. *after* Carolinea.
Cavanillesia, R. et P, *after* Pourretia.
— 104, *add Myrodendron*, Schr. *after* Humirium.

Page 105, *add* HESPERIDEÆ, Vent. *as a synonyme of* AURANTIACEÆ.
— 111, *add* Methyscophyllum, Eckl.
Hippobromus, Eckl. } *to* Burseraceæ.
— 116, *add* *Ardinghelia*, Comm. *after* Kirganelia.
Euchidium, Jack. *after* *Cratoschwilia*.
— 117, *for* Gommia, *read* Commia.
after *Anisophyllum*, *add* Poinsettia, Grah.
— 124, *add* Trianthema, L.
Zaleya, Burm.
— 128, *add* Psammotropha, Eckl. *after* Hapalosia.
— 133, *add* Agathosma, W. *after* Okenia.
— 140, *add* Cissabryon, Popp. *after* Oxalis.
— 142, *add* *Chamælea*, Tourn. *after* ? Cneorum.
— 145, *add* Coluria, R. Br. *after* Dryas.
— 148, *add* Leucosidea, Eckl. *before* Alchemilla.
Tetraglochin, Pöpp. *after* *Aphanes*.
— 155, *add* Cladrastis, Raf. *after* Virgilia.
dele Westonia, Spr.
for *Ædmannia*, Thunb. *read* *Œdmannia*, Thunb.
add Xiphotheca, Eckl.
Lathriogyna, Eckl.
Euchlora, Eckl.
Cryphiantha, Eckl.
Amphithalea, Eckl. } *after* Priestleya.
Priotropis, W. et A. *after* Heylandia.
Leptis, E. Meyer, *after* *Chrysocalyx*.
Buchenrædera, Eckl. *after* *Viborgia*.
Melolobium, Eckl.
Argyrolobium, Eckl. } *after* Dichilus.
Acanthobotrya, Eckl.
Calobota, Eckl. } *after* Lebeckia.
Polylobium, Eckl.
Krebsia, Eckl.
Lotononis, Eckl. } *after* Natrix.
— 156, *dele* Atylosia, W. et A.
Dunbaria, W. et A.
add *Oxyramphis*, Wall. *after* Lespedeza.
Westonia, Spr. *after* Rothia.
Pyrrotrichia, W. et A. *after* Nomismia.
Macroceratites, Radd. *after* *Carpopogon*.
Atylosia, W. et A.
Dunbaria, W. et A.
Cyanospermum, W. et A. } *after* *Cajan*.
— 157, *add* *Acidandra*, Mart. *after* Zollernia.
Coquebertia, Brongn. *after* Gourliea.
Dalhousiea, Wall.
Riveria, H. B. K.
Heterostemon, Desf. } *after* Colvillea.
Theodora, Medik. *after* Schotia.
— 164, *add* Helophyton, Eckl. *after* *Turgosea*.
— 191, *add* Blandovia, W. *after* Tristicha.
— 200, *add* *Pleuranthe*, Salisb. *after* *Erodendron*.
— 202, *add* *Litsea*, Lam.
Tomex, Thunb. } *after* Tetranthera.
— 208, *add* *Oplotheca*, *after* Hoplotheca.
Scleropus, Schr. *after* Centrostachys.
— 209, *add* Londesia, F. et M.
Panderia, F. et M.
Thelygonum, L. } *to* Chenopodiaceæ.
— 212, *add* Pterostegia, F. et M. *to* Polygonaceæ.
— 221, *add* *Cuellaria*, R. et P. *after* Clethra.
— 223, *add* Leucopogon, R. Br. *after* Cyathodes.
Pentachondra, R. Br.
Needhamia, R. Br.
Oligarrhena, R. Br. } *after* Decaspora.
— 227, *add* *Cavanilla*, Lam. *after* *Embryopteris*.
Tremanthus, Pers. *after* Styrax.

Page 228, *add Foveolaria*, R. et P. *after* Styrax.
— 229, *add Azima*, Lam. *after* Monetia.
— 232, *add Cladostylis*, Bonpl. *after* Evolvulus.
— 245, *add Lygistum*, P. Br. *after Nacibea*.
— 246, *add Acrodryon*, Spr. *after* Cephalanthus.
Schwenkfeldia, Schreb. *after* Sabicea.
— 260, *add* Astelma, R. Br. *after* Hyalolepis?
— 262, *add* Bacazia, R. et P. *after Penthea*.
— 263, *add* Fichtea, Schr. *after* Krigia.
Luthera, Sch. *after Adopogon*.
— 264, *add* Bæria, F. et M. } *next* Lasthenia.
Callichroa, F. et M. }
Botryadenia, F. et M. *next* Carpesium. } *after* Townsendia.
Hemisteptia, Bge. *next* Aplotaxis.
Onopyxus, Raf.
— 273, *add* Tournefortia, L. } *after* Rhabdia.
Messerschmidia, L. }
— 274, *add* Plagiobotrys, F. et M. } *after* Lithospermum.
Cryptantha, Lehm. }
Platynema, Schr. *after Mertensia*.
— 277, *add* Hymenocrater, F. et M. *after* Roylea.
— 283, *add* Cyrtandra, Forst. }
Æschynanthus, Jack. } *to* Cyrtandraceæ.
Lysionotus, Don. }
dele Rehmannia, *at the bottom*.
— 287, *add* Tanaëcium, Swz. *to* Gesneraceæ.
— 292, *add* Duboisia, R. Br. *after* Anthocercis.
Rehmannia, Libosch. *after* Russelia.
Hydropityon, Gærtn. *after* Limnophila.
— 305, *add Agenoria*, DC. *after* Apteranthus.
Stylandra, Nutt. after Podostigma.
— 340, *for* Leptoia, Lindl. *read* Leptotes, Lindl.
after Ionopsis, H. et K. *add Cybelion*, Spr.
— 346, *add Cleophora*, Gærtn. *after* Latania.
— 348, *add Gyromia*, Nutt. *after* Medeola.
— 353, *for* TULIPACCÆ, *read* TULIPACEÆ.
— 354, *dele* Aphyllanthes.
after Asparagus, *add* Oncus, Lour.
add Lomatophyllum, W. *after Rhipidodendron*.
— 356, *for* JUNCEÆ, *read* JUNCACEÆ.
— 357, *add* Aphyllanthes, L. *before* Dasypogon.
— 361, line 12, *for* infer this, *read* infer from this.
— 378, *add Cabrera*, Lag. *after* Paspalus.
— 379, *add Centrophorum*, Tr. *after* Raphis.
— 380, *add Epiphytis*, Tr. *after* Zoysia.
Hymenothecium, Lag. *after* Pleuraphis.
— 382, *add* Periballia, Tr. *before* Eriachne.
column 1, line 53, *for* Cass. *read* Cap.
add Dissanthelium, Tr. *before* Eragrostis.
— 385, *add* Androtrichum, Brongn. *after* Eriophorum.
Ptychocarya, R. Br. *after* Scleria.
Thryocephalus, Forst. after Kyllinga.
Vaginaria, Rich. *after* Fuirena.
— 393, *for* BALANOPHOREÆ, *read* BALANOPHORACEÆ.
— 401, *add Cincinalis*, Desv. *after* Notholæna.
Hemitelia, R. Br. *after* Matonia.
— 424, *add* Ruthea, Opal. *after* *Psathyra.
Gyrodon, Opal. *after* Suillus.
Acrospermum, Tode, *after* Clavaria.
Cryptosphæria, Grev. } *after* *Heterosphæria.
Cucurbitaria, Grev. }
for Artidium, *read* Actidium.
add Bostrychia, Fr. *after* Cytispora.
— 425, *add Dictyophora*, Desv. *after Hymenophallus*.
Dendromyces, Libosch. *after* Battarrea.
Cenococcum, Fr. *before* Geaster.
Pelidium, Kunze, *before* Periola.

Page 425, *add* Leioderma, Pers.
Hymenella, Fr.
Thecaphora, Fingerh.
Urosporium, Fingerh.
— 429, *add* *Cyphelium*, Ach. *after* Rhizocarpon.
— 436, *for* Rytiphlæa, *read* Rhytiphlæa.
— 437, *add* Chlorococcum, Grev. *after* Protococcus.
— 438, *add* Aniba, Aubl.
Cedrota, Schreb.
Arsis, Lour.
Adolia, Lam.
Anneslea, Wall.
Acladodea, Fl. Per.
Baccaurea, Lour.
Bembix, Lour.
Catonia, P. Br.
Moldenhauera, Spr.
Cavanilla, Thunb.
Rhytis, Lour.
Rochefortia, Swz.
Morella, Lour.
Myrianthus, Beauv.
Plegorhiza, Molin.
Euphronia, Mart.
Griselinia, Forst.
Hecatea, Thouars.
Helicanthera, Lour.
Heptaca, Lour.
Commiphora, Jacq.
Tetrapilus, Lour.
Xylosma, G. Forst.
Myroxylon, R. Forst.
Xenopoma, W.

P. S. The total number of genera, exclusive of their synonyms, catalogued in this work is 7840.

THE END.

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