

BOTANICAL DIALOGUES,

BETWEEN

HORTENSIA AND HER FOUR CHILDREN,

CHARLES, HARRIET, JULIETTE AND HENRY.

DESIGNED

FOR THE USE OF SCHOOLS,

BY A LADY.

*"If we give our children nothing but an amusing employment, we
"lose the best half of our design; which is, at the same time
"that we amuse them, to exercise their understandings, and to
"accustom them to attention. Before we teach them to name
"what they see, let us begin by teaching them how to see.
"Suffer them not to think they know any thing of what is merely
"laid up in their memory."*

ROUSSEAU'S LETTERS ON BOTANY.

LONDON:

PRINTED FOR J. JOHNSON, IN ST. PAUL'S CHURCH-YARD.

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1797.

ADVERTISEMENT.

THE Authorefs of the Botanical Dialogues hopes that the following Letter, which ſhe is kindly permitted to publiſh, will ſecure her from the charge of temerity in preſenting her work to the public, which ſhe does with unfeigned diffidence, although with the hope that her endeavours to render the ſcience of Botany a more amuſing and leſs difficult ſtudy to young people, than it has hitherto been found, may not prove wholly ineffectual.

Derby,

Derby, Aug. 24, 1795.

Dear Madam,

According to your desire, Sir Brooke Boothby and myself have been agreeably busied for many days in reading and considering your *Botanical Dialogues for Children*; and much admire your address in so accurately explaining a difficult science in an easy and familiar manner, adapted to the capacities of those, for whom you professedly write; and at the same time making it a compleat elementary system for the instruction of those of more advanced life, who wish to enter upon this entertaining, though intricate study. We think therefore, that not only the youth of both sexes, but the adults also, will be much indebted to your ingenious labours, which we hope you will soon give to the public.

We beg to subscribe ourselves, with true regard,

Dear Madam,

Your obedient Servants,

BR. BOOTHBY.

E. DARWIN.

ANALYSIS OF THE FIRST PART

OF THE

BOTANICAL DIALOGUES,

DIALOGUE THE FIRST. From Page 1 to 29.

PAGE 1st, Introduction. 2d, Rudiments of a science or language necessary to be understood before much proficiency can be made in either. 3, Explanation of Linneus's system. 5, The Linnean terms ought to be made use of; knowledge of Latin of no great use to Botanical pupils. Botany has a language peculiar to itself; an agreeable study. 6, Term Fructification explained; all parts of it not essential to the product of perfect seed; seven parts of Fructification. Calyx, seven different kinds. 7, Fool's Parsley distinguished from all other known umbelled plants. Different kinds of Calyx explained. 8, Male Bloom of Willow, called Yellow Gossings by children. Red Tassel on Hazle Trees the Female Bloom. 9, Spathe explained. Spathe of Narcissus resembles Indian paper. Calyptré, the Calyx of Mosses beautifully shewn in Mr. Curtis's London Flora. 10, The study of Nature affords amusement at all seasons of the year, improves the mind. Volve the Calyx of Funguses. 11, Corol explained, its leaves called petals. Marks by which the different kinds of Corol are distinguished. Polyanthos a one-petalled Corol. Method of knowing a one-petalled Corol from a Corol of many Petals. 12, Généra of Plants distinguished by the form and position of their Petals. Seven different formed Corols. 13, Resemblance of the

b

Corol

Corol of Snap-Dragon to a Mouth; that of the Pea-bloom tribe to Butterflies not very exact. Nectary, the name given by Linneus to the honey-bearing part of the Corol, 14, not always a part of the Corol. Stamen, a most essential part of Fructification, consists of three parts. Anther, wrongly called the Seed, explained. 15, Nature has provided for the security of the Dust. On its preservation depends the continuation of the species. Wet injurious to the Anther-dust. Supposition of the Anther-dust being preserved from injury by a waxy substance surrounding it, erroneous. Mr. John Hunter's experiments prove that the Anther-dust is not Wax. Collected by Bees for Food to the Bee-maggots. Pistil of equal importance with the Stamen; consists of three parts. 16, Anther and Stigma, in botanical language, constitute a Flower; essential to the production of Fruit—late investigations seem to make the Nectary an essential part of Fructification; Honey contained in it intended for the nourishment of the Anthers and Stigmas. 17, The Nectary had not even a name before the time of Linneus. Vegetables have a right to be placed among the animated creation. 18, Eight different kinds of Seed-vessel. Sudden manner of the Seed-vessel of 'Touch me not' bursting. Two kinds of Silique explained. 19, Distinction between the Silique kind of Seed-vessel and the Legume. Legume the part eaten of the Papilionaceous, or Pea-bloom Flowers. Follicle and Drupe explained. 20, Exceptions to the definition of a Drupe. Defects of the system of Lynneus few. 21, Strobile, the Strobiles of Larch beautiful, commonly called Fir-apples. 22, Seed, definition of it. Seed consists of three parts. Young plants supported in a similar manner to young animals. By soaking a Bean in Water, the three parts of the Seed may be well seen. 23, Young Plants perish, if their Seed-lobes or Cotylédons are destroyed. Corn dug out of the ground by Wood Pigeons. Care taken by Nature in the protection and dispersion of Seeds. Muslin made from Cotton.

Cotton

Cotton the soft Cradle of Seeds, as Silk is that of Insects. Aril, 24, that part which surrounds the Seed within its Vessel, may be seen in Fraxinella, Wood-forrel, and Spindle Tree. Dispersion of Seeds. 25, Beauty of the Seed of Feather-grafs; most curious of the Flying Seeds. Tillándfia, a parasite Plant, manner in which its seeds are conveyed similar to the migration of Spiders. 26, Beautiful lines in the Botanic Garden, on the migration of the seeds of aquatic plants, and of those which grow on the banks of rivers. Much knowledge to be gained from the Botanic Garden. Birds the means of disseminating some kind of seeds. Holly growing on Birch, 27, Mountain Ash on an Apple-tree. Doubtful in what manner Trees growing upon others receive Nourishment. Seeds of Feather-grafs, Geranium and Barley dislodged from their Receptacles when the ground is best fitted to receive them. 28, Two kinds of Receptacle, Proper Receptacle, and Common Receptacle; Common Receptacle belongs peculiarly to the Compound Flowers. Examples of a Common Receptacle, made use of by Linneus to discriminate the Génera of the class Syngenesia, United Anthers.

DIALOGUE SECOND. From Page 30 to 60.

Page 30, Specimens of the different kinds of Calyx. 31, Peculiarity in the Wheel-form Corol of Verónica. The Genus distinguished by that peculiarity. Hollow protuberance at the base of the Petals of Ranúnculus, the Nectary. 32, The essential Mark of that Genus, constant, even in the double Flowers. Flowers more easily to be distinguished from each other than is supposed by those who have not attentively studied their different parts. 33, Specimens of different formed Corols. 34, Corol not always coloured; no obvious rule by which the Calyx and Corol may be distinguished; rule given by Linneus for distinguishing

them ; his transgression of that rule. 35, Cover of the Crown Imperial, a Corol. Better to follow the terms of Linneus. 36, Quantity of Honey in the Nectaries of Crown Imperial nicely adapted to the Cavities which contain it. Form of the particles of Anther Dust perfect and regular. Moisture on the summit of the Stigma fits it to receive the Anther-dust. Germ, the term for the immature Seed-vessel ; Pericarp, for that which is mature. 37, Only six parts of Fructification in the Flower of Crown Imperial. Bract, a part which may be mistaken for a Calyx. Rule for distinguishing the Bract from the Calyx. Green Tuft at the Top of the Stem of the Crown Imperial formed from Bracts ; 38, the Bract a part of great use in marking the Species of Plants. Bract one of the Fulcra of Plants. Poppy and Tulip shew the Stigma and Germ without a Style. Great encrease of plants from Seed. Beauty of Seeds ; 39, Great variety in the size, shape, and surface of Seeds. 40, Study of Science or Language agreeable only as it is a mean to obtain an end. Explanation of the term Fulcra. Seven kinds of Fulcra. 41, Distinction betwixt the terms Peduncle and Petiole. Stipule explained. Stipules of Plants ought to be attended to, as they frequently mark one species from another. Infant Leaves of Tulip-tree perfect in all their parts. 42, Stipules of Plane-tree add to its beauty in spring. Weak Plants generally furnished with Tendrils. All climbing Plants injurious to the Trees which support them. 43, Dodder seems intended by Nature to draw nourishment from other vegetables. By its growth, strangles the Plant by which it was fostered. 44, Few instances of this in the Vegetable Kingdom. The injury sustained by the supporting Plant generally small. Orobanche a parasitical Plant from choice. 45, Pubescence might more properly be called a Defence than a Support. 46, Young Leaves and Stems commonly protected by a downy Covering. Arms of Plants, Thorns and Prickles their Defence against Animals. Hollies in Need-wood Forest, armed only on their lower

lower branches, afford food to the Deer in severe winters. 47, Curious mechanism of the Sting of a Nettle. Many curious contrivances of Nature for the defence of Plants. 48, Venus's Fly-trap particularly curious. Sun-dew resembles it; 49, Easily found on heaths by the red colour of its leaves. Scape, a particular kind of Flower-stalk. Inflorescence, the term for the different modes by which Flowers are joined to their Peduncles. 50, Seven different kinds of Inflorescence. 51, One-ranked and two-ranked Spike explained. 52, Distinction betwixt a Corymbe and Umbel. Industry of Linneus more to be admired than his genius. Great advantage derived to the world from his system. 53, Philosophical pursuits preservative from idle company. 54, The study of a science teaches the art of thinking; learning to work, the education of the fingers; 55, Science and language, of the mind; the first to have the preference in female education. 56, Comparing one object with another is thinking. Thyrses and Racemes explained. 57, Wherein the Raceme and Corymbe differ. Panicle explained. 58, Modes of Flowering not comprised under the term Inflorescence. Linneus's definition of the term Rachis. 59, Method of impressing what is taught, upon the memory. 60, The art of making learning agreeable; the more deeply the study of Botany is entered into, the more pleasing it will be found.

DIALOGUE THE THIRD. From Page 61 to 87.

62, Botanical names ought to be acquired as soon as possible; great confusion arising from the neglect of them. 63, Many objections against an English Nomenclature. 64, Instance of the awkwardness of the attempt to establish English Generic Names. 65, Many of the Linnean Names already in general use. The Names in Mr. Curtis's Botanical Magazine being accented, would make them universally used.

66, Explanation of the term Class, may be compared to a Dictionary. Characteristic mark of a Class arbitrary. On the number and situation of the Stamens; the Classes of Linneus founded; 67 what constitutes a natural Class; most of the Classes of the Linnean system artificial; their being so of little consequence; the great advantages of his system. 68, Labours of many ingenious Botanists of little use from want of arrangement. Much useful knowledge of the ancients lost to the world from their ignorance of the science of Botany. Dr. Grew's book very informing. His opinion of the use of the parts of Fruetification agrees with that of Linneus. Linneus's works best calculated to teach the science of Botany. 69, Linneus divided the Vegetable Kingdom into twenty-four Classes. Character of the first ten Classes. Names of the Numerical Classes taken from the number of Stamens or Males. 70, Useful to be acquainted with the scientific terms of Botany. 71, The translated System of Vegetables found difficult from not being properly studied. 72, Ten first Classes distinguished by their number only. 73, Eleven Stamens not found sufficiently constant to form a Class. Titles of the last three Numerical Classes would mislead if they were not explained. 74, Linneus aware of the defect in the titles. Distinctions of the class Icosandria and Polyandria necessary to be attended to. 75, Fruits belonging to Icosandria have their Calyx remaining when ripe, like a little crown on their summit. Great number of Stamens in the class Polyandria. 76, Classes easily understood, if a few only are studied at a time. Explanation of the Orders or first Subdivisions of the Numerical Classes founded on the number of Pistils. 77, A Flower cannot belong to any of the first thirteen Classes, unless it contain both Stamens and Pistils within the same cover. Essential Character of the Eleventh Class. Essential Character of the Twelfth and Thirteenth Classes. 78, Attention to minute circumstances in the position of the parts of Fruetification necessary in the study of Botany. 79, Character of

of the class Two-powers; contains two Orders. Distinguished by their Seeds being inclosed by a Vessel or not inclosed. Flowers of the different Orders not similar in their appearance. 80, Class Tetradynamia or Four-powers explained, a really natural Class; no exception to this, except the Genus Cléome. Divided into two orders from the form of the Seed-vessels. 81, A good deal of variety in the form of the Silicle. Two divisions of the Silicle Order. Seed-vessel of Lady Smock, a Silique. 82, Class Monadelphia or One-brotherhood explained; beauty of the position of the Stamens and Pistils of this class; peculiar structure of the Anthers. Stamens and Pistils of China Rose particularly beautiful. 83, Orders of the Class Monadelphia founded on the number of Stamens in each Flower. Class Diadelphia or Two-brotherhoods perfectly natural. Peculiar Structure of the Flowers belonging to it. Classic character difficult to be traced. 84, Genus Sophóra separated from the Two-brotherhood Class, from its Stamens being not united in two sets; the Orders founded on the number, only, of Stamens; each part of the Corol distinguished by different names. Shape, &c. of these parts of use in marking the Généra, particularly the Calyx. Legume belongs to the Diadelphia Class of Plants. 85, Distinction betwixt the Legume and Silique Seed-vessels. Class Polyadelphia, or Many-brotherhoods. St. John's Wort, a good Specimen of this Class. The Orders of Polyadelphia depend on the number of Anthers in each Flower. 86, Anthers and Stigmas the essential parts of the Stamens and Pistils. The Classics should be studied with the plates of their different characters, a few at a time.

DIALOGUE THE FOURTH. From Page 88 to 120.

Page 88, Nothing can be learnt without time and attention. 89, The Grasses too difficult for young botanists;

should be studied by themselves; best time of examining flowers, when their Stamens are ready to burst forth; number of Anthers not easily distinguished after they are arrived at maturity. 90, *Hippúris Vulgáris*, remarkable for the simplicity of its structure; its stalk cut across, a curious microscopic object; most difficulties may be overcome by attention; specimens of flowers belonging to different classes. 91, Deep divisions of the Stigma of *Crocus* make the order to which it should be referred doubtful to young botanists; its Fructification cannot be accurately examined without taking the root out of the earth. Stamens of *Plantágo*, (*Plaintain*) curiously folded within the Corol. 92, Chagrin at not learning without difficulty unjustifiable; proceeds from pride. Good humour to be valued before all other acquirements. Difficulty of investigating the Umbel-bearing Plants. The terminating Flower of the Umbel determines the class to which the Flower belongs. 93, Number of Stamens often varies in Flowers of the class *Pentandria*. More Flowers than one of the same Plant should be examined. Umbelled Plants not proper subjects to begin with. Large Flowers of simple construction should be first examined. 94, *Parsley* (*Apium*) belongs to the class *Pentandria*. Advantages derived from the art of gardening. Only two species of *Apium*. Celery procured from a species of *Apium* by cultivation. 95, Specimens of Plants belonging to different classes. Class *Enneándria* (nine Stamens) contains only six *Génera*. Only one British species of this class. 96, *Lychnis Dioica* puzzling to young botanists, being placed in the class Ten Stamens; a defect in the system. Obviated by being noted for its want of Pistils. *Lythrum* subject to vary in its number of Stamens; necessity of examining many Flowers of the same genus. 97, Examination of *Euphórbia* deferred till the *Génera* of Flowers are begun with. Marks of the twelfth and thirteenth Classes. Specimens of different Classes and Orders, not depending on the number of

of Stamens. Seed-vessel of Snap Dragon a Capsule ; 98, Cause of its peculiar appearance. Seed-vessel of Drába (Whitlow Grass) a Silicle. Seed-vessel of Hésperis (Purple Rocket) a Silique. Many Plants of the class Tetradynamia, Four-powers, eaten, some without cookery ; variety of eatable plants from the genus Bráslica. 99, Change produced in plants by the art of gardening an amusing part of the study of botany. Specimens of the class Monadelphia, One-brotherhood. Stamens firmly united at the base. Systematic character of the class Diadelphia, Two-brotherhoods, shewn in Lupine. Curious circumstance respecting the Pistil of common Broom. 100, Names of the different parts which compose a Papilionaceous Corol. 101, Specimen of the class Polyadelphia (Many-brotherhoods). Stamens of Hypéricum (St. John's Wort) beautiful ; the only British genus of the Polyadelphia class. The genus Cítrus, comprizes Orange, Lemon and Citron. Different appearance of their Stamens to those of Hypéricum. 102, Explanation of the class Syngénésia, or United Anthers, explained. Elasticity of the Filaments in the Flowers of this class ; consists of the Compound Flowers ; natural, if a few Génera be excepted ; this exception a fault in the system. 103, What constitutes a Compound Flower. Genéric character founded, in part, on the variety in the form of the Corol. The first four orders on the Stamen-bearing and Pistil-bearing Florets. 104, Mark of the fifth order. Sixth marked by the Corols being simple. Perhaps from that circumstance ought to have been separated from the class. Placed in it by their Anthers being united. Linneus does not pretend to make his classes natural. 105, Gratitude due to Linneus from all Botanists due also to his predecessors. Tournefort's system ingenious. Orders of the class United Anthers cannot be retained by the memory without examining flowers belonging to each. Scabious has the appearance of a Compound Flower ; 106, Belongs to the class Tetrándria, Four-stamens. Marked distinctions

tinctiōns between them. Scabious, a specimen of an Aggregate Flower. 107, Specimens of the orders of the class United Anthers should be studied according to their orders. 108, Florets of the fourth order having Stamens and Pistils not the only circumstance to be attended to. Having seeds or not, the essential character of the fourth order. Globe Thistle (*Echinops*) like net-work. 109, Difference in the Stigmas of Violet and Pansie. *Jasione* cannot belong to an order of Simple Flowers; its Anthers united only at the base; does not agree exactly with the characters of the Compound Flowers, nor of the Aggregate kind. 110, Curious circumstance of the Calyx of Compound Flowers. Ripeness of the seeds of Compound Flowers known by the white tuft protruded out of the Calyx before it expands. 111, Elegant forms of those Compound Flowers which have their seeds furnished with a Pappus. Extraordinary structure of the Flowers of the class *Gynándria*; its essential character. The Pistil must be first attended to. Contains nine orders, founded on the number of Stamens. First order natural. 112, Structure of the Fructification explained. Resemblance of the Flowers of the first order to insects; fanciful names given them. *Ophrys* genus contains several species resembling insects. Nectary, the principal feature in their different forms. 113, Bee *Ophrys* (*Cypripedium*) has its name from its resemblance to a slipper. Structure of the parts of Fructification of *Arum* differs from that of all other known plants. 114, Opinion of the younger Linneus respecting it. The fruit of *Arum* ripens about the close of summer. Plants growing commonly on the hedge-banks should be well understood. Explanation of the class *Monoecia*, or One-house. 115, Orders founded on the number, union, and situation of the Stamens. Eleven orders of the class One-house. Names by which they are distinguished. Essential character of the first twenty classes. Description of the true Nutmeg, *Myristica*, first given by Dr. Thunberg. 116,

Nutmeg used in cookery the seed of the plant. Mace the material by which the seed is enclosed within the outer husk. Class Dioecia, Two-houses, explained. Flowers of Vallisnéria thought to be a strong argument for the sensation of plants. Hemp, Cábnnabis, and Willow, Salix, belong to the class Two-houses; contains fifteen orders founded on the number, union, and situation of the Stamens. Contradictions in the system of Linneus; 117, A removal of its defects may be expected from the liberal spirit of the present age. Mistletoe, Viscum Album, a parasitical plant. Can be propagated only by one method; curious manner of the seed germinating. 118, Superstitious regard paid to it in the time of the Druids; believed of great efficacy in epileptic cases; not peculiar to the oak; disregarded now as a medicine; still hung up in our kitchens at Christmas.

DIALOGUE THE FIFTH. From Page 121 to 157.

Page 121, Explanation of the class Polygamia. Many plants of this class dispersed into the classes Monoecia and Dioecia. 122, Difficulty of ascertaining by what manner the Anther-dust of the Fig, Ficus Carica, was conveyed to the Stigmas of the Pistils. Fruit of the Fig a Receptacle enclosing the Stamens and Pistils. Fertilization of its seed supposed to be effected by the intervention of a Gnat. Process performed by it, termed Caprification; object of much attention to the inhabitants of those countries in which Figs make an article of trade. 123, Account of Caprification given by Mr. Milne. Objections against the necessity of Caprification. Receptacle of Figs gapes at top when the Stamens are mature, analagous, in this, to water plants. Air, an element apparently necessary to the process of fertilizing seeds. 124, Caprification esteemed by many authors a strong argument for the system of Linneus. First doubted of by
the

the author of the Botanical Garden : his conjecture concerning it. Apples wounded by worms ripen sooner than others which are not so. Fig-trees of Malta bear two crops in the same season ; last crop ripened by Caprification. Figs of Provence and Paris ripen sooner by being wounded with a straw. 125, Probable that the second crop of Figs in Malta ripens from being pierced. Fig-trees cultivated in England produce two crops ; latter crop pulled off by gardeners. Crop obtained by Caprification in Malta scanty, and not of good quality. 126, Opinions generally received must be opposed with modesty. The flowers of Fig to be looked for within the part which is eaten as fruit. Inside of a Fig beautiful. Anther-dust may be seen in the Figs cultivated in England, if opened when they gape at top. 127, Class Cryptogamia explained ; consists of four orders. The system of Linneus may have retarded a more distinct knowledge of this class. Definition of Ferns. 128, Leaf of Fern termed by Linneus a Frond. Curious mechanism of the seed of Ferns. Sago Powder made from the pith of a species of Fern. Vegetable Lamb, a species of Fern ; 129, Marvellous stories from want of proper investigation. Glove and Stocking Tree in Caffraria. Confusion arising from too great credulity ; facts should be reasoned upon before they are assented to. 130, Root of common Fern (*Pteris Aquilina*) used for bread in New Zealand. Bread made from a species of Fern in the Canary Islands. Second order of Cryptogamia contains the Mosses, Musci ; circumstances from which the Genera are marked. Their seeds have no Cotylédons. Linneus doubted whether what he termed the Anthers were really so. Dillenius the first who attempted the arrangement of the Mosses. Many curious circumstances belonging to the tribe of Mosses ; 131, Recover their verdure on being moistened, after having been long dried. Fructification of the Alga, Flags, too obscure to admit of precise arrangement ; two divisions of them. Terrestrial and Aquatic, their

their *Généra* distinguished by the outer structure. Many curious and useful Vegetables among the *Algæ*. Lichen *Rangiferinus*, or Rein Deer Lichen, its use to the inhabitants of northern climates. 132, Contemplation of the laws of nature instructs us not to be idle. Different species of Lichen used in dying. A species of *Ulva* used for food by the Japanese; 133, Some kinds used for pickles in England. Curious structure of some of the Aquatic *Algæ*. *Conferva Ægagróphila*, *Vagabunda*, and *Fucus Natans*, itinerant vegetables. *Byssus Flos-aquæ*, floats on the sea all day and sinks at night. 134, *Conferva Polymórpha*, lines upon it in the Botanic Garden; grows on the British shores. Last order of *Cryptogamia* consists of the *Funguses*, *Fungi*, divided by Linneus after the method of Dillenius. Method of Dillenius explained. Fungus tribe divided into ten *Généra*. *Funguses* produced from seed; their species constant; renewed by uniform laws little known of this part of the vegetable creation. Much attended to in these times. Mr. Curtis's investigations valuable on this subject. Mr. Sowerby's English Botany recommended. 136, Late discoveries of the production of animals may lead, by analogy, to the knowledge of the reproduction of vegetables. Curious facts of the *Polypi* genus; 137, Experiments of Monsieur Trembley. *Hydra*, the Linnean name of the *Polypi* genus. Reproduction of Plants from Strings and Suckers, similar to the encrease of *Polypi*. 138, Regularity essential to obtaining clear ideas of any subject. Information to be gained of the class *Cryptogamia* very small. Parts of Fructification not only to be considered. Experiments founded on analogy may lead to important discoveries. Small progress made from those which presupposed a Fructification. Beauty of the *Cryptogamia* Plants in winter; 139, Difficulty of preserving *Funguses* an impediment to the investigation of them; method of preserving them lately discovered. Mr. Bolton's plates and history of *Funguses*, with the drawings of other botanists,

botanists, must be studied by those who wish to acquire a knowledge of the Fungus tribe. 140, Star-jelly not a vegetable. Account of Star-jelly, Tremélla Nostoc, from the Botanic Garden. Extraordinary structure of Lycoperdon Forficatum. Gerrard's description of it. 141, His language prolix; too great diffuseness in the botanical descriptions of modern authors: Expressive conciseness of the System of Vegetables. Appendix of Linneus. 142, Plants contained in it arranged under the general head of Palms. Singular structure of these plants. Their leaves resemble those of Ferns. Termed Fronds; their Fruëification produced on a Spadix. Terms Spathe and Spadix originally applied to Palms only, now used for other plants, whose flowers are protruded from a Sheath. Cocoa-nut, Cocos Nucifera, and Date-tree, Phœnix Dactylifera, Palms. Anther-dust of Date-tree, and Pistácia, said to retain its virtues more than a year. Great height of Corypha Umbraculifera. 143, Erroneously named Cabbage-tree. True Cabbage Palm, *Aréca Oleracea*, 144, Used by the inhabitants of the West Indies as a rarity; sent pickled to Europe as such. Cutting away the Cabbage-shoot destroys the tree. 145, Cabbage obtained from most of the Palms. Breadfruit-tree, Artocárpus Communis, of Forster. Has born fruit in Jamaica. Disappointment of Dr. Thunberg, in his attempt twenty years ago, to bring Breadfruit-trees from Ceylon into Europe. 146, The fruit made use of, by the rich inhabitants of Ceylon, in a more luxurious manner than by the natives of Otaheitee. Fifteen different dishes prepared from it in Ceylon. The fruit of extensive benefit to the poor. Make use of it as the poor of England do of potatoes. Two kinds found in Ceylon; the least sort without seeds, the larger produce great numbers of seeds; size of the seeds; 147, Several varieties of the Artocárpus in the South-Sea isles, all without seeds; this deficiency attributed by Mr. Foster to the effects of cultivation. The Bread-fruit-tree of Ceylon supposed to be of the same genus with that of

Otaheitee. 147, Seeds of the Bread-fruit of great value; eaten by the rich; prepared in different ways; eaten plain roasted by the poor; simple manner in which the Bread-fruit is used by the poor inhabitants of Ceylon. 148, The trees flourish whole centuries; bear fruit on their Stems. The fruit used for food in three different states of maturity; when quite ripe eaten in its fresh state. Plantain-tree, *Musa Paradisiaca*, and Bânanâ, *Musa Sapientum*, called Bread-trees in the West Indies. Cultivated in Jamaica for the use of the negroes; found in the South-Sea isles. Banana loses its seeds by cultivation. 149, Leaves of Banana made use of for shade in warm climates. Cocoa-nut-tree deserves a place in the first rank amongst the vegetables which are useful to mankind. Leaves of *Borassus Flabelliformis*, and *Licuâla Spinosa*, used by the inhabitants of Ceylon, in the state in which they grow, for writing upon. Ingenious method of writing upon them; books made of them. Leaves of *Licuâla* used for umbrellas; six persons may be sheltered by one of their leaves. 150, Extensive use of the vegetable kingdom to mankind. Great advantage derived to the human species from the knowledge of fire and tools. Ignorance of the Otaheiteans of the properties of fire. Knowledge of fire introduced the use of tools of iron; peculiar advantage of such tools. 151, Many vegetables rendered eatable by the use of fire. Savage life not to be preferred to civilized. Faculties given to man that he may use them; 152, Benefit to society from the exertion of them. A life really savage must be distinguished from what is commonly called so. Dr. Franklin's essay on that subject. 153, Man derives his superiority over brutes from laws. The greater portion of voluntary power possessed by mankind one of their chief distinctions; the more such power is exerted the more they rise above the brute creation. Digressing from the subject under consideration to one that arises out of it teaches to think. A blacksmith's shop shews the use of the knowledge of fire. 154, Children should be

led to reflect on causes of the effects which are daily presented to their view. Iron, a vegetable production; may be found in plants by a loadstone. Happiness may be increased by knowledge. Writing-paper produced from flax; blotting-paper from wool. 155, Ingenuity of man could not extend far without the knowledge of fire and iron. Iron more valuable than other metals from its hardness. Superiority of the European world over that of America thought to arise from the use of iron. Eagerness of the American nations to obtain iron tools from the Europeans. Natural orders, attempted by Linneus, placed at the end of the *Génera Plantarum*. 156, Natural method attempted by many botanists not without success. Merit of artificial systems generally allowed. Opinion of Linneus concerning natural systems. Fifty-eight natural orders of Linneus. These orders well explained in Mr. Milne's *Botanical Dictionary*. 157, Artificial system must first be learnt. Order in which a young botanist ought to proceed.

ANALYSIS OF THE SECOND PART.

DIALOGUE THE FIRST. From page 160 to 189.

PAGE 160, By teaching others we learn ourselves. Génera of Plants, the third division of the system; the term Genus explained; well compared to a family. Botanical Alphabet of Linneus. The different Receptacles, or Alphabetical Marks; necessary to be understood before Compound Flowers can be read. Receptacle of the Fructification explained. 162, Receptacle of the Flower, and of the Fruit explained; made use of in the Génera Plantarum; only when it forms a character of the Genus. Botanical Alphabet, or 26 marks, taken from the parts of Fructification. Essential characters. 163, Généric character of Hippúris. 164, Language of Linneus excellent from its conciseness. Terms *Two-cleft* and *Above* explained. Permanent, as applied to the parts of Fructification, explained. Généric characters of Canna. 166, Length of the Généric descriptions confusing. Curious position of the Anther and Style of Canna. Généric descriptions of the Génera Plantarum compared with the Généric descriptions of the System of Vegetables. Method of studying the System of Vegetables. 167, Difficulties in the study of it explained. 168, Method of Studying the System of Vegetables continued. Only two species of Hippúris. 169, System of Vegetables preferable to the Génera Plantarum for a young botanist. Fuller descriptions of the Génera Plantarum useful. Peculiarities of difficult Plants noted in the Génera Plantarum. Species Plantarum; a translation of it would be useful. Excellence

of the System of Vegetables. 170, The Lichfield translation of the System of Vegetables invaluable to English botanists. Method of investigating a Plant; the whole of the description should be attended to. 171, Reference of a Plant to its Genus, not difficult. *Lonicéra*, Woodbine, referred to its Genus. 172, Specific divisions explained. Remarks in the *Génera Plantárum*, after the généric characters of *Lonicéra*, of use in distinguishing the species. Flowers of the most simple construction ought first to be studied. The tube of *Crocus* deeply covered by the earth. *Crocus* described. 173, *Crocus* Genus distinctly marked by its convolute Stigmas. Term *Six-petal-like* explained. Seed-vessel of *Crocus* rises out of the ground as the other parts of Fructification begin to decay. Corol of *Iris* dissected. The Stigma of *Iris* best seen by taking off the six-petalled Corol. The Genus distinctly marked by the Stigma. 174, Beautiful structure of the *Iris*. Fringe, on the Petals, the Nectary. Some species destitute of the Fringe. Their Nectaries, three external dots at the base of the Flower. Variation of the form of the Capsule in different species. Useful observations in the *Génera Plantárum* on the *Iris*. The *Génera* placed in order, according to their affinity. Colour, smell and taste of Plants too variable to enter into their généric or specific characters. 175, Variable marks of Plants noted in the *Species Plantárum*; such marks useful. Nectaries of great importance in the discrimination of the *généra*. The part now termed Nectary had not a name before the time of *Linneus*. Various forms of the Nectary necessary to be well understood when the *Génera* are investigated. 176, *Althæa Officinális* referred to its Genus, in the System of Vegetables. Arils, nice order of the seeds round the Receptacle. System of Vegetables not difficult when the method of studying it is understood. 177, Minute distinctions in the *Génera* of the class *Diadelphia*. *Geránium* Genus investigated. First description of *Geránium* not just; second very exact. Seeds,

Arilled,

Arilled. English name of Crane's Bill, from the long threads to which the seeds are attached: 178, Seeds dispersed by the twisting of these threads. Linneus's subdivisions of *Geranium* perplexing. L'Heritier's new arrangement of the *Geranium* Genus. *Geranium* Genus, perhaps improperly placed in the Monadelphia class. 179, Horseshoe *Geranium* a *Pelargonium*. Botanical names soon become equally familiar with common ones. Four species of British *Geranium* ought to be arranged under the Genus *Eródium* of L'Heritier. Artichoke dissected. 180, Dissection of the Artichoke continued. Pappus of the seed beautiful. Receptacle and base of the leaves, the parts eaten. Botanical names of Artichoke, *Cynara Scólymus*. 181, Dandelion, *Leóntodon*, dissected. Receptacle, the prime mark of the first division of the first order of the class *Syngénesia*. Receptacle of *Leóntodon* not covered with down or chaff. The Calyx marks the Genus of *Leóntodon*. Hairy and plumy Pappus, how distinguished. The Pappus of great use in discriminating the *Génera* of class *Syngénesia*; should be perfectly dry when examined. 182, Linneus saw all the parts of flowers without the assistance of glasses. *Leóntodon Taráxacum*, Dandelion, differs from the rest of the Genus in its Pappus. This difference not sufficient to separate it from the Genus. The variety in its Pappus noted by Linneus, in the *Génera Plantárum*. 183, Many *Génera* of the Compound Flowers more easy to distinguish than the *Cynara* and *Leóntodon*. Excellence of the Linnean method, shewn in the minute and decided distinctions of the *Génera*. Constant marks discovered by Mr. Curtis in the *Génera* of class *Syngénesia*. Curious mechanism of the Calyx of *Onopórdon Acáanthium*. Differs from the Calyx of most Compound Flowers. 184, Smaller flowers of the compound kind difficult to investigate; must be proceeded with in regular order. Method of investigating the Umbelled Plants. Anthers of Umbelled Plants drop off when they arrive at maturity.

185, Explanation of the terms Flosculous and Fertile, Radiate and Abortive. The particle *Sub*, as used in botany, explained. Genera of Umbelled Plants frequently marked by the form of their seeds. 186, Flowers and seeds generally found at the same time on Umbelled Plants. Term Egged explained. System of Vegetables not difficult to understand. Subdivisions marked by the Involúeres. Scandix investigated. 187, Terms Disk and Ray explained. Specific name of Scandix; *Pecten* taken from the long beak of its seeds. Gentianella and Centaury dissected. Method of finding the number of Cells in a Capsule. Distinction between a *Valve* and a *Cell*. 188, Form of the Corol of Gentiana; varies in different species. Gentianella and Centaury not alike in their structure. Peculiar structure of some species of Gentiana. Centaury removed, by Mr. Curtis, to the Genus Chirónia. The authority of Mr. Curtis truly respectable.

DIALOGUE THE SECOND. From page 190 to 218.

Page 190, Genus Prunella distinctly marked by the two-forked Filaments. 191, Extraordinary appearance of the Stamens of Houseleek explained, by Mr. Curtis. Advantage of examining flowers in different states of maturity. 192, Distinction betwixt Sempervivum and Sedum. Genus Euphorbia accurately described by Mr. Curtis. Linnean characters of Euphorbia defective. 193, Investigation of Euphorbia, on the Linnean principles, extremely difficult; a distinct idea may be attained of the Genus by the dissection of some of the larger species. The part, called by Linneus, the Corol, Mr. Curtis names the Nectary. Singular appendage of the Seeds of Euphorbia; the use of this appendage not yet discovered; taken notice of by Mr. Curtis. Great benefit derived by the botanical world from the labours of Mr. Curtis. Essential characters of many Génera discovered

by him. 194, Genus *Euphórbia* distinguished by its milky juice and outer habits. Curious structure of its fructification. Many beauties in plants lost to superficial observers. Class *Polygámia*, peculiar structure of the Filaments of *Paríetaria Officinális*. Curious manner in which the Anthers disperse their dust. 195, Minuteness of the fructification of *Centúnculus*. Corol of *Centúnculus* opens only when strongly shone upon by the sun. 196, Corol permanent, contrary to most other wheel-form Corols; the Genus marked by its round Capsules seated in the bosom of its leaves. Nectaries of particular consequence in *Passion Flower*, *Arum*, and *Orchis*. 197, Definition of the term Nectary. Honey profuse in the flowers of *Arbutus Unédo*; found at the base of the petals of *Papilionaceous* flowers. Clover contains much honey. Chief distinctions of those Nectaries, which adhere to the parts of fructification. Nectary of *Fritillária*, most obvious in the Species *Imperiális*, *Crown-imperial*. 198, Different kinds of Nectary. Nectary, the term applied by Linneus, to every singularity of fructification, which cannot be reduced under the seven regular parts of a flower. 199, Nectary, as a separate appendage, not found in all flowers. All flowers believed, by Linneus, to contain honey. Nectaries distinguished, by Linneus, into two kinds. The tube of the Florets of Compound Flowers contains honey. Nectary only noticed by Linneus when it characterizes a Genus. 200, The tube of one-petalled flowers termed, by Linneus, a true Nectary; he calls the stamens of *Fraxinella*, Nectar-bearing. Resinous matter on the filaments not of the nature of honey; similar to that with which the stalks abound; reason why the stalks remain unburnt, when the resinous substance which covers them is set fire to. 201, Nectaries placed apart from the fructification; the structure of them merits the strictest attention. Nectaries of *Columbine* resemble the parts of a bird. Beauty of the Nectaries of *Helléborus* and *Parnássia*; Globules not the

true Nectaries. 202, The base of the petals of Pink^s sweetish. The base of the Calyx replete with honey. Difficult to determine by what part of fructification the honey is secreted. Fanciful structure of the flower of Monk's-hood. 203, Beautiful structure of the Nectary of Mignonette, Quick motion of bees in their search for honey; industry of bees. 204, Economy and laws of bees generally taken notice of; equalled, or surpassed, by those of other insects. The economy of insects imperfectly understood; their ingenuity not the result of instinct. Nice sense of touch of some insects gives them the superiority of ingenuity over other species. Spider pre-eminently ingenious. 205, The silky material within the body of a spider enables her to migrate from place to place; her web formed from it; curious structure of her web; resembles the rigging of ships; the spider counterfeits death, when frightened. 206, Want of thought equally pernicious with deliberate cruelty. Study of natural history humanizes the mind. The strength of the spider's web well adapted to the prey, which it is intended to entrap. 207, Spider, in Jamaica, forms herself a house underground; curious account of this house. Section on instinct, in *Zoonomia*, contains much agreeable information on the economy of animals. 208, Materials of childrens books not well arranged. Mr. Galton's natural history of birds composed in an excellent manner. 209, Reading methodically necessary to forming memory in children. Dissection of Passion-flower. 210, Nectaries form the principal feature in the Genus *Passiflora*; in some species resemble a bead-basket. Linnean description of *Passiflora* not just. 211, Difficulty of attaining a distinct idea of the *Gynándria* class. Extraordinary structure of fructification peculiar to the *Orchis* tribe. *Orchis* flower dissected. Twisted germ of *Orchis*; curious structure of the stamens, and the cases by which they are contained; may be drawn out of their cases by the most gentle touch. 212,

Globule at the base of each stamen difficult to be seen in the natural size of the flower. The Globules and Anthers shewn in the plate. Anthers composed of Corpuscles; same effect, probably, produced by them as by Anther-dust. Seed of Orchis apparently perfect. 213, Smallness of seed no argument against its vegetating. Ferns propagated from seed, Orchises not yet decidedly so; encrease sparingly by the root. Patience and impartiality requisite to make experiments. 214, Very young persons not equal to making experiments. Early purple Orchis obviously distinguished by its spotted leaves, and brilliant flowers. 215, Orchis Morio appears under many varieties; marked through all its varieties by the green lines on the two outermost petals, Anthers green. Ten distinct species of British Orchis. Different Génera of the Orchis-like plants distinguished by their Nectaries. 216, Bee-orchis an Ophrys. Characters of the Ophrys Genus should be examined with magnified drawings. Different structure of Orchis and Ophrys. The character of several species taken from the Nectary. Leaves of Ophrys Apífera, and Ováta, differ materially from the leaves of the Orchis Genus. Roots of Ophrys Apífera resemble those of Orchis. Roots of Ophrys Ováta fibrous. 217, Supposed error in the character of the seed-vessels of Orchis, Satyrium, Ophrys, and Serápias. Beauty may be found in all flowers, and in all the works of Nature. Advantages to be derived from reflection. 218, Happiness encreased to ourselves and others by the exertion of thought. Flowers of Arum have an offensive smell in a short time after they have been gathered.

DIALOGUE THE THIRD. From Page 219 to 241.

Page 219, Arum subject to great variety. Colour of the club-form receptacle of Arum may depend on its different

degrees of maturity. Arum, a plant of extraordinary structure. Nature not limited in her modes of re-production. 220, Singular situation of the stamens of Arum, respecting the Pistil. Stamens a collection of Anthers only. Nectaries of Arum. Seeds of Arum. Opinion of the younger Linneus of the classic character of Arum. 221, Roots of common Arum extremely acrid; eaten by thrushes; the roots of some species made use of as food; the leaves of some species boiled and eaten. Starch made from the roots of Arum Maculatum; injurious to the hands which use it. 222, All parts of the plant acrid. Dangerous consequence of tasting plants, the qualities of which are unknown to us. Mercurialis Perennis, a good specimen of the class Two-houses. Description of the flower of Mercurialis. Hydrócharis easily referred to its Genus. 223, The leaves and whole structure of Hydrócharis exceedingly curious. Singularities of the stamens explained. Nectaries observed, by Mr. Curtis, on the pistil, not noticed by Linneus. 224, Spathes of the flowers of Hydrócharis appear full of bubbles. Mr. Curtis's account of Hydrócharis differs from that of Linneus. Flowers of Typha, or Cat's-tail, difficult of investigation. Mr. Curtis does not wholly agree, in his account of them, with Linneus. Mr. Curtis's account to be relied on. 225, Flowers of Typha described. Supposed calyx, of Linneus, hairs which cover the receptacle after the stamens are fallen off. Spikes of flowers Aments, or Catkins. Cylindric form of the spikes marks the Genus Typha. Culm, the Linnean term for the straw of Grasses. Difference of position of the male and female flowers on the Culm. Magnificent appearance of the flowers of Typha Major; every part of the plant worthy of attention. 226, Species of Carex not easily distinguished from each other. Carex Pédula distinctly marked by the long pendant Aments of its flowers. The Catkin tribe of flowers merits attentive examination; manner of investigating Ament-bearing plants. 227, Cryptogamia

togámia class. Brown spots on the under side of the leaves of Fern, a most important part of the plant. Plants of the Fern-tribe wonderfully constructed. Stamens and pistils not yet discovered in the Cryptogamian class. Meaning of the term Fructification, as applied to the plants of Cryptogamia. The Fílices, or Ferns, divided into three sections, by the disposition of their fructifications. Radical fructification explained, well seen in Pilulária. 228, Hedwig's botanical researches, in class Cryptogamia, of great importance. Equisétum Sylvaticum, a good specimen of the spiked fructification of Ferns. Extraordinary appearance of the supposed seeds of Equisétum; magnified, draws a great assistance in the investigation of obscure plants. Plates not wholly to be relied on. Little progress made in any study by those who rely on the authority of others. 229, Diffidence proper in young persons. Method of study recommended to them. 'The rule, 'See for yourself,' to be observed in all studies; Mr. Curtis's works rendered valuable by the observance of this rule. 230, Inconvenience arising from reliance upon authority. Candid correction of the few errors of Linneus, of essential service to the botanical world. Questions, properly asked, not impertinent. Account of the progress of Equisétum. 231, Greenish powdery mass shook from the spike. Particles of powder appear regular formed bodies, viewed in the microscope; account of their form. Regular organization of the parts of plants. Curious appearance of the powder shook from the spikes of Equisétum. Hedwig's opinion of this powder; circumstance in favour of his opinion. Scales of the protruded spike of Equisétum, protected the spikes before protrusion. 233, Knowledge of the fructification of Equisétum leads to the knowledge of the fructification of other spiked Ferns. Leafy fructification; beauty of the maiden hair. The parts of fructification too minute for the investigation of young botanists. The larger size of Hart's-tongue, shews the fructification distinctly.

234, Fructification described; wonderful mechanism of the seeds, with their apparatus. Benevolence of nature in all her works. Mechanism of the capsules of Fern. 235, Seeds produced by a plant prove that it possessed other parts of fructification. Difficulty of viewing the capsules of Fern through a microscope. Capsules opened by the warmth of the breath. 236, Have the appearance of being alive; dextrous management, and patience required in viewing them. Arts by which instructors of youth may induce their pupils to attend to their studies. Polypódium Vulgare. 237, Root of Polypódium Vulgare resembles the large kind of caterpillars. Error in the description of Polypódium Vulgare by eminent botanists; ascribed by Mr. Curtis to too great deference to authority. Error of Tournefort in delineating the capsules of the Polypódium Genus without rings; one of the many instances of the fallacy of authority. 238, Polypódium Vulgare appears destitute of the membrane by which the capsules of all the other species are enclosed. The Fern tribe opens an ample field of discovery to modern botanists. Education of women should not be superficial; public distinction not advantageous to women. 239, Improvement of the world favourable to the exertion of female talents. Domestic occupations the peculiar province of women; best fulfilled by women whose understandings have been cultivated; liberal education of females distinguishes them, at present, above their companions; liable, from such distinction, to render them vain; danger of vanity decreased by liberal education becoming general. 240, Practice can alone make us acquainted with the different Génera of Ferns. Similarity of their fructifications. Capsules variously placed on the fronds; precise générique character not easily attained. Plates and remarks of Mr. Curtis, in his London Flora, particularly useful in the study of Ferns. 241, Roots of Osmúnda Spicant resemble the large kind
of

of caterpillars. Ferns ornamental in all situations, Groups of Cryptogamia plants beautiful in winter.

DIALOGUE THE FOURTH. From Page 242 to 283.

Page 242, Mosses, a tribe of plants little understood; beauty and use of Mosses. The opinion that they impoverish the ground on which they grow, erroneous. Roots of Mosses penetrate little way into the earth. 243, Fuel, called Peat, formed from the roots of Moss. Peat-fuel not, exclusively, derived from Moss. Whole trees enter into the composition of a Peat-bed. Moss retains moisture a long time, without becoming putrid; its use to gardeners. 244, The distinct fructifications of Mosses well established since the time of Linneus; their situation not yet determined. A revision of the works of Linneus desirable. Class Cryptogamia improved since his time. Généra of Mosses distinguished by their outer habits, and situation of their capsules. Resemblance of Mosses to the Pine tribe; slowness of their growth. 245, Difference in the leaves of Mosses. Male and female flowers placed separately. Calyx, termed by Linneus Calyptré. From the presence or absence of the Calyptré Linneus has distinguished the Généra. Opérculum of Mosses, a curious microscopic object; should be examined with magnified drawings. The most beautiful objects of nature viewed with indifference when not understood. 246, Parts of the fructification of Mosses may be seen, in an early state, with the assistance of glasses. Hedwig's discovery of the difference betwixt the leaves of the plant, and those which form the fructification buds; esteems the bud-leaves true involúcrés; encrease in size as the capsules grow towards maturity. Hedwig's researches promise great information on the subject of Mosses. His researches not of much use to young botanists. Mr. Curtis's figures and descriptions

scriptions accurate and plain. Mr. Curtis does not venture to decide whether the powder contained in the capsules of Mosses is anther-dust or seed. Hedwig asserts that the capsules are true seed vessels. 248, Young plants raised from the capsules of Mosses, by Hedwig; sowed, by Dillenius, without success. Cause from whence these different results of the same experiment may arise. The parts of the supposed fructification must be well understood before we reason upon their use. Description of Curled Bryum. Hedwig's observation upon the expansion and contraction of the fringe of the capsule in dry and moist air; closes, even from the moisture of the breath. 249, Curious mechanism of the capsule of Mosses; contents of the capsule protected by the fringe found under the Calyptræ. Calyptræ of Bryum Undulatum described. Mechanism of the supposed fructifications of Mosses and Ferns equally curious; both seem formed for the protection and dispersion of their seeds; the manner in which the seed is produced unknown, unless Hedwig's researches may be relied on. 250, Magnified leaf of Bryum Undulatum shews its undulated edges. Bryum Undulatum produces its capsules from November to February; situations in which it is found. The leaves curl up soon after the plant is gathered; method of examining the plant. Bryum Hornum placed by Linneus among the Mniums; distinguishable from Undulatum by its bending peduncles. 251, Star-like appearance on Mosses supposed, by some authors, to be the pistil-bearing parts of fructification. Various opinions respecting these stars; conjecture respecting these stars. An outline of the opinions of eminent botanists on the class Cryptogamia should be given to botanical pupils; admits only of conjecture. 252, Hedwig's opinions must be justified by experiments before they are fully assented to. Investigation of the Cryptogamia class impeded, perhaps, by too strict adherence to the enquiry after reproduction from seed. May not the supposed seeds of Mosses be bulbous

progeny? *Bryum Hornum* produces capsules from February to March. Peculiar appearance of the capsules of *Bryum Trunculatum*. 253, One of the least of the Mosses, distinguishable by its great number of little brown capsules, from September to February. *Bryum Trunculatum* and *Viridulum* known from each other by the form of their capsules. A knowledge of the outer habit and structure of Mosses should be attained by botanical students. 254, Regular experiments can alone lead to discoveries of importance. *Hypnum* and *Bryum* Génera distinguished, by Linneus, from the situation of their peduncles. The part, termed Anthers by Linneus, now known by the name of capsule. Singular structure of the leaves of *Hypnum Proliferum*, found by Linneus under the shade of thick woods. 255, Rare appearance of fructification in *Hypnum Proliferum*. Time of fructifying, from December to February. Structure of capsules nearly the same in all the Mosses. Peculiarities, discovered by Mr. Curtis, in the capsules of *Bryum Subulatum* and *Polytrichum Subrotundum*. The use of these peculiarities not understood. 256, Great nicety requisite in making experiments. 257, Curious and beautiful structure of the capsules of *Polytrichum Subrotundum* discovered to be a constant mark of the Genus. Structure of the capsules described. 258, A cheap publication of the figures of the plants of class Cryptogamia, with descriptions of them, given by Mr. Curtis, would be a work of extensive benefit to the botanical world; his London Flora too expensive for general use. 259, *Polytrichum Pilosum* made use of for beds, by the inhabitants of Lapland; curious method of preparing these beds. 260, Reflections on the wants of others, should render those who are placed in happier situations, contented and cheerful under slight inconveniences. *Algæ*, or Flags, not treated of by Mr. Curtis. The root, stem, and leaf of *Algæ* scarcely admit of distinction. 261, Destitute of obvious flowers; manner of distinguishing the Génera. *Algæ* of great importance

portance in the economy of Nature; vegetate upon the barest rocks. Lichen *Pascalis* found by Dr. Smith on a torrent of hardened lava; peculiarly fitted for the beginning of vegetation on a hard surface. Thread-form Lichens insinuate their roots into crevices of the barks of trees. Crustaceous kinds vegetate on smooth surfaces. 262, Process of Nature in forming vegetable mould apparent upon the smooth and barren rocks upon the sea-shore; account of the process. Lichens made use of in dying; fed upon by goats and rein-deer. 263, Cup-moss, a Lichen. Numerous species of Lichen difficult to distinguish. Hedwig's investigations of them; his opinion of their parts of fructification. Fringes from Lichen *Céliaris* put forth roots; distinct from the supposed parts of fructification. Hedwig's plates of the *Algæ* tribe. *Algæ* not well understood. Sea-wrack, a *Fucus*. 264, Prolific property of the leaves of *Fucus Vesiculosus*. Black hair-like tufts found growing upon *Fucus*, a *Conferva*. Some species of *Fucus*, perhaps not true vegetables. Sea-anemone falsely esteemed a vegetable. Green films on water and on trees not thoroughly understood. Class *Cryptogamia* requires new arrangement. 265, *Génera* of the third order distinguished by no obvious common character; peculiarities of them worth attending to. Beauty of the Lichens. White Moss, on heaths, Rein-deer Lichen; many varieties of it; distinction between them and the true species. 266, Moss on trees a Lichen. Lichens, Mosses, Ferns, and Funguses, form a complete winter garden. Funguses easily distinguished from each other by the attentive study of good plates. Generality of Funguses not offensive either to the smell or taste. Much information gained, concerning them, within the last twenty years; not yet perfectly understood. 267, Hedwig's researches into the *Fungi* tribe, supposed, by him, to possess stamens and pistils. Curtain of Funguses, not found in every species. Curtain described. Hedwig's account of the supposed pistils. 268, Seeds of *Fungi*. Globules uniformly found

found in the *Génera* *Agáricus* and *Bolétus* believed, by Hedwig, to be stamens. A distinct knowledge of plants which present themselves daily to our eyes, agreeable to attain. 269, Parts which can be seen only with powerful magnifiers cannot be used for the distinction of *Génera*. Excellence of generic characters to be obvious and clear. Fungi continue their species by a powder which is visible in the gills of many of them, generally allowed to be seed. Short continuance of some of the *Agáric* species. Investigation of an *Agáric*. Genus *Agáricus* described; three first divisions of the Genus founded on the position of the stipes. 170, Distinction betwixt the *Volve* and *Curtain*, explained by Mr. Bolton. Erroneous account of the *Volvé*, by Linneus. Under the *Curtain* of Fungi the parts of fructification found, by Hedwig. Ring of *Funguses* formed from the remnants of the *Curtain*. Ring uncertain in its appearance; cannot be used for a permanent mark. Stem of *Agáricus* either solid or hollow; varies much in its degrees of solidity. 271, Colour of the gills varies in different species; vary much in their respective lengths. Seeds formed between the membranes of the gills. Situation of the gills. Peculiarity of structure discovered, by Mr. Curtis, in the gills of *Agáricus Ovátus*; use of that structure. 272, Secondary subdivisions of the *Agárics*, on what founded. Gills a part of great importance; various appearance of the gills; colour of the gills not liable to vary. Character of the species taken from the colour and structure of the gills. Colour changes when the plant begins to decay; colour must be observed in their first state of expansion; colour of the flat side of the gills, that which must be attended to. 273, Hat of the *Agárics*, the part least to be depended on. Viscous juice of the hat depends on the state of the atmosphere. Acrid juice in *Agárics*, not constant. 274, Structure of *Agáricus* nearly the same as that of the other Fungi *Génera*. Dr. Withering's arrangement of the Fungi. Exception to the uniformity of colour

in the gills; in *Angáricus Aurántius*. Beautiful colours of the *Agárics*. *Agaricus Cæsareus* the most splendid of the *Agárics*; a rare plant in Britain, common in Italy. 275, *Agáricus Campéstris*, the fungus most commonly eaten in England; method of propagating it. Caprice of mankind in their choice and rejection of food. All kinds of fungi used for food by the Russians. 276, Doubtful whether the common mushroom be poisonous, if properly prepared. Many vegetables rendered wholesome by fire. Necessitous situation of the inhabitants of northern climates. 277, Make use of the inner bark of the *Pinus Sylvéstris* for food. Method of preparing it for bread. Swine fattened upon pine-bark bread. Advantages derived from the knowledge of the properties of fire. 278, Pride and folly of considering the creation for the use of man only, numerous tribes of insects sustained by the Fungi. Extensive use of the *Pínus Sylvéstris*. Scotch fir; roots of Scotch fir used in the Scotch Highlands for candles. 279, Ropes made by fishermen of the inner bark. *Pínus Sylvéstris* the only species of fir which grows naturally in Scotland. Oil extracted from the cones of Scotch fir; lives to a great age; profuse in Anther-dust. Powder which flies from puff-ball, believed to be the seeds. 280, Appearance of this powder when viewed through a microscope. Puff-ball, the *Lycopérdon Bovista* of some Authors. Species of Fungi not distinctly understood. Truffle and Morel, different species of Fungi. Truffles, *Tuber Cibaria*, grow underground; dogs taught to hunt them; dug up by pigs in Italy. 281, Mould a regular plant; its parts distinctly seen through a microscope. Thirteen different species of the *Múcor* Genus. 282, Golden *Múcor*, stains the fingers yellow, when touched; commonly found on the Genus *Bolétus*; repels moisture. The history of the plants of *Cryptogamia* interesting. The knowledge of Grasses an important branch of the science of botany. 283, Farming, a useful pursuit to a gentleman, as it employs himself and the poor.

DIALOGUE THE FIFTH. From Page 284 to 307.

Page 284, The knowledge of the outer habits of the Cryptogamia plants sufficient for young botanists. Investigation of the *Génera* made easy by plates of low price. 285, Lichen *Candelarius*, Golden Lichen, well figured by Sowerby; his numbers of British plants a useful and agreeable publication. 'The Grass tribe requires a particular mode of investigation. 286, Without energy nothing can be learnt. Vague idea conveyed by the vulgar term Grass. 287, Grasses imperfectly understood until late years. Names by which they have been distinguished not in general use; subject greatly elucidated by Mr. Curtis; his practical observations on British Grasses; useful knowledge to be acquired from that work. 288, Grasses form one of the natural orders of Linneus. Corn arranged under the same order. Similarity in the parts of fructification of Grasses. Striking agreement in their outer habits. Whole class characterized by simplicity of structure. 289, Seed of Grass does not divide into lobes when it germinates; termed, by Linneus, One-cotylédoned; the husk of the seed may be seen adhering to the fibres of the young plants of wheat. 290, Peculiarities of Grasses shewn in *Alopecurus Pratense*, Meadow Fox-tail; better seen in the plant than in plates. London Flora amusing and informing on Grasses. Leaves and sheaths of Grasses often furnished with bristles. Specific characters taken from the presence or absence of bristles. Parts of fructification not noticed by common observers. 291, Beauty and structure of those parts worthy of the highest admiration. Natural character of the flower of Grasses. *Arista* of Grasses. Awn of barley particularly strong; not constant in every species. Corol of Grasses termed *glume*. 292, Divisions of the outer glume often mark the Genus. Difficulty of distinguishing the calyx from the corol. Botanic terms ought to be made use of. Calyx and corol to be understood

according to the definition of Linneus. Necessary of Grasses distinctly shewn in Mr. Curtis's plates; not difficult to be seen in the natural flower. 293, May be seen at the base of the germ in wall barley; nearly resembles the corol; furnishes no generic distinction. Three stamens, the number commonly found in Grasses. Two pistils. Exceptions to this number. Styles beautiful; seen with advantage through a microscope. 294, Close spiked Grasses do not shew their fructification well. Seen well in feather-grass. Should be examined before the Anthers have discharged their dust. The flowers of Grasses have no seed vessels. Seeds emitted from the calyx in various ways. Seeds of feather-grass dispersed by the twisting of their awns. Receptacle of Grasses. The stem lengthened out. Awns of feather-grass twist after they have been gathered. 295, Spikes of quake-grass ornamental in dress; derives its name of quake-grass from the tremulous motion of its peduncles. The parts of fructification obvious in quake-grass. Briza Máxima. 296, Wilful ignorance the only kind of which we ought to be ashamed. Characters of fructification nearly constant in Grasses of the Triandria class. Strict adherence of Linneus to the classic character of Grasses. 297, Hólcus Lanátus placed in the class Polygamia. Greatness of the works of Linneus a just excuse for the few errors contained in them. Variation of the number of stamens not uncommon in several species of Grass; inconstant in their variation. Strict adherence to the classic character perhaps advantageous in an arbitrary system. 298, Anthoxáanthum judiciously placed in the class Diándria from its constant number of two-stamens. No other Grass found with two-stamens. Named vernal-grass, from its early appearance in the spring. Much esteemed by farmers. 299, Experiment makers in agriculture should associate with sensible practical farmers. Fragrant scent of hay derived from the leaves of Anthoxáanthum; not the only English Grass which is fragrant. Flowers of annual Póa said to be

so by Mr. Swayne. 300, *Anthoxanthum*, viviparous, many Alpine Grasses viviparous. Canary birds fed on the seeds of *Phalaris Canariensis*. Ribbon-grass, a species of *Phalaris*. Genus *Avéna*, marked by the twisted awn on the back of the corol. Motion of *Avéna Fatua*, 301, Named Animated Oat. Curious circumstance respecting the seed of barley; may be said to walk. Automaton ingeniously made on the principles of the awn of barley. 302, Merit of experiments depends on their usefulness. Makers of experiments not sufficiently respected. Mankind first fed upon corn by the invention of Ceres; deified by the Egyptians on that account. 303, Heathen deities often derived from mortals, from whose discoveries mankind had received benefit. Osyris the inventor of the plough. Straw of oat the first musical instrument. Objects familiar to us not sufficiently reflected upon. Inventors of useful arts have only a secondary claim to gratitude. Beneficence of God shewn in the products of various climates. Wheat the most nutritive of the grains used for food; found in most parts of Europe and of Asia. *Zéa*, Indian wheat, the product of the torrid zone. 304, Pickled wheat from the West Indies. A species of *Zéa* parrots fed with the same wheat in a more mature state. Rice of the natural order of Grasses; separated from them in the artificial system of Linneus; chief food of the inhabitants of most eastern climates; converted into poison by the spirit extracted from it. 305, Extensive utility of the natural order of Grasses; their roots not destroyed by being trampled upon. The Flowers of plants not eaten by cattle. Admirable provision made by Nature for the preservation of Grasses. 306, The structure of Grasses to be studied with a microscope.

DIALOGUE THE SIXTH. From Page 307 to 335.

Page 307, Nectary of Grass difficult to discover. Marked characters of *Anthoxanthum*. Peculiarities in the fructification. *Anthoxanthum* dissected. 308, Glumes do not expand themselves as in other Grasses. Nectaries differ from the common structure. 309, Rule of dissecting flowers in different states of maturity necessary to be observed. Similarity of the parts of fructification of Grasses. Involucre of wall-barley. 310, *Hólcus Mollis*, when magnified, shews the fructification distinctly; improperly placed in class *Polygámia*; thought to be an *Aira*, by Mr. Curtis. Dr. Withering's botanical arrangements contain much information respecting Grasses. 311, Grasses not more difficult to refer to their respective *Génera* than compound flowers. Mr. Curtis's London Flora of great use in the study of Grasses. Linneus first begun to form essential specific distinctions of plants. Confusion arising from the want of such distinctions. 312, Specific distinctions of Linneus. Trivial name, given by him, generally arbitrary; resembles the name given to the individuals of a family; advantage of such names in preference to descriptive names. 313, Confusion arising from the neglect of the use of proper names. Perfection of Nomenclature may be hoped for. 314, Great advantage of the use of the proper names and the terms of science. Excellence of the language of the Lichfield translation of the System of Vegetables. Awkwardness of forming English trivial names. 315, Such names injurious to the science of botany; defended only by superficial botanists. Children should not be allowed to describe objects vaguely. Specific characters not to be formed from variable circumstances. 316, Colour one of the least permanent characters. Departure of Linneus from his own rule. Weak defence of our friends more injurious to them than an acknowledgment of their errors. Botanical pupils should be made acquainted with the defects
of

of the Linnean system. 317, Shortness of life sufficient excuse for the imperfections of so great a work. Children should be taught to judge with reason. Root of plants a true specific mark. Difficulty of examining the root prevents it being made use of as such. Trunk and stalk afford strongly marked characters. Fulera and inflorescence furnish permanent marks. 318, Parts of fructification sometimes used with advantage in specific distinctions. Some *Hypéricums* and *Gentians* distinguished by their parts of fructification. Such distinctions agreeable from being obvious. Many other specific characters equally obvious. Study of leaves necessary to the understanding the species of plants. Most elegant specific distinctions formed from leaves. 319, Great variety in leaves; must be attentively studied; method of studying leaves. Form of leaves first to be considered; divided into simple and compound; simple leaf defined; sixty-two ways in which a simple leaf may be diversified. 320, Various forms of leaves must be studied with plates of them, and terms of explanation. Genius of Linneus shewn in the construction of his botanical language. English botanists much indebted to the Lichfield translators of Linneus's works. Preface and advertisement to the Lichfield translation should be read by botanical pupils. The knowledge of leaves may be acquired by attention. 321, Explanation of the Linnean language. Excellence of the Linnean descriptions. Want of precision in the descriptions of other authors. 322, Method of acquiring precise ideas of the different forms of leaves. Language of the Lichfield translators explained; agreeable conciseness of that language. 323, Compound leaf defined. 324, Compound leaf and branch known from each other by two rules. Leaves of *Robinia Pseud-acacia*, a good example of the compound character. Three kind of compound leaves. 325, Great variety of compound leaves. Each modification of a compound leaf marked by an appropriate term; method of studying

dying compound leaves. Idleness should be conquered. Different modifications of the compound leaf enumerated. Fingered leaf seen in horse-chestnut and lupine. Specific characters frequently formed from the various modes of compound leaves. 326, Various forms of simple leaves should be studied before those of the compound kind are attended to. Language of the System of Vegetables not intelligible until it is studied. The Lichfield translation the only book from which an English botanist can completely learn the science of botany. 327, Sufficient knowledge of Latin, to enable an English botanist to read the Species Plantarum, easily acquired. 328, Determination of leaves explained, Belongs to simple and compound leaves equally. *Alternate* leaves shewn in ivy-toad-flax. *Opposite* leaves, in myrtle. Manner of leaves being placed on the stem common to the whole Genus. *Direction* of leaves explained. Various modes of direction must be studied. *Insertion*, a general term for the manner in which leaves are attached to plants. Each mode has an appropriate term; these terms well explained in the System of Vegetables. 329, Double flowers, some knowledge of them requisite for young botanists. Term monster, not necessarily expressive of ugliness. Double flowers, the pride of florists, the product of culture. 330, Vulgar error of gardeners respecting double flowers. Completely double flowers lose their stamens. Various modes of vegetable monsters being produced. Calyx and lower row of petals unchangeable in double flowers. Half-double flowers bear fruit. Rose in Rose Polyánthos, a prolific flower. 331, Hen and Chicken daisy, a beautiful vegetable monster. Extraordinary change caused in Rose Plantain, by becoming double. Flowers multiply by their nectaries; become double in various ways. Parts of Mr. Rose's Elements of Botany should be selected for the instruction of young botanical pupils. Provence Rose destitute of stamens. Damask Rose does not lose its stamens by becoming double.

Many-

Many-petalled flowers most liable to become double. One-petalled flowers rarely multiply beyond a double corol. Beauty of compound flowers encreased by multiplying. 332, Single flowers generally more beautiful than double ones. Various causes from which plants depart from their true species; culture the most prevailing cause. Fruits and vesiculent vegetables derive their excellence from the art of gardening. Culture the best test of a true species. Ingenuity and industry of mankind conspicuous in the culture of corn. Botanists should attend to distinctions arising from seedling varieties. 333, Varieties of plants not noticed in the System of Vegetables, marked in the Species Plantarum with a capital B. Leaves subject to all the varieties which take place in flowers; undergo extraordinary changes in their appearance. Many changes in leaves may be effected by art. The beauties of a science more agreeable to study than its defects. 334, After the outline of the Linnean system is attained, practical study must make the complete botanist. The study of botany renders every plant interesting. Pleasure the consequence of reflection. Evil effects of a bad method of education; happiness the result of a good one. Objects of education, *happiness, utility, and agreeableness*. 335, Philosophy of botany may be studied, after a systematic knowledge of the science is attained. Philosophy of botany the most agreeable part of the science. Gratitude to God must result from the study of the works of Nature.

IN the pronunciation of the names of plants, *e*, at the end of Latin and Greek words is always pronounced, and not sunk as in English. Thus, Agáve, is pronounced A-gá-ve; and Acre, A-cre.

Cb in these languages is pronounced like *k* in the English. Thus, Achilléa is pronounced as if it were spelt A-kil-le-a; and Chelóne, as if it were spelt Ke-lo-ne. In words ending in *ides*, the *i* is always to be pronounced long. In words beginning with *ſce* and *ſci*, the *c* is generally pronounced soft. In words from the Greek, the *g* should be pronounced hard, as in Syngenéſia and Storge.

E R R A T A.

Page	line	
19	6.	For Allyſum, read Alyſſum.
23.	15.	For Goſſypum. read Goſſypium.
24.	6.	For oxális, read óxalis.
24.	29.	For Acér, read Acer.
26.	24.	For Iléx. read Ilex.
32.	22.	For Tulípa, read Túlipa.
38.	18.	For 800. read 8000.
9.	15.	For Muſſel-shell, read Murex-shell; place the ſtop after cab- net. inſtead of after ſhell.
50.	22.	For Lavendula, read Lavándula.
52.	1.	For <i>is</i> an example, read are examples.
57.	27.	Place a ſemicolon after nature.
58.	1.	Place a comma inſtead of a period after ſuppoſe.
63.	3.	For Fritilária, read Fritillária.
81.	23.	For Généra, read Généra.
	24.	For <i>ſhe</i> , read <i>the</i> .
110.	20.	Eraſe <i>when</i> .
	23.	For <i>it is</i> , read <i>they are</i> .
116.	13.	For <i>ſcem</i> , read ſeems.
122.	3.	For contains, read contain.
140.	23.	For Lycopergon, read Lycopérdon.
140.	26.	For Umbraculiſeræ, read Umbraculifera.
151.	7.	Put a ſemicolon inſtead of a comma, after diſteſtion; a comma inſtead of a ſemicolon after ſire.
154.	23.	For blot-paper, read blotting-paper.
186.	4.	For Síum, read Sium.
197.	11.	For Uned, read Unédo.
203.	6.	For Mignonelle, read Mignonette.
209.	11.	Ditto.
222.	25.	For Frog's bet, read Frog's bit.
226.	8.	Eraſe to.
227.	8.	Eraſe for, and the laſt it.
254.	14.	For Finished, read Furniſhed.
305.	8.	For juſt as, read the ſame as.
232.	1.	After oval, read bodies.

BOTANICAL DIALOGUES.

PART THE FIRST.

DIALOGUE THE FIRST.

The Seven Parts of Fruetification explained.

Harriet. Now, mamma, Charles and I hope we may claim your promise of teaching us Botany, and that you will not any longer refuse to fulfil it, because we are idle.

Hortensia. I shall fulfil my promise with pleasure. I am happy to say, that the last year you have given me reason to be satisfied with your application ;—and of you, Charles, your tutor gives so good an account, that I have no longer any cause to distrust your industry.

Charles. Indeed, ma'am, you made me ashamed, when we parted, of my idling character ; and Harriet and I resolved, that we would no more give you reason to say, that you could not attempt to instruct us in botany, because we did not seriously apply to our more necessary studies.

Hortensia. Having found the advantage and pleasure, which may be derived from an industrious performance of your duties, I am persuaded, that you will not again relapse into those indolent and desultory manners, which have given me so much uneasiness. I am not ambitious of making you shining characters ; but I am anxious to prevent your establishing such habits, as would render you trifling ones. There can be nothing learnt ; there can be no strength, no dignity of character attained, where the habits are idle. I apprize you that you will not find the first part of the study of botany particularly entertaining.

Harriet. That we expect—I did not like learning my french grammar ; but, when I could read french, I was glad that I had learnt it.

Hortensia. So you will find it with every thing ; if we do not make a point of understanding well the rudiments, either of a language or a science, we shall never make any great proficiency in it.—I have prepared this little room, which opens into my flower garden, for our study. Hither you may at any time come ; and you will find books and glasses, and every thing that you may want.

We will begin our lectures this morning. I have promised Henry and Juliette that they shall be of our parties; they are never idlers either at lessons or play, and will, I dare say, find both amusement and instruction from the study.

Henry. We will be very attentive.

Juliette. I long to know the names of all those pretty things, that we find when we pull a flower in pieces.

Hortensf. I am a little afraid, lest the hard names should be too difficult for my younger pupils; however I will endeavour to make them easy.---Now for our first lecture.---Linneus, the great Swedish naturalist, whom I have already taught you to respect, has divided the vegetable world into 24 *classes*; these classes into about 120 *ORDERS*; these orders contain about 2000 *families*; and these families about 20,000 *species*, beside the innumerable varieties, which the accidents of climate or cultivation have added to these species. The system of Linneus is called the sexual system of botany, because it is founded on observations, which seem to prove, that there are males and females in the vegetable world, as well as in the animal. The stamens

are termed males, and the pistils females ; these most frequently exist in the same flower, but are sometimes in different flowers, and sometimes even on different plants ; and from their number, situation, and other circumstances belonging to them, he has formed his *classes* and ORDERS ; his *families*, or *genera*, are formed from all the parts of the blossom or fructification ; his SPECIES, which are individuals of the families, from the leaves of the plant ; the varieties, from any accidental circumstance of colour, taste, or odour : the seeds of these varieties do not always produce plants similar to the parent, but frequently such as resemble that species, to which the parent belonged. Having given you a sketch of the philosophy of the system, we will proceed to the examination of the different parts of a *blossom*, which now, if you please, we will accustom ourselves to call the *fructification* ; and pray observe, that I intend strictly to require the use of the Linnean terms, as that will be a means of imprinting on your minds what you learn, and, as you grow older, will make you ready in the language of botany.

Harr. Last year, this would have been sufficient to have frightened me from the study.

study. Charles will have the advantage of us, as he understands latin.

Hortens. In some things he may ; but the language of botany may be learnt without any such assistance, and perhaps more readily by not being confused with a knowledge of the more common signification of those words which Linneus has appropriated to this science : for instance, Charles will know that calyx means cup ; but that will not assist him in the various species of calyxes, which he will have to retain in his memory ; the common meaning of words is not sufficiently precise for the purpose of science, and cup and calyx require equal explanation, when appropriated to the particular part of a flower. The works of Linneus are now translated ; botany has a language peculiar to itself ; that language is, I think, somewhat less difficult to learn than any other language, and, when learnt, introduces us to so delightful a study, that had I found ten-fold the difficulty that I did find in acquiring it, I should think that I had spent my time well.

Charles. I am glad to find that I am not expected to learn more readily than Harriet, as I know that I shall not do so---But pray,

ma'am, explain to us the term *fructification*?

Hortens. Linneus defines it to be a temporary part of vegetables dedicated to germination; that is, all the parts of the blossom, which are intended for the production and preservation of the seed, and which, having brought that to perfection, wither and fall off. All these parts, however, are not essential to the production of perfect seed, as we shall see hereafter, or are all these parts present in every flower. There are *seven parts of fructification*. 1st, the *calyx*; 2d, the *corol*; 3d, the *stamen*; 4th, the *pistil*; 5th, the *pericarp*; 6th, the *seed*; 7th, the *receptacle*. The *calyx* is the termination of the outward bark of a plant; of it there are seven kinds; it generally appears in the form of a green cup; it's chief use is to enclose, support, and protect the other parts of the fructification. The first and most common kind of calyx is the Perianth; it is placed immediately under the flower, which is enclosed in it, as in a cup; primroses (*primula*) and roses (*rosa*) have their calyxes of the Perianth kind. 2d, Involucre, which is a calyx, growing at a distance from the flower. Most flowers which have Involucres have also

Perianths,

Perianths, as the *prímula* genus. These slender leaves, which grow at the base of the numerous flower-stems of this polyanthos (which is a *prímula*) are termed *Invólucres*; the same in *meadia dodecátheon*, in *parsley*, *apium*, and all that tribe of plants which is termed umbelled. The plant called fool's parsley, *æthúsa*, by eating of which, mistaking it for garden parsley, some persons have been said to be poisoned, may be distinguished from all other umbelled plants by the *Invólucres*, which belong to the small umbels, and which consist of three long, narrow, pendulous leaves, placed at the bottom of each of them: these are called partial *Invólucres*; that which grows at the base of the whole collection of umbels is termed the general *Invólucere*. 3d, *Glume* chiefly belongs to grasses, and consists of one, two, three, or more valves, folding over each other like scales, and frequently terminated by a long stiff-pointed prickle, called the *Awn*, or beard. 4th, *Ament* is, what is commonly called a catkin; it consists of a great number of chaffy scales, dispersed along a slender thread, or receptacle, and has obtained the name of catkin from it's resemblance to a cat's tail. These *Aiments* (we must

no longer call them catkins) are composed both of male and female flowers; what Henry calls gossings in spring are the Aments of the willow tree; his green gossings are female Aments, and, when mature, have the appearance of little tufts of wool, which appearance is caused by the downy material that crowns their seeds; his yellow ones are the males, and derive their beautiful yellow colour from the tips of the stamens, which contain a dust ready to fly and to fertilize the seeds of the pistils. This you will better understand presently. The female Aments of the birch (*Bétula*) are beautiful; the tips, we have not yet learnt their scientific name, being of a bright crimson, and the other part of a light green. The female bloom of nut trees is also very pretty, but so minute as generally to escape common observation.

Ful. O mamma, is it that pretty red tassel that looks like ravellings of crimson silk? Henry and I admired it yesterday, but did not gather it; for he said, perhaps it might be the nut, for that you had told him, that the catkins only made the nuts perfect, and did not themselves *produce* nuts.

Hortens.

Hortensf. He was right ; but remember in future to use the terms of the science, that you are learning. The 5th species of calyx, called a Spathe, wraps round the flower or flowers contained in it, till they are strong enough no longer to require it's protection, and then they burst forth. Sometimes the Spathe consists of one piece, as you may see in the snow-drop, *galánthus nivalis*, and daffodil, *narcíffus pseudo-narcíffus*, and in most plants which have this kind of calyx ; sometimes of two, as in the Japan lily, *amary'llis formosíssíma* ; and sometimes of many. I have frequently seen you pull off the Spathes of snow-drops and daffodils, and have heard you call them indian paper, which they much resemble in their texture. 6th, Calypstre is the term for the calyx of mosses. Calypstre is defined by Linneus to be the cowled calyx of moss, covering the anther ; which definition strongly expresses this species of calyx ; it may, however, be necessary to give you some more familiar idea : the calypstre resembles a very small extinguisher of a candle, which covers the flower of moss, and protects it's dust, or seed, from injury : in Mr. Curtis's London Flora I can show you some beautiful specimens of
this

kind of calyx ; in November and December I can show you the calyx itself.

Charles. This, Harriet, will make our walks in winter entertaining. How carelessly we have often passed by the moss bank in the wood, and complained that there were no flowers !

Hortensf. In the study of nature you may at all times find both amusement and instruction ; the nice economy of all her works must lead the mind with praise and gratitude to God, who is the first great cause of all : that person must have a *dull, sluggish* mind, who, seeing the care that is taken throughout the creation for the good of the whole, is not stimulated to an endeavour to perform his part as an individual ; and it is much, that an individual may perform, be he ever so insignificant, if he do all the good, that the situation, in which he is placed, brings within his power.—But to return to our 7th and last species of calyx :—Volve is the term used by Linneus for the calyx of funguses, which, when we come to that tribe of plants, may be more fully explained. We will examine the different kinds of calyxes given in this plate, and the calyxes of such flowers as are now in bloom,

bloom, and then proceed to the other parts of fructification. The Corol is that part of a flower, which most attracts our notice, consisting generally of beautifully coloured leaves. Linneus says, that it is formed from the inner rind of the plant, as the calyx is from the outer ; it's leaves are called Petals, which term pray remember, as it is necessary to prevent confusion betwixt the green leaves of a plant, and the coloured ones of the flower. By the number, division, and shape of the Petals, the different kinds of Corols are distinguished ; a Corol is called one-petalled, when it consists only of one piece ; two, three, or more petalled, according to the number of pieces of which it is composed. What would you call this Polyanthos flower ?

Harr. I should call it five-petalled.

Charles. So should I, if I only looked at the top ; but I do not know what to call the part, which the five round leaves grow from.

Hortensf. The polyanthos is a one-petalled flower, though on the first view, from it's divisions round the margin, it appears to consist of five petals. The best way of knowing, whether a flower consist of one or more petals, is to try to take them off all together ;

the

the one-petalled flowers, be their divisions ever so deep, have their petals united together at the base, forming a tube, sometimes very short, but long in polyanthos, as you may see by taking off the petal. In flowers of many petals they are fixed by the claw to different parts of the fructification, which circumstance is frequently of use in distinguishing one flower from another. Linneus has availed himself of it in his formation of the génera, or families of plants. The various shapes of the corol are also of great use in this particular, and therefore should be accurately understood; a more clear idea may be given by plates than by description. I will enumerate the various kinds, and then we will look them over in our plates, and compare them with flowers. There are seven different forms of the corol: bell-form, of which there are great varieties; funnel-form; salver-form; wheel-form; cross-form; gaping and grinning corols, which may be considered as different kinds of the same form; and papilionaceous, or butterfly-form, which belongs to the pea-bloom, or lupine tribe of flowers. There is an eighth form, which does not belong to any of these that I have mentioned, and is properly called an irregular

irregular flower ; of this kind are the monkshood (*aconítum napéllus*), violet (*víola*), larkspur (*delphínium*), orchis, and fraxinella (*dielámnus*). *Campanula* is an instance of the bell-form ; of the funnel-form, henbane (*hyoscy'amus*) and oleander (*nérium*) ; of the falver-form, periwinkle (*víncá*) ; of the wheel-form, mullein (*verbáscum*), and pimpernel (*anagállis*) ; the cross-form may be seen in wall-flower (*cheiránthus*), and in candy-tuft (*ibéris*), and consists of four petals nearly equal, and spread at the top upon claws, the length of the calyx, in form of a cross. The butterfly form is seen in peas ; the gaping and grinning in white archangel (*lámium*), and snap dragon (*antirrhínium*).

Henry. I often make snap-dragons grin at Juliette ; they look very like a mouth, when I squeeze them ; I never thought peas like butterflies.

Hortensf. The resemblance is not very exact, though more so on examination than at the first view. There is another part of the fructification, which Linneus considers as belonging to the corol, and to which he first gave a name ; this is the Nectary, so he has called that part wherein the honey is found, from

the fancied resemblance to the fabled liquor of the gods, concerning which you remember that we were reading yesterday. The Nectary frequently makes a part of the corol, but as frequently is distinct from it: in honeysuckle (*lonicéra*) you have often tasted the sweet drops at the bottom of it's tube, and also in cowslips (*prímula*). I could amuse you on this subject, but at present it is sufficient to inform you, that there is such a part belonging to most if not to all flowers.

Harriet. We will be very diligent in learning the rudiments of the science, that we may the sooner come to the amusement of it. I long to dissect a flower.

Hortens. That you may soon do, if you are attentive. A most essential part of fructification is the *stamen*; as by it the fine dust, or powder, is prepared, which makes the seeds capable of producing young plants. The Stamen consists of three parts, the Filament, the Anther, and the Dust. The Filament is the thread on which the Anther grows; the Anther is that part, which you have hitherto often wrongly called the seed; it contains the Dust, and, when ripe, bursts and scatters it abroad for the use to which
nature

nature has destined it. You have often seen it fly about nettles (*urtica*), and the sweet gale (*myrica*). Nature has guarded with nice care this precious dust, as on it's preservation depends the continuation of the species. The apparatus, by which in many flowers it is defended from injury, is very curious, and often gives a singular appearance to the corol. In wet years it sometimes happens, that the excess of moisture causes the anthers to burst, before their contents are ripe, and thus we lose our cherries and apples. It has been supposed, that the anthers were preserved from harm in rainy seasons by a fine waxy substance enclosing their contents. This idea was believed by Reaumur to be erroneous some years ago, and the experiments of the late Mr. John Hunter confirm his opinion. Mr. Hunter affirms, that the substance gathered by bees from the anthers of flowers is not wax, as is generally supposed, but that it is collected by them as food for the bee-maggots, and is what you call the bee-bread. A part no less important is the Pistil, as it contains the seed, which is to be fertilized by this Dust. The Pistil also consists of three parts, the Germ, the Style, and the Stigma.

Germ

Germ is the term for that part, which contains the seeds, before they are mature ; when mature, the same part takes the name of Pericarp. The Style is that small pillar, which grows from the Germ, the top of which is called the Stigma. This part is of great importance, as it receives the Dust of the Anthers, and conveys it through the fine vessels of the Style to the seed contained in the Germ. Indeed the Anther and Stigma are by Linneus considered as the essential parts of a flower, and in the language of botany they constitute one ; these parts being present are sufficient to the production of fruit, without them there can be none : the presence of the Stigma implies that of the Germ, as the Anther does of the dust : there is however another part, which the late investigations of a celebrated philosopher seem to make an essential one ; this is the Nectary ; from his reasoning it appears, that the honey contained in it is intended for the nourishment of the Anthers and Stigmas ; consequently whenever these are found, it will be found also, as I believe it commonly is, though some flowers are said to be without it ; this, however, may not be the case, as
the

the part in question had not even a name before the time of Linneus, and the world is yet only conjecturing about its use.

Jul. I thought the honey had been for the bees, mamma? Can flowers eat?

Hortensf. That enquiry does not belong to the present part of our study; but I will so far tell you, that I mean to make my favourite flowers not only beautiful objects of sight, but agreeable companions: before I have done with them they shall eat, drink, sleep, and have a will of their own.

Henry. O, dear mamma; then you must have a fairy wand?

Hortensf. I shall use no magic art; and, I assure you, I am not in jest. I do not tell you that I shall make them of the first order of animals, but, I think, I can convince you that they deserve a place among the animated creation.

Charles. This Mr. Wilson has told me, and I thought so too, when he talked to me about it; but having only been told the fact, and not having studied the subject, I had forgot it again.

Harr. O Charles, I wish we had been always as attentive as Henry and Juliette, we

should have known all this now, and made experiments like mamma.

Hortensf. The past cannot be recalled; be industrious henceforward, and make up the time that you have lost. We will finish the parts of fructification, and then you will have done enough for the first lecture. There are eight different kinds of Pericarp, or Seed-vessel; 1st. Capsule, 2d. Silique, 3d. Legume, 4th. Follicle, 5th. Drupe, 6th. Pome, 7th. Berry, 8th. Strobile. Capsule is a little chest or casket, a dry hollow seed vessel, when ripe, which splits in different ways, and discharges its contents, sometimes with great force, so as to disperse them to a considerable distance; you have all amused yourselves with the seed-vessel of Touch-me-not, which is a Capsule. From the violent manner in which this plant disperses its seeds, Linneus has named the genus or family, *Impatiens*, the seed-vessel of *viola*, violet, and pansie is a Capsule; before this species of seed-vessel is ripe, it is frequently fleshy and succulent, like a berry, which pulpy substance probably is intended for the nourishment of the young seeds. Silique is a Pericarp of two valves, but as some are long and larger, others round

or broad, and less, Linneus has distinguished them by their form into Silicle and Silique, and has founded on this circumstance the orders of one of his classes: the Silicle is roundish; the seed vessels of allyson of crete (allysum faxátile) is an instance; and candy-tuft (ibéris), the common wall-flower (cheiránthus), and cabbage (bráffica), are examples of the Silique. The Legume is distinguished from the Silicle and Silique by the manner in which the seeds are fixed to its edges; in the Silicle and Silique the Seeds are fixed alternately on each side of their edges, in Legume they are fixed on one side only; the Silique seed-vessels belong to the cross-form flowers, the Legume to the papilionaceous; it is this part that we eat of french-beans, and of some kind of peas. Follicle is a bag, which opens on one side, and has its seeds fixed to a receptacle or thread within this bag, instead of being fastened to the edges of the bag itself; when the seeds are ripe, it opens lengthways on one side; the bladder fenna (colútea) has a Follicle for its seed-vessel. Drupe is a Pericarp, or seed-vessel, that is generally succulent or pulpy, having no valve or external opening, and generally contains within its

substance a stone or nut, within which lies a kernel, that is, a seed: there are exceptions to this definition, but it would confuse you to name them at this time; all the stone fruits are properly Drupes. Pome belongs to those fruits, which contain within their fleshy pulp the other kind of seed-vessel called Capsule; the apple (*pyrus*) is an instance of the Pome: the core of the apple is the Capsule; the pippins contained in it are the seeds; this kind of Pericarp, or seed-vessel, has no valve or outward opening. What you call the blossom of the apple was the calyx. Berry is a pulpy substance containing seeds, disposed promiscuously through the pulp, without other covering, raspberries (*rúbus*), Strawberries (*fragária*), gooseberries (*ríbes*), answer well to this definition: in many genera, or families, the berry and the drupe seem to have been imperfectly defined; as we proceed, I shall point out to you the defects of Linneus in his most ingenious system, but they are so few as scarcely to cast a shade upon the light which this illustrious naturalist has introduced into the science of botany; indeed some of his definitions, which have been treated as obscure, have been

proved,

proved by late experiments to be most exact. I tell you this to warn you from being too hastily led to think slightly of the merits of this great man, by a book* which I shall put into your hands, and which will give you much information ; but, at the same time, you will find the small failings of Linneus pointed out in it with an ungenerous acrimony. The Strobile is defined to be formed of an Ament with hardened scales ; this, when you understand the subject, you will find to be a just definition, at present it conveys no precise idea to you ; this kind of seed-vessel is found in the fir tribe.

Charles. Then, for the future, we must call the cones, the fir-apples, Strobiles ?

Hortensf. That is their scientific name ; the Strobiles of the larch (*pínus larix*) are beautiful.

Henry. Juliette and I always admire them much ; they are crimson and green, like what you told us of the Aments of the birch.

Hortensf. Henry has remembered to use the proper term, of which I perceive he is not a little proud. The Seed is defined by Linneus

* Milne's Botanical Dictionary, 7s. bound,

to be the rudiment of a new plant : a Seed consists of 1st. the part which is to be the new plant, and, 2d. of nourishment for that new plant till it has attained sufficient strength to provide for itself : the young plant consists of what are termed the *Plume* and the *Radicle* ; the *Plume* rises into the air, and constitutes the trunk and branches ; the *Radicle* penetrates into the earth, and forms the roots. The *Cotylédons*, which are the mealy substance of the seeds, are converted into a sweet juice by the growth of the plant, and are absorbed by it ; these sweet stores of nourishment last long enough for its sustenance, till by having thrown out roots it collects its own food ; as lambs and the young of the higher order of animals suck milk, till they are able to seek their own nourishment. The *Plume*, the *Radicle*, and the *Cotylédons* of a bean (*vicia faba*) we will examine. By soaking a bean in water they may be well seen. I will shew you a drawing of a cucumber (*cúcumis*) seed. If you split an almond (*amy'gdalus*), you may see, lying within the kernel, which makes the *Cotylédons*, two beautiful small leaves sawed round their edges, growing upon a little stalk, which is the *Radicle*, as
the

the leaves are the Plume. If the Cotylédons of a bean be cut off, the young plant is starved and dies, or becomes very weak; grafs has its Cotylédons under the ground, which preserves them from destruction: so has corn, which however is not safe from all enemies; the wood-pigeon digs with her bill till she finds the Cotylédon of the corn, and then eats it, pleased, as I conclude, with the sweet taste that it has acquired, as the plant or Plume has sprouted. The care that nature has taken for the preservation and dispersion of seeds is admirable; in some plants they are wrapt up in soft down; as for instance in cotton plant (gossy'pyum); the part, of which we make our muslin dresses, was originally the soft cradle of seeds; as the material, of which our silks are made, was the cradle of an insect. Some seeds you have seen nourished and kept warm by the pulp of our fruits; others are protected by soft hairs: in thistles (cárduus) they lie in a soft silk-like substance, the down of the seed of artichoke (cy'nara) is particularly beautiful; others are surrounded by what is termed an Aril, which is of a substance very like parchment,

Harr. I have seen it, I think, in *fraxinella* : pray does not it line the outer husk, that has so sweet a smell?

Hortensf. It does, and bursts suddenly, when the seeds are ripe. That little white case, out of which the seeds of wood-sorrel (*oxális acetosella*) leap, when you have warmed them by holding them in your hands, is an Aril. You may also find it in the spindle tree (*euónymus*), which Juliette calls the red comfit tree.

Charles. This is very entertaining: pray, ma'am, tell us how nature has provided for the dispersion of the seeds?

Hortensf. By various methods; some she has enabled to fly by a small light crown fixed on their tops, others have single feathers, others small feathery tufts: you are all well acquainted with the feathered seeds of dandelion (*leóntodon*), and have proved by blowing on them, how small a degree of air is required for their dispersion, when ripe; some have an appendage like a wing, as the seeds of fycamore (*acér*); the centaurea has a seed furnished with a tuft so nearly resembling a camel-hair pencil, that it might be mistaken
for

for one ; feather grafs (ftípa) has a beautiful plume ; one of these plants makes an elegant appearance, when in a bright day with a gentle wind a number of these plumes are seen together, waving in the air, and shining like silver ; but the most curious of the flying seeds is that of the tillándsia ; this plant grows on trees, like the misletoe (viscum), and never on the ground ; the seeds are furnished with many long threads on their crowns, which, as they are driven forwards by the winds, wrap round the arms of trees, and thus hold them till they vegetate : this is very similar to the migration of spiders on the goffamer, who are said to attach themselves to the end of a long thread, and rise thus to the tops of trees or buildings, as the accidental breezes carry them. These flying seeds are carried to a very considerable distance from their parent plant ; others have hooks, by which they attach themselves to the hair or feathers of animals, or by a glutinous substance, in which the seed is lodged, as misletoe. The seeds of aquatic plants, and those which grow on the banks of rivers, are carried many miles by the currents, into which they fall ; some of the American fruits,

among

among which is the cocoa-nut (cocos), are annually thrown on the coasts of Norway. Charles shall read to us some beautiful lines out of the Botanic Garden, to which this wonderful fact has given rise.

Harr. We shall all like that vastly; you have treated us with some things out of that poem before, ma'am.

Hortensf. I shall have frequent occasion to recur to it, as we proceed in our botanical studies: I do not know a book, which contains more variety of knowledge on the subject, or any one where that knowledge is so clearly and agreeably given; I have learnt much from it. Birds are the means of disseminating some kind of seeds, either by dropping them as they carry them from place to place, or by parting with them whole, after they have swallowed them. In this way seeds are frequently dropped in the hollows of trees, where, if they meet with a sufficient quantity of soil and moisture, they vegetate, and make an extraordinary appearance: such is the holly (il^éx) growing in the birch tree, which you see every day, and which in winter is peculiarly beautiful from its deep green foliage and scarlet berries, being intermingled

mingled with the white shining branches, and elegant brown pendant twigs of the birch ; such is the mountain ash (forbus) in the apple tree.

Charles. Do the roots of the mountain ash penetrate into the apple tree—the place they grow in seems too high above the ground to admit of their drawing any nourishment from the earth ?

Hortensf. I do not exactly know in what manner such trees receive their nourishment ; they become, I imagine, parasite plants ; that is, derive their food from the juices of the tree on which they grow, or perhaps live chiefly on the air, as those trees must necessarily do, which grow out of rocks or walls, where there is not earth sufficient for their sustenance ; lastly, seeds are dispersed by an elastic force in the seed-vessel, or in some part belonging to the seed. Stípa (feather grass), as its seeds arrive at maturity, dislodges them, by twisting the base of the long feather by which they are crowned, till it flies from the receptacle, and carries the seed to a considerable distance from the plant : thus are the seeds of geranium and barley dispersed by the

the twisting of the awn which crowns them ; this is said to be effected by moist weather, by means of which they are lodged in the earth at the time, when it is best fitted to receive them. The Receptacle is the last part of fructification, that we have to consider ; it is that part, by which all the other parts of fructification are connected, and by which they are supported : it is called a proper receptacle when it supports the parts of only one flower, as in *primula*, *anemone*, and *tulip* ; a common receptacle, when it supports several florets. This last kind of receptacle belongs to what are called the compound flowers, which you will understand hereafter ; an instance of a *common* receptacle you may see in *scabious* (*scabiósa*), *dandelion* (*leóntodon*), and *daisie* (*béllis*) ; all those parts, which you suppose to be the leaves of one flower, are flowers themselves, and are arranged under a particular class. The various circumstances belonging to this kind of receptacle are made use of by *Linneus* to discriminate the *généra*, or families of this class. Now we will look over our plates, and rehearse what we have learnt.

At

EXPLANATION OF PLATE I. PART I.

OF THE SEVEN PARTS OF FRUCTIFICATION.

Fig. 1. The parts of Fructification of a Crown-imperial.
Fritillaria-imperialis.

a, a, a, a, a, a. The Petals.

b, b, b, b, b, b. The Stamens.

c, c, c, c, c, c. The Anthers.

d. The Germ.

e. The Style.

f. The Stigma.

Fig. 2. A Petal and Stamen of Crown-imperial. *g*, the Nectary. *h*, the Anther scattering its Dust.

Fig. 3. The Pericarp of Crown-imperial cut across to shew the three Cells.

Fig. 4. The Perianth of a Rose, *i, i, i, i, i.*

Fig. 5. The Involucre of *Prímula*, *k, k*, with the Perianth of the single Flower, *l.*

Fig. 6. A Flower of Grass. *m*, the Glume. *n*, the Stamens. *o*, the feather'd Stigmas of the Pistils.

Fig. 7. A Male Ament, containing the Stamens only.

Fig. 8. A Female Ament, containing the Pistils only.



Fig. 1.

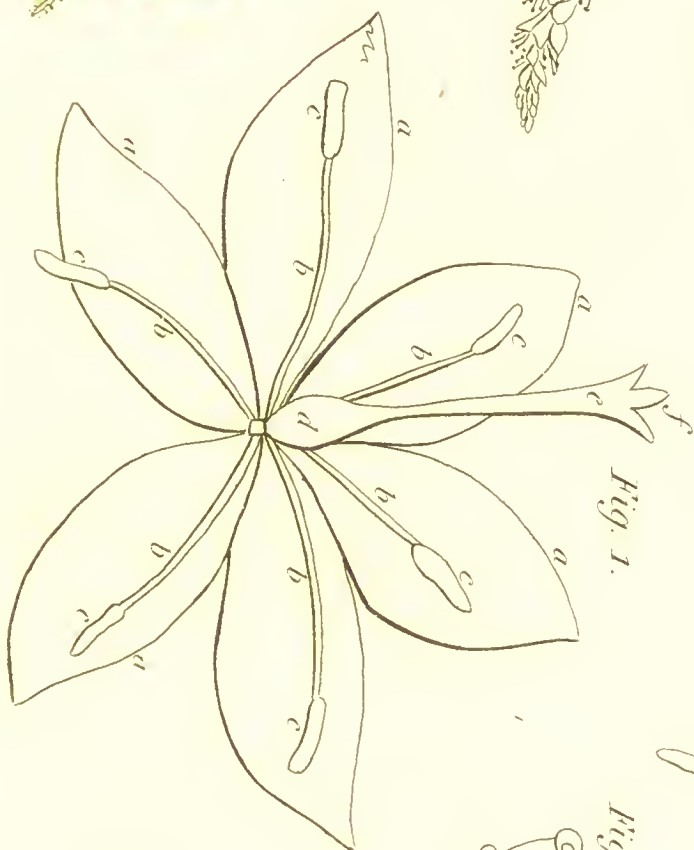


Fig. 2.



Fig. 3.

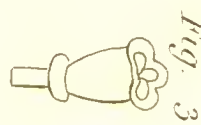


Fig. 4.

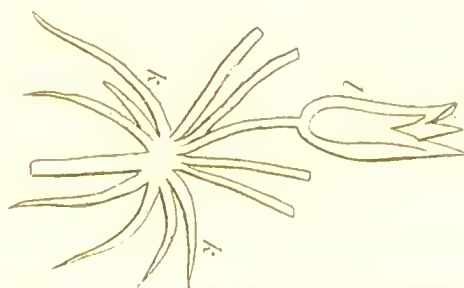


Fig. 5.

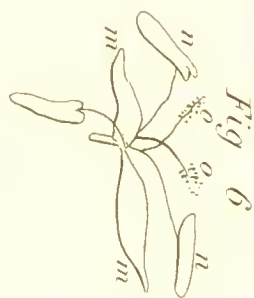


Fig. 6.



Fig. 7.

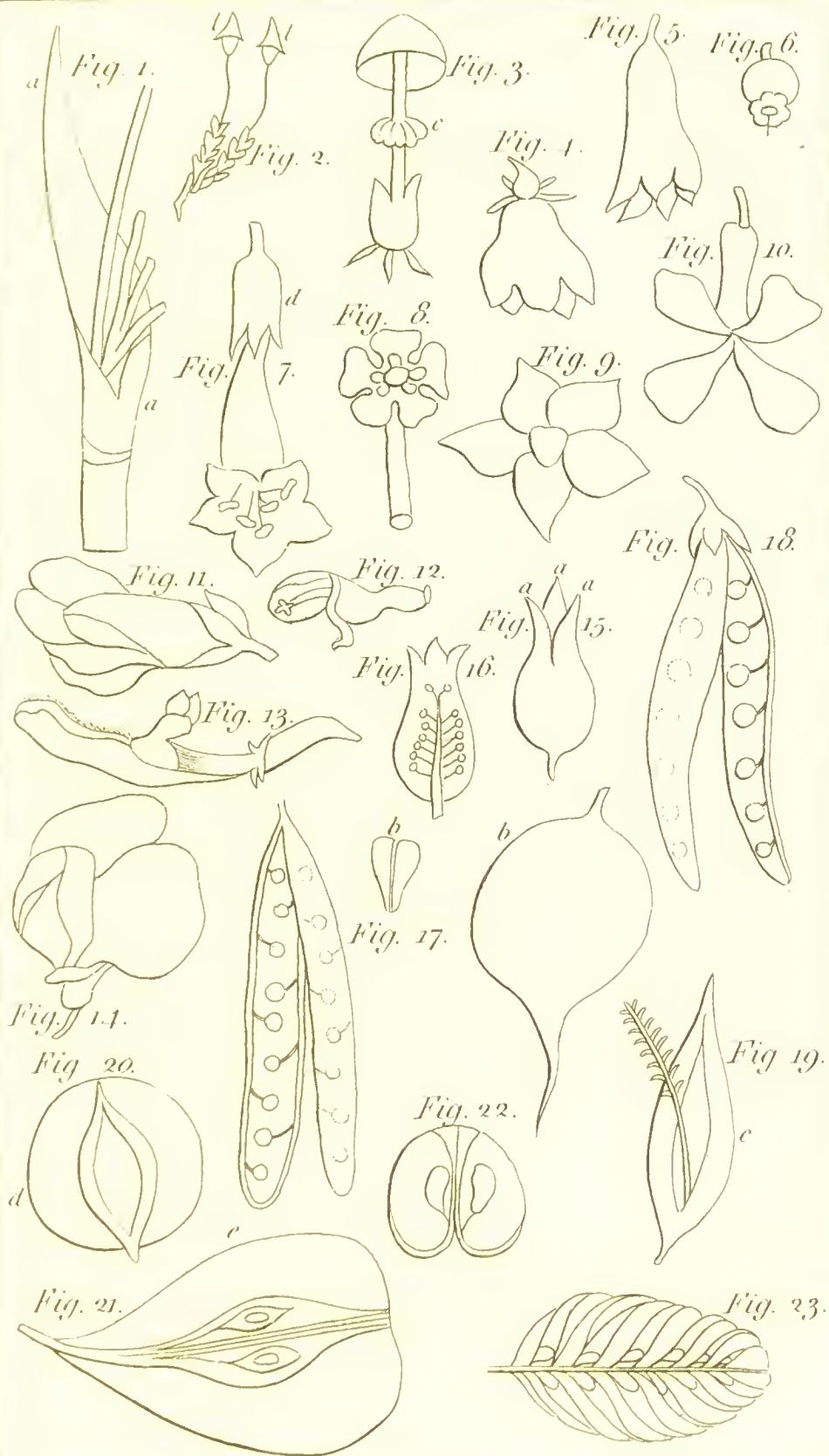


Fig. 8.

EXPLANATION OF PLATE II. PART I.

OF THE DIFFERENT SHAPED COROLS AND KINDS OF SEED VESSELS.

- Fig. 1. A Spathe, *a, a*, enclosing the Peduncles of the Flowers,
- Fig. 2. The Calyx of Moss, Calyptrae, *b, b*.
- Fig. 3. The Calyx of Fungus, *c*, called by Linneus a Volve.
- Fig. 4, 5, 6. Different kinds of the Bell-form Corol.
- Fig. 7. Funnel-form, *d*, the Calyx, a Perianth.
- Fig. 8. A regular one-petalled Corol with a long tube, the Corol Salver-form.
- Fig. 9. Back view of a Wheel-form Corol, shewing the very short tube.
- Fig. 10. Cross-form.
- Fig. 11, 12, 13. Gaping and Grinning Corols.
- Fig. 14. Papilionaceous, Butterfly-form.
- Fig. 15. A Capsule, with three Valves opening at top, *a, a, a*.
- Fig. 16. A Capsule cut open lengthways.
- Fig. 17. A Silique and Silicles, *b, b*, Silicles.
- Fig. 18. A Legume.
- Fig. 19. A Follicle, with its receptacle for Seeds, *c*.
- Fig. 20. A Drupe, *d*, the Stony Seed.
- Fig. 21. A Pome, *e*, the inside Capsule.
- Fig. 22. A Berry (a Grape) cut across, shewing the Seeds.
- Fig. 23. A Strobile, cut lengthways,



At our next lecture I hope that you will each of you bring with you a flower, which will shew some one of the numerous parts, and the different species of those parts, which I have endeavoured to explain to you ; or, for your first essay, an instance of each kind of calyx and corol will be sufficient.

DIALOGUE THE SECOND.

A Flower dissected: the different kinds of Fulcra and Inflorescence explained.

Hortensia. I perceive you have all been very diligent: lay down your flowers, and I will look them over.

Harr. We have endeavoured to find the different kinds of calyxes and corols, but I am afraid we may not have been quite right.

Hortensf. If I find you are for the most part so, I shall think you have done very well: this verónica and crowfoot certainly have the Perianth kind of calyx; this earth-nut (búanium) of the Involucre, and at the same time the single florets shew the Perianth, which may have escaped your notice from being so minute. This walnut bloom (júglans) shews the Ament; this narcissus the Spathe. The other three kinds of calyx, the Glume, the Calypstre, and the Volve, as they belong to peculiar and difficult classes of plants, we will not at present think about. Your flowers are all equally right: pray what share had Henry and Juliette in making the collection?

Harr.

Harr. A great deal indeed, mamma ; the hare-bell and verónica I had laid aside for many-petalled flowers ; but Henry remembered, what you had said about trying them, and pulled off the Corols, and found they were only one-petalled ; and Juliette said at first, that the hare-bell had a bell-form corol, and the verónica a wheel.

Hortensf. The wheel-form of the verónica is less decided, from the inequality in the breadth of its petals. You perceive, that the lowest petal is narrower than the other three ; this circumstance is a mark, which distinguishes that family of plants. The curling divisions of the corol of the hare-bell disguise its form also ; but in neither of these genera is the form of their corols the essential character ; that circumstance therefore is of less consequence.

Charles. Pray, ma'am, in this many-petalled flower of the crow-foot, what must I call this little hollow notch at the bottom of each petal ? There is something shines in it like honey, is it the nectary ?

Hortensf. I rather suppose the shining appearance is caused by the rich texture of the petal ; that notch is the nectary, and is the
essential

essential character of the ranúnculus family, the proper name of your crow-foot being ranúnculus; this mark you will find also in the double flowers. The minute circumstances, which Linneus has availed himself of for the discrimination of one plant from another, fills us with admiration; till his time there was much confusion in the ranúnculus tribe; his penetrating eye marked this small appendage to the petal; he found it to exist uniformly in the individuals of the genus; and we are now no longer at a loss to distinguish a ranúnculus from other families, which in their outward appearance much resemble it.

Charles. It would be very agreeable, if all flowers were so decidedly marked.

Hortensf. You will find them more easily to be distinguished from one another than you imagine, though rarely by so obvious a character as this of the ranúnculus; yet when you understand how to study the system of vegetables, you will find that very minute circumstances, and such as in the common observation of a flower we might overlook, have been made use of to mark not only one family, but every individual of that family from each other.

Charles.

Charles. This is like the shells of which I was so sure I could find two alike, though you, ma'am, told me I could not.

Hortensf. The less we know, the more apt we are to be positive.---But to return to our general subject:---This ladysmock (cardamine) is a right specimen of a cross-form flower; this lung-wort (pulmonaria) of the funnel-form; this thyme (thymus) of the grinning; this broom (spartium) of the butterfly. As a reward for your great attention, we will dissect a flower; the parts of crown-imperial are so large, that it is well suited to our purpose. Be so good to gather one, Charles, also bring a poppy and a tulip at the same time.

Charles. I have brought the flowers; but I think they have not any of them a calyx.

Hortensf. The calyx of the poppy (papaver) falls off immediately when the flower expands; the crown-imperial (fritillaria imperialis), and the tulip (tulipa) have none. You may recollect, I told you that there are only two parts of fructification necessary to constitute a flower in botanical language, though perhaps there properly may be a third, the Nectary; the calyx is the part wanting in
D these

these two flowers ; but we must not, when we find only one of these covers, and that coloured, always infer that it is the Corol, because it is not green.

Harr. How then are we to distinguish the Calyx from the Corol ?

Hortensf. In most cases the Corol may be known by the gayness of its colour, or by its not inclosing the seeds ; but there are too many exceptions to these rules for them to be relied on. The petals in passion flower (*Passiflora*) are not coloured ; the corol in *Selágo* incloses the seeds ; they may however be distinguished by the following rule : the stamens and petals are found to be ranged alternately in the complete flowers ; that is, such as have both Calyx and Corol of the fourth and fifth classes of Linneus's system ; hence this is concluded to be their most natural situation, while the stamens are placed opposite to the divisions of the Calyx ; Linneus seems to consider this as a constant mark ; yet he terms the single cover of many plants of the sixth class a Corol, in contradiction to it. Here is only one cover present in this crown-imperial ; examine it, and determine whether it be a Calyx or a Corol.

Harr.

Harr. The stamens and petals are not placed opposite, so I should say it was a Corol.

Hortensf. According to the rule, you would be right ; however, as I have told you that a close observance of this rule would lead you into error in examining many of the beautiful flowers of the sixth class, I recommend to you to follow Linneus in the term that he has given to the only cover that you will find, and call it a Corol, till these small defects of his system are removed by the attention of those, who, knowing its great merit, are more desirous to render it perfect than to expose and cavil at the few errors they can find in it; our crown-imperial has all its parts, except the Calyx ; the Corol is six-petalled, and belled ; observe with what grace these beautiful bell-flowers are hung round this rich green stem, and the elegant appearance of this tuft of shining green leaves rising in the middle of them ; the small cavity at the bottom of each petal, filled with honey, you have all often admired.

Jul. That we have, mamma ; Henry and I very often stop to look at those pretty drops ; they are the Nectaries, I suppose ; we have wondered the honey did not fall out.

Hortens. The quantity is so nicely fitted to the part which contains it, as to be always full, and apparently ready to overflow, yet never to exceed its proper limits. If we were to take the natural honey out, and replace it by honey and water, we should find it difficult to make it stay in ; nor will it do so if the cavities are filled by art as full as they are by nature, so poor and clumsy are our imitations of her in even the most simple of her works. The Stamens and Pistils are very conspicuous in this flower ; the Dust from the Anthers is beautiful when seen through a microscope : we will look at it. You will be surprized to observe the perfect form of its separate particles ; the Stigma and Style we will also examine, though with the naked eye we may see that moisture at the top of the stigma of this large flower, which fits it to receive the Dust of the Anther, and from thence to convey its essence through the Style to the Germ ; when this Germ becomes a Pericarp, that is, when it becomes mature, it is a Capsule filled with large flat seeds. Now we have taken off these five parts separately ; tell me, Henry, what name belongs to the sixth part which remains ?

Henry.

Henry. I think, the Receptacle.

Hortensf. You are right.---Here are only six parts of fructification to be found in this flower ; do you, Juliette, recollect the name of the one it is deficient in ?

Jul. The Calyx, Ma'am, is it not ?

Hortensf. It is, my dear ; I am much pleased by the attention of you all ; and am particularly so, that you and Henry do not find it difficult to remember the scientific names. There is another part which may be mistaken in some flowers for their Calyx ; this is what is termed the Bracts, or Floral-leaves ; they are situated on the petiole, or flower-stalk, and often so near the fructification as to be confounded with the Calyx. Examples of the Bract may be seen in tilia (lime-tree), monárda, passiflora, passion-tree ; the Bracts may be distinguished from the Calyx by their longer duration ; they differ in size, shape and colour from the other leaves of the plant, but commonly continue as long as they do, whereas the Calyx always withers when the fruit is ripe, if not before. There is a species of Bract which consists of a tuft of leaves, which terminates the flower-stem ; we have just now admired this tuft in the

crown-imperial. There is a species of sage (sálvia) whose Bracts are beautifully coloured; sometimes they are red, and sometimes of a deep blue. Linneus has made great use of these singularities in determining the species of plants; therefore you should be well acquainted with them. The Bract is ranked amongst the Fulcra, or supports of plants, of which I shall treat presently. This poppy and tulip shew you the stigma attached to the germ, without the intervention of the style: the germ of poppy with its stigma is very beautiful; the stigma shuts up the germ, like the lid of a box; when the germ is mature, it is a capsule, and opens at the top in several places to let out the seeds, which are very numerous. From one head of white poppy, 800 seeds are said to have been produced in one summer. This has been ascertained by counting the number of seeds, which would weigh a grain or two, and then by weighing the whole. Your trouble will be well repaid, if you examine seeds of all kinds through the microscope; they have much beauty, which from their minuteness escapes common observation.

Harr. Violet seeds I have often admired.

Hortensf. They are worthy of admiration; the variety, that may be found in seeds, is very great, both in size, shape, and surface, also in the vessels which contain, and the substance which encloses them, before they are ripe. If you consider the difference in the size of the cocoa-nut seed, and that of the poppy, you may imagine there must be many different sizes between these two extremes. The appendage, which nature has given to seeds for their dissemination, also adds much to the beauty of many of them. The seed of the common chick-weed is worth looking at through a microscope, the surface of it being like the mussel-shell. In my cabinet I can shew you the pictures of various seeds elegantly given in Mr. Curtis's London Flora.

Harr. That is the book in which you shewed us the grasses?

Hortensf. Their mode of flowering is well explained there, and their very minute parts of fructification drawn with great accuracy. It now remains for me to instruct you in what is termed the Fulcræ and Inflorescence of plants, and then we may begin with the classes.

Harr. That we shall like.

Hortensf. I am afraid that you are rather more apt to expect pleasure from your studies than to find it; the study of either a science or a language can only be agreeable, as it is a mean to attain an end; when you enter upon the practice of what you have learnt, then will the amusement begin.

Charles. I have a great deal more pleasure in looking at flowers, now I know their separate parts, and have some idea of the use of those parts, than I had before, when I was wholly ignorant of them.

Hortensf. I dare say you have; and the more you apply the knowledge you have gained, the readier you will find yourself in learning, what remains for you to be instructed in. Linneus has named those parts of plants, whose chief use is to strengthen and support them, Fulcra; or Props; *supports* is the term given them in the translation of the system of vegetables: they are defined to be, assistances for the more commodious support of the plant. There are *seven* kinds of Fulcra, or Supports: Petiole, Peduncle, Stipule, Tendril, Pubescence, Arms, Bract. Petiole is the foot-stalk of a leaf, which it supports without any flower, Peduncle is the foot-

foot-stalk of the flower. Petiole is defined to be a prop supporting the leaf. Peduncle, a prop supporting the fructification. Stipule is a scale, or small leaf stationed on each side of the base of the Petioles, or Peduncles, when they first begin to appear, as may be seen in the Papilionaceous, or butterfly shaped flowers: I dare say you have observed the Stipules of the tulip-tree (*liriodéndron*).

Henry. Juliette and I have often observed them, and amused ourselves with pulling them off, and examining the very little leaves which are so pretty within them; I did not know those two blueish scales had any particular name; I will always call them Stipules now.

Hortensf. Pray do. The Stipules of all plants should be attended to, as they frequently serve to distinguish one species from another; I admire as much as you do the small leaves of the tulip tree enclosed by their Stipules; it is pleasing to contemplate the care which nature has taken to preserve these infant leaves from all outward injury, and how perfectly they are formed in every part, though you may find them so minute as to require a microscope to examine them accurately; these

two Scales, or Stipules, protect and cherish them till they acquire sufficient strength to support themselves. The Stipules of the plane tree (*plátanus*) add much to the beauty of the tree in spring, being formed like little ruffs which surround the branches. In peach (*amygdalus*) and bird-cherry (*prúnus*) the Stipules resemble two very small narrow leaves, and are seated at the base of the Petiole of the common leaves. The Tendril you are all acquainted with; those plants are generally furnished with this kind of Stipule, which are not strong enough to support themselves. Vines (*vítis*) twist themselves round other trees by their clasps or tendrils, and thus raise themselves from the ground. Long poles are placed in our hop-yards for the support of the hop plants (*húmulus*), which make a very elegant appearance in their most luxuriant season; their natural place of growth is in hedges, where they readily find supporters; all these climbing plants are in some degree injurious to the tree of which they take hold for support, as they deprive it of that share of light and air, to which it has a natural right. There are however some climbing plants, which seem

in-

intended by nature to receive their nourishment from other plants, as dodder, cuscúta, The seed of this plant splits without Cotylédons, so that the young plant, having no store of nourishment laid up for it by nature, seems necessitated instantly to find a foster mother, or to perish; when the seed splits it protrudes a spiral body, which, without making any attempt to root itself in the earth, ascends the vegetables in its neighbourhood, twisting round them, and absorbing its nourishment by vessels apparently inserted into its supporters: this must injure the plants it lives upon materially; and I am sorry to find an instance of so much ingratitude in the vegetable kingdom, for the sequel of the history is, that after it has been afforded support and nourishment by a stranger plant, it overpowers and smothers its protector: in this resembling those vicious human creatures who, being too idle to work for their own support, bring their parents to poverty and death, by the efforts their tenderness induces them to make for their subsistence.

Jul. Oh, mamma, I hope there are not many such people!

Hortens.

Hortensf. We will hope not, my dear: I am happy to say there are but few instances of such plants as *cuscuta* in the vegetable kingdom. In most situations the injury is small, which the supporters of the climbing plants sustain from the assistance they afford, as generally the climbers have roots which strike into the earth, and from thence draw nourishment.

Henry. I think, mamma, you told us, that the hop buds, we eat in spring, are the tops of the hop plant?

Hortensf. They are. Climbing plants are of such quick growth, that their tops are always tender, and, when rendered mild by boiling, are agreeable food. The tops of white bryony (*bryonia*) are said to be sweet and pleasant to the taste, but I have never eaten of them. There is one plant of the parasite kind, which appears to be so from choice, as it first vegetates in the earth, and is sometimes found growing in it; nor has it any want of support from its neighbours, being a stiff short stemmed plant; this is the *orobanche major*, it grows upon the roots of other plants, chiefly upon the butterfly-flowered tribe; it has an extremely small seed,
which

which makes it difficult to shew its vegetation by experiment, more particularly as it requires a peculiar soil and situation for its culture. Mr. Curtis, in his London Flora, gives a plate of it, and supposes, that when the seed has first vegetated in the earth, that the Radicle shoots downwards, till it finds a proper root to attach itself to, that it then quits its parent earth, and becomes parasitical.

Charles. I dare say this is the plant I once saw when I was with the gardener digging up broom. Pray, ma'am, does it not look like a plant dried in sand? and is it not of a purplish colour? The gardener shewed it to me, and said, look how close it sticks to the roots; but I never thought it grew upon them.

Hortensf. No doubt it was the orobánche, as it is generally in its parasitical state, found upon broom hills; though when it contents itself with the earth for its nourishment, it grows in corn fields, and on hedge banks. I wish you had brought me a plant of it, but you were careless at that time about such curiosities. We will now consider the fifth kind of Fulcra, *pubescence*, which however may more properly be called a defence than a support.

support. This term is applied to every kind of hairyness, which exists on plants. If we examine the young parts of plants by a microscope, particularly the young stalks or stems, we shall find almost all of them covered with hairs: this clothing in their tender state seems intended to preserve them from severe winds, and from the extremes of heat and cold, which purpose it is well adapted to answer. Arms is the general term for those points, which prevent animals from injuring the plants; these arms consist of Prickles, Thorns, Forks, and Stings. The shrubs and trees which have Prickles and Thorns for their defence, are grateful food to animals, as gorse (*úlex*) and gooseberry (*ríbes*), and would be quickly devoured, if not thus armed. The large hollies in Needwood Forest are armed with thorny leaves about eight feet high, and have smooth leaves above; which is a curious circumstance, as it would seem to imply a consciousness in the trees, that when their branches were out of reach of the deer, they had no occasion for arms; but though they may thus preserve their lower branches from the attacks of the deer, they cannot defend themselves from the

de-

depredations of the keepers, who lop their upper boughs in winter, and strew them on the ground, and thus furnish their herds with a grateful food, when herbage is scarce; the deer peel off the bark from these branches with great dexterity; and this with the smooth leaves forms a great part of their sustenance in severe winters. Stings, as in nettles (*urtica*), are the pipes of a small bag furnished with a venomous fluid; when the sting, or point, has made the wound in your finger, which has touched the plant, this fluid passes into it, and causes the pain I have heard you complain of, when you have accidentally taken hold of a nettle.

Jul. Is it true, mamma, that rubbing my hand with dock leaves will cure the pain; I never was the better for it?

Hortens. You may then answer the question yourself. I imagine the amusement you find in seeking the dock leaves, and repeating the lines of—In dock, out nettle—rather serves to divert your mind from the evil than to cure it. There are many curious contrivances for the defence of plants, which may be considered as arms. On the leaves of Venus's fly trap (*dionæa muscipula*) there is

a won-

a wonderful contrivance to prevent the depredations of insects; the leaves are armed with long teeth, and lie spread upon the ground round the flower-stem, and are so irritable, that, when an insect creeps upon them, they fold up, and pierce or crush it to death. We have a plant of our own country, which in its curious mechanism greatly resembles the so much celebrated flytrap; this is the sundew (*drosera*): its round flat leaves are thickly beset with hairs, both on their upper surface and on the margin; each of these hairs is crowned with a little purple globule, which in the sunshine exudes a pellucid drop of mucilage, and gives the whole plant a beautiful appearance. These hairs with their viscous juice entangle the flies, which attempt to plunder the leaves, so completely, that, when once enclosed by them, it is not possible they should escape. It is also supposed, that the leaves of the *drosera* possess a power of folding themselves upon the insect, that they would destroy, in a manner similar to those of the flytrap; but these researches do not belong to the present part of our subject; I will, however, shew you a plate of the sun dew, and when we walk out we will endeavour

endeavour to find some plants of it; they commonly grow upon marshes, but I have found them on the wet part of heaths, and on ditch banks; in these situations they are not difficult to discover, as they form a little red patch, which immediately attracts the eye. There is a viscus juice which surrounds the stems of some plants, and which effectually defends them from the depredations of insects, as they no sooner approach them than they are destroyed; from this circumstance a species of silene has obtained the common name of catch-fly. I could enumerate many more extraordinary arts, which nature has used to preserve the vegetable kingdom from its enemies, particularly from insects, but at present I wish only to make you so far acquainted with them as to give you an interest on the subject. We will enter more deeply into this curious part of it, when we begin with the philosophy of botany.

The Bract, or floral leaf, I have before explained to you. There is another kind of flower-stalk, beside the peduncle, which is termed Scape. The Scape is that kind of flower-stem, which raises the fructification without

the leaves ; it is a naked stalk proceeding immediately from the root, and terminated by the flowers. Hyacinth (*hyacínthus*), lily of the valley (*convallária*), and áloe are examples of the Scape.

Charles. And the little stalks belonging to each flower, I suppose, must be called Peduncles ?

Hortens. They are Peduncles. Now you are acquainted with the different kinds of flower-stalks, you will better understand the different modes of Inflorescence, a term which signifies the various manners in which flowers are joined to their Peduncles. There are seven different modes of Inflorescence, distinguished by the following terms: Verticil, Head, Spike, Corymbe, Thyrsé, Raceme, Panicle. The Verticil is that kind of Inflorescence, where many flowers surround the stem like a ring, or ruff, the individual flowers standing upon very short peduncles, dead-nettle (*lámium*), and lavender (*lavendula*), bear their flowers in a Verticil, or Whorl. Head has many flowers collected into a globe on the summit of the common stalk, sometimes with, and sometimes without distinct peduncles. Clover and globe amaranthus
(tri-

(trifólium and gomphréna) shew this kind of Inflorescence ; it is distinguished into various kinds by its shape and other circumstances. Sweet William (diánthus barbatus) has its flowers in that species of head, which is called a fascicle, though I think that the mode, in which the flowers of sweet william are put together, places it more properly under the term corymbe than Head ; but I always dissent from Linneus with great diffidence. The Spike has its flowers placed alternately round a common simple peduncle, without any partial ones, which is called being sessile, or sitting close on the stem. Many of the grasses have their flowers in Spikes ; it is called one-ranked, or a single rowed spike, when the flowers are all turned one way following each other ; a double-rowed spike, or two-ranked, when the flowers stand pointing two ways, as in daniel (lólium). The Spike, like the Head, is distinguished into various kinds by its shape, and other varieties. The Corymbe is formed by the partial peduncles produced along the common stalk on both sides, which, though of unequal lengths, rise to the same height, so as to form a flat and even surface at top. Spi-

raea opulifolia, candy-tuft (*ibéris*), also is an example of the Corymbe.

Harr. Are not the flowers of earth-nut and parsley Corymbes?

Hortensf. Their manner of flowering resembles that of the Corymbe; there is however this distinction, the flowers which form the general bunch of parsley (*ápium*) and earth nut (*búnium*), which is called an umbel, all grow from the same centre; whereas those of the Corymbe grow from different parts of the common flower-stalk.

Charles. I am surprized to find such a variety of ways in which flowers grow; I envy Linneus having made such discoveries: how great must be his genius!

Hortensf. His genius was uncommonly great, but it is his industrious application of that genius, which I think most to be admired. He was indefatigable in research; hence he discovered those innumerable minute and wonderful varieties in every part of a plant, which has enabled him to give the world a system, from which by attentive study we may arrange every plant, that grows, under its proper class, order, genus, and species. We can now converse in one language

guage with botanists in every part of the globe. The labours and knowledge of every individual are preserved, and added to the general stock. All this we owe to Linneus; yet I advise you not to indulge yourself in envy of his great abilities, till you have been as useful to the world, as the abilities, which nature has given you, will allow of your being. I always set down for idlers those persons, whom I hear envying distinguished characters; they are themselves commonly weak and indolent.

Charles. I will not deserve that character, when I am a man.

Hortens. I hope, and now believe you will not; but as you are born in that class of society, which exempts you, as my eldest son, from the necessity of a profession, it will require more exertion to avoid this character, than you may be aware of; on this account I wish particularly to cultivate your taste for useful and elegant studies. If you have philosophical experiments, which interest you at home, you will give no more of your time, than is necessary, for the civility of social life to idle and profitless company; you will be eager to return to your seeds and roots,

or to your laboratory; finding yourself respected among men of science, you will seek their company.

Charles. I have already found the pleasure and benefit of studying chemistry: as soon as I became interested by it, I no longer cared for those companions, from whom, ma'am, you have warned me before in vain; and Mr. Wilson said I was quite changed.

Hortensf. You are now nearly what I wish you to be: a few years passed in a course of industrious habits will, I trust, fix your character for life. My little Henry must exert his industry in a profession; he may enter into that of medicine, in which case his present studies may be of much use to him; in any situation the study of a science teaches us to think, which is the foundation of all acquirements, and in my opinion of more value than all the train of accomplishments commonly taught at schools.

Ful. Then, mamma, I am learning two things, botany and thinking.

Hortensf. One is the consequence of the other; your works you learn by rote, like a parrot; the acquirement of them may be called the education of the fingers, that of science,

science, or language, of the mind : they are both becoming the female character ; but if I was obliged to omit one in my education of you, which do you think I should lay aside ?

Harr. I know that it would be science and language ; because, ma'am, you have always told us, that the first point was to make ourselves useful in the small duties of life, which daily occur, and that we may have many opportunities of putting the acquirements of our fingers to use, both for ourselves and others, before we can those of science and language. I should however be very sorry if I could only work.

Hortensf. There is no situation of life, where a knowledge of work is not requisite ; there are various states, which will not allow of our time being spent in pursuits, that cannot be put into daily practice ; your situation admits of both acquirements. I have however not allowed of your beginning the study of an amusing science, while you were idle at that most necessary one, arithmetic, and careless with your needle.

Ful. But, mamma, you have always taught us to think.

Hortensf. I have endeavoured to do so, and have found the advantage of it, in all other things I have had to instruct you in. Had you not been accustomed to compare one object with another, which is thinking, you would not have understood so readily, what I endeavoured to explain to you on the subject of botany: but we have wandered far from our study; which of you can tell me where we quitted it?

Henry. You were, ma'am, explaining to us the difference betwixt a Corymbe and Umbel; the peduncles of the Corymbe rise from the different parts of the common stalk of the Corymbe, but all from the same part of the Umbel.

Hortensf. Very well, Henry; you prove that I have not thrown my time away in teaching you the art of thinking. The Thyrsé is the mode of Inflorescence, we have now to consider. The flower of lilac (*fyrínga*), and of butter-burr (*tuffilágo*) are examples of the Thyrsé. Linneus calls it a panicle condensed into an egged form; the lower peduncles, which are longer, extend horizontally, or cross-way; the upper, which are shorter,
mount

mount vertically, or perpendicular. The raceme has its flowers placed on short partial peduncles, proceeding like little lateral branches from and along the common peduncle; it resembles a spike in having the flowers placed along the common peduncle; but differs from it in having partial peduncles; it also differs from the corymbe in the shortness and equal length of its peduncles, not forming a regular surface at top. The vine (*vítis*) and the currant (*ríbes*) bear their flowers in Racemes. The Panicle has its flowers dispersed upon peduncles, variously subdivided; it is a branching diffused spike, composed of a number of small spikes, that are attached along a common peduncle. Oats (*avéna*) have their flowers in Panicles. We have now gone through the various terms given by Linneus for the manner of flowers being placed on their peduncles, all of which are ranked under the term Inflorescence. Flowers too are sometimes found growing on the leaves, as in the *rúscus* genus. Dr. Thunberg takes notice of this singular kind of inflorescence, in his account of Japan, having seen it in the *Osy'ris Japonica*, and calls it a most rare circumstance in nature, from its

rarity,

rarity, I suppose. Linneus has not thought it necessary to distinguish it by any particular term, though in the *rúscus*, where it occurs, he calls it leaf-bearing. The umbel, which I have before explained, the cyme, and the spadix he has ranked under the general term receptacle. The cyme and umbel are much alike, both having a number of slender peduncles growing from one common centre, which rise to the same height; they differ in the cyme, having its partial peduncles dispersed without any regular order. Elder (*sambucus*) and laurustinus (*viburnum*) are specimens of the cyme. The term spadix is used to express every flower-stalk, that is protruded from a spathe or sheath; the family of palms have their flowers in a spadix, which is branched. The spadix of all other plants is simple. There is another term, which Linneus makes use of, which is rachis; this means only the stem, on which the flowers grow that form a spike; he calls it a thread-form receptacle, connecting the florets longitudinally into a spike.

Harr. O dear, mamma, I hope you will not think me very stupid, if I do not remember all these distinctions?

Hortens.

Hortensf. I do not even expect that you should understand them, until by examining the definitions of them with the plates of the different kinds of inflorescence they are made more intelligible to you; and when they are become so, you will with ease make them familiar to you, if, as you walk out with your brothers and sister, you examine such flowers, as you meet with, by those definitions, of which you have made yourself mistress.

Juliette. I am afraid of not remembering the hard names; but Henry will, and he will assist me.

Hortensf. The hard names will become familiar to you by degrees. You must assist one another; we are all interested in the study; we shall converse upon it, which will contribute more to your improvement than twenty lessons learnt by rote. However, I would have you make a point of committing to memory what you learn in each of our lectures, and to form it into question and answer, such as, What is fructification? How many parts of fructification are there? &c. &c. this will amuse and improve you at the same time. Botany is reckoned a dry study of names and terms; if the pupil finds

it so, it must be the fault of his teacher. You would not, any of you, have given your attention to me, if I had begun with teaching you only out of a book, and required you to remember all the numerous distinctions, without at the same time shewing you the natural objects, and acquainting you with their use and history.

Charles. I did not expect the amusement I have found so early in the study. I am impatient to tell Mr. Wilson how much I like it.

Hortens. You will like it still better the farther you enter into it. We shall have the whole season before us; and, I doubt not, shall be great proficients, if we make as good use of our time henceforward, as we have hitherto done. We will part for the present, as you have learnt sufficient for one day.

Henry. I wish to-morrow was come. Now let us go into the garden, and try to put into order what we have learnt, and then we can question each other in turns.

EXPLANATION OF PLATE III. PART I.

OF INFLORESCENCE.

Fig. 1. A Seed of Cucumber, *a*, before it is put into the ground. *b*, Beginning to germinate. *c*, *c*. The Cotyledons expanded. *d*, The Plume. *e*, The Radicle.

Fig. 2. The Seeds of Geranium, to shew the manner in which they are dispersed. *f*, The Awns by which they are attached to the Pistil.

Fig. 3. The common Receptacle of a Compound Flower.

Fig. 4, and 5. Different shaped Florets of Compound Flowers.

Fig. 6. The Wheel-form Corol of Verónica, to shew the narrow division.

Fig. 7. A Petal of common Crow-foot. *g*, The Nectary.

Fig. 8, Shews a Tendril, *h*. Stipules, *i*. Glands, *k*.

Fig. 9. A Verticil.

Fig. 10. Head.

Fig. 11. A Spike.

Fig. 12. A Corymbe.

Fig. 13. A Thyrsé.

Fig. 14. A Raceme.

Fig. 15. A Panicle.

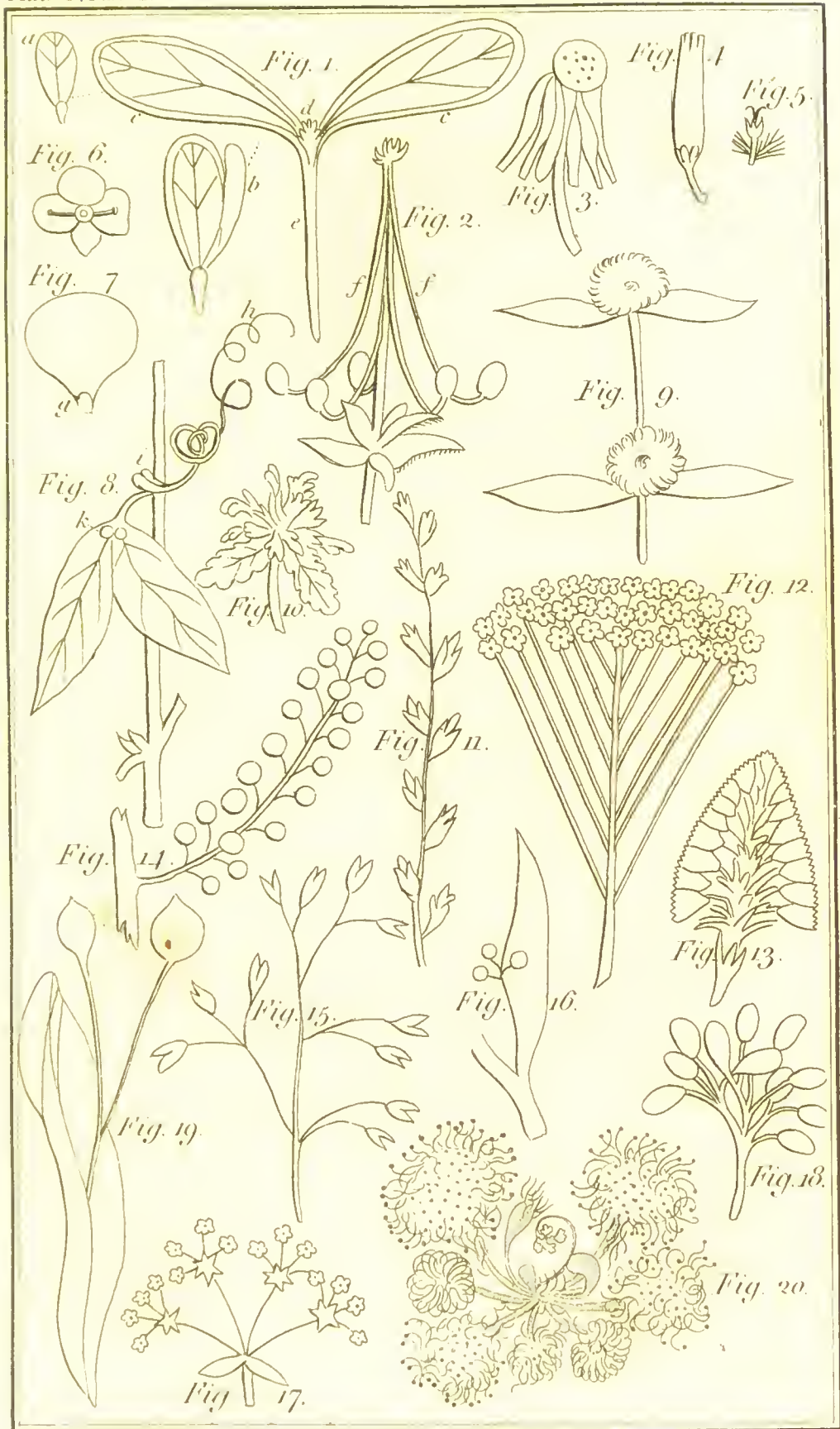
Fig. 16. Leaf-bearing.

Fig. 17. An Umbel.

Fig. 18. A Cyme.

Fig. 19. A Bract, of Lime Tree (*Tilia Europæa*) with the Capsules mature.

Fig. 20. A Plant of *Drósera*.



DIALOGUE THE THIRD.

System of Linneus explained. The first eighteen Classes, with their Orders explained.

Hortensf. I am glad to meet you all again in our botanical room ; by your countenances I judge that you have gone through your school business well, and that we may proceed with our study of amusement.

Henry. Yes, indeed, we may ; Juliette and I performed our tasks so readily this morning, that Mrs. Pratt allowed us to meet Charles and Harriet in the alcove, where we have been together more than an hour looking at flowers, and asking each other questions from the paper we formed yesterday ; do, mamma, look at it ? I do think you will find we have remembered every thing you taught us.

Harr. The parts of fructification we readily remembered. What we found difficult yesterday, we made out by the plates ; and this morning we could all by turns answer the questions.

Hortensf. You have managed it very well indeed, and I am pleased to see that you have rigorously observed my rule of placing the
botanical

botanical name with the common one of the flowers, you have had occasion to mention.

Charles. We could not do this by memory, but were obliged to look for them in the botanical books, which however answered our trouble; for finding them accented in the translated *Génera Plantarum*, we were no longer afraid of pronouncing them, and in a little time I dare say, we shall find the botanical names as easy to remember as the common ones.

Hortensf. I wish you to attend to this; the confusion arising from the neglect of the use of proper names is so great, that a knowledge of them cannot be too soon acquired, and their being accented makes it now not difficult to pronounce them.

Harr. I would rather all plants had English names; I shall be afraid of speaking the botanical names though they are accented, lest I should be thought conceited.

Hortensf. You may avoid that evil by a discreet use of them. Such censures are generally made by ignorant people, but cannot be justly incurred, unless you make a display of your knowledge of the botanical names, by officiously using them for flowers universally

fally known by their common ones: for instance, if instead of talking of a crown-imperial, you say you have gathered a *fritilária imperialis*; or for lily of the valley you say *convallária*, you will deservedly be ridiculed both by the ignorant and well informed.

Harr. But why cannot there be English names to English plants at least?

Hortensf. This has been attempted, and has only served to make more evident the disadvantages of such a plan. Genéric names are merely arbitrary, and ought to be equally familiar to botanists of every nation, which could not be the case, if family names were given in every language; perhaps it would be better if all names were banished which are expressive of any particular quality, as this frequently tends to mislead. In regard to an english généric nomenclature, many objections may be made to it; first, there are but few english généric names, which comprize all the plants belonging to the same family, southern-wood, mug-wort, and worm-wood, have all an equal claim to become the family name of that genus, but have all been too long appropriated to each individual species

cies to be now assumed for the name of the genus. The Linnean generic name for this family, *artemisia*, includes them all; and by being thus ranked under a name not familiar to us, we feel no violence done to our old habits of considering them as distinct families. So the generic name of clary does not seem to include the sage, nor the generic name of sage to include the clary. *Salvia* comprehends them all, and may be retained by the memory with as much ease as the english names. I will give you an instance, in which this attempt to establish english generic names is productive of so uncouth an effect as, I think, will put an end to your desire to have it become general. The generic name *pyrus* is adopted by Linneus for the family of pear, apple, and quince; in the attempt to an english nomenclature, pear is taken for the name of the genus, apple and quince for the specific names; hence we must speak of the pear-apple, the pear-quince, which could convey no distinct idea to a Linnean botanist, and must confuse an english one.

Harr. That would be very awkward indeed. I will no longer wish for the general use of english names; I always find, mamma,
you

you are right ; but I like to know sometimes the reason why one thing is better than another.

Hortensf. I also like to have you enquire : I never wish you to take any thing upon my authority, when objections arise in your mind against my opinions ; this however requires discretion, and an attention to making your questions pertinent, and offering them with diffidence. Many of the Linnean names are already become familiar ; they are now allowed to take the lead even in a work, where it had been attempted to establish an english genera ; and in imitation of the Lichfield translators, in their useful publication of the *Génera Plantarum* and *System of Vegetables* in an English Dress, the botanical names are accented. This must greatly facilitate the use of them ; and it is much to be wished, that Mr. Curtis would follow this example in his very agreeable work the *Botanical Magazine*, which from the information, it contains in its accurate plates, and the lowness of its price, being only one shilling each number, is in every body's hands, and has diffused a general knowledge of plants. Were the names in this work accented, it would tend greatly to

bringing them into universal use ; even without these assistants we hear those very people, who object most to the difficulty of them, speak without hesitation of convólvolus, geráanium, aspáragus, campánula, and many other names, which are all of them the Linnean ones. Now we are all agreed upon the utility of endeavouring to establish the common use of the botanical names, we will, if you please, begin with the Classes.

A Class is the first and highest division of every system. It may be compared to a dictionary, in which all the words having the same initial letter are arranged together, every word may be compared to a genus ; the classic character is constituted from a single circumstance, as the words are arranged by a single letter ; this one circumstance must be possessed equally by every plant admitted into the Class, how different soever they may be in other respects. This single character is arbitrary, and has been taken from various parts of the fructification by different authors ; some have chosen the petals, others the fruit ; Linneus has made choice of the stamens, and on their number and situation has founded his classes ; he makes the excellence of the
classic

classic character to consist in its greater or less approximation to the natural one. The classes called natural are those, which contain plants agreeing in a variety of circumstances; such as habit, manner of growth, uses, and sensible qualities. The grasses are a natural class; the compound, the pea-bloom, the cross-form, the umbelled, and the verticilled plants are natural classes; so are the ferns. Though some of Linneus's classes are natural, most of them are artificial; this however I think of little consequence; his system has opened to our view a distinct knowledge of every plant that grows; it has given us a clear and ready method of referring an unknown plant, 1st, to its Class; 2d, to its Order; 3d, to its Genus; 4th, to its Species; and 5th, to its Varieties. Before we had this ingenious system to guide us to a knowledge of the vegetable kingdom, all was confusion. Much acuteness had been displayed in the investigation of plants; but the labours of many ingenious men were rendered of little use from want of arrangement; they classed plants together, which had scarce any affinity, from a fancied resemblance in imaginary virtues. Much useful knowledge has been lost to

the world, almost all the medicines, and many of the arts of the ancients, we are now ignorant of, from their deficiency in the knowledge of botany.

Harr. But I think, mamma, I have often heard you say, what an ingenious man Dr. Grew was ; and you are always entertained, when you look for plants in Gerrard's Herbal.

Hortensf. Whoever is fond of the study of plants must feel grateful to Dr. Grew ; he made his investigations with so accurate and penetrating an eye, that much information may be found in his book on the anatomy of plants, particularly in the philosophical part of botany ; besides, it is pleasing to observe the coincidence of his opinions with those of Linneus, in regard to the use of the parts of fructification. Gerrard's descriptions are full and strong, and his language amusing ; but, for want of arrangement, I am bewildered, when I look for a plant in his Herbal ; the various systems of modern botanists have deservedly had their partisans ; but it now seems generally allowed, that the works of Linneus are best calculated to enable us to attain a knowledge of botany. He has divided

vided the vegetable kingdom into twenty-four Classes; the first ten Classes include the plants in whose flowers both stamens and pistils are found, and in which the stamens are neither united nor unequal in height, when at maturity. These Classes are therefore distinguished from each other simply by the number of stamens in each flower, and may be known upon the first view by their numbers, as expressed by the words prefixed to the Classes: the first Class is known by the name of monandria, which signifies one-male, or one-stamen, the stamens being the part of fructification, which Linneus calls the male; so that the numerical word joined to the word andria forms the titles of the first thirteen classes. Perhaps, Charles, you can with this previous information enumerate them to us?

Charles. I believe, Ma'am, I can, but I will own not quite fairly, as I cast my eye over them yesterday in the preface to the Botanic Garden, which lay open in Mr. Wilson's room.

Hortensf. In whatever way you may have come by your knowledge, we will be obliged to you to impart it to us. We expect you to

translate for us; for male, you may say stamen.

Charles. I am to enumerate the titles of the first thirteen Classes:—monándria, one-stamen; diándria, two-stamens; triándria, three-stamens; tetrándria, four-stamens; pentándria, five-stamens; hexándria, six-stamens; heptándria, seven-stamens; octándria, eight-stamens; enneándria, nine-stamens; decándria, ten-stamens; dodecándria, twelve-stamens; icofándria, twenty-stamens; polyándria, many stamens.

Hortensf. We thank you; you have performed your task well; and we will not enquire whether your previous knowledge of language, or memory, has had the greatest share in your doing so.

Harr. Will it be necessary for me to learn these hard names to the Classes? I could readily remember the titles of one-stamen, two stamens; for they give me some idea of the flowers.

Hortensf. I do not wish you to perplex yourself with them; but it will be useful to make yourself a little acquainted with terms, which you will meet with in most botanical books; and if you will take the trouble to fa-

familiarize yourself with them at first, you will soon find them appear not very uncouth to you.

Harr. I shall not think any thing too much trouble, that you recommend to me, Ma'am ; but sometimes I feel a little afraid of being found dull ; and I think I have heard of botanical books written for ladies, which make all the hard words easy.

Hortensf. There are some books, which pretend to do it ; but the scientific terms are still to be learnt, and when learnt, in the language of those books, you cannot converse with a Linnean botanist ; they may make you a partial, but cannot make you an universal botanist. A knowledge of the translated works of Linneus enables us to converse with botanists of all nations, and to understand any botanical descriptions of plants, that we may meet with. Those who have not industry sufficient to study those books, will learn the science but superficially from any. The complaint, that the translated works of Linneus are hard, arises from not knowing how to study them. I have several times removed this difficulty by pointing out a method, and have been assured by my pupils who have

adopted it, that they have learnt more readily from them than from all the pretty round-about ways, which have been adopted to level the science to the capacity of ladies, and which, I think, serve only to confuse. The method, by which I teach you, is the same, which I recommend for studying the Lichfield translation.

Harr. But then, mamma, we have you to explain all difficulties to us.

Hortens. That is true; and in consequence of my assistance, you find the study more amusing to you; but there are few persons, who have not some friend, to whom they can apply, who can either resolve these difficulties, or recommend books by which they may be removed. I am rather amused at the complaints of the young people of this age, of the hardness of the study, when so many books and plates of explanation are to be met with every where. Before the translation of the system of vegetables, they who wished to make any proficiency in the science of botany, were first obliged to learn Latin.---But to return to our Classes, the ten first of which, as I can shew you by a plate, are known by their number only; the eleventh Class is
called

called dodecándria, which you know signifies twelve-stamens. The reason of passing from ten to twelve is, that the number eleven has not been found sufficiently constant in any flowers to form a Clafs. In the genus *reséda* eleven stamens are sometimes found, but oftener more ; yet they never exceed fifteen. The essential character of the eleventh Clafs is, that the flowers belonging to it shall not have fewer than eleven stamens, nor exceed nineteen ; added to this may be, that in this Clafs the stamens are fixed to the receptacle ; whereas in the next, which has the title of twenty-stamens, *icosándria*, though no more determined in point of number than the preceding one, they are attached to other parts of the fructification ; their position it is also necessary to attend to in the thirteenth clafs ; so that if we regarded only the titles of these three classes, we should find ourselves much confused.

Harr. Why then did Linneus give such names to his classes, as were sure to mislead a young botanist ?

Hortensf. I am sorry I cannot answer that question satisfactorily ; it seems that he might have given such titles to the three last of the
numerical

numerical classes, as would have been expressive of the circumstances which distinguish them. I am ready to believe he had good reasons for not doing so, as he was evidently aware of the defect in the titles he did give them, and as he has obviated the inconvenience, which would arise from the first character expressive of a decided number of stamens, by adding in the Key to his system the situation of their growth, and by which circumstance alone we can distinguish these three classes one from the other. The twelfth class, icofándria, has generally twenty stamens, often more, which are inserted on the calyx; there are also other more obvious characteristic marks, which may serve to distinguish this twelfth class from the following one, and which should be attended to, as this contains most of the wholesome fruits, and the thirteenth chiefly consists of such plants as are poisonous. The plants of the twelfth class have a hollow calyx of one leaf, the corol fastened by its claws to the inside of the calyx, and, as I told you before, the stamens placed on the inside of the calyx or corol.

Henry. So then, mamma, if I was in an unknown country, and found a plant bearing
flowers

flowers with these marks, I might conclude it was of a wholesome species.

Hortensf. Your conclusion would probably be right, and might be of service to you, as the fruits of the twelfth class frequently have their calyx remaining like a little crown on their top, when they are ripe; and while in a fresh state, a skilful botanist may distinguish the insertion of the stamens on the inner part of its leaves. The *thirteenth* class, many *stamens*, polyándria, has its stamens inserted on the receptacle; their number being from twenty to one thousand in the same flower. This class is the last of the numerical ones, or, more properly, of those which have numerical titles; for we have seen that the character of the last three classes depends nearly as much on their situation as those of which we are about treat. However we will proceed no further, till we have well understood these first thirteen classes with their orders; and then we will enter upon those which are more difficult,

Harr. I am glad of that; for I have not got very clear ideas about the classes yet.

Hortensf. You have yet only gone through the ceremony of introduction, and have not
had

had time to form an acquaintance with them, which you will not find very difficult, if you will be content to study only a few of them at a time. I will introduce you to the first subdivisions of the thirteen classes, which are called Orders, and then we will examine our plates, and some flowers with them. The subdivisions or orders are founded on the number of pistils, or on that part of fructification, which Linneus calls the female. If a flower contains one of these females or pistils, it is of the first order; if it contains two, of the second; and so on to any number that it may contain. The Linnean term for the orders is formed from the Greek word, which signifies a female, joined to another word expressive of the number; so that, as monándria signifies one-male or stamen, monogynia means one female or pistil; digy'nia signifies two pistils, which refers the plant to the second order; trigynia signifies three, and so on to polygy'nia, or many pistils. Do you think you can remember the titles of the classes and orders.

Henry. I think I shall remember them: I am to know to which of the first ten classes a flower belongs by the number of stamens,
that

that I find in it, and to which order by the number of pistils. Am I right, mamma?

Hortensf. Quite right, only remember that a flower, to belong to any of the first thirteen classes, must contain both stamens and pistils, and that the stamens must be at an equal height when at maturity. Henry has explained the first ten classes; there is yet one class left for each of you three to explain.—What is the character by which we are to know the eleventh class, Juliette?

Juliette. There are not to be fewer than eleven stamens, nor more than nineteen; and the stamens are to be fixed to the receptacle.

Hortensf. Now, Charles and Harriet, you must tell me the characters of the twelfth and thirteenth classes, and the circumstance which distinguishes one from the other.

Charles. The class icofándria, or the twelfth class, has generally twenty stamens, often more, inserted upon the calyx, which is of one leaf with the claws of the corol fastened on the inside of it.—Now, Harriét.

Harr. I will not be behind-hand with Charles with his hard words. The flowers of the class polyándria, or the thirteenth class, have stamens from the number of twenty to
one

one thousand, which are inserted on the receptacle. The orders depend on the number of pistils. In all the numerical classes, the stamens must be of an equal height when mature, and the stamens and pistils must be found in the same flower ; but I will own, that I repeat more than I understand ; for, finding myself confused, I resolved to apply wholly to retaining what mamma told us, and trusted to understanding it when we came to look at the plates.

Jul. So did I ; for you know, mamma, you have sometimes advised us to learn things in this way.

Charles. I dare say I shall understand them better, when we have seen some flowers and the plates ; but I think I have a clear idea of the position of the stamens in the three last classes.

Henry. I have often seen the stamens growing on the inside of the calyx in apple and pear bloom ; and yesterday Charles and I pulled off the petals of a crow-foot, and the stamens all grew on the receptacle.

Hortens. You will find that an attention to these small circumstances will be of much use to you, as we proceed in our study.---When
you

you are satisfied with examining the plates, we will go on with the classes.

Harr. We are all ready to attend, I believe, now, ma'am.

Hortensf. The character which distinguishes the class didynamia, or the fourteenth class, is this, viz. that the flowers, of which it consists, have four stamens, two of them being longer than the other two; hence it is called the class of two powers. The grinning and gaping flowers belong to this class. There are however two such distinct natural assemblages of plants contained in it, that it would have been difficult to have brought them together from their affinity in any one circumstance, but that which Linneus has arranged them under, viz. the curious position of their stamens. This class contains two orders, which are strongly marked; the first gymnospermia, or that in which the flowers have their seeds naked, being contained in the bottom of the calyx; and the second order, angiospermia, having the seeds covered or contained in a pericarp. The whole appearance of the flowers belonging to these two orders is perfectly different: what can be
more

more so than the fox-glove (*digitális*), and lavender (*lavéndula*), or thyme (*thy'mus*). Yet the cross-form growth of the anthers, with the unequal position of the stamens, may be found in them all. The next class, tetradynamia, or the fifteenth class, has six stamens, and is called the class of four-powers: these six stamens not being of an equal height, four being taller, and the two lower growing opposite to each other. This class contains the cross-form flowers, and is a really natural class. Linneus has admitted only one genus into it, which can be at all objected against, that is the genus *cleóme*, in many species of which there are more than six stamens, and these not in the regular proportion of length, which gives the name of four powers to the class, so that it seems that the family of *cleóme* has no right to be admitted into it, unless the affinity of its near-kin to those of the cross-form flowers may be allowed a sufficient title. This class is divided into two orders, which are distinguished by the form of their pericarps, or seed-vessels; the first order having its seed-vessels of the *Silicle* kind, the second of the *Silique*; the

Silicle

Silicle being furnished with a style, often the length of itself, the Silique with a style scarcely visible. What is the difference, Henry, betwixt the shape of a Silicle and a Silique?

Henry. The Silicle is roundish, but the Silique is long; I think honesty has a Silicle for its seed-vessel, and that the seed pod of mustard is a Silique.

Hortens. You are quite right. The silicle of honesty, when mature, is a great ornament to the plant; from its shining appearance, like white flint, it has received its botanical name of *lunaria*, or moonwort. There is a good deal of variety in the forms of the silicle kind of seed-vessel; that of *lunaria*, you know, is nearly round; there are others which are oval: the small silicle of shepherd's purse (*thlaspi*) is triangular, and notched at the top, and resembles a little heart; the circumstance of being notched or plain makes two divisions of the silicle order, and thence renders the investigation of the genera belonging to it a less difficult task. The seed-vessel of lady's smock (*cardamine*) is a silique, and also that of radish (*raphanus*). Some of

these filiques form very pretty skeletons, in the same manner as the holly leaves that you pick up in winter, and which you so much admire. The sixteenth class, monadélphia, or one-brother-hood, is so called from the flowers belonging to it having all their stamens united at the base into one company, surrounding the pistils. The stamens and pistils in the flowers of the sixteenth class add much to the beauty of the fructification; they stand like a little pillar in the centre of the flowers, from which circumstance Linneus in his Natural Orders has named them column-bearing. The anthers have a marked character, which contributes to their ornament, being shaped like a small kidney, and attached to the filaments by the middle in so slight a manner, that they appear rather to lie upon than to be fixed to them. The pistils are enclosed by the stamens, till they begin to advance towards maturity, when they burst forth, and form an elegant tassel, a little above the surrounding anthers; in the china rose (*hibiscus*) this tassel is particularly beautiful; the rich crimson pistil rises rather higher than usual above the golden anthers, which

which encircle it, and dividing into five filaments at top bends down its round stigmas amongst them ; these stigmas then have the appearance of the richest crimson velvet spangled with gold.

Jul. I think I have observed the brightness of its colour, but am not sure it was that which you describe ; I think it was double. Pray, mamma, shew us the first hibiscus that flowers.

Hortens. You shall see the first, that we can gather. The double hibiscus most people are fond of cultivating, but it is very inferior in beauty to the single. As the sixteenth class is founded on the situation of the stamens, so are the orders on their number, beginning with the number three, and ending with that of eleven. The class diadélphia, or two-brotherhoods, the seventeenth class, is perfectly natural, and the structure of the corol so remarkable, that the outer habits of its flowers are sufficient to distinguish them ; but, according to the Linnean system, it is necessary to have recourse to the situation of the stamens, which is their being united into two sets ; this classic character is however to

be traced with difficulty, for what is termed one of the sets consists only of a single filament ; but Linneus has made this separation of the stamens of such essential consequence, that he has not admitted into this class the genus *sophora*, which has all the outward habits of the tribe belonging to it, except having its stamens separate, therefore he has placed it in the tenth class. The orders, or secondary divisions of the seventeenth class, are founded upon the number of stamens, without any reference to their union ; the singular structure of the corol having made it necessary to distinguish each separate part by a name peculiar to itself, the broad spreading petal at the back of the corol is called the Banner ; the side petals, the Wings ; and the two petals, by which the stamens are enclosed, are termed the Keel, from the resemblance of their form to the keel of a boat. The shape, and other circumstances attending these different parts, are found of use in distinguishing the genera of this class from each other ; but the calyx is of most service in this important office ; it is to this class of plants that the legume seed-vessel belongs. Henry explained

plained the filicle and filique ; do you, Juliette, tell us the mark of distinction betwixt the legume and filique ?

Jul. I think that in legume the seeds are fixed only on one side, and that in filique they are fixed on each side alternately.—Pray, inamma, let us examine a pea flower in all the different parts, which form the corol ?

Hortensf. When we have finished our morning lecture, we will imprint it upon our memories, by talking over what we have learned, and by comparing flowers with plates of their various parts, and with the descriptions, which I have given you of them. We will now go through the eighteenth class, and then leave the remaining six classes for our next meeting. The eighteenth class is called Polyadelphia, or many-brotherhoods, the flowers contained in it having their stamens united into distinct sets. St. John's wort (*hypericum*) shews the disposition of the stamens very plainly ; they may, with very little attention, be taken off in little bunches : the orders of this class depend on the number of stamens, or more properly on the number of an-

thers in each flower, as some of the *généra* have five anthers on each filament: indeed this is a circumstance, which ought always to be attended to, the *ANTHERS* and *STIGMAS* being the essential parts of the *STAMENS* and *PISTILS*. If they are present, it is sufficient to place the flower, they belong to, in the class or order, to which their number refers it. I am afraid you do not find the classes so amusing, as you flattered yourselves you should have done.

Harr. I acknowledge, that I am not so well amused by them, as I was with what we before learned; but I am not at all tired, and should like to go on, only I think I shall better understand, what we have now heard, by studying the plates, before we proceed further, than if we attempted to learn the outline of all the classes together.

Charles. So do I; for if we can attain a clear idea of the classes, that we have learned, we may begin to practise our knowledge, and that we shall all like.

Henry. That we shall; and I hope we shall have time to-morrow morning to meet in the alcove.

Jul.

Jul. I hope so too. Now, mamma, let us have the plates, and we will class all the flowers at our next lecture.

Hortens. If you do, I shall think you great proficient; it gives me pleasure to find, you all so well entertained. You understand the first thirteen classes; the plates, that we must now look at, must be those of the five classes, that we have just now been considering.

DIALOGUE THE FOURTH.

Examination of Flowers belonging to different Classes. The Classes 19, 20, 21, and 22 explained.

Hortens. I have observed, you all very busy in your alcove, and have great expectations from the result of your researches, particularly as yesterday you were all so ready in the theory of the classes.

Jul. Ah, mamma, you laugh at us, when you say, you expect great things. You knew the difficulties we should find in practising our knowledge: I boasted too soon; but indeed I expected to class the flowers quite readily; now I am afraid I shall be a great while, before I can make any thing of them.

Hortens. Your imagination went a little too rapidly; a few years will teach you, that it is by time and attention only we can learn any thing; and that there are very few people, if any, who are able to seize upon knowledge in a moment. You now seem to doubt your powers as much too hastily, as before you trusted in them; and, I dare say, when I come to know what you have all done, I shall be satisfied.

Harr.

Harr. I do believe, mamma, you will; but it is because you will not expect much; if Juliette had not been discontented, I should have been a little vain of our performances. We cannot make out, to what class the plantain belongs; and some grass, we have gathered, puzzles us, and Juliette thinks this very stupid.

Hortensf. The grasses I advise you not to think about at present; they must be studied at first by themselves. Plantain (plantago) you have probably been puzzled with, by not taking it in a good state for investigation; the best time to examine the number of stamens is just before they burst forth; after the anthers are mature, it is difficult in many flowers to distinguish their number. Be so good to give me your plants in order according to their classes.

Charles. We have had great doubts about this mare's-tail; first we thought there was no flower; then we recollected, that an anther and stigma must be esteemed a flower; and, on very close examination, we discovered a stamen and pistil at the bottom of each leaf, which grows round the stalk; but we are not yet quite sure, whether we must consider

sider this as one flower, or reckon the number altogether, that forms the whorl ; but we think it belongs to the first class and order.

Hortensf. You are right in your conjecture ; greater simplicity in the structure of a flower can scarcely exist than in this plant, which is the *hippúris vulgáris*, or mare's-tail ; it has neither calyx, corol, nor seed-vessel ; and those parts, which are most essential to the fructification, are as few as possible ; there is one stamen, one pistil, and one perfect seed ; the stalk cut across is a curious microscopic object ; we will look at it presently. Juliette may console herself for not being able to class the plantain and grass, as, on the first essay, I should not have expected any of you to have classed the *hippúris* ; but your having done so proves, how much we may learn, when we have a real desire to understand a subject, and give proper attention to it. These *verónicas* are right, they belong to the class two-stamens, *diándria*, and the order one pistil, *monogynia*. These grasses belong to the third class, but you have gathered them too far advanced in flower ; we will think no more about them, till we understand all the classes. This cro-

cus belongs to triándria, or three-stamens ; but to what order have you referred it ?

Harr. We are not all of the same opinion ; though at first when we gathered the flowers, we all thought it belonged to the third.

Hortensf. The deep divisions of the stigma give the flower the appearance of having three pistils, if however you take off the other parts of fructification, to do which you must take the root out of the ground ; you will find one very long pistil within the tube of the corol ; your plaintain like the grasses you have gathered too ripe. You should collect several flowers of the same kind at different degrees of maturity. Pray bring a few flowers of what you call the fighting cocks, which is a plantago, and I will convince you it belongs to the fourth class.

Henry. I have brought several in different states ; I think I see four stamens now.

Hortensf. You recollect that those four stamens must also be of equal heights to place your flower in the fourth class (tetrándria). Observe, now I touch them with this fine needle, the unfolding of the filaments, which bear the anthers, and how closely they lie doubled

doubled within the corol, that they may be preserved free from injury, till they become mature.

Jul. We cannot class this parsley:

Hortensf. I have rarely had occasion to reprove you, Juliette ; but for the chagrin you give way to, when you do not excel in the degree you expect to do ; I fear this disposition proceeds from pride rather than modesty, and much wish you to get the better of it. I should be sorry to be obliged to lose you from our party ; but if this discontent is indulged every time, you cannot refer a plant to its proper class or genus, it will render you a very troublesome companion. Good humour is to be valued far above all other acquirements, and I would rather you were a dunce than that you should be fretful. The parsley (*apium*), the flower in question, is a difficult one to class : it is not easy in the umbel-bearing plants to find the stamens in a proper state for investigation ; they also differ in number, in which case the flower, which terminates the umbel, is to be examined, and, according to the number of stamens contained in that, is to be classed. The difficulty of variety in the number of stamens in
the

the same species too frequently occurs in the flowers of the class pentándria, and is a perplexing circumstance to young botanists ; but as nature commonly preserves a certain proportion through all the parts of the same work, you may generally discover the class to which a flower belongs by attending to the numbers of the other parts of fructification. Should you find a flower, which has its calyx divided into five parts, and its corol consisting of five petals, though its stamens should exceed or fall short of the number five, you may conclude, that it belongs to the fifth class : and if you examine a few more flowers of the same species, or even of the same plant, you will see, that five stamens are the most constant number belonging to such flowers, and need no longer hesitate to refer them to the class pentándria. The umbelled plants are improper subjects to begin with from the minuteness of their parts of fructification. I advise you to choose the larger kinds of flowers, and those of the most simple construction ; and when you are become familiar with their classes and orders, then endeavour to make yourselves acquainted with those, which are more complicated. In
this

this unopened umbel of parsley I can shew you plainly, that your plant belongs to the class five-stamens (pentándria), and to the order two-pistils (digy'nia). The two rough seeds, you observe, have no vessel appropriated to contain them; but in those umbels, which have done flowering, are enclosed by the calyx. The art of gardening has rendered many of the umbelled tribe of plants useful to us in cookery; which in their wild state are too acrid to be palatable food. Your parsley is of the *ápium* genus, distinguished by the specific name *petroselinum*. Linneus gives only two species of the *ápium* genus; the second, *ápium graveolens*, is the finallage, which, though in little request in its natural state, is of much consequence, when it has undergone the process of cultivation, as from it we derive our celery; but whether from the species, which grows on the sides of brooks in our own country, or from what has originally been brought from a warmer climate, is not decided. You have, I dare say, watched the process of blanching celery, by earthing up the root and lower part of the leaves, and thus by depriving them of the air they are rendered white and mild, and
the

the parts of the plant covered by soil converted into solid root, which is the eatable part.

Henry. I have often been with the gardener, when he has earthed up celery, but I did not think much about it. Pray, mamma, are this woodbine and lungwort of the class five-stamens, and the order one pistil?

Hortens. They are; so are this snow-drop (galánthus), chefnut (ésculus), and mezereon (daphne), of the sixth, seventh, and eighth classes, and of their first orders. The class of nine-stamens (enneándria) contains only six génera. There is but one british species known, which belongs to this class, that is the bútomus, or flowering rush, and this is not to be commonly met with. Your specimens of the ten-stamens, decándria, and the second and fifth orders, monogynia, and pentagynia, one pistil, or five pistils, are right in this saxifrage (saxífraga) and wood-forrel (óxalis). You are puzzled, I suppose, by those champions (ly'chnis), as you have let them lie on the table?

Charles. We found stamens in their flowers, but could not find pistils, so we thought they might belong to some of the classes we have

have yet to learn ; but we brought them to ask you about them, ma'am.

Hortensf. By a strict observance of Linneus's rules this lychnis could not be placed in the tenth class, as that requires the presence of both stamens and pistils in the same flower ; however he has himself placed it there, being found to agree with the rest of its family in every particular but that of its stamens and pistils being on the same plant ; rather than separate it from them, he has taken this circumstance for its specific character. This, and a few more instances of the same kind, may certainly be considered as defects of the system ; but the inconvenience that might arise from such a violation of the general rule, by which the classes are characterized, is obviated, as much can be, by being noted, whenever such contradiction occurs.

Harr. Be so good, mamma, to look at this willow-herb and churn-staff : we think the willow-herb ought to belong to the eleventh class, but are puzzled by the churn-staff ?

Hortensf. You are fortunate in the specimen of your willow-herb (ly'thrum), as it is subject to vary in its number of stamens,
which

which shews you the necessity of examining many flowers of the same genus. The churn-staff (*euphórbia*) belongs also to the eleventh, or dodecándria, class; but we will defer the examination of it, till we begin with the génera of flowers. Your pear (*py'rus*) and *ranúnculus* you were ready in, having before examined the position of their stamens: take this hawthorn (*cratægus*), and this pheasant's eye (*adónis*), Juliette, and refer them to their proper classes.

Jul. I think the hawthorn belongs to the twelfth class, the stamens are fixed to the calyx, and this pheasant's eye must belong to the thirteenth, for here they grow on the receptacle.

Hortensf. Very well answered, now let me look at your specimens of the fourteenth, fifteenth, and sixteenth classes, with their orders, which, as they no longer depend on the number of pistils, will require more attention.

Charles. We gathered a dead-nettle, and a snap-dragon, to shew both orders of the class two-powers; the four naked seeds of the dead-nettle place it, I suppose, in the first order;

H

der ;

der ; and the seed-vessel of the snap-dragon refers that to the second.

Hortensf. Certainly. Of what species of pericarp, or seed-vessel, is this of the snap-dragon (*antirrhinum*), Henry ?

Henry. A capsule, I think ; it is dry and hollow : how like a monkey's face it is !

Hortensf. Those two holes, which open at the top to let the seeds out, give it a curious appearance. This whitlow-grass (*drába*) is right, both as to its class and order ; its filicle referring it to the first division of the class four-powers (*tetradynámia*), as this filique of purple rocket (*hésperis*) places it in the second. We eat many of the plants belonging to this class ; some without cookery, as water-cress (*fisy'mbrium*) and mustard (*finápis*) ; others are rendered mild by boiling, as cabbage, turnep, brocoli, cauliflower, and some others ; all of which are the produce of cultivation from one genus, *brássica*.

Jul. I have eaten of them without a thought of what they came from. I shall now always want to know the history of the vegetables at dinner. You told us at first, mamma, that we could not learn botany without, at the same time, learning to think.

Hortenf. And you have found it so. The change produced in vegetables by the art of gardening is curious, and will not be the least amusing part of our study. The flowers of the three last classes, we have to consider, are strongly marked. The geranium and mallow (málva) are right specimens of the one-brotherhood class (monadélphia); attempt to take off the stamens, you will see they are firmly united at their base; this genus has many stamens, therefore is of the order so called, or polyándria. Take off a few flowers from this *large lupine*: the form of its flowers marks it to be of the diadélphia, or seventeenth class; but we must examine its systematic character. You see nine of the stamens are separated from the tenth, and closely united at the base; this Linneus calls *two-brotherhoods*, though by that term we should be led to expect a more equal division of the number of stamens. I will shew you a curious circumstance respecting the flowers of common broom (spártium scopárium).—The males, or stamens, which are ten in number, are more equally divided into two sets, one rising a quarter of an inch above the other; the upper set does not arrive at

maturity so soon as the lower, and the stigma, or head of the female, is produced amongst the upper or immature set; but as soon as the pistil grows tall enough to burst open the keel-leaf, or hood of the flower, it bends itself round in an instant like a French horn, and inserts its head, or stigma, amongst the lower or mature set of stamens, as you may see by touching the keel-leaf; the pistil continues to grow in length, and in a few days arrives again amongst the upper set, by the time they become mature. This wonderful fact is given in the note on *genista* in the botanic garden, and might, I think, have made some agreeable lines in the poetry.

Harr. This is very curious: how quick the pistil moves, when I touch the keel-leaves!

Hortensf. Can any of you tell the names, which belong to the different parts of this broom flower?

Harr. I believe we all can; but Henry looks, as if he would like to explain them: would not you, Henry?

Henry. Thank you, Harriet. This large petal at the back is called the banner; the side petals the wings; and these two petals, which shut up the two sets of stamens and
the

the pistil, are so like the bottom of my little boat, that I cannot forget they are called the keel.

Hortensf. You are so ready in your lesson, that I am not surprized, that you should be desirous of repeating it. Pray give me the specimen you have gathered of the eighteenth class? Polyadélphia, or many brotherhoods.

Charles. We could not find any flower, except the hypéricum, that seemed to belong to that class; and you know, ma'am, you had told us it did so; however we brought it: how beautiful its stamens are! They are like a fine yellow silk tassel with the ends tip'd with crimson beads.

Hortensf. It is a handsome flower: the hypéricum is the only British genus which belongs to the class of many-brotherhoods; it must also be of the fourth order polyándria, or many stamens. When you walk out, you may gather some orange flowers in the green house; the orange, lemon, and citron all belong to the genus cítrus, which is of this class, and of the third order, icofándria, having twenty stamens; but so different is the appearance of the stamens to those of hypéricum, that a young botanist would not sup-

pose them to be of the same class, though on investigation the stamens will be found separated into small bundles. We must now quit this more agreeable practical part of our study, and return to the theory of the classes.

The class syngenesia, or united anthers, is founded on the very peculiar situation of the anthers, which are joined together in the form of a cylinder, while the filaments remain distinct; by slightly pressing this cylinder of anthers at the top, you may bend their filaments so as to have the appearance in the larger flowers of those open paper baskets, which Juliette was cutting last night; the number of stamens so united is five; they form a ring round the pistil, which rises in the midst of them, and seems conscious of the homage she is receiving. This class consists of what are called the compound flowers, and is certainly a natural one, if we except a few *généra* which are contained in the last order, and which are placed in this class from the single circumstance of having their anthers united in a cylinder; one of these *généra* is the *viola*, under which the violet and pansie are ranked: we will allow this to be a fault in the system, and at present consider

consider only the compound flowers: Linneus makes the essence of a compound flower to consist in the union of its anthers into a cylindric form, one seed being placed on the receptacle beneath each floret. A compound flower is so called from being composed of many small flowers or florets, which are fixed on a common receptacle, and enclosed by a common calyx. These florets vary greatly in their contents of the stamens and pistils, and also in the form of their corols, which in some florets is tubular, in others flat, which is called tongued. In the same flower sometimes the border of the corol is wanting, and sometimes there is not even a tube. On the variety of form in the corol is founded, in part, the generic character. On the florets bearing stamens, or pistils, or both, are founded the first four orders. If all the florets of a compound flower are found to contain stamens and pistils, it must then be referred to the first order: if some of its florets contain stamens and pistils, and others only pistils, you must look for your flower in the second order: to the third it will belong if the florets in the *centre* have both stamens and pistils; and if those in the circumference be

destitute of either. The fourth order depends also on the florets in the centre having both stamens and pistils ; but from some defect in the pistils, producing no seed, the florets in the circumference having only pistils, and producing seed. The fifth order is not distinguished by any circumstance belonging to the stamens and pistils, but by the florets being separated from each other, by being enclosed in a partial calyx, all the florets being contained in a common one, so as to form one flower. The character of the sixth order is derived from the form of its flowers being simple, which perhaps ought to have excluded them from this class ; but as they agree with the compound flowers in the essential character of the united anthers, Linneus has placed them in it ; and as the principle of the system on which he has founded his classes does not pretend to make them natural, I do not see any great objection to it.

Harr. Mamma always defends Linneus.

Hortensf. I have received so much amusement from his labours, that I should be ungrateful not to consider his defects with candour ; his life was spent in laborious research into natural history, by which the botanical world

world has been so materially benefited, that it ought at least pay the tribute of gratitude to his memory, however gratitude is not exclusively due to him ; much was done by his predecessors, and you will sometime have pleasure in understanding the ingenious system of Tournefort, but at present we are to think only of Linneus as our great master. The characters of the orders of the class syngenesia, United Anthers, are too complex to retain in your minds without having examined some flowers belonging to them, therefore we will do so before we proceed further. Pray gather some dandelions (*leóntodon*), thistles, *cárduus*, and a few of any flowers which, from their outward habits, you suppose to be of the compound kind ; also a few pansies and violets.

Charles. I have brought a large collection of flowers. You, ma'am, will be so good to separate them, and explain the orders they belong to ?

Hertenf. I perceive you have brought some flowers of the scabious (*scabiósa*). Its mode of inflorescence in outer appearance nearly resembles the compound flowers ; it however
be-

belongs to the fourth of the numerical classes. On examination you will find marked distinctions of character between them: the scabious, and several other généra of the same habits, have their four stamens separate; the compound flowers, as you see in this thistle (*cárdus*), have their *five* anthers united in a cylinder; there is also another difference, these flowers of the fourth class have the florets, of which they are composed, attached to the common receptacle by a small peduncle, or foot-stalk; the florets of the compound flowers are sessile, or fixed to the common receptacle by their base, without the intervention of a peduncle; the scabious, and that tribe of flowers, which have not the essential mark of the United Anthers belonging to the compound flowers, are called aggregate.

Charles. I see a very great difference betwixt the stamens of this thistle and those of the scabious. I am glad, I brought the scabious, having compared them will mark the character of the syngenesia class on my memory.

Hortensj. This thistle (*cárdus*) and dandelion

lion (leóntodon) both belong to the first order; examine them, and tell me why they do so?

Charles. The florets of this thistle all contain both stamens and pistils, and that, I believe, refers it to the first order.

Jul. So do the florets of this dandelion: I begin to have some idea of the character of the orders now.

Hortensf. I will give you the flowers according to their orders, and you will then more easily remember the marks, which distinguish them. Here is a flower for each of you. The daisy (béllis), blue bottle (centauréa), mary-gold (caléndula), and globe thistle (échinops).

Charles. The daisy has florets, with stamens and pistils in the centre; but those in the circumference have only pistils, this must go to the second order.

Harr. My blue bottle has both stamens and pistils in the central florets, but I cannot find either in the circumference; according to the order you gave it me in, ma'am, this must be the character of the third division.

Jul. This mary-gold has both stamens and pistils in the florets of the centre, and pistils
only

only in the circumference ; this is like the daisie ; I cannot be right, for it ought, I suppose, to belong to the fourth order, and I can only find the marks, which refer it to the second,

Hortensf. You are perfectly right, so far as you go ; but there is another character to be attended to in this fourth order : look at your mary-gold again ; you will not find any appearance of seeds in the central florets, but in those of the circumference you will see large ones, flat, and in the form of a heart. This circumstance of the florets with and without seeds, is the essential character of the fourth order. I did not expect you to retain these minute distinctions ; to remember the class and orders of syngenesia, it is necessary to make ourselves acquainted with the flowers. Now, Henry, tell us the character of the fifth order, to which your globe-thistle belongs ?

Henry. I remember about that ; the florets should be all in separate calyxes, and all contained in one common large calyx ; so they are here : I love a globe-thistle ; when it is in full flower it looks like net-work.

Hortensf. The sixth order, you all recollect,

lect, depends on the single circumstance of the United Anthers. Observe the stigmas of this violet and pansie; they are both of the genus *viola*, which is separated into two divisions from the peculiarity of their stigmas; that of common violet being reflected into a simple hook, and that of the pansie (or three-coloured *viola*) being round and perforated. *Jasione*, or sheep scabious, is placed in this order of simple flowers, to which it certainly cannot belong, being composed of many florets; nor is there any circumstance respecting its fructification, which gives it any pretence to be classed with the compound flowers, except that of its five anthers being slightly connected at their base, for they are not united in a cylinder: from the first view of this plant it seems to be of the tribe called aggregate, but, on examination it differs essentially from them in the numbers of its fructification, and other circumstances. The *Jasione* puzzled me much, when first I studied botany, and I am not now satisfied about it. Have you studied this class sufficiently to make you understand it?

Harr. I dare say we have, ma'am; though
presently,

presently, if you please, we shall like to look at some plates.

Hortensf. You shall do so. There is a curious circumstance in regard to the calyx of most of the compound flowers, though not belonging to all, which is worthy of attention. When the florets become mature, they burst open the common calyx, which contains them ; as soon as the stamens and pistils of these florets have done their office, they wither with the corols, the common calyx then rises, and encloses the remaining parts of fructification, till the seeds arrive at that state of ripeness, which makes them ready for dispersion ; the hairy down, by which they are crowned, then expands, and again bursts open the calyx, so as to bend its leaves quite back, and, by the help of this down, the seeds are carried by the wind to a considerable distance.

Jul. We know when the seeds of dandelion are nearly ripe, and ready for our canary birds : when we see the white down coming out of the calyx in a little tuft, it is always near flying, when it does so ; it is very pretty when quite ripe, and what we call a clock.

Hortensf. Those compound flowers which
have

have their seeds furnished with a downy pappus, take a variety of elegant forms; and the class of United Anthers, though difficult at first to study, amply repays our trouble in attaining a perfect knowledge of it, from the curious mechanism of its flowers. The structure of the stamens and pistils of the class gynándria, or twentieth class, is so extraordinary as to be supposed by Linneus to occasion the unusual appearance of the flowers belonging to it. The órchis tribe, passion flower, (passiflóra) and árum, which you call lords and ladies, are of this class: the essential character of which is the stamens growing on the style, or on the receptacle elongated into the form of a style, bearing the pistil with the stamens, and becoming a part of the pistil, which part you must first consider to obtain a distinct idea of the situation of the stamens. This class contains nine orders, founded on the number of stamens in each flower. The first order, which is called diándria, or two-stamens, is natural; the génera differing from each other almost only in the Nectary. The structure of the fructification of this order is very singular; for the germ, always beneath, is contorted: the petals are
five,

five, of which the two inner converge, so as to resemble an helmet: the under lip constitutes the Nectary, which occupies the place of the pistil and sixth petal: the style grows to the inner margin, and can scarcely be distinguished with its stigma: the filaments are always two, very short, elastic, and bearing two Anthers, which you may divide like the pulp of a citron; they are enclosed in little cells opening downwards, and fixed to the inner edge of the Nectary; the fruit is a one-celled capsule, with three valves gaping at the angles. The généra of this first order afford flowers which, in outward appearance, so nearly resemble the animal kingdom, as to have occasioned a variety of fanciful names being given to them. The family of óphrys contains several species, which resemble a variety of insects, the Nectary being the principle feature in their different forms; sometimes their flowers resemble a gnat, a butterfly, a bee, a fly, or a bird: the Nectary of the bee-óphrys is a large thick leaf of a sooty colour, and, when seen in the light, seems varied with three bright yellow circular lines, with rust coloured spaces between them, and so exactly represents a drone,

drone,

drone, or bee, that it might be mistaken for them. This curious tribe of flowers requires very accurate investigation to enable us to understand them ; and I propose myself much pleasure in studying them with you, as my borders of the gynandria class come into flower.

Henry. I have often observed the border of orchises, and wished to understand them ; there is one very like a slipper.

Hortensf. That is a plant belonging to the genus cypripedium, and has its name of lady's slipper from the resemblance you mention. The eight remaining orders of this class are known by their number of stamens. The structure of the parts of fructification in the arum is most extraordinary, and not to be found in any other genus. The receptacle is enlarged into a naked club, with the germs at the base. The stamens are affixed to the receptacle, amidst the germs, which is called by Linneus a natural prodigy : the most eminent botanists have been perplexed by it. The younger Linneus was of opinion, that every Anther was to be considered as a distinct floret, and thence that the genus ought to be removed from the class gynandria, to

the following one monœcia, or stamens and pistils separate. I cannot decide on this subject, but hope as this opinion of the younger Linneus opens a new principle of investigation, some ingenious botanist of the present age may be able to discover the secret of the wonderful mode of fructification found in this family: its fruit ripens about the close of summer. You have I dare say often observed a cluster of beautiful scarlet berries growing on a short stem on the ditch banks.

Charles. Frequently; but I did not know they were the seed of árum: if you please, ma'am, I should like to examine some flowers of this plant.

Hortens. We will do so. A plant, that grows commonly on our hedge-banks, we ought not to remain ignorant of; it is also in my botanic garden, but I could never satisfy myself about it. The following class monœcia, the twenty-first class, contains such plants as have their stamens and pistils in separate covers, but growing on the same root, hazle (*córylus*), nettle (*urtíca*), are instances of the monœcia class, or class of one-house; the orders of this class are derived from

from the number, union, and situation of the stamens, circumstances which constitute the chief characters in the classes, where the stamens and pistils grow together in the same cover. There are eleven orders of the class one-house, which are distinguished by the same names that are given to the preceding classes. Hazle (*corylus*) having several stamens in each scale of its ament, or catkin, is placed in the order polyándria, many stamens. Nettle (*urtica*) in tetrandria, four stamens, and cypress (*cupressus*), which is also of this class, is arranged under the order monadélphia, one-brotherhood, having its stamens united at their base, like the flowers of that class, which might lead a young botanist to place it there, if he did not keep in his mind the essential circumstance of the first twenty classes, viz. their having their stamens and pistils in one flower: to this class of one-house belongs the nutmeg (*myristica*), the knowledge of which flower the world is indebted for to Dr. Thunberg, who has given a description of the genus from the real flowers, whereas the former characters were taken from a plant, which had no affinity to the true nutmeg.

Harr. The nutmeg, I suppose, ma'am, is the kernel.

Hortensf. You should call it the seed; the fruit, I imagine, somewhat resembles a walnut: the inner material, which surrounds the nut or seed, is what we call mace, and use in cookery.

The Class Diœcia, or two-houses, contains those flowers, which have their stamens growing on one plant, and their pistils on another. Vallisnèria belongs to this class; the wonderful progress of the flowers of this plant seem to furnish a strong argument for the sensation of plants; but this is not the time to enter into the discussion of that part of our subject. Hemp (cánnabis), hop (hú-mulus), mercury (mercuriális), and willow (fálix), all belong to the class two-houses: there are fifteen orders contained in this class, characterized from the same circumstances with those of monœcia, or one-house, and named by words expressive of those circumstances. Great fault is found with the contradictions, that this occasions, and certainly this part of the system is open to censure, and in all probability would have been corrected, had Linneus's health during the latter
part

part of his life permitted. Alterations have been made in these classes of late years, which I believe are pretty generally received; and as the liberal spirit of the age inclines his successors in this delightful science rather to render his labours perfect, than to hold out his failings to ridicule, we may hope that time will give us his system as free from defect, as such an undertaking can be expected to be.

The mistletoe (*viscum*) belongs to the class two-houses: this is a parasitical plant, or one which lives upon the juices of another vegetable, without fixing its roots into the ground; it can only be propagated by sticking the seeds upon the bark of trees, into which they strike their roots in a curious manner. A seed first sends out three claws, which fix themselves on the bark of the tree, and begin to separate at the centre of the seed, as if each claw was to become a distinct plant; but in a year or two the three claws become swollen and enlarged enough to meet at their points, and are so strongly united, that they make the foundation but of one plant; the place of their first joining in the centre opens and divides, so that three dis-

tinged branches appear spreading from the root ; after this, it proceeds to blossom and bear fruit, and will live to a great age, agreeing very well with its foster tree, which it ornaments, in grateful return for the support it receives ; it grows mostly on apple-trees, but is sometimes found on the oak, though rarely, and on several other kinds of trees ; the seeds are inclosed by so viscous a pulp, that they readily adhere to other vegetables, on which they are often dropped by birds, and thus the species is propagated.

Charles. I always supposed the mistletoe grew upon oaks, we read so much of it being found in the Druids groves.

Hortens. Druids, oaks and mistletoe are ideas that we assemble together from infancy ; but I imagine the cause of mistletoe being so much connected with the Druids, was, that in former ages it was esteemed a powerful remedy for epileptic complaints, which were looked upon in those superstitious times as visitations of the devil, the Druids being then the great healers of the diseased, held this valuable medicine in their hands, which they, in quality of priests and physicians, gathered on the first day of the year, with
many

many imposing ceremonies, and distributed amongst the people with much mystery; hence the mistletoe became sacred; but I do not recollect any proof, that it grew only upon their oaks, though it might be propagated by them upon those trees. It is at this time wholly disregarded as a medicine, stripped, as it now is, of the aids of ceremony and superstition; though we yet hang it up in our kitchens at Christmas.

Charles. I like to see respect paid to mistletoe; I shall never lose my reverence for it.

Hortensf. Cherish that as much as you please.---I had intended to have gone through the classes this morning; but our lecture has exceeded already the time we can call our own; to continue it, we must infringe either upon your hours of relaxation, or upon those which belong to Mr. Wilson and Mrs. Pratt; therefore I am afraid we had better leave the two last classes, with the plants arranged by Linneus in his appendix, for our meeting to-morrow.

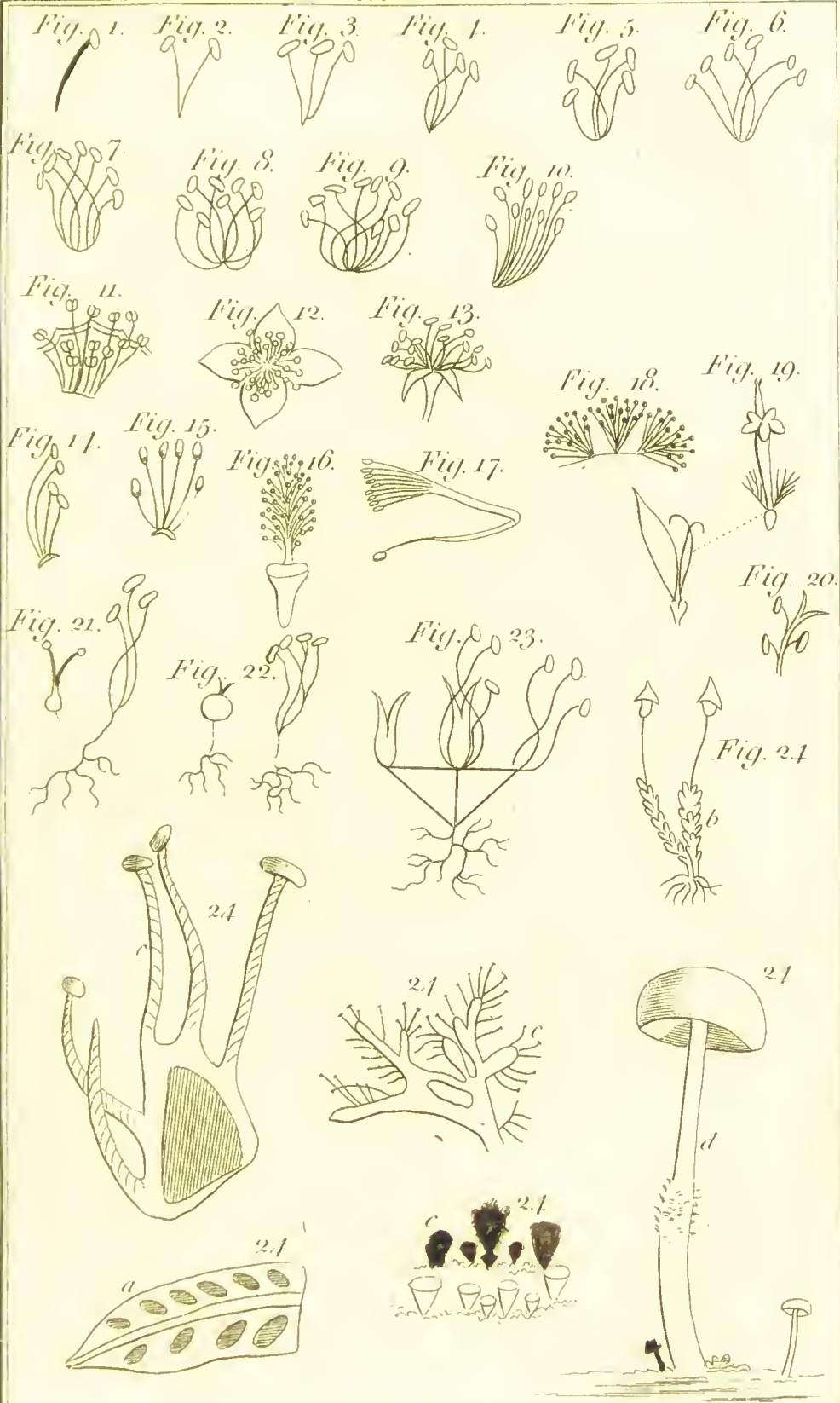
Harr. I am very sorry you think so, mamma; but we will take our walk now, as you like to have us do so.

Hortens. If you please, my dear ; and you may bring in a few flowers, which we will compare with our plates this evening ; and then we shall be ready to begin with the remaining classes in the morning.

EXPLANATION OF PLATE IV. PART I.

OF THE CLASSES.

- Fig. 1. One Stamen, Monandria.
- Fig. 2. Two Stamens, Diandria.
- Fig. 3. Three Stamens, Triandria.
- Fig. 4. Four Stamens, Tetrandria.
- Fig. 5. Five Stamens, Pentandria.
- Fig. 6. Six Stamens, Hexandria.
- Fig. 7. Seven Stamens, Heptandria.
- Fig. 8. Eight Stamens, Octandria.
- Fig. 9. Nine Stamens, Enneandria.
- Fig. 10. Ten Stamens, Decandria.
- Fig. 11. Eleven to Nineteen Stamens, Dodecandria.
- Fig. 12. Not less than Twenty Stamens placed on the Calyx, Icosandria.
- Fig. 13. Many Stamens placed on the Receptacle, Polyandria.
- Fig. 14. Two-powers, Didynamia.
- Fig. 15. Four-powers, Tetradynamia.
- Fig. 16. One-brotherhood, Monadelphia.
- Fig. 17. Two-brotherhoods, Diadelphia.
- Fig. 18. Many Brotherhoods, Polyadelphia.
- Fig. 19. United Anthers, Syngenesia.
- Fig. 20. Stamens on the Pistil, Gynandria.
- Fig. 21. One-house, Monoecia.
- Fig. 22. Two-houses, Dioecia.
- Fig. 23. Polygamies, Polygamia.
- Fig. 24. Fruëfications concealed, Cryptogamia. *a*, Fern,
b, Moss, *c*, Lichens, *c**, fringed Lichen of the
 natural size, *c*, the same magnified, *d*, a fungus.





DIALOGUE THE FIFTH.

Class Polygamia explained.—Caprifscation.—Class Cryptogamia explained.

Hortens. The specimens we examined last night of the four classes, you had learned in the morning, were so just, that we have no rehearsals to make now, so may immediately enter upon the twenty-third class, polygamia. The plants of this class must, on the same root, have flowers which contain stamens and pistils within the same cover, and also other flowers, which bear either stamens separately, or pistils separately ; sometimes flowers are found on the same plant, which contains stamens and pistils, stamens without pistils, and pistils without stamens ; the presence of the first kind marks the class ; without flowers, which contained both stamens and pistils, the plant would belong to either the class one-house, or two-houses. The plants of the polygamia class are many of them dispersed by the present botanic writers into monœcia and diœcia ; so that probably that class will soon be banished from the system. The orders, of which there are three, depend on

the disposition of the stamens and pistils in the flowers of the different plants. The fig (*ficus carica*) long perplexed the botanic world, to discover by what mode the dust of the stamens could be conveyed to the pistil, as these parts of fructification are inclosed within separate fruit, this fruit not being a seed-vessel, but a receptacle surrounding the stamens and pistils, which grow upon it ; some of them being so closely immured, that the manner in which they are fertilized was incomprehensible. At length it was discovered, that a kind of gnat deposited its eggs in these receptacles, and, by going from one kind of fig to the other, was supposed to bear on its wings the anther dust of the stamen-bearing fig, to the stigmas of that which bore only pistils. This process performed by the gnat was called caprification, and was so strongly believed to be essential to the ripening of the cultivated fig, that the inhabitants of the Archipelago, who trade with their figs, spent much time in observing the critical moment of the gnat issuing out of one kind of fig and entering the other, and sometimes gathered the fruit, in which the gnat was contained,

and

and brought it to that, which they wished to have fertilized. Mr. Milne gives a long and curious account of the process of caprification ; but I cannot assent to the truth of the necessity of it, there appear to me so many objections against it. First, there is not any species of fig known, which bears pistils only ; consequently not any which is not sufficient in itself to its own fertilization. In Provence and Spain the cultivated fig is proved to be so by being brought to perfection without the process of caprification. Secondly, these fruits generally open at the top, at the time that their stamens become mature ; a circumstance analogous to all water-plants, which rise to the surface, when their stamens are ready to scatter their dust, in order that they may disperse it in the open air ; an element which seems necessary for that process. But I fear tiring you on this intricate subject, as we cannot examine the insect or its effects in this climate with our own eyes.

Charles. I shall not be tired ; I am interested on the subject of caprification. Mr. Wilson read an account of it to me yesterday, and said it was a strong argument for Linneus's

neus's system of the anther dust being necessary to the fertilization of the seed.

Hortensf. So it has been considered, and made use of as such by many intelligent authors. Indeed I do not know any who have doubted of it, till the celebrated author of the Botanic Garden, whose investigations have thrown light upon many obscure subjects in botany, conjectured that those figs, which have their receptacles closed on all sides, might be vegetable monsters cultivated for their fruit, as those grapes and barberries are, which are without seed; and that the process of caprification might be of imaginary use, or that it might contribute to ripen the fruit, as those apples ripen sooner which are wounded and penetrated by worms in our own climate; and this seems probable from what is told us by Mr. Milne concerning the figs of Malta; one kind of which, he relates from Tournefort, bears two crops in the same year, the figs of the first being sweet, and arriving at perfect maturity *without* the assistance of caprification; those of the second being much smaller, and not ripening at all, if this process be not followed. Tournefort adds, that the figs in Provence and in Paris ripen

ripen sooner if they are pricked with a straw, dipped in oil, which seems to make it probable that the puncture of insects in caprification may cause the second crop of fruit to arrive earlier at maturity in Malta; that is, before the inclement part of the season comes on; as in our climate the plumbs and pears wounded by insects frequently ripen some weeks sooner than the others, to which that circumstance has not occurred. The fig-trees cultivated in our own country produce two crops; the first upon shoots of a year's growth, which appears in spring, and arrives at maturity in the course of the summer; the last crop does not put forth till autumn, and proceeds from the shoots of the preceding summer. This crop can never ripen in our climate, and is carefully pulled off by the gardeners. It would seem that the tree has not power to bring two crops to perfection, even under the influence of more benignant skies, as at Malta, as the fruit obtained by the process of caprification is scanty and of bad quality.

Charles. Mr. Wilson will not like to have me doubt of the truth of caprification; but I now see the force of your objections, ma'am, and

and wonder I did not find them out myself.

Hortensf. We will talk with Mr. Wilson on the subject ; he may perhaps shew us that our objections are not sufficient to overturn an opinion so long and so generally received. Where we find that men of acknowledged abilities have been mistaken, it will become us to hesitate. The necessity of caprification has obtained a general belief in the East ; but in this enquiring age, we cannot assent to facts, to which we think both reason and analogy opposed. We ought, however, to controvert them with great modesty. We will now release Henry and Juliette from this long dissertation. You too, Harriet, I fear are tired.

Harr. No indeed, ma'am ; I do not pretend to have been particularly amused ; but I have been informed.

Henry. I have often wondered, that I did not see flowers on the fig-trees.

Hortensf. Remember that you must look for the flowers within the fruit. If you cut a fig open at the time, when it gapes at the top, you will see the florets arranged on the inside in a beautiful manner, and you may find

find several of the stamen-bearing kind in the state of dispersing their dust.

We will now begin with the last class, cryptogamia, which consists of such plants as have their fructification so obscure, that there are but few genera, in which it has yet been distinctly seen. This class includes all those plants, which have a structure different from those comprized in the other three and twenty classes, and is divided by Linneus into four orders, the filices, ferns ; musci, mosses ; algæ, wrack, or sea-weed ; fungi, funguses. The little knowledge, that has hitherto been obtained of these numerous tribes of plants, has been considered a great reproach to the science of botany. Perhaps the system of Linneus may have retarded a more distinct arrangement of them, that being founded upon the parts of fructification, which in most of the généra belonging to the class cryptogamia, are so difficult to ascertain. The ferns are defined to be plants bearing their flowers and fruit on the back of the leaf or stalk, which in this tribe of plants are, the same, the stem not being distinguishable from the common foot-stalk, or rather mid-rib of the leaf : so that in strict propriety the ferns may be said

to be without stems. The stem and leaf thus united are termed by Linneus a frond. The seed of the ferns affords an instance of the most curious mechanism, and will be well worthy of our attention, when we are become professed botanists ; at present I shall only give you an outline of the characters of the genera contained in the class cryptogamia, and, by shewing you some of them with plates, enable you to form a clear idea of their extraordinary structure. The true sago powder is said to be made from the pith of a species of fern, *Cy'cas circinalis* ; and that great vegetable curiosity, the tartarian lamb, is now known to be the root of the polypodium barometz, which, being pushed out of the ground in its horizontal situation by some of the inferior branches of the root, bears some resemblance to a lamb standing on four legs, which is increased by the thick yellow down, by which its root is covered. It is said to destroy all other plants in its vicinity. We will look at a print of it.

Charles. I have heard wonderful stories of this vegetable lamb, and believed it to be some extraordinary monster.

Hortensf.

Vegetable Lamb



Siphonidium. Barometz.



Hortenf. Many things have gained the character of monsters from want of being investigated. In former ages, travellers might have given a grave account of a tree, bearing gloves and stockings and caps, growing in Caffraria; the report of which was so general as to excite the attention of Dr. Thunberg, when travelling in that country. With his usual assiduity he unveiled this mystery, and found all this wearing apparel to be nothing more than the downy leaves of the *Bupleurum giganteum*, which by a little dextrous management were converted into those various articles, which were asserted to grow upon the plant. Hence you see the confusion, that arises from being too ready to believe or to relate, what we hear.

Harr. I should have thought the inhabitants of the place must have been well informed.

Hortenf. So might Dr. Thunberg, had he not been accustomed to reason upon facts related to him, before he assented to the authenticity of them. Do any of you recollect the use that was made of a species of fern in New Zealand?

Henry. Captain Cook says, the people use the root of common fern for bread. Pray what is it's botanical name?

Hortensf. *Pteris aquilina*. Bread is also made from a species of fern by the inhabitants of Palma, one of the Canary isles, when corn is scarce, and is said to be little inferior to that made from wheat.---But we must now begin with the second order of cryptogamia. The mosses, (*musci*), are divided according to their anthers, being calyptred, or not calyptred, being on the same, or separate plants, and having the pistil florets solitary, or growing in cones. Their seeds have no cotyledons, or any proper coverings. Linneus doubts, whether what he has called anthers might not with greater propriety take the name of capsules, and their dust be considered as true seeds, as in *Buxbaumia*, and some other genera, have been seen within the covers real dust-bearing anthers depending from their filaments, gaping at the top to discharge their dust on the fringes, as on pistils. Dillenius, professor of botany at Oxford, was the first, who attempted an arrangement of the mosses. There are many curious circumstances belonging to the tribe of mosses, which some-

time

time we will fully enter into. One I will now mention to you, which is their having this singular property, that though preserved dry for several years, upon being moistened they resume their original verdure, and probably their power of vegetation ; but I do not recollect whether this has ever been tried. The fructification of the flags, or algæ, is so obscure, as not to admit of precise arrangement ; they are only divided into terrestrial and aquatic, and the genera distinguished by their outer structure. This order contains many curious and useful vegetables ; among the latter there is none more worthy of notice than the lichen rangiferinus. This little plant may be properly esteemed the support of millions of mankind, as it is the sole food of the rein-deer ; without which serviceable animal, the inhabitants of the northern regions could not exist. The rein-deer furnishes them with milk, butter and cheese, draws them in sledges with ease and swiftness over vast tracts of land buried in snow ; his flesh affords them food ; his skin, cloathing ; his tendons, bow-strings ; and his bones, spoons. All these benefits would be lost, had not nature formed this lichen so as to enable it to

vegetate beneath the snow, by which it is commonly covered to a great depth; the rein-deer however contrive to dig through it with their feet and brow-antlers, till they arrive at their food. The common name of rein-deer lichen, by which this plant is known, it has therefore the fullest claim to.

Harr. It is very agreeable to know such particulars; they make the study of vegetables very interesting.

Hortensf. In the general study of nature, we cannot too much bear in our minds the advantage derived by one individual of the same common stock from another. The contemplation of this general law of nature strongly points out to us, that we are not placed here to be idle and useless spectators of the transactions of our fellow-creatures, but that it is our duty to contribute, as much as we have the power, to the general benefit of all. The lichens still further contribute to this general benefit, different species of them being used in dying reds and purples. Dr. Thunberg relates, that the Japanese gather a species of ulva, which is one of the algæ, and, clearing it from all impurities, dry and reduce it to a fine powder, which they eat with boiled rice,

rice, and sometimes put into soup. There are other species also of them, which are used for food or pickles by ourselves. The formation of some of the généra, which belong to the aquatic division of this order, is worthy of remark. The *conférva ægagrópila* is of a globular form, from the size of a walnut to that of a melon, much resembling the balls of hair found in the stomachs of cows. It does not adhere to any thing, but rolls from one part of the lake, on which it lives, to another. The *conférva vagabunda* has its name from it's wandering habits. It dwells on the european seas, travelling along in the midst of the waves. These may not improperly be called itinerant vegetables. In the same manner, the *fucus natans* strikes no roots into the earth, but floats on the sea in extensive masses, and may be said to be a plant of passage, as it is wafted by the winds from one shore to another. The *byssus flos-aquæ*, water flower, floats on the sea all day, and sinks a little during the night, as if to protect itself from the injuries of nocturnal air, or possibly this may be its mode of sleeping or taking rest.

Charles. Pray, ma'am, is it not a species of *conférva*, that you shewed me the playful

lines about in the Botanic Garden, and which make that pretty picture of the Lady bridling the Pard ?

Hortens. It is the *Conferva Polymórpha*, whose extraordinary changes of appearance gave rise to the lines, you allude to. This plant twice changes it's colour from red to brown, and then to black, and varies it's form, by losing it's lower leaves, and lengthening some of it's upper ones, so as to be mistaken by unskilful botanists for different plants : it grows on the shores of this country. The last order of the class Cryptogamia, consists of the Funguses, or Fungi. Linneus has divided this order of plants according to the method of Dillenius ; indeed he does not seem himself to have attended to any of the orders of this obscure class, with that indefatigable research, which characterizes his labours in regard to the other part of the vegetable kingdom ; but, with a candour belonging to true knowledge, he frankly owns himself indebted to Dillenius, and Micheli, for the information he is able to give the world respecting them. The method of Dillenius, which Linneus has followed, is founded upon the figure of the Stipe, or Foot-stalk ;
the

the hat, or upper part, with its plates, holes, and cavities, and from the variety of structure in these parts, has divided the whole Fungus tribe into ten *Génera*. The sudden appearance of these kinds of plants, in places where they had not been known before, gave rise to the belief, that they had their origin from putrefaction; but this has been clearly proved to be a mistake, and that they are produced from seeds; that their species are constant, and renewed by uniform laws; notwithstanding it must be confessed, that we are yet much in the dark, concerning this part of the vegetable creation; but, as it is now particularly attended to, a few years may probably make us acquainted with the various modes of its re-production. We already owe much to the accurate investigations of Mr. Curtis, and to other able botanists of the present age, who have elucidated the knowledge of these plants by many beautiful drawings. Now you are become botanists, I will make you a present of * Mr. Sowerby's English Botany,

* Sowerby's English Botany, published monthly in numbers, containing six coloured plates, each number price 2s. 6d.

which will assist you greatly in the knowledge of the most rare English plants, as good coloured plates are given of them, and agreeable accounts of their habits, and whatever peculiarities belong to them; in the Cryptogamia class particularly you will find the use of this publication, as by studying the pictures of various plants belonging to that class, which in these numbers are elegantly represented, you will feel an interest in the originals, and be led to search into their histories, in which no doubt we have much curious matter to discover; the late discoveries of the wonderful manner, by which various species of the animal world are continued, may possibly lead to some equally extraordinary regarding vegetables. The histories of the Polypi or Hydræ astonish us, particularly of the Hydra Stentorea, which multiplies by splitting lengthways; in twenty-four hours these divisions, which adhere to a common pedicle, re-split, and form four distinct animals; these four in an equal time again split also, and thus proceed, doubling their numbers daily, till they acquire a figure somewhat resembling a nosegay; the young afterwards separate from the parent stock, attach themselves to the roots or leaves of

of

of aquatic plants, and each individual gives rise to a new colony. The fresh water Polypus you may cut into innumerable divisions, and every separate piece will become a separate animal.

Henry. That is like the fable of Hydra's heads.

Hortensf. I am no longer inclined to think that history fabulous ; at least we have facts from the experiments of Monsieur Trembley in regard to the fresh water Polypus, or Hydra, being so named I imagine from the fable, which equal any ideas, that could occur to the imagination of the most romanic fabulist. Such instances of propagation in animals have led me to the suspicion, that similar modes may possibly be found to take place in some of the tribes of vegetables belonging to Cryptogamia ; I mean exclusive of all others ; for the increase of plants from suckers and strings, may be considered analogous to the re-production of the Hydra genus ; but such analogies it is not our business to enquire into at present.

Juliette. You always quit the subject, mamma, when you have excited our curiosity.

Hortensf.

Hortens. I do not mean to tantalize you ; but if we do not proceed with regularity, we shall not be able to arrange our ideas. The information is so small, that I can give you of the class Cryptogamia, that I fear misleading you, if I fix your attention on the supposed parts of fructification of the plants contained in it ; however, what I have said of the possibility of their increase, by modes similar to that of the curious animals I have mentioned, is mere conjecture ; but on so obscure a subject light may be thrown from experiments founded on analogy. It is certain, that little progress has been made in the knowledge of these extraordinary plants by those, which have proceeded upon the expectation of discovering the parts of fructification. The uncommon beauty of an assemblage of these plants on our banks walls and heaths in winter must engage the attention of botanists ; and we will hope from our united endeavours, that fame is reserved for some of us on this subject.

Charles. I fear the attainment of that fame is a great way off : however, we will try for it, and begin by collecting all the different kinds of ferns, mosses, flags and funguses, we
can

can find ; but we shall not be able to preserve the funguses.

Hortensf. That has been ever a great impediment to an accurate investigation of them. A method of preserving them has lately been delivered to the Linnean Society, which; should it prove effectual, will be a means of enabling you to attain a more convenient opportunity of investigating them, than has yet been acquired ; but you must arrange, before you pretend to discover, the plates of Mr. Bolton with his history of Funguses ; and the elegant drawings of other ingenious botanists will assist you in this undertaking ; but it is to be lamented, that such useful works as we see frequently appear on this subject, cannot be afforded at a cheaper rate. Mr. Bolton's * works are much too expensive to be in many hands ; and even Sowerby's English Botany would be more generally bought, was it published at as low a rate as Mr. Curtis's magazine : it ought to be a point with every one, who publishes on any science, to make their work as easy of access as possible.

* Mr. Bolton's History of Funguses, growing about Halifax, in four volumes, each vol. 2l. 2s. coloured; 18s. plain.

Harr. I recollect that you told us, Ma'am, that the star-jelly was not a vegetable, but a substance, that herons parted with, after they had eaten frogs.

Hortensf. If you recollect all the information, you received on that subject, pray relate it to Juliette and Henry.

Harr. I never forget, what I read in the Botanic Garden. The frozen statue of the fair Tremella was in reality this star-jelly, which, becoming transparent after it has been frozen in autumnal mornings, is distinguished by this property from other vegetable mucilage. The paste that we use in our works, is no longer of service after being frozen, as it does not adhere; but poor Tremella could no longer move, after she had been congealed; therefore we may conclude that she was not of vegetable origin. May not Juliette and Henry read those lines, mamma?

Hortensf. They may read them this evening. There is a species of fungus, the *Lycoperdon fornicatum*, or Turret puff-ball, which is of a very extraordinary form, having the appearance of an inverted mushroom; it is well described by old Gerrard, who says, "It hath a small stringy root, differing from all others,

Lycoperdon Fornicatum.



*Found growing in C^W Rooke's
Kitchen Garden, near Mansfield Woodhouse,
September 1792.*

others, and a round white fungus at first, which afterwards breaking open, divers reddish branches do arise out thereof, which do all join together, making round arches of hollow netted bars or lattices, as it were separated one from another.”—I will shew you his plate of it, and also one from the plant itself, which was found growing in Mr. Rooke’s kitchen garden, near Mansfield. Gerrard calls it *Fungus Coralloides*.

Henry. We should be a great while of learning botany, mamma, if you were to teach us in the language of old Gerrard.

Hortensf. He is certainly very prolix ; but his descriptions are expressive : such prolixity we do not meet with in these days ; but we are often confounded by the profusion of characteristic circumstances, which are crowded into a generic description. One line of the system of vegetables will be frequently found to mark a plant as decidedly as a whole page of some other books. The expressive conciseness of Linneus is yet unrivalled.—But we are amusing ourselves, rather than learning.—It is time to think of the appendix, which is adjoined to the Classes. This consists of plants, which Linneus rather chose to place apart,
than

than to distribute them into the several classes of his system, and this on account of their singular structure ; he has arranged them all under the head of Palms, and defines them to be plants with simple stems bearing at their summit leaves resembling those of ferns, which you remember are called Fronds, and are a composition of a leaf and a branch. Their flowers and fruit are produced on that particular kind of receptacle called a spadix, protruded from a common calyx in form of a sheath, termed by Linneus a spathe. The terms spathe and spadix were originally applied to palms only, but are now used with much greater latitude, and applied to the narcissus, arum, and many other plants, whose flowers come out of a sheath ; the cocoa-nut-tree (*cocos nucifera*) is a palm, so is the date-tree (*phoenix dactylifera*) ; and it is asserted by some authors, that if the stamen-bearing flowers of this plant are gathered in a proper state of maturity, and dried, the dust of the anthers will retain its virtues for more than a year ; the same also is said of the Pistacia, which belongs to the class two-houses (*Dioecia*) the corypha umbraculiferæ belongs to this majestic order of vegetables being often

200 feet in height ; it is a native of the West Indies, and has obtained the name of umbrella-bearing, from the shelter which it's large feathered leaves afford to the inhabitants of that scorching climate from the ardent rays of the sun. This tree has also been called the cabbage-tree, but erroneously : Mr. Forster informs us, that the true cabbage palm is a species of aréca, the aréca oleracea, so called I imagine from the use that is made of the kernel-like substance, which is found towards the top, and which is a most grateful and salutary food to sailors, who have been long confined to salt diet ; on which account, this substance has been celebrated by all navigators, and from them has obtained the name of cabbage, from its resemblance in taste to that vegetable.

Charles. I have read an account of the cabbage-tree, wherein it is said, that the part called cabbage is commonly used as food in the West Indies, though at the same time it is observed, that the tree is destroyed by being deprived of it. This I did not understand, as I think we have not any tree, that would be killed by having it's top cut off.

Hortensia.

Hortensia. I believe it to be an error, that this cabbage is generally made use of in the West Indies; I am well informed, that it is esteemed there only as a rarity, and sometimes sent as such, when pickled, to England; and so far is it from being plentiful, that it is seldom obtained, except when by thinning the woods, or from some other cogent reason, it is necessary, that the tree must be cut down: it is a fact, that the part called cabbage, cannot be procured but by the destruction of the whole tree; and if we consider it's manner of growth, we shall not be at a loss for the cause of this; the whole tribe of palms bear their leaves on the upper part of their stems only; some of which rise to the height of 200 feet; the part eaten as cabbage I believe to be the yearly shoot; by cutting off which the leaves, which should form the buds for the ensuing year, are destroyed, and with them the life of the plant: if you strip the leaves from any common tree, so as to prevent the formation of buds, you will either entirely kill it, or at least so far destroy it's vigour, as to render it of no value. This is an agreeable branch of the study of botany; but we are not yet ready to enter upon it.

Harr. Pray, Ma'am, is the aréca the only palm, that bears the shoot called cabbage ?

Hortensf. The cocoa-nut palm, and several others, are said to afford it ; but the aréca oleracea is the only one, that has it in perfection ; but the accounts we have of these trees are so short, and often confused, that I am not able to inform you respecting them, as accurately as I wish to do. The history of the vegetation of warm climates by a philosophical botanist would be a work of the first value.

Juliette. Pray, mamma, what tree is the bread-fruit tree ?

Hortensf. It is the *artocarpus communis* of Forster, and belongs to the class *monoecia*, one house. The various attempts, which have been made to introduce this valuable tree into the West India Islands, promise at length to be successful. There are now plantations of it in Jamaica, from which fruit has been gathered. Nearly twenty years ago Dr. Thunberg exerted his best endeavours to bring it into Europe ; but at the time, when he flattered himself that he was on the eve of depositing his treasure with safety, all his hopes were frustrated by a violent storm, which endangered the loss of

the vessel, on board which he was with his valuable cargo of more than an hundred bread-fruit trees, and other rare plants, all of which were destroyed. These trees he had brought from the island of Ceylon ; the luxurious inhabitants of which place do not confine themselves to the use of the fruit in the plain manner, in which it is eaten by the more simple natives of Otaheitee (who, for food, bake it amongst hot stones, and for liquor, mix it with water.) The Cingalese have a variety of high dishes made of it. Dr. Thunberg enumerates fifteen different ways, in which they have it prepared ; but what gives this celebrated tree its real importance is the extensive benefit, which is derived from it to the poor, who make use of its fruit to supply the place of bread or rice, or as our poor do of potatoes, whence its name of bread-fruit. There are two kinds found in Ceylon ; one which yields smaller fruit, has no seeds, and is more rare ; the other, bearing fruit from thirty to forty pounds weight, grows in all parts of the island, and produces seeds to the number of two or three hundred, each of which is four times the size of an almond.

Charles. Then I suppose it is the first kind, that they have in the islands of the South-Sea; as I recollect Mr. Forster says, that the seeds of the fruit found in those islands are shrivelled up, and lost in the pulp.

Hortensf. Mr. Forster tells us, that the bread-fruit tree of the South-Sea isles has four or five varieties, all without seed; which deficiency he attributes to the effects of cultivation; but as Dr. Thunberg, contrary to his usual accuracy, omits giving the botanical names of the bread-fruit tree of Ceylon, I cannot ascertain to you in what particulars it differs from, or agrees with, those of the Pacific Ocean; but I suppose them certainly to be of the same genus. If they are deprived of their seeds by cultivation, they lose a part, which in Ceylon is much esteemed as a nutritious and palatable diet. They are prepared by the rich in different ways; fried in cocoa-nut oil, they are esteemed a great delicacy; by the poor they are eaten roasted like chestnuts, alone, or mixed with the pulpy part of the fruit, which they frequently eat simply boiled or roasted, or sometimes mixed with a little rice, raspings of cocoa-nut, onion, and a small quantity of salt and turmeric. The

bread-fruit trees flourish for whole centuries, and bear their fruit, which ripens by degrees, not only upon the thickest branches, but upon the stem itself, for the space of eight months together. The fruit is used for food in three different states of ripeness, but cannot be eaten without preparation, till it arrives at maturity ; at which time the pulp, which furrounds the seeds, has a sweetish taste, and is often eaten in its fresh state, after peeling off the rind, which is thick, and covered with prickles.

Henry. Pray, Ma'am, is not there another tree called the bread-tree ?

Hortensf. The banana and plantain tree, *musa sapientum*, and *paradisfiaca*, have obtained the name of bread-trees from the same cause that the *artocarpus* has been so called ; many hundred acres of them being cultivated in Jamaica for the use of the negroes, who are said to prefer the fruit of the plantain tree, when roasted, to bread, and that most of the native whites use it in the same manner. The banana is also found in the South-Sea isles and is said by Mr. Forster to lose its seeds by cultivation, as the *artocarpus* does ; but it is not food only, that these trees supply

to the inhabitants of the warm climates: the banana administers to their wants by the shade of its leaves, the size of which is often eight feet long, and three feet broad; it is most interesting to read the accounts given of the vegetables in those luxuriant regions, which these trees among others of equal or more extensive use inhabit. The cocoa-nut tree seems to merit a place in the first rank; and Dr. Thunberg tells us of two species of palm-tree in Ceylon, the *borassus flabelliformis*, and *Licuála spinosa*, whose leaves are used without any further preparation than separating and cutting them, even for writing upon; the method of which is to carve with a fine pointed style the letters upon the leaf, and then rub them over with a fine charcoal, which gives them the appearance of having been engraved: thus they write all public edicts and letters, and form books by stringing several slips of these leaves together, and ornament them by figures engraved in the same manner as the letters: one of these books Dr. Thunberg brought with him to Europe. The leaves of the *licuála* palm are used for umbrellas; one single leaf is said to be sufficient to shelter six persons from the sun or rain; but it would take too much of our time at

present, were I to enumerate to you the various ways, in which the vegetable kingdom, from the majestic palm to the humble grasses, leaves and roots, woven into mats and baskets with peculiar ingenuity by the negroes on the coast of Africa, has been made subservient to the wants of mankind; since by our knowledge of fire and tools we have gained dominion over it.

Henry. How is that?

Hortensf. You may judge of the state of mankind before the important discovery of fire from the wants of those nations who are yet wholly ignorant of it's powers. You may learn from the voyages to the South Sea, how little acquainted even the cultivated inhabitants of Otaheitee were with it's properties, when one of the principal of them caught a stream of boiling water in his hand, not conceiving it could become hot, like red fire. The knowledge of fire enabled mankind to furnish themselves with tools of iron, by which they have been enabled to conquer forests of immeasurable extent, while in countries, whose inhabitants are yet ignorant of the use of such instruments, or but partially enjoy the benefit of them, these forests con-
 tinue

tinue almost to exclude the growth of other vegetables, and to deny the use of the soil to man. Besides this, we make use of fire to render a variety of vegetables wholesome and agreeable food ; some of which in their natural state are either noxious, or difficult of digestion, without fire ; for instance, you could not eat potatoes, cabbages, or kidney-beans.

Charles. Mr. Wilson often calls my attention from the highly civilized state, in which I am placed, to that of man in the woods. Some writers, I think, Ma'am, prefer the latter to the former.

Hortensf. There are some, who affect to do so, and who declaim upon the superior virtues of man in an uncivilized state. Were we to pursue their principle to the farthest, it is solitary man, whom we must extol ; for he no sooner enters into society, be it ever so small, than he begins to be civilized, and to lose that virtue, so much praised, by the power he gains of committing vice ; for the savage, pilfering betel-root, as much transgresses the laws of his society, as a thief, who breaks a house, infringes those of our's. The faculties we possess are surely meant to be employed ; the more we cultivate them, the

more we gain the power of benefiting the whole creation ; but if we mis-use that power, we sink ourselves beneath the virtue of the poor savage, whose life is divided between the care of procuring, and the pleasure of consuming his food. But if we exert it to the advantage of the society we live in, we shall not feel ourselves inclined to envy the sluggish state, in which even the most civilized inhabitants of but partially cultivated countries are found.

Charles. Mr. Wilson has never so little patience, as when we read authors, who extol the life of savages above our's.

Hortens. We must distinguish betwixt what is really savage, and that which Europeans proudly call so, because it differs from our own. We will read that sensible and humorous essay of Dr. Franklin's on this subject, wherein he pointedly satirizes this general contempt of the various Indian nations, who we have stigmatized with the name of savages. Where we find a regular society, bound by the same laws, and united together by one common interest, we are not to call that state savage, because it's modes and customs do not agree with our's. Without
laws,

laws, mankind are little superior to the brutes ; it is their united strength, and their united wisdom, which makes them numerous and powerful. An eminent philosophic writer of the present age has remarked, that it is the superior portion of voluntary power possessed by mankind over brutes, and the greater energy and activity of the exertion of that power, which is one of the most distinguishing marks between them : hence the more we exert that power, the more we raise ourselves above the brute creation.---But Henry's question has led us far away from our subject ; and we shall have need of the exertion of our voluntary powers to get back to it.

Harr. It will be a force upon my voluntary power to quit our present conversation ; and you know, mamma, you always allow us to digress a little, when a new subject arises out of the old one, that we are studying ; you say, it teaches us to think.

Juliette. I shall never pass a blacksmith's shop, without thinking of the discovery of fire and iron.

Henry. He could not do any thing with the iron, if he was not acquainted with the use of fire.

Hortens.

Hortens. Certainly not.—I wish you to accustom yourselves to reflect on the origin of the different objects, which hourly present themselves to your view ; to reason from the horse-shoe to the first formation of iron in the earth, which the philosophic author of the Economy of Vegetation supposes to be a production formed from the decomposition of vegetables.—Charles, who is a chemist, understands this.

Charles. Mr. Wilson has shewn me frequently by a load-stone, that iron may be found in plants, and always leads me to reason upon causes. This made my tour with him through the manufacturing towns last spring very agreeable.

Hortens. Every fresh acquisition of knowledge may add to our stock of happiness ; our visit to the paper-mills last week has amused us ever since.

Henry. When I see a sheet of writing paper, I think of the small seed it came from ; and when I see blot-paper, I think of a sheep.

Hortens. It is an agreeable contemplation to consider the many links, by which a single flax-seed is connected with a piece of writing paper ;

paper ; and the same in regard to that paper, which is made of woollen rags, and the sheep ; and also to reflect on the advantages which may be derived to mankind by their exertions of ingenuity and industry ; but without fire and iron these exertions could not have proceeded to any great extent.

Harr. Is there no other metal, that could supply the place of iron.

Hortensf. Iron is more valuable than other metals, as it is capable of being hardened by fire to so great a degree as to render it proper for the most powerful tools. The discovery of this property in iron has been thought to give the european world their great pre-eminence over that of America ; and we may judge of the advantages to be derived from the use of iron tools by the eagerness, with which the inhabitants of that hemisphere endeavour to obtain them in their intercourse with the european nations.---But we will now, if you please, return to our botany.

Linneus has annexed to his *Génera Plantárum* an attempt to arrange all known vegetables according to their natural affinities ; which, from the principle of his artificial method,

method, are necessarily separated, and distributed amongst the various classes in his system. To establish a natural method, or one founded on the numerous, permanent, and sensible relations, that one plant bears to another, has been attempted by many eminent botanists, and with much success in regard to many of the *généra*; but, unless the species could also be arranged in the same manner, a system cannot be established upon these principles. The superior excellence of an artificial system seems now to be generally allowed, as more readily leading us to the knowledge of a plant, that we may wish to be acquainted with, so far as its class and order. However, Linneus was of opinion, that time would discover a natural system; and that all plants, of what order so ever, would be found to shew an affinity to some others, to which they are nearly allied; and on this principle he has arranged his natural orders, of which there are fifty-eight, and rather more than a hundred *généra*, which he calls yet dubious. These orders are well explained in Mr. Milne's Botanical Dictionary, where we will study the characteristic marks by which the plants contained in them are assembled; but

we

we must first make ourselves well acquainted with the artificial system, which will enable us to distinguish plants, and then proceed to the natural orders, where we may learn to study the nature of them. We will lay aside our regular botanical meetings for the present. In our walks, in our rides, and in our home conversations, we will exercise ourselves in the knowledge of the seven parts of Fructification, of the various modes of Inflorescence, of the Classes and Orders; all of which we are to consider as our grammar, nay, as our alphabet of botany; and when we are all perfectly ready in the grammar, we will begin to read, that is, we will study the *Génera*.

Harriet. I wish to be perfect in what I have learnt, before I attempt any thing farther.

Hortens. So, I dare say, do you all.--You will now walk, and begin the practice of your botanical knowledge.

BOTANICAL DIALOGUES.

PART THE SECOND.

DIALOGUE THE FIRST.

Génera of Plants.

Hortensf. After a month's discontinuance of our studies as a daily occupation I feel the greatest pleasure in assembling you again, that we may proceed in our endeavours to attain the knowledge of a science, from which you all seem to derive so much pleasure.

Harr. You cannot feel more pleasure, mamma, than we do: we have been a little impatient the last week, but would not say so, for we knew you would let us begin our lectures again, as soon as you thought us ready for them. Juliette and Henry have had a pupil, they have taught Mrs. Pratt botany.

Jul. She is so good natured, that she let us teach her, and said it was the best way to improve ourselves.

Hortensf. You are obliged to her; for it
was

was certainly the best method she could take of exercising you in what you had learnt; and as she likes flowers, I hope she was amused.

Henry. O, Mrs. Pratt liked it vastly!

Hortensf. I am glad to hear it. We are now to begin with the généra of plants, which is the third division in the system; and you are all so well grounded in the parts of fructification, that I hope you will soon easily attain a knowledge of vegetables, so as to arrange them properly in the different families to which they belong. A genus is an assemblage of several species of plants, which resemble each other in their most essential parts, and has often been well compared to a family, the whole of which bears one common name, while a particular one, or a specific name, is given to each individual. Linneus has shewed us, that nature has imprinted certain characteristic marks on the parts of fructification, which may be esteemed the alphabet of botany, and by the study of which alphabet we may learn to read the généra. He enumerates 26 marks or letters; the first six are taken from the calyx. 1st, the Involucre; 2d, the Spathe; 3d, the Perianth;

rianth; 4th, the Ament; 5th, the Glume; 6th, the Calypstre; three from the corol, the Tube and Claws, forming the 7th character; the Border the 8th; and the Nectary the 9th. The stamens afford two marks, 10th, the Filaments, 11th, the Anthers. The pistil three; 12th, the Germ; 13th, the Style; 14th, the Stigma. From the pericarp are derived seven; 15th, the Capsule; 16th, the Silique; 17th, the Legume; 18th, the Nut; 19th, the Drupe; 20th, the Berry; 21st, the Pome. From the seed are taken two; the Seed itself the 22d mark; and the Crown the 23d. The Receptacle of the Fructification makes the 24th; the Receptacle of the Flower the 25th; and that of the fruit the 26th, which completes the alphabet.

Jul. I think, mamma, I do not quite understand these distinctions about the receptacle; will you be so good as to explain them to me?

Hortens. Willingly: it is necessary that you should have distinct ideas of this part of the alphabet, before you can read the compound flowers. The *receptacle* is that of *the fructification*, when it contains the corol, the stamens, the pistils, and the germ, which be-

long to one flower. When it is a base, to which the parts of the flower are joined, and not the germ, it is a Receptacle *of the flower* : in which case the germ being placed below the receptacle of the flower, has a proper base of its own, which is called the Receptacle of the Fruit. Linneus does not mention the receptacle in his *Génera Plantarum*, except when he can introduce it as a character varying in shape and surface ; by which several of the *généra* of the class United Anthers are distinctly marked.

Jul. Thank you, ma'am, I understand it now, and find myself ready in the whole alphabet.

Hortensf. With that alphabet, or 26 marks taken from the fructification, added to the number, figure, situation, and proportion, Linneus has so well distinguished the *généra* from each other, that nothing more is wanting to enable us to read the whole vegetable kingdom. When an essential character could be obtained he has added it, as that taken from the nectaries in *parnássia*, *hellebóre*, *ranúnculus*, and *aconíte*. Could so distinguished a mark be found in all *généra*, it would render the study of botany agreeable indeed ;

indeed ; and we are not to despair of time bringing about this much wished for improvement, and it more probably will be obtained, if we content ourselves with making the principal point of our labours the perfecting the system of our great master, than if we endeavour after fame by seeking to establish a new one. I have brought some flowers, that we may refer them to their proper genera. The hippúris (mare's-tail) and cáнна (flowering reed) are of the first class and order. Examine them with the descriptions in the *Génera Plantárum*. You will see that the hippúris has

Cal. None.

Cor. None.

Stam. Filament one, sitting on the receptacle of the flower. Anther half-two-cleft.

Pist. Germ oblong, above. Style one, awled, erect, between the stamen and stem, longer than the stamen. Stigma acute.

Per. None.

Seed. One, roundish, naked.

Henry. It is very odd language.

Hortenj.

Hortensf. A very little time will make it familiar to you, and then you will perceive the excellence of its conciseness. Is there any part of the description which is not clear to you?

Harr. I do not entirely understand the meaning of the anther being half-two-cleft, nor of the germ being above.

Hortensf. The first expresses that the division of the anther is not very obvious. The germ being above or below, expresses its situation in regard to the receptacle; in the rose it is below, so it is in apples, and in the canna, which we will now examine, and observe whether it agrees with the description given of it. Calyx, perianth three-leaved, the leaflets lanced, erect, small, coloured, permanent.

Jul. This calyx is quite right; but what does permanent mean?

Hortensf. Continuing to adhere to the germ after the other parts of fructification are fallen off. Now for the corol.

Cor. One-petalled, six-parted: divisions lanced, coalesced at the base, of which the three *exterior* erect larger than

the calyx; the three interior larger than the exterior, (two erect, one reflected) constituting the upper lip.

Nectary petal-like, two-parted, the length and figure of the petals: the superior division ascending; the inferior one revolute, counterfeiting the inferior lip of the corol.

Stam. Filament none. Anther linear, adhering to the superior margin of the nectary-bearing division.

Pist. Germ roundish, rugged, beneath. Style one, sword-form, adjoined to the anther-bearing nectary, lanced, the length and figure of the petal. Stigma linear, adjoined to the margin of the style.

Per. Capsule roundish, rugged, crowned, three-furrowed, three-celled, three-valved,

Seeds. Few, globular,

Do you understand the characters, when you compare them with the flower?

Harr. I do not understand them clearly.

Charles, Habit I suppose will make it easy to us.

Jul. I am confus'd with the many different characters to which I have to attend.

Henry. So am I; and the canna is not so easy as some flowers.

Hortensf. It is not. I brought it to shew you the curious position of its anther and style; also as it is now in bloom, I thought it would be agreeable to you to know its characters. Those of the canna and hippúris I have shewn to you in the *Généra Plantárum*; we will now examine them by the system of vegetables; you will then be able to judge which of the two books will be the easiest to you. Examine both the canna and hippúris, that you may know their classes and orders.

Harr. They have one anther and one pistil.

Hortensf. You must then open your book at the first class, and observe what plants are placed in the first order. You find thirteen; are they all together, or divided?

Charles. There are two divisions; ten plants are placed under the first division; the character of which is, "fruit celled, beneath. That of the second One-seeded." Under which there are three plants; but pray what
am

am I to understand from the *valeriána rubra*, and *calcitrapa*?

Hortenſ. They are two ſpecies of the *valeriána*, which have but one ſtamen. When Linneus has thought proper to make the circumſtance of an individual plant differing in the number of ſtamens from the reſt of its genus, the mark of a ſpecies, he has always noted ſuch plants under the claſſes to which in ſtrict propriety, according to the rule of his ſyſtem, they ſhould have been referred, and marked them with an aſterisk; ſo you will find the *lychnis dioíca* noted in the claſs two-houſes; and ſeveral others in the ſame manner. If your *cánna* agrees with the character of the firſt diviſion, examine it with the plants contained in it, and ſee which of them it moſt reſembles.

Charles. To the ſeven firſt it cannot belong, their corols are not fix-parted; nor to the laſt, the corol is grinning; nor to *alpínia*, for the corol is bellied and fix-cleft; it muſt be either *kaempféria*, or *cánna*, they have both corols fix-parted, lips two-parted, but here they ceaſe to agree. *kaempféria* has its corol flat, that of the *cánna* is revolúte, and the calyx three-leaved, My

plant must be *cánna*. This is easy indeed !

Hortensf. Now you are convinced of the genus of your plant ; observe by what number it is marked, and turn over the pages till you find that number.

Charles. It is number 1, and here I find a fuller account of my plant. Corol six-parted, erect. Lip two-parted, revolute. Style lanced, growing to the corol. Calyx three-leaved.

Hortensf. You find under the genus *canna* three species, distinguished by the shapes and situation of their leaves ; with which, as you have not yet studied them, you have at present nothing to do. Your plant is the *cánna indica*. Do you, Harriet, refer the *hippúris* to its genus.

Harr. Having only one seed, my plant must belong to the second division, which contains only three génera ; the first and last have either calyx or corol, or both, mine has neither, therefore must be *hippúris* ; its number is 11, which is here ; the fuller description is cal. 0, petals 0, stigma simple, seed 1. I can also tell the species of my plant, as there are only two ; one having its
leaves

leaves eight-fold, the other four-fold; mine are eight-fold, therefore it is the *hippúris vulgáris*, or common mare's-tail. I like this book vastly, it is so clear, and marks so exactly the characters of the different flowers. I greatly prefer the system of vegetables to the *Génera Plantárum*. Do not you, Charles?

Charles. Yes, indeed; but I suppose we should often find the fuller accounts in the *Génera Plantárum* of use.

Hortensf. They certainly will be of use to you as you proceed further. When you meet with difficult plants, you will often find your doubts removed by the notes at the end of each genus in the *Génera Plantárum*, which mark particular circumstances; an assistance which you will not receive from the system of vegetables. There is another work of Linneus's, the *Species Plantárum*, which gives an account of the species only, with their varieties; this work is not translated, which is to be lamented, though the system of vegetables in part supplies its place, and is much to be preferred to it, being an abstract of it, and of the *Génera Plantárum*. The *System of Vegetables* is a work of wonderful ingenuity; there are to be found in many
single

single pages of it twenty plants accurately discriminated from every other known plant; and more than 10,000 plants are described in the compass of one octavo volume. The translation of this work cannot be too highly prized by all who are unacquainted with the Latin language, and are desirous of studying botany.

Jul. The division of the orders seems to make it so easy! May I try to find out the genus of woodbine? I do not know the botanical name, so shall have no assistance from that circumstance.

Hortensf. Both you and Henry shall refer a plant to its genus. You have fixed upon rather a difficult one, but you may try. I recommend to you however to look through the whole description, as you may find one circumstance in it more obvious than another, and which may equally distinguish your plant from the others, among which it is placed. Look for the fifth class, and the first order.

Jul. O, mamma, there are a great many plants in all these divisions. I had better take an easier flower.

Hortensf. Do not be discouraged. You
will

will not find your wood-bine so difficult to investigate as you apprehend, if you proceed in regular order.

Jul. My flower cannot belong to the four first divisions, the corol being in all of them beneath; in the fifth it is one-petalled and above, so is mine. The twelve first généra I do not think of, their pericarps not being berries. There are fourteen généra, all of which have berries.

Hortensf. First look at the forms of the corols, the cells of the berries are not very easy to distinguish.

Jul. Here are two généra with unequal corols; the first has the stigma headed, the latter oblong. My flower must be the lonicéra. This is a charming book!

Hortensf. Now refer your flower to the number of lonicéra, and compare it with the fuller description.

Jul. Its number is 233. Corol one-petalled, irregular. Berry many-seeded, two-celled, beneath. My flower agrees with all this, but there are more divisions, what are they?

Hortensf. They are divisions of the species, which reduce under one head as many of the généra

généra as agree in any one circumstance, from which the specific character is formed. If your *lonicéra* has a twining stem, you will find it in the first division. If the peduncles are two-flowered, in the second. If many-flowered, in the third. But we must be perfect in the généra, before we attempt to understand the species. Look into the *Généra Plantarum* for number 233, which marks *lonicéra*. You will see many observations below the généric characters, which may be of use in distinguishing the species. Henry shall now choose his flower.

Henry. Here is a dwarf iris: will this do for me?

Hortensf. It is better at first to examine flowers of a more simple construction; and I recommend to you to make a point of this, when you are by yourselves; and now I think you had better take a crocus, and I will explain the iris to you afterwards. You must carefully draw the crocus with its root out of the ground, as so much of the tube is covered by the earth.

Henry. The germ is below the corol. The corol six-petal-like, erect, expanded. Stigmas convolute coloured. I know my flower
by

by its stigmas, how nicely they are rolled up. I do not quite understand six-petal-like.

Hortensf. Six-petal-like signifies that the corol is so deeply divided as to have the appearance of six distinct petals, which upon first seeing the crocus, we should suppose to be really the case. Upon further examination these apparently six petals are found to be only divisions of a one-petalled corol, connected together by a very long tube. I shewed you the seeds of crocus last summer.

Henry. I remember them. The seed-vessel begins to rise out of the ground, as the other parts of the fructification begin to decay; and, when it is quite ripe, scatters its pretty pink seeds about the borders.

Hortensf. You may now give me that iris, and I will explain it to you. The corol is six-parted, the three outer divisions falling back, the three inner erect, and all joined together by their claws. Stigma, petal-like. Strip off the six-parted corol, and you will plainly see the stigma.

Harr. I see it, ma'am, but I should have taken it for three petals.

Hortensf. It distinctly marks the genus of iris.

iris. Under each division is a stamen pressed down upon the falling petals of the corol. This beautiful fringe along the middle of these reflected petals is the nectary. Some species have another kind of nectary, consisting of three honey-bearing dots externally, at the base of the flower. The capsule also varies in different species; in some it is three-cornered, in others six-cornered. There are observations on the genus iris in the families of plants, which are very useful. Such génera as are nearly allied to each other are placed in regular order; and if their affinity is very great, the circumstance, which separates them into distinct families, is noted.

Harr. I do not observe that either colour, smell, or taste are mentioned.

Hortensf. Those circumstances are liable to vary so much, that they are by no means proper to enter into either the genéric or specific character of plants, which ought always to be taken from such marks as are most constant. On this account Linneus has rejected the dimensions of the parts, except relatively, one to the other; place of growth also is too uncertain to be admitted as a decided character; but all these circumstances of

of smell, taste, colour, size, and situation are noted after the specific characters in the *Species Plantarum*, and have their use, if taken in aid of the more decided marks of discrimination. Linneus esteemed the nectaries of greater importance in determining the genera, than almost any other part; and by the use he has made of them, has established their consequence, though so much neglected and overlooked before his time, that they had not even a name. As we have begun with the genera of plants, it is time you should be acquainted with the various forms under which the nectaries appear.

Charles. Before we begin to investigate them, I should like to refer a flower to its genus in the class syngenesia.

Harr. And I in monadelphia, if you will help me a little.

Hortensf. I have no objection to your doing so; I was rather afraid of tiring you, or should have proposed it. You will not want much assistance. Bring some mallows, and geraniums, and an artichoke; we will proceed in order. Harriet will first take her flower, as it belongs to the sixteenth class, one-brotherhood.

Harr.

Harr. I will begin with the mallow ; its class I know ; its order must depend on the number of stamens ; here are many, so I must find it in polyandria. The généra contained in that division are again divided by the number of females or pistils, mine has many pistils ; but I perceive that I must look for some other circumstance, as there are six généra that have the same character in the number of pistils. The outer calyx of my flower is cloven into nine parts, so is the calyx of althæa, and of no other genus. Arils one-seeded and verticiled ; my seeds are in arils, I think.

Hortensf. They are. You may readily take them out of their little parchment-like cases, which are called arils. In the fuller description you find that the calyx of althæa is double ; so is that of your flower, which is the althæa officinális. Observe the nice order in which the seeds are placed round the receptacle. You will give Juliette leave to investigate the geranium.

Harr. Willingly. I did not expect to find the genus of a plant so readily.

Hortensf. Now you have attained a knowledge of the method of studying your book,
you

you will not often find yourself at a loss; though between some of the *généra* of the two-brotherhood class (*diadélphia*) the distinctions are so minute, as sometimes to puzzle able botanists; therefore you must not be discouraged, if you do not always make out your plant as readily, as you have hitherto done. Juliette will now examine her *geranium*.

Jul. It has ten stamens, there are only three *généra* in that order. I see that my flower is *geranium*, but I am at a loss—the description mentions a capsule five-grained—here is no capsule.

Hortensf. Look for the longer account of *geranium*.

Jul. O, here it is all right. One female, stigmas five; fruit beaked; five-grained—but why in the first description is a seed-vessel named?

Hortensf. I imagine from mistake, as in the *Généra Plantarum* there is said to be no pericarp. The seeds are separate; each enclosed by an aril, and joined to the style by long threads, which form the beak-like appearance, from whence it derives the english name of crane's bill. When the seeds are

mature, these long threads, or awns, twist and carry them to the earth, where they vegetate, as I shewed you, when we were considering the various modes of dispersion, which might be found in seeds.

Jul. What do all these divisions of the geraniums mean? I have found the order to which my flower belongs by its ten stamens, and here they are divided from different numbers.

Hortensf. Look again, and you will see that the sub-divisions of the genera depend on the number of anther-bearing stamens. However this equally perplexes a young botanist, and is now remedied by L'Heritier's new arrangement of the geranium family, which he has divided into three distinct genera. Eródium, Pelargónium, and Geranium. The names eródium and pelargónium signifying heron's-bill and stork's-bill, as geranium signifies crane's-bill. Eródium includes Linneus's division with five perfect, or anther-bearing stamens. Pelargónium those with seven anther-bearing stamens. And geranium those with ten. It is doubted whether the genus geranium may with strict propriety be classed with the flowers of one-brotherhood,

as it has not its stamens decidedly united at their base ; at present it remains in the class to which Linneus referred it, and probably will be continued there, as the appearance of the stamens and pistils so much resemble those of all the one-brotherhood flowers, that without very nice examination, the want of union at the base is not easily discovered. Your flower is a pelargónium, as you will see, if you count the number of its anther-bearing stamens.

Jul. There are seven. I am sorry I must no longer call this plant the horse-shoe gerá-nium.

Hortens. The zoned pelargónium will soon become equally familiar to you. Four of our British species of gerá-nium ought now to be arranged under the genus eródium, only five of their stamens bearing anthers ; these are the cicutárium, the pimpinellifólium, the moschá-tum, and the marítinum. We will now try our skill in the class syngenésia, or united anthers. You may begin with the artichoke, Charles.

Charles. The artichoke belongs to the first order, the florets of which it consists having all both stamens and pistils. The first divi-

sion contains the ligulate corols; my flower cannot belong to that; its corols are tubular-headed flowers—it may be here—the généra cárthamus and cy'nara both have their calyxes ragged. The calyx of the cy'nara has its scales channelled and thorny. Here I will rest; my flower is cy'nara—is it not, ma'am?

Hortensf. It has much the appearance of being so; when you have examined it by the further description, we can then pronounce decidedly.

Charles. The number of cy'nara is 928, calyx dilated, imbricated with scales fleshy, end-nicked with a point. I will venture to decide, that my flower belongs to the genus cy'nara.

Hortensf. You are right in your decision. Observe the beautiful pappus which crowns the seed, and the size of the receptacle, which is the part that we eat of the artichoke, or the cy'nara scólymus; we also eat the fleshy base of the large leaves, which form the calyx. Will you, Harriet, dissect the dandelion?

Harr. If you please, ma'am. I am however a little afraid I shall find it difficult to understand the minute distinctions by which
the

the génera are separated, but I will try. I know it belongs to the first order, and the corols being ligulate, that it must be of the first division. The receptacle, I see, is the first mark of all the génera of this division. The receptacle of dandelion is clear from either down or chaff, so cannot belong to the seven first génera. I will pass the pappus, and observe the calyx, which answers the description of that of leóntodon, being imbricated with loose scales; there is no other genus that this character belongs to. This pappus puzzles me; I do not distinctly know the meaning betwixt plumy and hairy.

Hortens. The pappus of seeds in the compound flowers is either formed of simple hairs, or of hairs set with other finer hairs; in the former case the pappus is called hairy, in the latter plumy or feathery. The pappus of artichoke, cy'nara, is hairy. This minute circumstance respecting the pappus of the seeds is of great use in marking the génera, therefore should be well understood, If you expose it a little to the air to dry, you will then more clearly perceive of which kind the pappus in your flower may be esteemed,

Harr. I should not say that this pappus was plumy, but I suppose I do not look at it properly. Did Linneus observe all the minute particulars, from which he has formed the généra, without glasses?

Hortensf. He tells us that he has not described any parts, but those which he has seen with his naked eye. It is not from want of proper investigation, that you do not find the pappus of the dandelion seed plumy. Its deficiency in this particular of the generic character has been thought sufficient by Scopoli to make another genus of it, which he has named Hedypnois; however as Linneus has uniformly shewn his disapprobation of multiplying the généra from the single circumstance of an individual differing in any one part of fructification from its family, it would perhaps be better to follow his method in this respect. In the observations, which follow the générique characters in the families of plants, you will find the leóntodon taráxacum, which is your plant, noted for having the pappus of its seeds simple, or capillary. Some peculiarities in a few other species are also marked, which might have separated them from
their

their genus with as much propriety as the *taráxacum* has been. You seem to be ready in the method of investigating the class of compound flowers; you will meet with many that may be more easily distinguished than those which we have now dissected. The burdock, *arctium lappa*, is strongly marked, by the outer scales of its calyx being hooked at the extremity with very sharp shining hooks. The *onopórdon*, cotton thistle, is distinguished from the *cárduus*, the true thistle, by having a receptacle somewhat like an honey-comb, that of *cárduus* being hairy. Hence you perceive the excellence of the Linnean method. Mr. Curtis has in many of the *généra* of this difficult class discovered constant marks, by which they may be distinguished in different states of growth. In the *onopórdon acanthium*, when the flowering is over, he has observed that the innermost scales of the calyx close strongly together, and preserve the seed, contrary to the calyx of *cárduus*, and most other *généra* of the compound flowers, which as I before remarked, expand and disperse their seeds. The smaller flowers of this class are more

difficult to investigate, from the minuteness of their parts of fructification ; but if you proceed in the same manner, that we have done with the larger ones, which we have now dissected, you will soon obtain a competent knowledge of them. We will examine a few of the umbelliferous plants, and then, I think, you will be sufficiently entered into the manner of studying your book. Juliette and Henry will like to examine the umbelled flowers. Here is the water-parsnip for you, Juliette, and the shepherd's needle for Henry.

Jul. Thank you, mamma, I like making out the flowers. When I find myself right, I am quite happy.

Hortens. Both you and Henry have been so attentive, that I have had great pleasure in instructing you. Now take your flower, and examine those florets, which are nearly ready to open, as you will not easily determine its class, if you attend only to those which are fully expanded, the anthers frequently dropping off as soon as they arrive at maturity.

Jul. Here are five anthers not united, and

two

two styles ; to the fifth class and the second order my plant must belong ; and to the division of flowers, five-petalled, above ; two-seeded, umbelled. These flowers having also universal and partial involucre. Now begins the difficulty—Flowers *flosculous* and *fertile*. What does that mean ?

Hortensf. Flosculous implies that all the florets are equal ; the term *radiate*, that the florets of the circumference differ from those of the centre ; fertile signifies that the stamens are furnished with anthers ; abortive, that they are deficient in them ; wherever you find the particle *sub* used, it means the same as the english termination *ish* ; so sub-umbelled, expresses that the flowers do not form a perfect umbel. I think there are no other terms made use of in this class, but what you will understand ; if there are, I will explain them to you.

Jul. Thank you, ma'am, I can go on now. My flower is flosculous and fertile, and the petals hearted, but so are many others.

Hortensf. Attend to the form of the seeds of your plant, as from that circumstance the genus is frequently marked ; and in the umbelled

belled plants you may generally find at the same time both flowers and seeds in a fit state for investigation.

Jul. My flower, I think, is síúm; the seeds are almost egged; that means, I suppose, almost of the shape of an egg; and striated, that is *scored*, is it not, mamma?

Hortensf. You are perfectly right; go on.

Jul. I must look for number 348: here is no further description than that the involucre is many-leaved. How easy this book is, and how hard it seems at first. Now, Henry, will you take this shepherd's needle?

Henry. Pray give it me. It belongs to the same class and order with your flower, but not to the same division, as it has no universal involucre. I shall look for the seeds first. The seeds of scándix are oblong, so are these of the shepherd's needle; they agree too in other particulars; the flowers are not alike in the centre and circumference; the number is 357; here is a long description. Cor, radiated; fruit, awled; petals, end-nicked; florets of the disk, often male; those of my flower have only stamens. Disk means centre, I suppose. This fruit is shaped like an awl, and is very long.

Hortensf.

Hortenſ. The centre and circumference are named the diſk and the ray, both of which terms are frequently uſed in the characters of the compound flowers. Your plant is a ſcándix. Its ſpecies is diſtinguiſhed by the very long beak with which the ſeeds are furniſhed, and is called ſcándix peſten, or comb ſcandix. We will diſſect this gentiannella and centaury, and then part for the morning. Both theſe flowers muſt belong to the ſecond order of pentándria, or five ſtamens. Their flowers are one-petalled, and beneath; their fruit, capſules; which reduces the number of genera to four; amongſt thoſe four you are to look for them. Cut the capſules acroſs, and preſs out the ſeeds, you will then ſee in how many cells they were contained.

Harr. Here are two génera, which have capſules of one cell, and two valves. Pray what is the exact difference between a cell and a valve?

Hortenſ. The valve is the coat by which the fruit is covered externally. The cell a hollow inward diviſion, in which the ſeeds are lodged. So you will ſee in the flowers that you are examining, the outer coat is di-

vided into two parts, but that the seeds are contained in one hollow cell. The tubular form of the corol of gentianella decides it to be of the genus gentiána; and as the form of the corol is said to be indeterminate, that is, to vary in different species, you may refer your centaury to the same genus, as it agrees in all other particulars.

Harr. The gentianella and centaury are so unlike in their appearance, that I should have been much puzzled if I had examined them by myself.

Hortensf. It is on that account that I brought them. The structure of those species of gentiána, which are known by the name of gentianella, is so peculiar as to seem to give them a right to form a genus of themselves; and the centaury is now placed by Mr. Curtis, in the genus chironia, from its anthers being twisted, after having shed their dust; a distinguishing character of that genus, also from its outer habits so much resembling those of chironia. Such respectable authority as Mr. Curtis must have great weight; accordingly you observe that I have marked in my System of Vegetables, the gentiána centa-
taurium,

taurium, as a chirónia. We will meet to-morrow, and study the nectaries, and the flowers of a few more classes. We have gone through our lecture to-day with great success.

DIALOGUE THE SECOND.

Nectaries of Plants.

Henry. We have been very busy, mamma, and we think we have made out two or three flowers by ourselves. Is this self-heal, prunella? and this house-leek, sempervivum? We have brought some churn-staff, which you promised to explain to us; and here is a flower, that we are not quite sure of its class; and there is something odd in the house-leek.

Hortens. I must arrange your questions before I can answer them. Your self-heal is prunella. Your house-leek sempervivum tectorum. I will explain the churn-staff to you, and also the odd appearance on the flowers of house-leek. But first tell me from what circumstance you decided upon the genera to which these plants belong.

Henry. The two-forked filaments shewed us the prunella directly; and we luckily first gathered a flower of the house-leek, that had not the odd appearance, which this bunch has, so traced it to the eleventh class and sixth order,

der, and there was only one genus in that order: we should have been puzzled, if we had seen this flower first; we cannot distinguish the pistils from the stamens.

Hortensf. The appearance, which has perplexed you, is accurately described by Mr. Curtis from Haller, who has given a very minute account of this plant; its filaments frequently, even while young, are evidently enlarged towards their ends, and throw out from their substance little oblong white corpuscles, like the eggs of some insect: the filaments thus enlarged, are more glutinous than those in their natural state, and have their anthers somewhat imperfect. As the fructification advances towards maturity, the filaments continue to enlarge about the middle, while the top is drawn out to a kind of beak, in which state they might be mistaken for the pistil. On cutting them through they appear hollow, and to contain some of the same corpuscles, which may be seen on the outside of many of them, so that it would be impossible to know them to have been originally filaments. This shews you the advantage of examining flowers in their different states of maturity, and before the full expansion

expansion of their corols. The sempervivum is nearly allied to the sédum, but differs in having more than five petals; it is also liable to increase in its number of pistils, when it grows luxuriant. Have you attempted to refer the churn-staff to its proper genus?

Harr. We did attempt it, ma'am, but could not even make out the class.

Hortensf. We are obliged to Mr. Curtis for an accurate knowledge of the euphórbia, which is the botanic name of your churn-staff. He justly remarks, that the Linnean characters of this family will not in any of the British species, even guide us to its class. The stamens are very minute; there are seldom more than two or three that appear above the calyx, the rest are concealed within it, and rarely amount to twelve in number, so that it fails in the essential character of the eleventh class, to which it belongs, that character requiring that the flowers contained in it should not have fewer than eleven stamens, or more than nineteen: the smallness of the stamens, and the milky juice, which flows so plentifully from every part when bruised, renders the investigation of the euphórbias,

phórbias, on the principles of the Linnean system, extremely difficult. I can however give you a clear idea of the flower and fruit of this singular genus, by dissecting some flowers of the large garden spurge tree, or euphórbia lathyris. The part which Linneus had called the corol, Mr. Curtis has now named the nectary. There is a singular appearance which crowns the seeds of these plants, and which I have long observed, without being able to discover the use of it; this extraordinary appendage has not escaped the notice of Mr. Curtis, and is termed by him a button; it is of a fleshy substance, of a greyish colour, heart-shaped, and stands loosely on a shortish foot-stalk. In the tree spurge it gives beauty to the large black seed which it crowns. Mr. Curtis takes notice of the defects, which occur in the system of Linneus, with such candour, as must every one capable of judging of its general excellence, and who is a true lover of the science of botany. No one has done more towards rendering the knowledge of this agreeable science easy of attainment, than he has done, having followed Linneus in his endeavour after the discovery of essential characters, and

in many génera having been successful in his pursuit. The outer habits and milky juice of the euphórbias are sufficient marks of distinction in that genus; but the curious structure of their fructification well repays the trouble of investigation.

Charles. It does indeed. How much beauty in flowers is concealed from us, when we do not understand botany! Will you be so good now, ma'am, to examine this plant, which has puzzled us? We suppose it must belong either to the 21st, 22d, or 23d class, but cannot decide which.

Hortensf. It belongs to the 23d class, polygamia, or plants containing flowers with stamens and pistils, stamens without pistils, and pistils without stamens. Your flower is the *parietária officinális*, and is remarkable for the curious manner in which its anthers shed their dust. Each filament has a peculiarity of structure, which renders it highly elastic: there are four in number; on their first appearance they all bend inward. As soon as the dust is ready to be discharged, the warmth of the sun, or the least touch of a pin, will make them instantly fly back with a degree of force, and discharge a little cloud
of

of dust. We will observe this process to-morrow, if it is a bright day, as it is best seen, when the sun is hot, and shines on the plant.

Henry. I shall like to see that vastly. What is that very little plant, mamma, in that little blue faucer of water?

Hortensf. I have brought it to shew you the remarkable minuteness of its parts of fructification. It is the centunculus minimus, or least centunculus, which however is an unnecessary appellation, as there is only one species known; you may refer it to its class, order, and genus.

Jul. Here are four-stamens and one-pistil, it belongs to the fourth class and first order. Corol wheeled, calyx four-parted; capsule one-celled, circumscised, that is cut round, I suppose. The flowers are all closed; but as the other parts agree with the description given of them, the corol is wheeled, I dare say.

Hortensf. The extreme smallness of the corol, and the circumstance of its never opening, but when the sun shines strongly upon it, makes the form difficult to be observed; it is however wheeled, and has this peculiarity at-

tending it, different from most of the wheel-form flowers. The corol remains after the stamens have shed their dust, and covers the top of the capsule. The distinguishing circumstance of this little plant is that of its round capsules, seated in the bosom of the leaves. We will now begin with the nectaries, before we proceed to investigate the passion flower, orchis, and arum, as in those genera they are of particular consequence.

Harr. I shall like to be acquainted with the different kinds of nectary, but I am rather sorry, when any thing interrupts the investigation of the genera. We have not dissected any of the butterfly tribe of flowers, nor of the class four-powers.

Hortensf. You are all so ready in the botanical language, and have attained so clear a knowledge of the method of reading your plants, that it is unnecessary to proceed with them in regular order, as a task ; and it will be more amusing to refer a flower to its genus, as it excites your curiosity, than if you gathered a certain number every day for that purpose.

Jul. We can try to make them out ourselves, and then bring them to you, mamma,
for

for further instruction ; but pray tell us about the nectaries ?

Hortens. Linnæus has defined the nectary to be that part of the corol, which contains the honey, having a wonderful variety both as to shape and situation, sometimes being united with the petals, and sometimes separate from them. The lower part, or tube, of one-petalled corols, generally is found to contain a sweet juice, which is the honey. In the flowers of *árbutus únedo* (strawberry tree) it is so profuse, as to run out, when the corol is opened, and to give the flowers a strong scent, resembling that of the honey of bees ; it is also found at the base of the petals, in many of the butterfly tribe of plants. Clover (*trifólium pratense*) contains much of this liquor. The chief distinctions of the nectaries, which adhere to any of the parts of fructification, are, *first*, the spur-form, which is found in one-petalled flowers, as snap-dragon (*antirrhínum*), and valerian (*valeriána*) ; and in many-petalled flowers, as in *órchis*, lark-spur (*delphínium*), and *víola* ; *second*, such as are on the inside of the petals, as in crown imperial, and all the family of *fritillária*, though in none so obvious as in

the species imperialis, in ranunculus, and dog-tooth (erythronium). The nectary in lily (lilium) is that raised line which you see run down the petal lengthways; *third*, the nectaries which crown the corol, as in passion flower, passiflora, narcissus, lychnis; *fourth*, on the calyx, as in nasturtion (tropæolum), being a spur attached to the calyx; *fifth*, on the stamens, which in bay (laurus nobilis) are three glands ending in two bristles, surrounding the germ; *sixth*, on the germ, as in some species of iris, and in hyacinth, and the plants of the class four-powers, tetradynamia; *seventh*, on the receptacle in sempervivum, and mercury, mercurialis; *eighth*, all those nectaries which are not apart from the corol, but whose singular construction does not admit of their being placed among any of the kinds I have enumerated, as in nettle (urtica), the nectary is situated in the centre of the stamen-bearing flower, very small, in the form of a cup. In fact, the term nectary is applied by Linneus to every part of fructification, which from its singularity cannot be ranked among the seven regular parts of a flower; it has been doubted whether this part exists in every flower, and

certainly we find many destitute of it, as a distinct apparatus; but if any part, wherein this sweet juice, called honey, is found, has a right to be termed a nectary, I think I would venture to decide, that there is no flower without it; and that Linneus was of this opinion appears from his having named it, in the System of Vegetables, as a constant appendage of the corol, calling it the honey-bearing part proper to the flower, distinguishing it into two kinds, *proper*, when separate from the petals and other parts. *On the petals*, when forming a part of the corol, it not being noticed in many of the généra may seem an objection to Linneus having considered it as a constant part of the fructification; but he could not be ignorant of its existence in the compound flowers, the lower part of the florets, of which they consist, generally containing the juice in question, and yet he has not named it in any of the généra of the class united anthers (*syngenésia*), except those of the order monogamia, or simple flowers, which have spur-form nectaries; whence I conclude he omitted it in all those généra, where its structure was not such as to form a marked

character. As a further proof of this, the nectary is not named in the one-petalled flowers, though nothing can be more evident than the honey contained in their tubes ; and Linneus has, in some of his works, called the tube of a one-petalled corol a true nectary. Among the nectar-bearing stamens, he enumerates those of the *fraxinella* (*dictamnus*), I suspect however that the resinous matter, with which they abound, is not of the nature of honey, but similar to that we find upon the stalks, which is so inflammable as to take fire on the approach of a candle, and to burn like spirit of wine, till it is entirely exhausted.

Henry. I remember, mamma, you set a *fraxinella* on fire last summer, and we wondered the stalks were not burnt through.

Hortensf. So long as any of this essential oil remains, it is caught by the flame, which runs rapidly along the surface of the stem till it finds no more food, and then is extinguished, not having force sufficient to burn the green stalks, which you may understand by escaping unhurt from the flame of a snap-dragon, which runs along your fingers without singeing them : but to return to the nectaries,

taries, which are placed separate from all the other parts of fructification; the structure of which is an object that merits the strictest attention, not only as distinguishing decidedly one genus from another, but from the artful manner in which they are formed for the purpose of preserving from insects the precious store contained in them. The most remarkable are those of the monk's-hood (*aconitum napellus*), of christmas rose (*helléborus niger*), parnássia and columbine (*aquilégia*), and of the órchis tribe. In *aquilégia* the nectaries have been thought to resemble the neck and body of a bird, and the two petals standing upon each side to represent wings, whence its name of columbine, as if resembling a nest of young pigeons, while their parent feeds them. In *helléborus* the nectaries are placed in a circle like little pitchers, and add much to the beauty of the flower, but I know not any which are a greater ornament than those of the parnássia. I have not yet been able with certainty, to discover the gland which bears the honey. The beautiful transparent globules which fringe the margins of the five scales, called nectaries, may probably contain some viscous juice,

juice, which serves to guard the honey from the depredation of insects; but that we have nothing to do with at present. If you have attained a knowledge of the different species of nectaries, with their varieties, it is all that this part of our studies requires.

Charles. I have perfectly distinct ideas of them, ma'am.

Harr. So have I.

Jul. I often bite the bottom part of the petals of pinks, and taste something sweetish, must I therefore call the claws of those petals nectaries?

Hortensf. If you dissect a pink with care, when the stamens first become mature, you will find the base of the calyx filled with honey; by what part of the fructification that juice is secreted, is not perhaps an easy matter to determine, but if that were determined, that part must be called the nectary.

Henry. My doves to my venus's chariot are the nectaries of the monk's-hood, are they not, mamma?

Hortensf. They are; and with the assistance of a strong imagination, and taking away the hood, which covers the nectaries, you form a tolerable chariot: exert your fancy a little further,

further, and I will shew you a store of honey, which from the smallness of its quantity, and the elegance of the apparatus to contain and preserve it, must belong to the queen of the fairies. Observe these flowers of mignonette, *reséda odoráta*; these two-fringed petals growing close together form a little casket, or box, the lid of which is this small scale growing betwixt the stamens and petals, and pressing so closely on the latter as to shut up securely a small drop of honey in the hollow formed by their union. I have frequently seen bees baffled in their attempts to plunder this honey, not being able to open the lid sufficiently to allow of the insertion of their trunks.

Henry. I like watching bees about the flowers, but they go so quick from one flower to another, that I can seldom see their trunks.

Hortens. They attend only to their business, and are so provident of time, that they never lose a moment in idleness. When we study insects, you will be struck with admiration, as we enter into the laws and economy of those tribes, with which mankind have made themselves most acquainted. We
have

have accounts of bees from every writer on natural history, as every one has an opportunity of observing their ingenuity to a certain degree. It is however equalled, if not excelled, by many other insects; but our knowledge of the general laws, by which many of their tribes are governed, is so imperfect, that we cannot accurately compare one with another; but so far we know of them as to give us cause to believe, that they do not act from the blind impulse of instinct, but that their senses enable them to vary their operations as occasion requires. Some evidently possessing the sense of touch in an exquisite degree, and their occupation requiring more constant exertion of their powers, we are authorized to believe, that those tribes are endued with a greater proportion of knowledge and ingenuity. You will be surprized to hear me mention the spider, as an insect which stands foremost in these qualifications.

Jul. A spider, mamma? I do not *like* a spider.

Hortens. Because you are not acquainted with it. You observe only its outer form, which is not very prepossessing, and do not
consider

consider the merits, which may be found under that form. If you will take the trouble to observe a spider, when she is making her web, you will feel more respect for that poor little insect. This web is a net, which she forms to entangle her prey, from a material given her by nature to supply her want of wings in travelling from place to place; and when used for the purpose of migration is formed into a long line, spun from her own body. When employed to make her web, you will find her assiduously adapting the form of each net to its situation, and strengthening those lines that require it, by joining others to the middle of them, and attaching those others to distant objects; with the same individual art, that you have seen your brothers use in supporting the masts, and extending the sails of their ships. You must all have seen another wonderful circumstance of management in this little creature, which is her counterfeiting death, when put into terror; and as soon as the object of terror is removed, recovering and running away.

Henry. I have seen that, when I have put my finger near a spider, it has rolled itself up like a little ball, and as I have taken
away

away my finger, it has moved, and then again rolled up, when I have come near it once more; but I did not know why it did so, or I would have let it alone.

Hortens. I dare say you would: but learn from this, that want of thought is often as productive of cruelty to our fellow creatures, as the most deliberate tyranny. There are few things which tend to humanize the mind more, than a knowledge of natural history. From ignorance, we are apt to consider the numerous tribes of insects, which surround us, as being equally unfeeling with the stones, that we tread upon; and few people are aware, that by the death of an ant, or bee, a whole colony may be thrown into confusion.

Henry. I have taken great care not to tread upon ants, since you told me their history, mamma. The spiders nets seem so slight, that they cannot hold any strong insect, I should think.

Hortens. The nets of the spiders of this country have the appearance of thin gauze, but from the art with which they are constructed, are perfectly well adapted in strength to the prey, that they are intended to entangle,

gle, which consists of different kinds of flies. In South America there is a large spider, which constructs nets of so strong a texture, as to entangle small birds, particularly the humming-bird; and in Jamaica there is another spider, which digs a hole in the earth obliquely downwards, about three inches in length, and one inch in diameter; this cavity she lines with a tough thick web, which when taken out resembles a leathern purse; but what is most curious, this house has a door with hinges, like the cover I have shewn you in some sea-shells; and herself and family, who tenant this nest, open and shut the door whenever they pass or re-pass. But we have digressed widely from our subject, and we will now think of the curious plants, which belong to the class gynándria, or stamens growing upon the pistils.

Jul. But will you, mamma, some time tell us more about insects?

Hortens. I promise to treat you, by letting Charles read to us to-night some parts of a section on the subject of instinct, in a book entitled *Zoonomia*, lately published by an eminent philosopher, who is not more celebrated for the depth and acuteness of his researches, than
for

for the agreeable and distinct manner, in which he gives them to the world. We shall there find some amusing and instructive histories of the economy of different animals, which will serve to give you an idea of the wonderful mechanism and art, which they employ in the construction of their habitations, and the care of their progeny. But you must regularly enter into the study of them, before you can receive the amusement, which such a subject is capable of affording.

Henry. We read a great deal about all kind of animals, and it is very entertaining; but I never remember any thing so well as what we read in the Natural History of Birds.

Hortensf. * There are few books so well managed as that you speak of. The subjects are scientifically arranged, and made interesting by the manner in which they are treated. You may look over a whole library for children, in general, and not find a subject to which you wish to refer; but in your book of the Natural History of Birds, the

* Natural History of Birds by Mr. Galton, intended for the amusement and instruction of children, with copper-plates, coloured, 11. 1s. sold by J. Johnson, St. Paul's Church-yard.

whole matter being divided under separate heads, you are never at a loss. My object has ever been, that you should read with method; and you find the benefit of having done so, from your memories being more clear and retentive, than those of most children. That I may be sure, I have not confused you by our dissertation on spiders, pray tell me what we last treated of in our botanical subject?

Jul. You had, ma'am, described the curious nectaries of mignonette. After having explained to us the different forms under which the nectary appears, whether joined to, or separate from the corol.

Hortensf. Very well. In this passion flower, from the large size of its parts of fructification, we may easily examine the position of the stamens and pistils, its botanical name is *passiflora*. The petals and calyx nearly resemble each other in front, both being of the same form and colour; these beautiful rays are the nectaries; the stamens are five, at first view having the appearance of being placed on the pistil, but in reality growing from the bottom of the germ, where it joins the little pillar on which it is elevated. The

three large styles are very evident, and from their purple colour, and that of their stigmas, give much beauty to the flower. The nectaries form the principal feature in the flowers of this genus, and in some of the species have the appearance of a basket made of blue and white beads strung upon wire. The generic characters of *passiflora*, given by Linneus, do not agree with any of the species which I have seen, and there is some doubt whether the stamens can be properly said to grow on the germ. Perhaps the small pillar, to which both the stamens and germ adhere, may with more propriety be considered a receptacle. Linneus calls this pillar a style, but if it be one, we are at a loss to know what part of the flower these three apparent styles, with their stigmas, must be called, and to which he gives the name of styles. This is one of the few *généra* that we find not justly described. Be so good to give me that spotted *órchis*, or king's thumb, as you call it. I see you have dissected some of its flowers. Have you been able to gain a distinct idea of the parts of fructification.

Harr. We found them so different from those of common plants, that we did not spend

ſpend much time over them, as we knew we ſhould underſtand the parts ſo much better, if we examined them with you, ma'am.

Hortenf. It is not an eaſy matter to obtain a diſtinct idea of the parts of fructification of the orchis tribe: a peculiarity of ſtructure runs through the whole of them, ſo different from what we commonly meet with in other plants, as to make them well worth investigating. Attend to the natural flower, and to the plate before us, which, as it ſhews all the parts magnified, will be of great aſſiſtance to you. I have in my hand a ſingle flower on its peduncle, with its bract, or floral-leaf, in which you ſee the twiſted germ, the petals, the lip and form of the nectary of their natural ſize. I will open it, and ſhew you the anthers, but you will underſtand them better from the plate. Each flower contains two ſtamens, the ſtructure of which is very curious. Each of theſe ſtamens is contained within a bag or caſe, the edges of which fold over each other, and open in front, as the plant advances towards maturity; at this period, in many of the orchis tribe, they hang down, out of their caſes, towards the ſtigma, on the ſlighteſt pull they are drawn

out. Draw them gently, Juliette, with a needle, and observe the base of each filament.

Jul. Here is a transparent globule, but so small, I cannot see it distinctly.

Hortensf. Compare the stamens with the drawings; in them you plainly see the globules at the bottom of the stamens, and at the top a club-shaped substance, of a yellow colour, in the flower we are examining, and generally so in others; the surface of which is covered with small grains, these we must consider the anthers. We will now lay all the parts before our microscope, and you will find the representation, given in the plate, to be most exact; and that the anthers are composed of irregularly square corpuscles, united together by fine elastic threads: that these corpuscles produce the same effect of the anther-dust of common flowers, seems highly probable, though at present the manner of their doing so is not known.

Charles. This seed-vessel is full of good looking seed.

Hortensf. Many of the orchis tribe have their seed-vessels large, well formed, and filled with seeds, which though extremely
minute,

minute, appear perfect. The smallness of the seed is certainly no argument against its vegetating. Some of the ferns, whose seeds are much smaller, are well known to be propagated from seed, and to come up spontaneously in hot-houses, where the original plant has scattered its seed : probably by minute attention we may be able to discover the seedlings of orchis.

Harr. You have sowed the seed, I think, ma'am.

Hortensf. I have done so, but not with success. However, I am of opinion, that the orchises are propagated from seed, as many young plants of them are frequently found together, and it is well known that they never increase plentyfully by the root ; but in this, and all other parts of natural history, we can only hope for satisfaction from accurate and repeated observation. Next year I hope you will understand enough of the subject to establish an experiment-garden.

Jul. That will be charming.

Hortensf. I hope you will find it so. To become an experiment-maker requires much patience, and impartial judgment.

Jul. Ah, mamma, you doubt my patience!

tience ! But what has partiality to do with making experiments ?

Hortens. If you watch a bed of orchises, in the hope of finding seedlings on it, you will eagerly catch at every circumstance that can favour this hope. It is the business of an experiment-maker to be always looking for circumstances which make against his theory, and not for it ; and to state as strongly what he remarks unfavourable, as favourable to his wishes. But you are at present too young to enter deeply into this part of the study. You will however be equal to assisting your brother and Harriet, when they begin experiments, and in time become an able experiment-maker yourself. You have an industrious application in all you do, which is an excellent foundation ; a little impetuosity, and impatience under disappointment, is what we have to get the better of ; and I flatter myself, I see them combated with good effect. You cannot be at a loss to know the species of orchis, that we have just now been examining ; its spotted leaves and bright purple flowers will generally be marks sufficient : but that glass, which is filled with such a seeming variety of them,

you

you will be surprized to find contains only one species.

Harr. Indeed I shall, ma'am ; for I gathered them for so many different kinds.

Hortensf. They are only so many varieties of the órchis morio, which shews you, how little to be relied on are the colours of the corol, which in this species assumes all the changes of colour, from a deep purple to a white ; yet it is obviously distinguished from all our other órchises, as through every variety it retains more or less strongly the character of having its two outermost petals marked with green, parallel lines. In this órchis the anthers are green.

Henry. I see the lines ; they are so exact, that they look as if they had been drawn by a camel-hair pencil. Pray how many kinds of órchis are there in England ?

Hortensf. There are ten distinct british species of the real órchis ; but by common observers some other génera have been confounded with them, which, you will see, ought not to be so. Linneus has distinguished the different génera of these curious plants by the form of their nectaries. The flower commonly known by the name of

bee orchis belongs to the genus of óphrys, the distinguishing character of which is the nectary hanging down longer than the petals, and being slightly keeled behind only. You shall compare this bee orchis, which is the óphrys apífera, with the plate of its parts of fructification; in * Mr. Curtis's London Flora, you will find them most accurately given; also we will study this tway-blade, or egged óphrys, with the plate of its parts magnified, which will make the investigation of it easier to you, and you will see the great difference there is in the structure of the óphrys and orchis génera. Linneus has formed the specific characters of several of these flowers from peculiar circumstances found in the nectary; that of the tway-blade, or óphrys ováta, is marked by its nectary being two-cleft. The leaves of these two species of óphrys differ materially from those of the orchis tribe. The root of the óphrys apífera resembles those of orchis genus, which are bulbous, but that of the ovata is fibrous. Linneus, in the generic

* For the convenience of those, who may not have access to that valuable publication, a plate of the orchis and ophrys is given at the end of this dialogue.

characters of the four families of órchis, fatty'rium, óphrys, and serápias, which are all closely allied, marks the circumstance of the germ being twisted as a peculiarity common to them all. It certainly does not run through all the species, and I suspect it will be found exclusively to belong to the órchis genus; but this I mention with great diffidence, and only that you may attend to this particular in your investigations of these extraordinary flowers.

Harr. When we have gathered orchises, we have frequently left the tway-blade, because we thought its flowers not handsome; but we are now attentive to every thing that is like a plant, be it ever so ugly; and we often think of what you always say, mamma, that there is no such thing as an ugly flower.

Hortensf. I am really of that opinion, and extend it to every product of nature, that we make the subject of our thoughts; it is to those who observe only with their eyes, that any of her works can appear ugly, or even indifferent. How often have you passed the leóntodon taráxacum, dandelion, as a flower of no beauty; now you are acquainted with
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the mechanism of its fructification, I dare say you have more respect for it.

Harr. Indeed I have. On the first view of the plant my mind is filled with the idea of its florets, its seeds with their down, and all the curious opening and shutting of its calyx: so that I have not a thought of its clumsy yellow flower, which before I understood the parts it was composed of, I did not like.

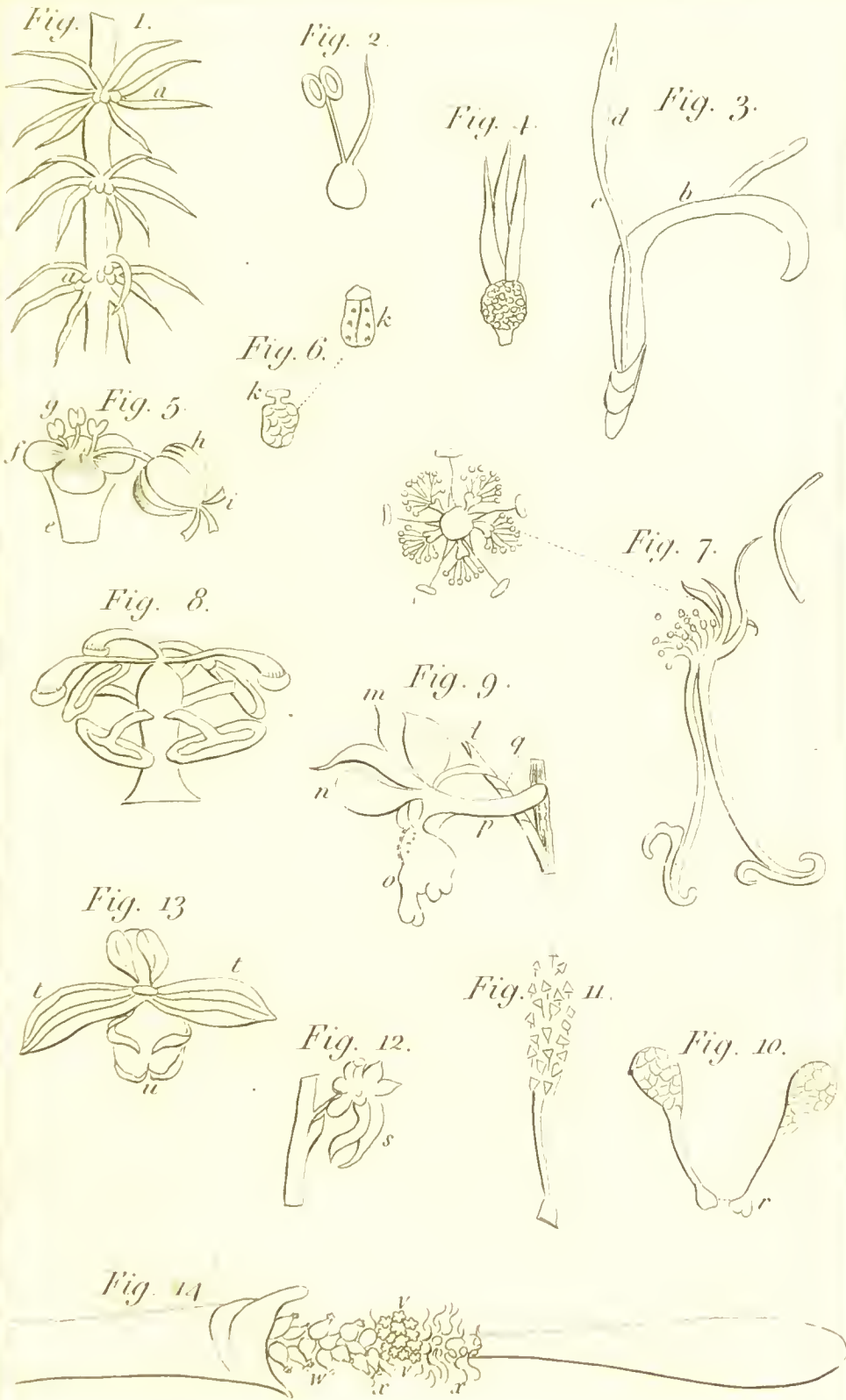
Henry. And I just now saw a spider on the window, and my finger was out, ready to stop it; but I thought, poor little thing, you have a great deal of work to do, I will neither frighten you, nor hinder you.

Hortensf. Thus it must ever happen to reflecting minds; the more we exert our powers of thinking, the more we lay up store for our own happiness, and for the benefit of others. The investigation of the orchis tribe has occupied us so long, that we will defer the consideration of the árum till to-morrow, when you had better bring some fresh ones, as its flowers have a very offensive smell, if kept more than two or three hours.

EXPLANATION OF PLATE I. PART II.

PARTS OF FRUCTIFICATION OF HIPPIURIS, CÁNNA, EUPHORBIA, ORCHIS AND ARUM, AND THE NECTARIES OF PARNASSIA AND ACONITUM NAPELLUS.

- Fig. 1. Part of a Spike of Hippúris Vulgáris, with the flowers in the bosom of the leaves, *a*.
- Fig. 2. A Flower of Hippúris Vulgáris magnified.
- Fig. 3. Anther-bearing Petal of Cánna, *b*. With the Style growing to the Petal-form Filament, *c*. *d*, The Stigma.
- Fig. 4. Three-leaved Perianth of Cánna growing upon the Germ.
- Fig. 5. A Flower of Euphórbia Helióscopia magnified. *e*, The Calyx. *f*, The Nectary. *g*, The Stamens. *h*, The Germ. *i*, The Stigma.
- Fig. 6. Seeds of Euphórbia to shew the small white button at the upper end, *k*.
- Fig. 7. Nectaries of Parnássia and Aconítum Napéllus, Monk's-hood.
- Fig. 8. Stamens and Stigmá of Passion Flower.
- Fig. 9. An entire Flower of early spotted Orchis. *l*, The Bract. *m* and *n*, The Petals. *o* and *p*, The lip and horn of the Nectary. *q*, The twisted Germ.
- Fig. 10. The Stamens magnified. *r*, The Glands at their base.
- Fig. 11. A Stamen magnified with the Anther drawn out.
- Fig. 12. A Flower of Ophrys Ováta. *s*, The Cloven Nectary.
- Fig. 13. A Flower of Ophrys Apífera, Bee-óphrys. *t*, The Petals. *u*, The Nectary.
- Fig. 14. A Flower of common Arum. *v*, The Anthers. *w*, The Germs. *x*, The Nectaries above and below the Anthers.



DIALOGUE THE THIRD.

Investigation of different Généra of the Classes One-house, and Two-houses, of Ferns.

Jul. We have brought several flowers of the árum. Pray, mamma, look how different the colours of the tongue are; here is one yellowish green, and another deep purple, the leaves and hoods too, are some spotted, and some plain.

Hortensf. This plant is subject to great variety in these particulars; also in the shape of its leaves, perhaps the colour, of what you call the tongue, may in some degree depend on the different state of ripeness in which you gather it. This is a wonderful flower, and seems intended by nature to shew us, that she is not confined to any one method of renewing her productions. Here are berries produced with perfect seeds, which germinate and continue the species, as certainly as those seeds formed in plants, which we call of a more natural structure, because they are of one more common: I have taken out the club-shaped receptacle, which you call the tongue, and separated the spathe

carefully from it. You will find an advantage in referring to the plate of this plant, though not so necessary as in examining the orchis tribe. All other known plants have their pistils placed within the stamens. In the *árum* the stamens are situated rather more inward than the pistils, and above them on the receptacle. These stamens are not raised by filaments, but are a collection of anthers four-cornered, and growing to the club-form receptacle; above and below these anthers are placed several roundish bodies, terminated by a tapering thread, these Linneus calls the nectaries. Beneath the lower order of nectaries, the seed-buds are placed, surrounding the base of the spadix, or tongue, of an oval shape, without styles, and their stigmas bearded with soft hairs. These seed buds become berries of a beautiful bright scarlet colour, corresponding in number with the germs; are round and have one cavity. I mentioned an opinion of the younger Linneus, when first we considered the class gynandria, that the *arum* did not properly belong to that class, but should be placed in the class one-house, as every anther and stigma were rather to be esteemed distinct florets,

florets, than as belonging to one common flower. I incline to this opinion myself, but do not venture to remove it from the class, in which it is at present placed, till farther observations of respectable botanists have determined more decidedly its proper situation. The root of this árum is extremely acrid; but that property does not prevent its being dug up and eaten by the thrushes. Some species have their roots so mild as to make a part of the food of the inhabitants of the hot countries, where they grow; and some of the sorts are cultivated by the inhabitants of the South Sea isles, and of the sugar colonies, as esculent plants. The leaves of one of the species, called indian cale, are boiled to supply the want of other greens. The roots of the árum maculatum, which is the species that we are examining, were formerly used for starch; Gerrard mentions it having been so, and adds, that it was so extremely acrid, that the people who made use of it had their hands so much chapped, that they were healed with difficulty.

Charles. I remember once biting the leaves, and my tongue was sore for some time afterwards.

Hortensf.

Hortensf. The whole plant abounds with an acrid juice. You should be cautious of putting any parts of plants into your mouths; thoughtlessness in this particular has sometimes been attended with dangerous consequences. Have you discovered the genus of that plant in the china jar?

Harr. We think it is *mercurialis*.

Hortensf. You are right; it is the *mercurialis perennis*, and is a good specimen of the class two-houses. It is an elegant plant; its yellow stamens, and tender green leaves, are a great ornament to the hedge-banks, while it continues in flower. Neither the male or female flowers have corols. In the latter, the nectary is formed of two small pointed filaments, placed on each side of the germ, and pressed into the furrows of it. The other plant, which you have laid with so much care into that deep dish of water, is one of the chief beauties of my aquatic garden. You have not found much difficulty in arranging that under its proper genus.

Charles. We suppose it to be the *hydrócharis*, or the frogs-bêt; but there are some appearances about it, that we hope to hear explained by you.

Hortensf.

Hortensf. The leaves, the whole structure, and economy of this plant are exceedingly curious, and deserve minute attention. Which are the parts that you do not understand?

Charles. It is an appendage of the stamens, which we thought might be a pistil, but we could not discover any thing like either a stigma or germ.

Hortensf. The male flowers of the *hydrócharis* have nine stamens, disposed in three rows. The filaments of the middlemost row put out from their base, on the inside, a style-like substance, which is placed in the centre of the flower. The two other rows are connected at the bottom, so that the internal and external filament adhere together. The anthers are yellow, nearly linear, and have two cavities. Linneus does not take notice of the nectary, but Mr. Curtis has observed in the female flower, three yellow glands crowning the germ, to which he gives that name.

Charles. Thank you, ma'am. I am glad to find that there was something really curious in the appearance that puzzled us. We
admire

admire the spathes of the flowers; they are somewhat like sea-wrack.

Hortensf. These buds, from their transparency, have the appearance of bubbles; and are, you see, very numerous, both in the male and female plants, and chiefly grow near the root. In the male, there are also a pair of these spathes, which grow out about the middle of the flower-stalk, and look like little bladders, containing the tender unopened flowers. Mr. Curtis differs from Linneus in describing the female flowers as enclosed by a spathe, which contains only one flower, that of the male three or four. The water plants seem to have engaged your attention particularly this morning.

Harr. Charles gathered these spikes of cat's-tail, but we could not make any thing of them.

Hortensf. They are the greater and lesser typha. Their flowers consisting of very minute parts, are difficult of investigation; Mr. Curtis's account of them somewhat differs from that of Linneus, and is to be preferred; as he examined all the parts accurately with a microscope. These plants are of the one-house-

house-cls, and by Linneus are placed in the order three-stamens; but as on one filament are found one, two, three, or four anthers, it seems that they might more properly have been arranged in that of polyándria, or many-stamens. What Linneus has called the calyx, from Mr. Curtis's observations, does not appear to be one, but rather some hairs proceeding from the receptacle, which is covered by them after the stamens are fallen off. These spikes of flowers are aments, or catkins, and their cylindric form marks the essential character of the genus. The male flowers are numerous, and terminate the *culm*, which is the term that Linneus gives to the straw of grasses, and these reed-like plants. The female flowers are also numerous, and entirely surround the culm. The *typha* major, when its spike of stamens is nearly ripe, makes a magnificent appearance, indeed every part of this plant deserves attention: the root derives much beauty from its fine moss-like fibres, and the shades of brown and green, with which the upper part is varied.

Charles. A part of it grows out of the
 Q ground,

ground, and is very beautiful. Here is another plant, about which we have not satisfied ourselves.

Hortensf. This is a *cárex*, one of a numerous tribe of plants, the species of which it is not easy to distinguish: this however may be known directly. As to the *cárex péndula*, for in whatever situation it is found, it is distinctly marked by its long pendant female spikes. These are very slender, when young, but become much thicker as the seeds ripen. Its fructification merits examination, as indeed does that of the catkin tribe in general, the investigation of which is not a difficult matter, when a proper method is once attained.

Harr. I think I shall not again be at a loss how to examine these plants. I perceive we must dissect the separate florets, as we do those of willow and hazle.

Hortensf. That is the only way; and after you have observed it in a few *généra*, the tribe of catkin plants will no longer perplex you; you will as readily refer a *ty'pha*, or *cárex*, to its proper genus, as you have done a *crócus*. We will now endeavour to attain

attain some idea of the structure of the cryptogamia plants, and begin with the filices, or ferns.

Jul. I am glad of that, for I wish to know something of the little brown spots on the back of their leaves.

Hortensf. Those little brown spots are a most important part of the plants belonging to the fern tribe; and their wonderful construction will well repay your trouble in the examination of them. The plants contained in the class cryptogamia have not yet been observed to bear either stamens or pistils, therefore when their fructification is spoken of, you must confine your ideas to the seed only, and the apparatus by which it is contained and dispersed. The whole tribe of the filices, or ferns, are divided into three sections, from the manner in which their fructifications are disposed. The first division consists of such as have their fruit in spikes; the second, of those which have it placed on the under side of their leaves; and the third, of what is termed by Linneus radical fructification, a specimen of which is well seen in the pepper grass (*pilulária*). The botanical world is much indebted to the ac-

curate researches of Hedwig, for many important discoveries in the obscure families of plants belonging to cryptogamia: of the spiked fructification we cannot examine a better specimen than the *equisetum sylvaticum*, at the time when it is beginning to disperse its seeds; in the progress of which there may be observed appearances, which seem to have a right to be considered as stamens and pistils. In our investigation of these plants, we must have recourse to the microscope; but you will find it more agreeable to view the parts through that glass, when you have attained some idea of their structure from the plate before us.

Harr. I would much rather study the plates, before we begin with the microscope; for I am sure that I shall then understand better what I see through it.

Hertensf. I think you will; but always remember, that in examining plates, you take the authority of others; whereas in botany, as in all other things, we can make little progress, if we do not see for ourselves.

Harr. If when I look through the microscope, I should see any thing different from what Hedwig, or Mr. Curtis describes,

cribes, I shall be certain that I am wrong, and they right.

Hortensf. With due limitations, that is a proper way of thinking; but in such cases accustom yourself to state in writing the particulars, in which you differ in your observations, from what you have heard or read upon the subject. You will by this means secure the benefit of being better informed, if you are mistaken, and it may happen, that you may be right; and then you will have the pleasure and honour of improving by your investigations this most agreeable science of botany.

Harr. But, mamma, it is not likely that great and wise men, who have studied botany all their lives with every advantage should be mistaken.

Hortensf. I grant you, that it is much more likely, that you should be so; but as we do not unfrequently see great and wise men err in their judgment and accounts of things, we must not rely upon them as infallible: in whatever you undertake, make it a rule to *see for yourself*. It is the observance of this rule, that has rendered the works of Mr. Curtis so valuable. Most of our botanical

publications are taken one from the other; and thus if an eminent botanist has in the course of his researches fallen into a mistake, the error has been propagated. Mr. Curtis from his caution in this particular has done more towards the improvement of the science, than any other writer with whom I am acquainted; and by his judicious and candid correction of the few errors in the works of Linneus has rendered essential service to the botanical world.

Harr. I will take your advice, ma'am; and when I have any doubts of what I read or hear upon the subject, I will write them down, or make them known to you; but if I had not you to apply to, I should be at a loss.

Hortensf. A question well and modestly put can never be impertinent, if not obtruded at an improper time; and you will always find it thought least so by those, who are most able to answer it. But we will begin with our equisetum: early in the spring this plant pushes out of the earth a little club-shaped head; round this head are placed in circles target-form substances, each supported on a pedicle, and compressed into angles, in

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consequence of their resting against each other before the spike expands. Beneath each of these targets are from four to seven conical substances, with their points leaning a little inwards towards the pedicle. They open on the inner side, and on shaking them over a piece of paper, a greenish powdery mass falls out, which at first is full of motion, but soon after looks like cotton or tow. All this we may see without a microscope; but by the assistance of glasses green oval bodies have been discovered, and attached to them (generally) four pellucid and very slender threads, spoon-form, at their ends, as you see in the plate.

Jul. I should not have suspected, that those little woolly bits of stuff had been so regularly and distinctly formed.

Hortensf. We may always be sure, that a nice and regular organization exists in all the various parts of plants, though from the want of a proper method of investigating them this may not be always visible to us. These pellucid threads are almost constantly in motion, and are said to contract themselves upon the least breath of moist air, and, when wet

with water, to roll round the green oval, from which they proceed.

Henry. I shall like to see this.

Hortensf. To do so, I am afraid requires greater magnifying powers, than we are yet able to manage; therefore at present we must content ourselves with taking this curious history upon trust. Hedwig makes no doubt that these green oval bodies are the feeds, as they gradually increase in bulk, and when they fall the spike shrivels; that the projecting spikes are the stigmas, and the conical substances under the targets are the capsules, and the pellucid threads, with the spoon-form substances attached to them, the filaments and stamens; the feeds are numerous, egg-form, or globular, placed upon and lapped up within the filaments of the stamens. Future observations must confirm or refute this opinion. The different appearance of the supposed feeds, with their stamens, before the bursting of the anthers and afterwards, seems to be strongly in its favour. The scales, or stipules, which surround the flowering stalk at certain distances after its protrusion, served, whilst it was young, as a general fence to the spikes.

spikes. From your investigation of *equisetum*, you must have gained a clear idea of the form, in which its fructification appears, and thence of that which may be found in the rest of the *généra*, which are arranged in the spiked division of ferns. We now come to that, which contains the leafy fructifications, or the little brown spots, which have so much attracted Juliette's attention.

Jul. Then, mamma, shall we examine the maiden-hair? Shall I bring a pot of it out of the hot-house?

Hortensf. Its purple stalks, and scollopped green leaves, dotted with brown underneath, are very beautiful. We may boast of this elegant plant as a native of England: the syrup of capillare, of which you are so fond, derives its name from the botanical appellation of your little favourite, *adianthum*, *capillus veneris*, or venus's hair, and is supposed to be in part composed of it, though I believe it is chiefly made from sugar and water: the parts of fructification are too minute for our present purpose. This hart's-tongue, *asplénium scolopendrium*, from its size, will shew the fructification more distinctly; the first appearances of which, that
can

can be observed, are some little bags, or cases of a yellowish or whitish green colour, placed in rows on the under side of the leaves; if these are opened, almost as soon as they become visible, there will be found capsules, or seed-vessels, very numerous, standing upright, and close together. At this time they appear to be of a green colour; as they approach towards maturity, they change this for a dark brown; at which period the cases open lengthways in the middle, and by the protrusion of the capsules, the two sides are turned quite back, and wholly disappear; this membranous substance may be considered as the same with the calyx in other plants, and serves to defend the tender capsules with their seed till ripe, when their curious mechanism strikes us with grateful astonishment at the benevolent and adequate care, that nature takes of the minutest of her works. Each capsule consists of three parts, the foot-stalk, which supports and connects them to the leaf, as you see in the plate, and the jointed spring, which nearly surrounds the third part, or cavity containing the seeds. The seeds being ripe, this cavity is forced open by the elasticity of the jointed spring, and

and the seeds scattered and thrown to a considerable distance, one half of the cavity remains connected to one end of the spring, and the other half to the other end.

Henry. It looks in the plate like a little box. Though we admired these brown spots, Juliette, we did not know any thing of all this.

Jul. No, indeed; we never thought of the apparatus they contained; we knew they were seeds; mamma had told us so, but I supposed them like stock feeds; but then, you know, we were ignorant of the parts of fructification. If there are seeds on a plant, we may guess there is generally something more.

Hortensf. You will seldom find yourselves mistaken. These capsules are an agreeable subject for the microscope, but it is difficult to manage them, so as to gain a distinct idea of their progress. They are placed so closely together on the leaf, that it is necessary to separate them from it with a fine knife, before you begin to view them, otherwise there appears only confusion. The warmth of the breath also, by occasioning the capsules to open and discharge their seeds, gives them
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the appearance of something alive. While you are intently looking at one, hoping to observe the operation, the strength and elasticity of the spring, at the moment of discharging, will often carry it out of sight, so that to see the manner of opening requires some dextrous management, and much patience; but we shall be able, I dare say, to overcome the difficulties, and obtain the amusement of viewing through the microscope this curious arrangement.

Charles. Mr. Wilson promised to shew me the wonderful mechanism of the seeds of fern, when we had entered upon the investigation of them with you.

Hortensf. Very well; we will then invite Mr. Wilson to our afternoon party, with Juliette and Henry's pupil, Mrs. Pratt; and we will spend it in amusing ourselves with the microscope.

Henry. Mrs. Pratt will like that, for she is quite fond of botany, and always wants a new lesson.

Hortensf. She is very good to you, and we must do every thing we can to amuse her. We will examine this species of fern, the polypodium vulgare. Observe its root, which

resembles as nearly one of the very large kind of caterpillars, as that of the polypódium barometz, if we may judge from the prints of it, does a sheep ! This plant is described by many eminent botanists, as being deficient in the elastic ring, which surrounds the capsules, and by means of which they are burst open, and their seeds discharged. It would be extraordinary to find any of the fern tribe destitute of this seemingly essential part ; neither has it yet been discovered, that they are so, by the accurate and diligent researches of Mr. Curtis, who ascribes this error of description to the blindly following the authority of figures ; for had those authors, who have falsely characterized the polypódium vulgare, from its want of the elastic ring, made use of their own eyes, assisted only by a common magnifier, they must have seen, what had long before their time attracted the notice of enquiring botanists. At the same time it is not easy to account for the error of the ingenious tournefort, who has delineated the capsules of the genus polypódium without rings ; but this is one of the many instances, which ought to deter us from relying upon authority, be it

ever so respectable. There is one circumstance attending this polypodium, which does not run through the whole genus, that is the want of the membrane, which in the rest of the family, is found enclosing the capsules; of this however it may not be destitute, but it may have escaped notice from early falling off, when the capsules are arrived at a certain degree of maturity. This tribe of plants not having been much attended to leaves to modern botanists an ample field of discovery; and I flatter myself it is reserved for you, Charles and Henry, to distinguish yourselves in it.

Charles. And why not my sisters, ma'am; I am sure they generally go before us in whatever we learn together.

Hortens. I do not doubt their abilities; and would have them as thoroughly informed upon the subjects that they study, as I wish you to be; but to avoid obtruding their knowledge upon the public. The world have agreed to condemn women to the exercise of their fingers, in preference to that of their heads; and a woman rarely does herself credit by coming forward as a literary character. The world improves, and con-

consequently female education. Some years ago a lady was ashamed to spell with accuracy; happily the matter is now reversed, and the time will come, when it must be granted, that by improving our understandings, we enlarge our view of things in general; and thence are better qualified for the exercise of those domestic occupations, which we ought never to lose sight of, as our brightest ornament, when properly fulfilled. At this time information in a woman, beyond a certain degree, distinguishes her above her companions, and like all other distinctions is liable to lead her into a vain display, of what she hopes will gain her admiration. Hence she becomes ridiculous, and brings, what in itself might be a credit, into a disgrace; whereas the disgrace ought to fall only on herself, and not stamp ridicule upon those of better understandings, who extend the advantages of their education to every occupation of life.

Harr. If we make an ill use of the education you give us, we shall indeed deserve blame.

Hortens. I have no reason to fear your doing so; and indeed the danger decreases to every generation. The subject of education

is much thought upon, and young people in general are well informed ; when their being so ceases to be a novelty, there will be no longer place for pride in those who have knowledge, nor for envy in those who have none ; as there will be no particular object to excite either spleen or admiration. You have, I think, attained a tolerably clear idea of the fructification of ferns ; practice and attention can alone make you familiar with the different génera, an undertaking in which there is much difficulty. So great a familiarity runs through the fructifications of them all, that the distinction cannot be founded on that part of the plant. The various modes, in which the capsules are placed on the Frond, or leaf, in some of them are strikingly different, and appear to form very distinct and satisfactory characters ; but when as a tribe, they come to be more minutely investigated, the characters of one are frequently lost in those of another, and we in vain seek for a precise generic character. The plates and remarks in Mr. Curtis's London Flora are particularly pleasing and useful on this subject. The elegance of the figures of some of the génera is scarcely exceeded by their natural

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EXPLANATION OF PLATE II. PART II.

HYDROCHARIS MORSUS-RANÆ, FROGS-BIT.

Fig. 1. A Plant of *Hydrócharis Morsus-ranæ*, Frogs-bit, to shew its outer habits and mode of growing. *a, b*; Transparent Sheaths, containing Flower-buds.

Fig. 2. A Female Flower with the Germ, *c*.

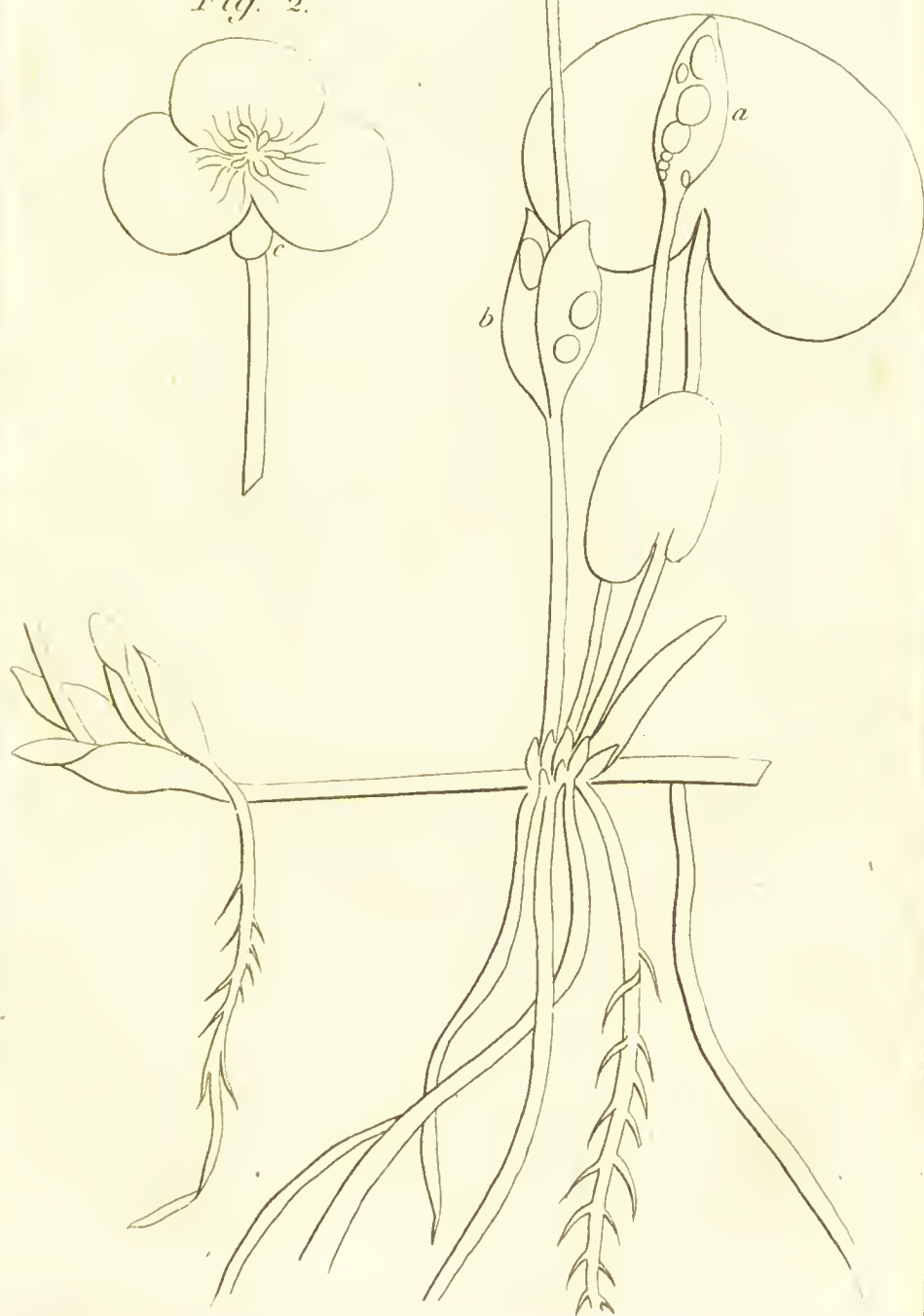
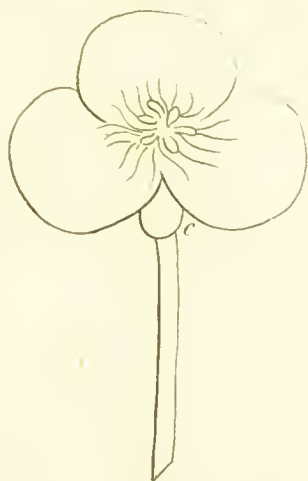
Hydrócharis Morsus-ranæ.

Hydrocharis
morsus ranae.



Fig. 1.

Fig. 2.



EXPLANATION OF PLATE III. PART II.

FRUCTIFICATIONS OF FERNS.

- Fig. 1. Part of a Plant of *Pilulária Globulífera*, Pepper-grafs, to shew the radical fructification of Fern,
a, a, a.
- Fig. 2. Spiked fructification of Fern, shewn in *Equisétum Sylvaticum*, Wood Horse-tail, the Spike of the natural size, beginning to disperse its seeds.
- Fig. 3. One of the Targets separated from the Spike, and highly magnified; termed, by Hedwig, a Capsule-bearing Target.
- Fig. 4. A Seed with its Stamens highly magnified.
- Fig. 5. A Seed-bud with the Stamens rolled round it, before expansion.
- Fig. 6. Part of a leaf of *Asplénium Scolopéndrium*, Hart's-tongue, to shew the leafy fructification of Ferns.
i, An Involucre, or bag containing Seeds, not fully expanded. *k*, An Involucre expanded, shewing the Capsules.
- Fig. 7. The Capsules in a magnified state, each surrounded by an elastic ring, and having one cavity.
- Fig. 8. A Capsule burst open, discharging its seeds.
- Fig. 9. The Seeds magnified.
- Fig. 10. A Leaf of *Fucus Vesiculous*, to shew the growth of one leaf out of another. See page 101, second part.

Fig. 1.



Fig. 2.



Fig. 3.



Fig. 5.



Fig. 4.

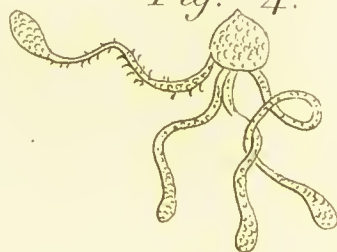


Fig. 6.

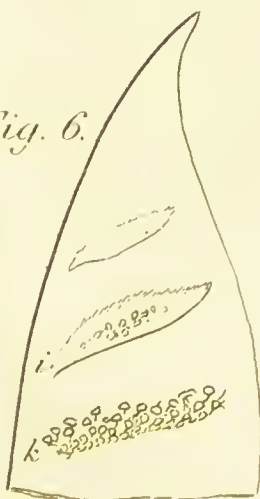


Fig. 10

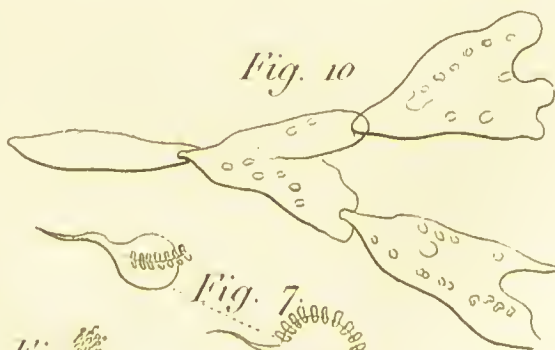


Fig. 8.



Fig. 7.

Fig. 9.



appearance: you will find that the roots of the osmúnda spicant, given by Mr. Curtis, have the same resemblance to a large caterpillar, that the root of the polypódium vulgare has.

Harr. That polypódium is a great ornament to your favourite stump of oak, mamma, at the park gate.

Hortensf. Wherever the ferns are found, they are ornamental; on walls, old wells, and banks in winter, they make a principal feature in that beautiful assemblage of the cryptogamia plants, which may be said to form a winter garden; and this they do, with so much greater elegance spontaneously, than can be effected by art, that I only collect the different families, and leave them to group themselves, which they have done in the most advantageous manner on the heath-bank on the outside of the park pale. I will walk with you thither, and we will return through the wood, and gather some mosses for our investigation to-morrow.

DIALOGUE THE FOURTH.

On the Mosses, Flags, and Funguses; Musci, Algæ, and Fungi.

Hortensf. We are now to enter upon a tribe of plants, little understood, but which from their beauty and usefulness in the vegetable kingdom deserve every respect and attention. The beauty of their leaves is too obvious to require any explanation; but many are so insensible to their use, as to suppose that they impoverish the ground on which they grow: this is by no means the case; they thrive best in barren places, and love cold and moisture, and hence cover those lands with verdure, which would otherwise remain bare: so far from injuring the plants, which are found intermingled with them, they afford them protection; their own roots penetrating to so small a depth into the ground, that they take from it little nourishment; wherever a small quantity of grass is found with mosses, there would be none without them; and if the land is drained and manured, it will be seen that the moss is no impediment to the growth of the grass; for it soon disappears, and the grass flourishes; a yet more essential use is derived

derived from various species of moss, which grow upon the sides, and shallow parts of pools and marshes ; in process of time their roots occupy the space, which was before filled with water, and in their half-decayed state are dug up, and used for fuel, under the name of peat ; of the importance of which you cannot be duly sensible, as you enjoy plenty of the best coal. It is not however from moss alone that peat is derived ; so that we must only give it a share of praise among other vegetables, several of which, even whole trees, form the composition of peat beds. You have found the benefit of covering young plants with moss, as by doing so, you have frequently preserved them from frost and burning heat ; it retains moisture a long time, without putrefying, and from that property is of great use in packing plants, that are to be sent to a distance.

Henry. I often see the gardener put moss about grafted trees ; and he tells me, that it prevents their drying too fast.

Hortens. That is owing to its power of retaining moisture ; whilst the moss continues damp, it prevents the juices of the graft from evaporating. Since the time of Linneus it has

been well established, that the musci, or mosses, have distinct fructifications, though botanists are yet divided in regard to their situation; but as these plants now have excited general attention, a few years will give us, I hope, a revival of the works of Linneus, with the improved knowledge derived from modern investigation: already an improvement in the class Cryptogamia has, I believe, been attempted and received; which encourages us to hope, we may see at no very distant period, that division of extraordinary plants no longer a reproach to the science. At present, the outer habits, and situation as to the growth of the flowers or capsules, are chiefly made use of to distinguish the *généra* of mosses. These plants resemble pines, firs, and other ever-greens of that tribe, in the form and disposition of their leaves, and manner of growth of their seed-bearing flowers, which are generally formed into a cone; most of the mosses are perennial and ever-green; their growth is remarkably slow; their anthers, from their first appearance to the time of the dispersion of their powder, continue from four to six months. In some of the species the leaves are small and undivided,

divided, and have no visible foot-stalk, or mid-rib ; in others, as in *hypnum proliferum*, they resemble the fronds of ferns. Their stamen and seed-bearing flowers are supposed to be placed apart ; sometimes on the same, and sometimes on different plants. The calyx, termed by Linneus the calyptré, covers the tops of what he called the stamens. From the presence or absence of this cover, which falls before the opening of the supposed anthers, Linneus, after Dillenius, has distinguished the *généra*. After the veil, or calyptré, is taken off, there is found another cover to the anthers, which Linneus calls the operculum, or lid. This is a beautiful microscopic object ; but you must be content to become acquainted with it, and the other parts of fructification of the mosses, first by the assistance of plates, and afterwards amuse yourselves with viewing them through glasses.

Harr. We are all, I dare say, Ma'am, very content to proceed as you think best. We learn daily to see with our naked eyes beauties in the most common plants, of which last year we were no less insensible than if we had been blind.

Hortensf. The eye of the body will not carry us far, unless assisted by that of the mind.---Before the parts of fructification are protruded, they may be seen by the assistance of powerful magnifiers inclosed within those small buds, which terminate the leaves of mosses, and have the appearance of being only a continuation of them. Hedwig discovered, that the leaves, or scales, composing these buds differed materially from the leaves of the plant, and considers them as true involucre to the parts of fructification. He has also observed, that in the capsule-bearing mosses, which have their cones situated towards their extremities, the leaves adjoining the fruit-stalk are much more beautiful than those of the stems. Sometimes the inner leaves become gradually smaller, and those nearest the fructification so very minute as to make it impossible to take them away without a microscope. These involucre, like the calyxes of many other well-known plants, grow larger as the capsules advance towards maturity. Hedwig gives so minute and particular an account of both the stamens and seed-bearing flowers of the whole family of mosses, that, if he has not been deceived in his researches, we may expect

pect soon to see a greater progress made in the knowledge of this difficult tribe of plants, than some years ago it appeared probable would ever be attained; but as these researches were made by the assistance of the most powerful magnifiers, and with every advantage that could be procured, I do not think you will at present gain much information in regard to the natural plant by studying his plates. Mr. Curtis's descriptions and figures will immediately make you well acquainted with every species, that he has delineated. We will therefore, if you please, examine one or two of the specimens he gives, and will begin with the *bryum undulatum*, or curled *bryum*, which he recommends to the notice of young students; as it's parts of fructification are large and distinct.

Juliette. I am glad we are not to leave Mr. Curtis, he makes every thing so plain to me.

Hortensf. In regard to the mosses, he does not pretend to decide the question, whether the powder, from what is called the capsule, is the anther-dust or seed. Hedwig asserts, that these capsules are true seed-vessels, and

tells us, he sowed them, and repeatedly procured from them a crop of young plants, similar in all respects to the parent plant.---Dillenius sowed these cones frequently, but without success: it is probable that the situation of the stamens and pistils under one or distinct covers may have occasioned such different results from the experiments of these eminent botanists. When you are well acquainted with the structure of the parts of these curious vegetables, you may reason upon the various opinions, which have been entertained of their use.---In the curled bryum, the capsules or anthers are cylindrical, bent inward, and if magnified, they appear somewhat striated. Their colour is first green, then livid brown, and lastly of a reddish brown colour. The bottom of the opérculum, or lid, is convex and red; the top paler, very slender, and rather blunt; the mouth of the capsule is fringed, and the fringe bent inward; the ring is red, and the powder, which issues from the capsule, be it seed, or anther-dust, is green. Hedwig has observed, that this fringe of the capsule in dry weather expands, and leaves the mouth of it open; but on the least moisture, even of the breath, it

it closes again. He remarks, the ring of the capsule of some species is elastic; and, when the seed is ripe, throws off the veil with more or less force; and it is after this veil, or calyptra, is gone, that the fringe serves to protect the precious contents of the capsule. The calyptra in *bryum undulatum* is of a pale brown colour, terminating in a long point, first upright, but afterwards, on the bending of the capsule, it becomes burst at bottom, and remains strait, with it's base at some little distance from the capsule. * We will now look at the plate, where we shall see all these curiosities well and elegantly delineated.

Charles. I do not know whether to admire most, the mechanism of the fructification of the mosses, or that of the ferns.

Hortensj. They both seem destined for the formation, protection, and dispersion of their seeds, or of some substance equivalent to it; but, unless we credit the plates of Hedwig, we are equally ignorant of the manner in which this seed is produced in both tribes. In

* A plate is given of the different parts of mosses, for those who have not the advantage of consulting Mr. Curtis's London Flora.

the magnified leaf of the bry'um undulátum you see the circumstance, which has given it's specific name, the leaf being waved at the edge. This moss produces it's fructification from November to February, and is commonly to be found either in woods or on heaths; it's leaves soon curl up, after the plant is gathered; seldom more than two peduncles arise from one stem, generally only one; they are both longer than the stem, upright, and of a reddish colour.

Henry. I shall know this bryum, when I see it growing, I think; for the drawing is so like a real plant.

Hortensf. Your best way of knowing it will be to gather a patch of it, and separate the plants one from the other: while the mosses are growing, you cannot observe the leaves distinctly.---We will examine another species of moss, which Mr. Curtis has thought proper to refer to the bry'um genus, though placed by Linneus among the mníums. On the first view it is distinguishable from the bryum undulatum; it's bending peduncles, which have occasioned it to be called the swan's-neck bryum, are an obvious character in this species; added to this, is the star-like appearance

ance, which terminates those stems, from whence the capsules do not proceed: these stars are supposed by some authors to be the female parts of fructification. Mr. Curtis, with very accurate investigation, was not able to discover any thing in their structure, in the least similar to any of the parts of fructification in other plants. Hedwig asserts, that these star-like appearances are the involucre of the stamen-bearing, or male flowers, and makes no doubt of the capsules containing the pistils, or female flowers. If the stars and capsules are really distinct parts of the fructification, it seems to me probable, from the situation in which they grow, that the stars contain the females, and the capsules the males; but, if I may conjecture, who have not investigated the subject, I should suppose, that some of the *généra* of mosses might have flowers of all kinds, like those plants which compose the class polygamia. On this obscure subject, I have thought it necessary to give you some idea of the opinions of different botanists, lest, by shewing you only the descriptions of particular individuals, I might lead you to form too decided an opinion upon a point, which is not yet sufficiently clear

clear to justify any thing further than conjecture.

Charles. Mr. Wilson says, Hedwig has made it all clear, and that he is the only author to follow.

Hortensf. On all unsettled points every system has it's partisans. The best method of judging of the fact, whether the stars found on several species of moss contain the male or female flowers, is repeatedly to sow them, and make accurate observations on the result; but we may find, that we mislead ourselves by too pertinacious an adherence to the enquiry after one mode of re-production; and that what we suppose to be seeds may partake more of the nature of buds, and that the mosses, and other plants of the class Cryptogamia, may be viviparous only, and not oviparous, or producing young plants without seed. The moss, that we have just now been considering, produces its supposed fructifications in February and March. This little moss, which we find almost upon every bank beset with capsules from September to February, is the *bry'um trunculátum*, or lopped *bry'um*, so called from the appearance of it's capsules, after the *opérculum* is fallen off; which

which having no fringed margin, seems to be cut across: it is one of the least of the mosses, and distinguishable on first view by the great number of its little brown heads. This plant is evidently distinguished from the *bryum viridulum*, which in size and outer habit much resembles it, by the difference in the figure of their capsules; those of the *bryum viridulum* being in the form of an egg, after the operculum is fallen off, and their mouths finely fringed; such decided marks of distinction are particularly agreeable, when found in plants which in so many circumstances resemble each other; but we are not far enough advanced in the knowledge of the genera to enter deeply into specific differences. I wish to give you some idea of the outer habits, and of the curious structure of those parts, which are supposed to be the fructifications of mosses, and thence make you ready to understand them, though it is not now in my power to inform you on the subject as I wish.

Charles. From what you have shewed us, Ma'am, we shall be able to understand what we read upon the subject; and the knowledge I have gained about the capsules, makes me very desirous to investigate their true use.

Hortens.

Hortensf. Regular experiment can alone enable you to make any important discoveries. We will examine two other kinds of moss, and then you will have a pretty good idea of the parts, that you may expect to find in the various génera, of which they consist ; the one, that we are now about to consider, is the hy'pnum prolíferum. The hy'pnum and bry'um families are separated by Linneus from the situation of the peduncle, which supports, what he terms, the anthers, but which later writers have agreed to call the capsule. This in the bry'um grows out of the top of the stem, and is finished at it's base with a little naked tubercle, or bulb. In the hypnum the peduncle grows out of the side of the stalk ; and the tubercle at it's base is covered with leaves. This elegant species of hy'pnum derives it's specific name, *proliferous*, from the singular structure of it's leaves, or fronds ; one large shoot proceeding from the middle of another repeatedly ; and these shoots extending themselves along the ground, and taking root. Linneus' found this beautiful plant in one of his journies through Sweden, growing in the thickest woods, obscured by per-

perpetual shade, and where no other plant could exist.

Charles. There is no appearance here of any thing like fructification, but in the capsules.

Hortensf. Nor in many other mosses. This plant is not often found in a state of fructification, though by diligent search it may be so. It's time of fructifying is from December to February. I do not know, whether it's capsules have ever been sown. The structure of the capsules will be found nearly the same in all the mosses. Mr. Curtis has however discovered some peculiarities in those of *bryum subulatum*, or awled bryum, and in *polytrichum subrotundum*, or dwarf *polytrichum*, which are worthy of further attention. The *bryum*, after it has lost it's calypstre and operculum, protrudes from it's mouth a substance, which by magnifiers is found to consist of a number of filaments, forming a thin spiral tube, loose and unconnected at the top: this tube may be seen through the transparent operculum, forming in it's young state a small spiral line. Mr. Curtis does not even conjecture, what may be the use of this extraordinary appendage; it may perhaps be the

receptacle of the seeds within the capsule, which on arriving at maturity bursts open the covers, and disperses it's contents; to ascertain this, when you begin with experiments, you must sow a great number of the capsules with, and without these tubes, and the tubes without the capsules.

Charles. The result of such experiments would prove the use of these tubes directly, I suppose.

Hortens. Such experiments repeated may do so: but there would be great nicety required in the time of gathering these capsules; it is possible, that at the moment of protrusion the vegetating power may be lost; therefore we should not be too hasty in concluding, that it did not reside in these filaments, because we did not obtain young plants from them; or in sowing the capsules, while their covers remained, without any produce, we should not determine that they were incapable of making any, as they might not be in a state sufficiently mature.

Charles. I see that it is not an easy matter to make experiments; however, I will begin, and with your assistance, Ma'am, hope to manage them.

Hortens.

Hortensf. There is no doubt of your doing so, if you apply your mind to it; and when once you have formed your method, you will not find it very difficult. We have now to observe the curious and beautiful structure of the capsules of the poly[']trichum sub-rotundum, and which Mr. Curtis has found to be a constant character belonging to the genus, as far as he examined the species he could procure. The capsules of mosses in general have only one veil or calyptré; in this genus there are two within the woolly calyptré of the poly[']trichum, which has the appearance of a little distaff covered with flax, he found a membranous shining substance, closely connected by its top to the inside of the woolly one, which is peculiar to this genus, but which was scarce visible, except by totally inverting it; by doing so, it is visible to the naked eye. This inner calyptré differs very little from that of other mosses; at first it wholly surrounds the unripe capsules; as they increase in size, it splits at the bottom, and finally becomes very short. We will here finish our inquiry in regard to the mosses, and now proceed to the third order of the obscure class cryptogamia, the algæ or flags.

Harr. If we find them as agreeable as the mosses have been, we shall be very fortunate ; the beauty and curiosity of their capsules, with their apparatus, have been very amusing indeed.

Hortensf. Their having proved so has detained us longer on their subject, than I had intended ; that you have found the investigation of them so particularly amusing has been owing to Mr. Curtis's accurate and elegant plates : but, with the assistance of common figures, an account of his discoveries cannot fail to be an interesting part of the study of botany ; it is therefore to be wished, that he would give the world a cheap edition of his investigations of the cryptogamia plants, with unadorned, but accurate plates, as he has done of the most common grasses, and by which he would greatly facilitate the endeavours of those, who were desirous of becoming acquainted with them ; his London Flora being a work of too much expence to be of general utility ; besides, that by placing one tribe of plants together, they are more readily consulted.

Fuliette. I wish he would ; Henry and I might then carry them out with us, and we should

should soon be acquainted with the cryptogamia plants, that grow within the compass of our walks.

Hortensf. You would, even with such assistance, still find it difficult to discriminate the species, if not the genera of these extraordinary vegetables, so nearly do many of them resemble each other. There is a species of polytrichum, the pilosum, or small hairy poly'trichum, which will be rendered interesting to you, from a knowledge of its use, like the rein-deer moss to the poor Laplanders; and this not through the medium of any other substance, but in it's own natural state, as it is found growing.

Henry. What do they do with it?

Hortensf. It serves them for beds, and that in a curious manner. When obliged to sleep in desert places, which not unfrequently happens, they mark out with a knife about two yards square of the ground, where they find the poly'trichum pilosum growing thick together; then, beginning at one corner, they gently sever the turf from the ground; and as the roots of the moss are closely interwoven, they by degrees strip off the whole marked-out turf in one entire piece; then they mark

out and draw up another piece, exactly corresponding with the first ; then, shaking them, they lay one upon the ground, with the moss uppermost, and the other over it, with the moss downwards ; thus obtaining both a coverlet and soft matras, between which they sleep with as much comfort, as we can do with all the numerous apparatus of a bed prepared for our repose.

Juliette. I shall be ashamed ever to complain again, that my bed is not easy enough, when it happens not to be quite even.

Hortens. It would be well, if we made a point of improving ourselves by the knowledge, that we gain of our superiority over too many other countries. Such reflections, as you have just now made, must arise ; but we suffer them to vanish again too hastily. If we governed our actions by them, we should increase the happiness of ourselves, and all around us.---We will now begin with the algæ ; I am sorry that we cannot have Mr. Curtis's assistance in that tribe of vegetables ; but we shall return to him again, when we enter upon the fungi, or mushrooms. The plants comprized under the description of algæ, or flags, scarcely admit of a distinction
of

of root, stem, or leaf; much less are their flowers sufficiently obvious to admit of a definition of their parts, though by the situation of their supposed flowers, or seeds, the genera are distinguished, or sometimes by the resemblance of the whole plant to some other substance with which we are familiar in the economy of nature. This tribe of plants is of great importance, as they frequently afford the first foundation, from which other plants draw nourishment. One species of byssus, and several species of lichen, fix upon the barest rocks, and are supported by what slender supply the air and rains afford them. Dr. Smith, in his tour on the continent, in the years 1786 and 1787, found near Mount Vesuvius, on a torrent of lava, which issued in 1771, the lichen *paschalis*, which covered it most copiously, and had the appearance of hoar frost, with no other plant near it. The lichen *paschalis* is peculiarly fitted for the beginning of vegetation on the hard surface of lava, from its shrubby figure, and slender roots; in the same manner, the thread-form lichens insinuate their roots into crevices in the bark of the oldest trees, while the broad crustaceous kinds cover young bark, and the

smoother sorts of stones and rocks. The lichen *paschalis* being a perennial of very slow growth, many years elapse before it's crumbling branches fall into the cavities of the lava, and there decaying form vegetable mould for the nourishment of other plants. By attentive observation the progress, in which such vegetable mould is formed, may be seen on the smooth and barren rocks upon the seashore ; and by a knowledge of the decaying plant we may know that, which will next succeed. After the *by'ssus* and several species of lichen have crumbled into dust, first appear other species of lichen, which require a deeper soil for their sustenance. When these perish, and have again more thickly covered the rocks with mould, various kinds of the mosses appear ; in their turn these also decay, when their places are supplied by other plants, till a sufficiency of earth is accumulated to afford nourishment to the largest trees. I have before observed to you, that some of the species of lichen are used in dying ; one of them, *lichen rosella*, called the orchel or argel, is brought from the Canary islands, and forms a considerable article of traffic ; they are a grateful food to goats, as well as to the rein-deer.

Juliette.

Juliette. I think, mamma, you have told us, that what we call the cup-mofs, is a lichen.

Hortensf. It is the lichen pyxidatus, or box lichen ; there is great difficulty in afcertaining the fpecies or varieties of the numerous plants of this genus ; according to Hedwig's inveftigations their cup and faucer-like appearances, which are found on the various fpecies of lichen, are to be efteemed the feed-bearing flowers ; and the notches, and warts with black tops, thofe which contain the ftamens : he afferts, that the fringes from the lichen ciliaris, fringed lichen, which take root, and the downy matter on the furface, have nothing to do with the real parts of fructification. He gives very particular accounts of thefe parts, with plates of feveral généra of the algæ tribe ; but the whole of thefe plants is at prefent fo little underftood, that I do not know how to give you any information concerning them, that will be of advantage to you. The plant you call fea-wrack is of the algæ tribe, and of the fucus genus ; it has it's fpecific name of vesículous or bladdered, from the bladders which cover it's furface. If the leaves of this vegetable receive an injury or

fracture, if the plant be in a vigorous state, abundance of young leaves are thrown out from the injured part, even if a small aperture be made in the middle of a leaf, a new one arises from either side of it.

Henry. I shall like to observe this, when we go next to the sea: I have gathered seawrack, with tufts upon it, like black horse-hair.

Hortensf. Those hair-like tufts are not any part of the fucus, but are distinct vegetables of the conferva genus, which attach themselves to the bladder fucus, and appear to belong to the plant itself. There are some species of fucus which perhaps on further investigation may be found to partake more of the animal, than of the vegetable kingdom, in the same manner as the sea anemone; which was believed, till lately, to belong to the latter. The green scum, which we see on stagnant water, and the green films on trees, are but just now beginning to be properly enquired into. In a course of years the whole class Cryptogamia must undergo a different arrangement; and I do not think, that any one of the four orders, of which it consists, requires it more than that, which we have now
under

under consideration; neither can I find amongst the généra contained in it a common character strong enough to assemble such a variety of families, which apparently differ in many striking circumstances: they all seem to possess peculiarities, which are well worthy of investigation; the beauty of the lichens attracts our notice in winter on every tree, and bank, and wall, as they form a conspicuous part of that elegant arrangement, which we always find in an assemblage of the cryptogamia families. That beautiful little plant, which you see on heaths, and which is commonly called white moss, is the rein-deer lichen; a knowledge of it's use to the starved inhabitants of the northern climates gives us an interest in it, beyond what necessarily arises from its elegance of structure. There are many varieties of this plant, from which it is distinguishable by its very different appearance, even when found in the same places. The lichen sylvaticus, wood lichen, which is only a variety of the rangiferinus, has uniformly its branches of a reddish brown colour, and its stalks smaller, and sometimes beset with minute crisp leaves, and the whole plant with age turns brown; neither of which

ever happen to the rein-deer lichen ; its colour always being white. What we call moss on trees, is also a lichen. This elegant tribe of plants well repays the trouble of investigation ; and, with the mosses, ferns, and funguses, furnishes the botanist with a complete winter garden.

Harr. The ferns and mosses are very agreeable ; but when I have gathered funguses, they have dirtied my fingers, and I have thrown them away.

Hortensf. Now you are a botanist, these extraordinary plants will become interesting to you, particularly as by Mr. Curtis's, Mr. Bolton's, and Monsieur Buillard's plates, you may soon learn to distinguish the généra from each other. There are some of the fungus tribe, that are disgusting to the smell, and disagreeable to the touch ; but the generality of them are not so, and may be dissected by persons of the greatest nicety without giving offence. Within the last twenty years our knowledge has been greatly improved in regard to the fructification of the fungi, as well as in that of the other three orders of the class cryptogamia, but yet remains so imperfect, that their generic characters continue

to be taken from their outer form. Hedwig's researches tend to establish for a fact, that the fungi possess all those parts of fructification, which in botanic language constitute a flower, viz. stamens and pistils. The stamens he conceives to be a collection of pellucid succulent vessels, with which innumerable oval globules are connected, of a dilute brown colour. These small bodies he discovered under what is called the curtain, a part which is found in some funguses, and not in others. This is a thin membrane extending from the stem to the edge of the hat; which is torn as that expands, and soon disappears; but the part attached to the stem often remains, and forms a ring round it. The parts supposed by Hedwig to be the pistils, he found in examining a portion taken from one of the gills, which he divided with some difficulty into two plates, the lower edge thickly set with tender cylindrical substances; some with globules at their extremities, and some without: the gill itself appeared netted with larger and more distinct spots, a little raised. In another fungus, a species of agaric, after the curtain was torn, and the hat pretty fully expanded, with the gills turned yellow, he found the upper part
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of the stem beginning to be tinged by a brown powder, shed from the gills. On examination he did not scruple to pronounce this brown powder to be the seeds, and that it proceeded from the larger spots, that he had before observed in the gills ; the two folds of which now readily separated. He asserts, that he has uniformly found in the genera of *Agáricus* and *Bolétus* the globules, which he believes to be stamens, either on their upper or inner surface. In those agarics, which have neither curtain nor ring, these globules with their threads are placed upon the stem.— Having given you a sketch of the modern discoveries, we will now examine the outward habits and structure of the fungus tribe, and from these circumstances endeavour to gain some knowledge of the different genera.

Charles. That I shall much like to do ; for seeing them daily makes me very desirous to have something more than confused ideas about them. But I am afraid, though Hedwig's discoveries should be confirmed by further investigation, that they will not be of much use to common botanists in the arrangement of these difficult plants.

Hortens.

Hortensf. Certainly what can only be seen with very powerful magnifiers, can never serve for the distinction of the généra; in which the character being obvious and clear constitutes the excellence of it. It is however very desirable, that such researches should be made. It is a decided fact, that fungufes continue their species by a powder, which is visible in the gills of many of them, and which is generally allowed to be feed. Some species of the agaricus have so short an existence, that from the time of their appearance to the time, when they begin to decay, is not more than five days. The manner, in which many of them decay, is by their gills dissolving into a very black liquor, like ink, which dropping carries with it the feed; which may be seen in the liquor, if greatly magnified. We will investigate the structure of one of this genus, as it is the most numerous of the fungus tribe, and, if well understood, will bring you acquainted with the bolétus, and other généra of this order. The agarics are composed of a pileus, or hat with gills underneath, and with, or without stipes or stems; the position of the stipes being either central or lateral; from whence arise

the three first divisions of the genus; they have also a root, more or less obvious; and some of them, while in their unfolded state, are wholly inclosed in a membranaceous, or leathery case, called the volve. This case must not be confounded with that part so termed by Linneus. Mr. Bolton has shewed us the just distinction betwixt the volve, and the veil or curtain, the latter being what Linneus has marked as the calyx, under the term volve; which has occasioned a confusion in these two parts, though in reality none can be more evidently distinct, or applicable to different purposes: the volve, wrapping round and protecting the whole plant in its infant state; the veil, apparently belonging to the supposed parts of fructification only, and under which Hedwig asserts he has found them. From the remains of the veil a ring is formed: this part is not only uncertain in its time of duration, but even will appear in some years on the stipe, and not so in others; consequently it cannot be used as a permanent character. The stem of an agáricus is either solid or hollow; the solid stem differs much in its degree of solidity, sometimes being as solid as the flesh of an apple, and some-

sometimes perfectly spongy. Next to the gills, the stem of an agaric is the part least liable to vary. The gills are the part commonly known by that name, and with which every one is acquainted ; they assume different colours in different species, and vary much in their respective lengths ; each gill consists of two membranes, and between these the seeds are formed ; the gills are always attached to the hat, and sometimes to that only ; sometimes they are not only fixed to the stem, but extended along it downwards, like the wires of an umbrella. This has been called a *decurrent gill*. Mr. Curtis discovered a peculiarity of structure in the gills of the *agáricus ovatus*, which he had not before observed in any other fungus : the gills are connected together by numerous transverse bars, or filaments, the use of which seems to be to keep them at an equal distance from each other, and thus to admit the air to the fructifications, which are situated on the flat surface of the folds, and to prevent their being destroyed by pressure from their too great closeness. These bars make it extremely difficult to separate one of these folds entire : they are visible only when greatly magnified.

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The secondary subdivisions of the agarics are founded upon the solidity or hollowness of their stipes with the position of their gills, which, being the part wherein the fructifications are contained, is of the greatest importance. They vary much in almost every circumstance belonging to them, except in colour, which in all other plants is the most variable of all their characters; the colour of the gills on this account is the mark, which has lately been adopted for the distinction of the species; their colour is supposed to be principally, if not wholly caused by that of the fructification or seeds, and is said to have been found sufficient, with their structure, to afford permanent specific distinctions. These colours change, when the plant begins to decay; and of those agarics, which dissolve away in an ink-like liquor, the gills in their young state are white, so that to judge of their colour, the plant must be gathered in its first state of expansion, when they will be found to be grey. It is the colour of the flat side of the gills which must be attended to in the system I am explaining to you, because the colour at the edge in some plants is different through all the stages of growth; and in

in others, it changes sooner than that of the sides, evidently from the discharge of the seeds, when ripe. The hat of the agarics is least to be depended on; its shape is either conical, convex, flat, or hollowed; the top like a funnel. It is constantly varying in the same plant before expansion, but not very changeable in the same species, when it is nearly, or fully expanded. The colour of the hat is extremely uncertain, therefore can only be attended to as a mark of varieties. The viscous juice on the hat and stipe, which is seen in many agarics, differs, according to their situation, or to the state of the atmosphere, so much, that the same species will sometimes be found glutinous, and at other times perfectly dry. Some of the agarics contain a milky juice, more or less acrid: this circumstance is not constant, it having been found in the *agáricus rubescens*, and the *agáricus cæfareus*, that plants equally vigorous, and in the same situation, will some of them pour out milk in abundance on being wounded, while others will not exhibit any marks of it. From the sketch I have given you of the characters, which may be observed in the structure of the agarics, and which is

nearly the same in the other genera of the fungus tribe, you may, I hope, with the assistance of plates form clear ideas of those parts, from which the various kinds are distinguished. Upon the principles I have explained to you, Dr. Withering has given the world an arrangement of the funguses, from which you will generally be able to investigate your plant. There is an exception to the uniformity in the colour of the gills in the *agáricus aurantius*, which species exists under almost every kind of colour, that can be imagined.

Henry. Then it is the *agáricus aurantius*, that we call the scarlet mushroom, and that is so beautiful in autumn.

Hortensf. I rather suppose, that the fungus, which you have observed, is the *agáricus integer*, or entire *agáricus*, as there is a variety of that species, which has its hat of blood-red colour, and which appears from August to October. The colour of many of the funguses is beautiful; the most splendid of all the agarics is the *cæfareus*, which with us is a rare plant, but is common in Italy, and brought to the markets for sale.

Juliette.

Juliette. Pray, mamma, what is the botanical name of the mushroom that we eat, and why do we eat only of one kind?

Hortensf. The plant, we eat under the name of mushroom, is *agáricus campestris*, which the gardeners propagate, either by sowing the gills, or by planting small fibrous shoots, which are found about the base of the stipe; and which produce tubercles, in the manner of potatoes. In regard to the reason why this is the only fungus commonly used in cookery, I cannot perhaps give you one that is satisfactory. The caprice of mankind, in their choice and rejection of particular kinds of food, is not easy to be accounted for. The *agáricus campestris* however seems to justify the distinction, that has been given it in this particular, from its fine flavour and tenderness of texture: but, though we use it almost exclusively for food, it has not the same pre-eminence in other countries; and the inhabitants of Russia devour almost every species, even those which by other nations are esteemed most poisonous.

Harr. We hear stories in our country of people being poisoned by eating even the common mushroom.

Hortenf. This seldom occurs ; and when it has done so, it has remained doubtful, whether the poison proceeded from the mushroom, or from the vessel in which it was dressed ; but as mushrooms make a part of our diet, which is more palatable than nutritive, it can never be necessary to eat them ; therefore when you find them hard, I would recommend to you not to do so, as it is probable the poisonous effects which are recorded of them, may have arisen from want of sufficient stewing ; as you know we have before spoken upon the salutary use of fire to many of our vegetables, which in their fresh state would be so far from affording wholesome food, that they could not be eaten without producing pernicious consequences.

Harr. I think I have read an account of some part of the scotch sir being eaten ; but I have not a clear recollection about it.

Hortenf. -From the highly civilized state in which we now live, we can form but faint ideas of the necessitous situation, under which many of the inhabitants of the globe exist, and in comparison of whom our poorest cottagers may be considered in a state of ease. It is in the rigorous and unfertile climates of
Sweden,

Sweden, Lapland, and Kamschatka, that necessity obliges the inhabitants to make use of the inner bark of the *pinus sylvestris* (scotch fir) for food. In the spring season they choose the fairest and tallest trees, and, stripping off the outer bark, they collect the soft white succulent interior bark, and dry it in the shade. When they have occasion to use it, they first roast it at the fire, then grind it, and after steeping the flour in warm water, to take off the resinous taste, they make it into thin cakes, which are baked for use. The poor inhabitants are sometimes constrained to live upon this food for a whole year, and are said to be fond of it; and it should be nutritive, as Linneus asserts, that it fattens swine.

Charles. Here we see the great advantage to be derived from the knowledge of fire: the poor people of Kamschatka must be starved, if they were ignorant of its properties. The scotch fir, I think, Ma'am, has many uses, besides this. I remember once expressing my dislike of it strongly, and wishing there was no such tree, when you enumerated so many of its virtues, that I have felt respect towards it ever since,

Hortensf. It is always a mark of ignorance to condemn any thing indiscriminately ; and of arrogance, to desire to deprive it of existence ; and this kind of arrogance is too often found amongst the inconsiderate part of mankind. When we do not find a particular vegetable useful to the human species, we are apt to regard it in too insignificant a light ; so by many are esteemed most of the funguses, whereas they afford sustenance to a numerous tribe of the animal creation, a variety of insects. The *pinus sylvestris* has been applied by mankind to more uses than most other trees. The tallest and straightest are taken for the masts of ships ; the timber is resinous, durable, and applicable to many domestic purposes ; such as making floors, wainscots, boxes, and all those things, which are made of deal ; which is the name given to the wood of this fir-tree, when sawn into planks. From the trunk and branches of this, as well as of most others of the *pinus* tribe, tar and pitch are obtained. Barras, Burgundy pitch, and turpentine, are acquired by incision. In the highlands of Scotland, the resinous roots are dug out of the ground, and divided into small splinters, which are burnt

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by the inhabitants to supply the place of candles. The most important use, we have observed, is made of the inner bark by the Swedes, Laplanders, and Kamschatkans; of the same material, the fishermen at Lockbroom in Ross-shire make their ropes. This species of fir has acquired the name of scotch, from being the only one which grows naturally in Scotland. It is found scattered in many places amongst the highland mountains; and large natural forests of it are seen of many miles extent in various low-land districts. From the cones of this fir a resinous oil is extracted, which is said to possess virtues similar to those of the balsam of Peru. This tree lives to a great age; Linneus affirms four hundred years. The anther-dust in spring has been carried away by the winds in such quantities, as to have alarmed the ignorant with the idea of a shower of brimstone.

Henry. That reminds me of the cloud of dust, which flies from the puff-ball, when I press it. What fungus is that, mamma? and is the dust that comes out the seed?

Hortens. This powder is believed to be the seeds; when viewed through a microscope,

the separate particles appear of a spherical form, and annexed to elastic hairs. The puff-ball is the *lycôpérdon bovista* of Lightfoot and some other authors ; but we have not yet a distinct knowledge of the species of these extraordinary plants. The truffles and morels, which we eat in ragouts, are different species of the fungus tribe. The truffle, *tuber cibarium*, is esteemed by some people one of the best of the esculent funguses ; but its tough, leather-like texture renders it, I think, very inferior to the common mushroom ; its outer structure is worthy of observation, having the appearance of a net, from the tubular honeycomb form of the whole head of the plant. The truffles gathered in Britain are apt to be gritty, as they grow under the surface of the earth, at the depth of four or five inches. Dogs are taught to hunt them ; and when they perceive their scent, they bark a little. and begin to scratch up the earth. Pigs in Italy are taught to root them out of the ground, accompanied by a person, who takes up the prey.

Juliette. That is hard upon the poor pig to disappoint him of the fruit of his labour.

Hortens.

Hortensf. We will hope the pig is allowed his share, or that he is bartered with, and fed well with some other diet, after having procured the truffles for his master.—The last genus of the Cryptogamia class, that we have to consider, is mucor or mould.—Should you suppose that the mould, you find on bread, fruits, leaves, and various other substances in a decaying state, was a plant subject to all the laws of the vegetable kingdom ?

Charles. Indeed I should not have suspected it ; but I recollect, Ma'am, that you have told me it was a plant.

Hortensf. By the assistance of a microscope of common magnifying powers, you may satisfy yourself, that it is so ; you may see it growing in clusters ; the stems a quarter of an inch high, pellucid, hollow, and cylindrical ; each supporting a single globular head, which at first is transparent, afterwards dark grey ; these heads burst with elastic force, and eject small round seeds, which are easily discoverable by the microscope. It is the mucor mucedo, which I have described to you ; but there are thirteen distinct species of mould, or mucor, which appear at different times of the year ; one kind, called the golden, from
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its brilliant yellow colour, covers the whole surface of plants, on which it grows, and stains the fingers yellow, if touched. It is generally found upon the plants belonging to the *bo-létus* family, and has the property of repelling moisture. It is said to remain free from wet, though immersed in water for a year. You are not yet sufficiently advanced in your botanical studies, to enter deeply into enquiries concerning these wonders of nature; but you know enough of them to interest you in their history.

Harr. I feel myself much interested in it, and hope, that when we become proficient in the other classes, you will study the *cryptogamia* class with us.

Hortensf. With pleasure; and in the mean time I will endeavour to understand it better myself, that I may be able to instruct you in it.—At our next meeting we will begin with the *Grasses*, which make an important part of botanical knowledge, and which to you, Charles, will be particularly useful, when you enter upon Farming pursuits.

Charles. They are the plants, which I am the most desirous of understanding, as I al-
ways

EXPLANATION OF PLATE IV. PART II.

FRUCTIFICATIONS OF MOSSES.

- Fig. 1. A Plant of *Bryum Undulátum* of the natural size.
Fig. 2. The Capsule much magnified with its Calypstre.
Fig. 3. The Calypstre separated from the Capsule.
Fig. 4. The fringed mouth of the Capsule.
Fig. 5. The Fringe, with the ring taken off the Capsule.
Fig. 6. The Opérculum of the Capsule.
Fig. 7. A magnified Leaf of *Bryum Undulátum*.
Fig. 8. A Plant of *Bryum Hórnum*, Swan's Neck *Bryum*, to shew the Rose or Star which terminates some of the Leaf-stems, *a*.
Fig. 9. A Plant of *Hypnum Prolíferum*, to shew the manner of its leaves growing out of each other, and of the Capsules being placed on the Stem, *b*.
Fig. 10. A Leaf greatly magnified, to shew its granulated appearance.
Fig. 11. The Capsule with its Fringe. *c*, The Opérculum separated from the Capsule.
Fig. 12. The Fringe with its Ring, separated from the Capsule.



Fig. 2.

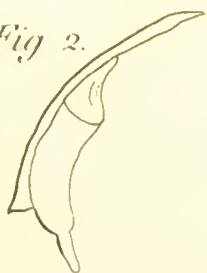


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.

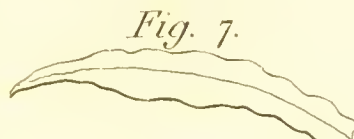


Fig. 8.

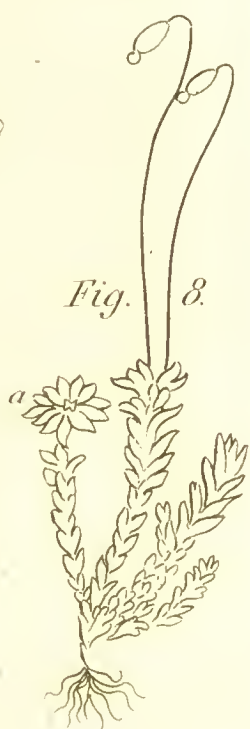


Fig. 9.



Fig. 10.



Fig. 11.



Fig. 12.



ways think of being a farmer with great pleasure.

Hortens. It is a pursuit, which a gentleman may enter into with much amusement to himself; and, though he should not find it immediately profitable, the result of his experiments may in future become so to mankind; which is a higher consideration; and there is the certain and immediate good attending it, that it affords employment to himself, and to the industrious poor of his neighbourhood.--- I have business this morning, which prevents me walking with you; but if you meet with any vegetable curiosities, you will not fail to bring them home with you.

DIALOGUE THE FIFTH.

On the Grasses.

Hortensf. On your return yesterday from your walk, you so well convinced me, that you had attended to our last lecture, that I with pleasure enter upon a new tribe of plants with you to-day—the Grasses.

Charles. I think, ma'am, we all pretty well understand the structure of the plants belonging to the four orders of cryptogamia; and we did attempt to make out some of the généra, but found ourselves not equal to that, except by comparing them with different plates.

Hortensf. I do not wish you to attempt any thing beyond a knowledge of their outer habits at present. Every year makes the investigation of the généra more easy, as we now see them given in plates among other plants, with accurate descriptions of them; and these plates published at a moderate rate, so that most people can afford to purchase them. I see Henry wishes to ask some question.

Henry. I scraped this crust off the bark of a tree this morning; last week I passed it, and thought it was a part of the bark, but
now

now I think it is a plant : pray what is it, mamma ?

Hortensf. It is one of the lichens, the lichen candelarius of Linneus, but from its yellow colour called the golden lichen by english authors ; you may see it well figured in Sowerby's numbers of british plants, to which agreeable publication we must often have recourse. We will now, if you please, begin with the grasses ; an order of plants with which you must become familiarly acquainted.

Harr. I wish much to understand them, but have so often heard them spoken of as being difficult, that I feel afraid of beginning with them.

Hortensf. The grass tribe certainly requires a particular mode of investigation ; and the plants contained in it are not so easy to understand as flowers, which have larger, and thence more obvious parts of fructification ; but the method of accurately dissecting them once adopted, you will find a knowledge of them more easily attained, than you imagine. Recollect the confusion that appeared to you in the compound flowers, before you understood the separate parts, and the regularity of arrangement, when you be-
came

came acquainted with them, and you will be encouraged in your present undertaking.

Harr. You always encourage me, mamma, and make so much allowance for dulness, that I learn what you wish to teach me much more easily, than I expect to do. But whenever I am to begin with any thing new, I feel afraid, and if left to myself, perhaps should give it up.

Hortensf. Such feelings are common, particularly in young people, and in those who have not very active minds; and are thence incapable of weighing the pleasures of indolence against the vacancy, in which the neglect of improvement leaves the mind. We can do nothing without energy; perhaps I find sometimes as much need of exertion to meet you on the same subject every morning, and to arrange the matter, that I have to teach, as you may do to attend me, that you may learn. Be this as it may, I am persuaded, that the pleasure on both sides predominates; so we will shake off all indolence, and enter at once upon our morning's business. The term *grafs*, as it is vulgarly used, conveys but a vague idea; and the common observer is furrounded, when walking in a
hay-

hay-field, by a variety of species, when he is not conscious of the precise existence of one individual.

Charles. I am sure this has often been my case; every plant in a field, of which I did not see the flower, I remember to have called grass.

Hortensf. It is only of late, that this useful and curious tribe of plants has been attended to; so that the knowledge of the most common and valuable vegetables of the creation is yet in its infancy. They have been confounded under one common name in general, and the few, which have been distinguished by a particular appellation, are far from being universally known by it. Mr. Curtis in this part of the vegetable kingdom, as in every other, has applied his researches to the most useful purposes. He has attracted the notice of the rich by his more splendid delineations of a variety of grasses in his London Flora; while he has diffused through all ranks a knowledge of those genera, which are every to be met with, by the low priced publication of his Practical Observations on British Grasses; a work from which a general knowledge of the outer habits of our most common

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mon meadow grasses may easily be attained. We will now endeavour to gain a distinct one of some of the genera. This tribe forms one of the natural orders of Linneus, and possesses a variety of common characters, by which several sorts of corn are arranged with those genera, which are more commonly known by the name of grasses. You will find a striking agreement in the parts of fructification of all the grasses that you may examine; but this is not more remarkable than the similarity of their general air, their manner of growth, and their whole appearance. A simplicity of structure characterizes the whole class; they have uniformly a simple, straight, unbranched, hollow stem, strengthened with knots at certain intervals; this, which is commonly called the straw in corn, is termed by Linneus the Culm. At each knot there is always a single leaf, which serves as a sheath to the stem to some distance; when it spreads out into a long narrow surface, of equal breadth all the way, till it approaches the end, where it draws off gradually to a point. The leaf is invariably entire in every species, has neither veins nor branching vessels, being only marked longitudinally with lines parallel to the

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the sides, and to a nerve or ridge, that runs the whole length of it. Another curious circumstance, almost peculiar to this tribe of plants, and common to them all, is the seed not splitting when it germinates, but continuing entire, till the young plant is sufficiently nourished by its mealy substance to seek its own food; at which time there remains of the parent seed only the dry husk. These plants are termed by Linneus one-cotylédoned, or one-lobed.

Henry. I remember this in wheat. One day I plucked up a root in a corn-field, and found the seed sticking amongst the fibres.

Hortensf. If you had pressed the seed, you would have found, that the skin only remained; the nourishing part having been absorbed by the young plant, but this part of the subject we must refer to future enquiry; it is sufficient to know, that every plant that comes under the denomination of a grass, has its seed of only one lobe, or cotylédon. Before we proceed further, we will examine, whether the characters of the tribe, I have been explaining to you, are just. I gathered this morning a few grasses for the

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purpose. The common meadow fox-tail, *alopecurus pratensis*, will shew the peculiarities, that we are to look for, as well as any other; and it is better to make yourself acquainted with them in the real plant than by plates, though Mr. Curtis's London Flora will afford you much amusement and information on the subject.

Harr. I find all the characters, that I am to look for in the leaf and stem of this fox-tail; and I recollect having seen the same knots, sheaths, and leaves, in oats, barley, and wheat. We have often amused ourselves by slipping the straw out of its case in corn; but the stems of grass are so slender, that they bend, and are spoiled, before the sheath can be taken off.

Jul. And some are so rough, that they prick the fingers.

Hortensf. Upon examining the leaves and sheaths by a microscope, you will find many of them furnished with bristles, which give them the appearance of a saw; from this circumstance, or the contrary, the species are frequently distinguished one from the other. The parts of fructification are what you have now to attend to; from their want of splendour

dour they commonly pass unnoticed, though their beauty and structure are such as must excite our highest admiration, when known. The natural character of the flowers of grasses is their having a glume, or husk, which is the term given to their calyx by Linneus. This glume is composed of one, two, or three valves, generally only two; the larger valve hollow, and the smaller one flat. These valves are a kind of scales, with their edges commonly transparent, and most frequently terminated by a pointed thread, termed by Linneus *arista*, or awn.

Henry. I have often observed that bristle in barley.

Hortens. It is particularly strong in the *hordeum* genus, of which barley is a species; but you may find it in a less degree in various other genera, though not constant through every species; from whence its presence or absence is used by Linneus as a specific distinction. The corol of grasses is also termed a glume, and in reality is only a dry skinny husk, consisting of two valves. You may compare the calyx and corol with a magnified drawing, and look at the natural plant through a microscope, and you will then

understand their construction. The division of the outer glume, or calyx, ought always to be attended to, as it is often made use of by Linneus to mark the généra.

Harr. I should have been puzzled to have determined, whether the grasses had corols or no; I should have supposed all these husks to have belonged to the calyx.

Hortensf. Call them glumes, as that is the proper term. We have before seen, that the limits between the calyx and corol are not sufficiently defined; therefore we are to understand them at present, according as Linneus has distinguished them. The inner glumes of the grasses we are to consider as the corol, the outer as the calyx. The flowers of this tribe have also universally a visible nectary, consisting sometimes of two very small oblong leaves, placed at the base of the germ, and sometimes different kinds of scales in the same situation, which are distinctly shewn in Mr. Curtis's plates of both the *hóleus mollis*, creeping soft grass, and *mélica uniflora*, single flowered melic grass, and *mélica cærulea*, blue melic grass, and are not difficult to be seen in the natural flowers. Though very minute, you may see
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the leaves, of which the nectaries are composed, at the base of the germ of the flowers of wall-barley.

Charles. I see two very small transparent leaves, very like the corol, but less; they are the nectaries, I suppose.

Hortensf. They are so named by Linneus, but as they furnish no generic distinction, they are not noted in the characters of all the genera. The number of stamens, that you will generally find in these flowers, is three, with two pistils, within the same cover. But there are exceptions to this rule, which I will explain to you presently. The stamens have three hair-like filaments with oblong anthers of two cells. The styles of the pistils are downy, bent back, with their stigmas beautifully feathered, in some species large and branching, which, with the anthers waving on their long filaments, form a most elegant appearance; but their parts are so delicate and minute, that they are seen to greater advantage, if viewed through a microscope.

Harr. The anthers of this fox-tail, alopecúrus I must now call it, are very pretty; but I do not see the pistils.

Hortensf. The close spiked grasses do not shew the parts of fructification so well as those with looser spikes, or the panicked kind. In feather grass, *stipa pennata*, they are very well seen, if examined in a proper state; but it is even more necessary to investigate these flowers, before their anthers have discharged their dust, than those of the other classes; for as soon as the cases containing it are burst, the whole plant assumes a withered aspect, and all parts, except the seed, fall to decay. These flowers have no seed-vessel, and only a single seed; which is enclosed by either the calyx or corol, from which, when ripe, it is emitted in various ways. The twisting of the long awn of feather-grass, in order to extricate itself from its receptacle, which in this tribe is the stem lengthened out to serve that purpose, gives it a very peculiar appearance. This will also happen if you gather a bunch of the seeds, and bind them tight together; they will twine themselves into all kind of directions, till they get loose from the bondage, that you have imposed upon them, and thus commit themselves to the earth, where they vegetate and produce a new progeny.

Jul. I remember last summer gathering some feather-grass to dress my doll with, and had tied it together with a ribbon ; but after it had been in her hat half an hour, it all stood different ways, and I pulled it out.

Hortens. Had you suffered it to twist, as much as it pleased, and then cut off the seeds, you would have found it more manageable. I recommend briza to you, as still more ornamental than the feather-grass. The beautiful drooping spikes of the *briza maxima* are peculiarly elegant from their tremulous motion, caused by their slender peduncles, and from whence the genus derives its common name of quake grass. In the flowers of this species you may also see the parts of fructification to advantage.

Henry. I think I have seen it. Yesterday I separated the joints of one of the spikes, and saw stamens, and two pretty little feathers, like what you just now told us were the stigmas. I intended to ask you about them, mamma, but I forgot.

Hortens. I shall always be ready to resolve any difficulties that may occur to you in botany, or on any other subject that I am able ; and though I may not be acquainted with it

myself sufficiently to inform you, as much as I wish, I may probably find some method of attaining the knowledge, we are seeking after, in a more effectual manner, than you can yourself. I am never ashamed of confessing my ignorance, where I have not neglected opportunities of improving myself, by which means I generally acquire some information, whenever I enter society qualified to give it. But to return to our grasses. Though the characters I have given you of the parts of fructification are all found nearly constant in those genera, which are placed in the class triandra, or three-stamens. There are others which fail in the classic character of the number of stamens, and are thence placed by Linneus in different classes; which separation of plants, manifestly of the same natural order, is the more extraordinary, as in some cases he has not thought it necessary strictly to adhere to the observance of the classic character, when it has so directly militated against an obvious similarity in every other part of the fructification, as in *holcus lanatus*, but has made the difference the foundation of a specific character. The *holcus lanatus*, meadow soft grass, having some of its
flowers

flowers deficient in the proper number of stamens and pistils, which would rank it in the class and order triandria digynia. Linneus has torn it from all its natural connections, and placed it amongst a tribe of plants, in the class polygamia, to which it has no affinity.

Harr. I dare say, mamma, that you can make some good excuse for Linneus.

Hortensf. His most flagrant faults, of which this must be esteemed one, admit of this excuse, namely, the greatness of the work, with which he has enlightened the botanical world. We ought to be less surprized, that we find in it a few imperfections, than that there are not more. This regarding the hólcus, I am inclined to think, escaped by some accident his correction, as it is not uncommon to find the same imperfection in the flowers tríticum and hórdeum, wheat and barley, and some other grasses, which cannot be considered as constant, but may arise from a variety of causes: though I am in doubt, as the character of the classes is purely arbitrary, whether in all cases it would not have been better to have observed it uniformly, than ever to have deviated from it. So,
for

for instance, the genus *anthoxáanthum*, which in every particular agrees with the character of the grass tribe, except that of its number of stamens, which are only two, and that without variation. From this circumstance Linneus has placed it in the class *diándria*, two-stamens. Had he done otherwise, a young botanist must have found himself much perplexed; the classic character being the first that he would refer to, he could never find the *anthoxáanthum* in a class, the essential character of which was three-stamens, though, from its general appearance, he could not expect to find it separated from the rest of the grasses.

Harr. I always first look for the number of stamens in the flowers of all the simple classes; so I should certainly be misled if the *anthoxanthum* was placed in the third class.

Hortensf. There is no other known grass that has only two stamens. Its common name of vernal grass is given to it from its early appearance in the spring, it being the second of the english grasses that comes into blossom; from which circumstance it is valuable to farmers; and also from its readiness to grow in all soils and situations.

Charles. I remember the plant vernal grafs. Mr. Johnson of the Park Farm once shewed it me, and said, you will be glad to see this grafs, when you are a farmer.

Hortensf. Mr. Johnson is so civil and intelligent, that you may gain much improvement from him : we must beg his assistance, when you enter upon agricultural experiments. His sound practical knowledge may be very useful to you ; the danger of experiment-making is too strong an attachment to theory. The anthoxánthum is the grafs, which gives the fragrant scent to hay ; and if the leaves are gathered, and folded up in paper, they will retain their agreeable scent for a long time : hence the specific name given to it by Linneus, of odorátum. It has been said to be the only english grafs that has fragrance ; and this may be true respecting the leaves. But Mr. Swayne in his account of pasture grasses informs us, that the flowers of the annual pea have a sweet smell like those of the *réda adorata*, *mignonette* ; and that the scent remains in the flowers, when dried. The anthoxánthum is said to have two modes, by which it is propagated ; first, the common way,

way by feeds; and secondly by bulbs formed upon its stems, which fall off when mature, and strike root into the ground. This circumstance is said also to take place in many of the alpine grasses, by which means their species are preserved, which would otherwise be annihilated, so perpetually are their feeds devoured by small birds.

Ful. Pray, mamma, from what grass does the feed, that I give my canary-bird, come?

Hortens. The name of the genus is *phálaris*, the species with which you feed your bird is called *canariensis*, for the same reason that the bird is so named, being a native of the Canary islands. The ribbon grass, with which you are sometimes so fond of adorning yourself, is a variety of another species of *phálaris*, the *arundinacea*, or reed-*phálaris*, and makes a beautiful appearance amongst the gayer colours of a flower-garden. The genus *avéna*, to which the common oat belongs, is obviously marked by a twisted and jointed awn, which issues from the back of the corol. The feeds of *avéna fatua*, fool's oat, or as it is commonly called, wild oat, exhibit an amusing spectacle. If placed on a table, after having been moistened in water, they

they twist themselves about with so much appearance of life, that the plant has been called the animated oat. There is also a curious circumstance belonging to the seed of barley; its awn being furnished with stiff bristles, which will all turn towards the point, like the teeth of a saw. As this long awn lies upon the ground, it extends itself in the moist air of the night, and pushes forward the barley-corn, to which it adheres: in the day it shortens, as it dries; and as these points prevent it from receding, it draws up its pointed end, and thus, creeping like a worm, will travel many feet from the parent plant.

Ful. This is extraordinary indeed, the barley-corn walks! Did you ever see this, mamma?

Hortens. I cannot say that I have seen it, but the fact is related by such respectable authority, that I cannot doubt of it. I am acquainted with a gentleman, who made a wooden automaton upon the principles of a barley-corn, which succeeded so well, that it walked across the room, in which it was kept, in the space of a month or two.

Charles. I recollect Mr. Wilson shewing
me

me an account of both the automaton and the barley-corn, in the Botanic Garden, and made me understand the principle, upon which they moved.

Hortensf. Such experiments are very amusing, but are of little value till applied to some useful purpose. Such ought to be the object of all our exertions, and the test of their merit the degree by which mankind may receive benefit from them. You eat your daily bread without reflecting on the experiment-maker, who first introduced corn as an article of food.

Harr. Indeed I never thought of its first introduction, or of being grateful to the person, who bestowed so great a benefit on the world. Pray tell me, mamma, to whom I must feel obliged?

Hortensf. What think you of Ceres, who was deified by the people of Egypt on this account; and as from that nation we have received our useful arts, it is to her that we must pay our tribute of gratitude; not however as to a goddess, but as to a human creature, whose useful discoveries deservedly placed her in a high rank as a mortal, and in those dark ages caused her to be revered as divine.

The

The deities of the heathen nations will frequently be found to originate from men, who by the superiority of genius over their contemporaries benefited mankind by useful and important discoveries. Such was Osyris, who invented the plough. The straw of the oat is also believed to have been the first musical instrument, invented in the pastoral ages of the world, before the discovery of metals.

Harr. It is very agreeable to trace to their origin things, that are now so familiar to us, that we are apt to enjoy them without reflection. I will never forget Ceres.

Hortensf. Remember however, that she has a claim to only a secondary gratitude. We cannot contemplate the fruits of the earth, which are so bountifully bestowed on all climates, and the faculties with which man is endued to discover their uses, but we must adore in silent and grateful praise, the beneficent Creator of all things. Wheat, tritum hybernum, the most nutritive of the various grains, which are applied to the use of food, is found in most parts of Europe and Asia; where the climate is too hot for its cultivation, as in the torrid zone, its place is well supplied by what you call indian and
turkey

turkey wheat, which is a species of zea; a genus placed by Linneus in the class monoe-cia, one-house. At dinner you may observe the long threads, which are so great an ornament to the pickled wheat, amongst the west indian pickles. These are the pistils of the separate florets of the zea: in a riper state you have seen the same corn at Mrs. Armitage's, who feeds her parrot with it.

Jul. I have often seen it at Mrs. Armitage's: when the spike is entire, it looks something like a pine-apple. Mamma, you have not mentioned rice, is that a grass?

Hortens. It is arranged amongst the grasses in the natural orders of Linneus; but wanting the essential classic character of his artificial system, it is there separated from them, and placed in the class monoe-cia, one-house; it belongs to the genus ory'za. In most eastern countries rice is the chief support of the inhabitants; and so far, as it is used for food, is wholesome and nutritive: but as we too often convert what, if properly used, would be a blessing into a curse; they are not content with that, but make from it a spirituous liquor, called by the english arrack; which, like all other spirituous liquors, may be

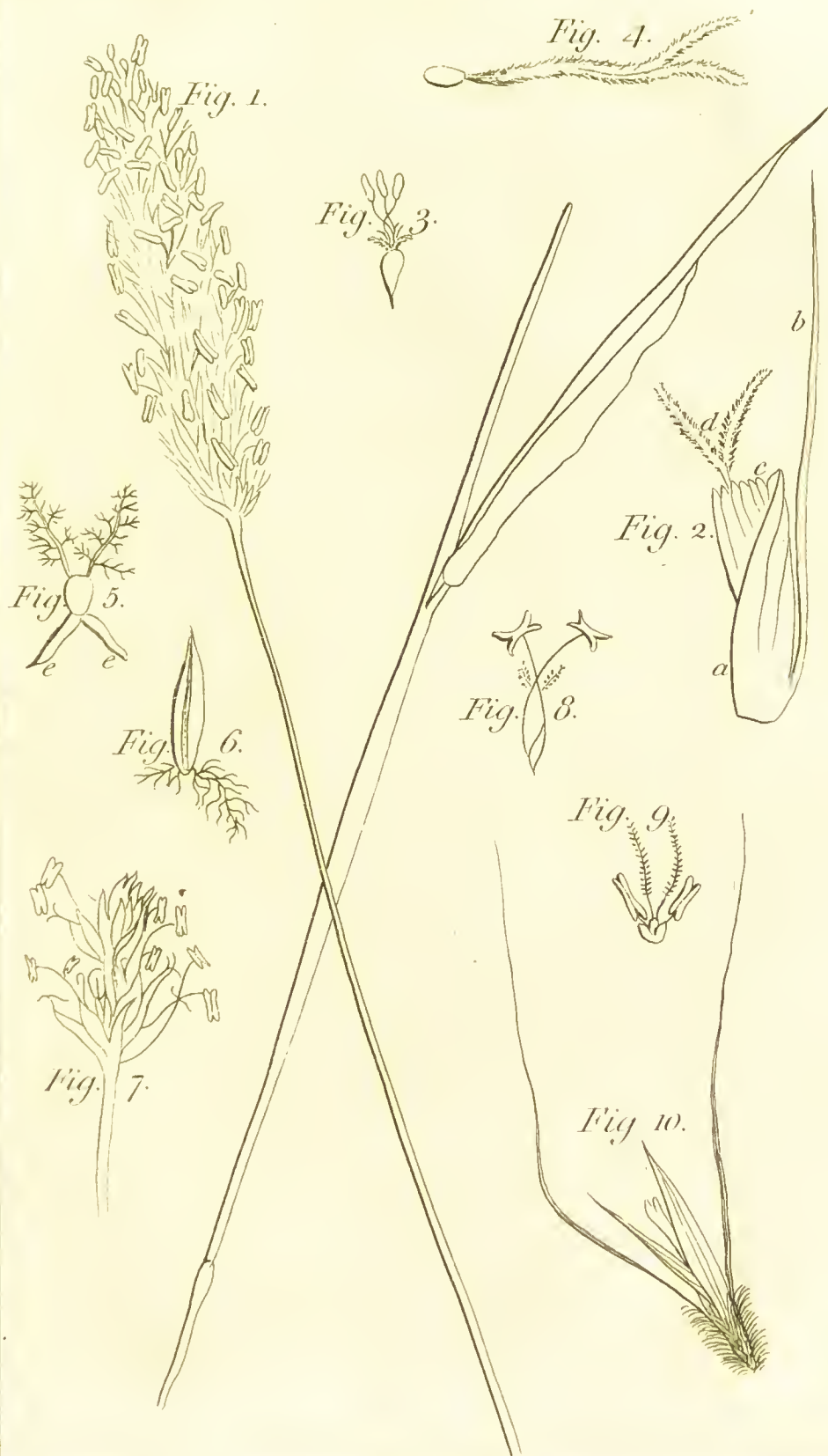
be esteemed a slow poison. Most of the plants belonging to the natural order of grasses afford plentiful and nutritive food not only to mankind, but to beasts, birds, and insects, and have the remarkable property of not being destroyed, though continually trampled upon: indeed they are constantly renewed by seeds; as their flowers, just as in other plants, are never eaten by cattle, which, if left at liberty in the pasture, uniformly reject the straw on which the flower grows, devouring only the herb of the plant, so that the seeds which escape the small birds, ripen, fall to the ground, and renew their species. For those grasses, which are more liable to have their seeds destroyed, or which from the coldness of the climate, that they inhabit, cannot bring their seeds to perfection, I have just now told you, that nature has provided another mode of encrease, which like all other provisions of nature is truly admirable. Do you think you are acquainted with the different parts, which you may expect to find in grasses?

Harr. I think I am, and I dare say we shall all be able to assist each other in accurately dissecting them.

EXPLANATION OF PLATE V. PART II.

FRUCTIFICATIONS OF GRASSES.

- Fig. 1. A Spike of *Alopecúrus Praténsis*, Meadow Fox-tail.
- Fig. 2. A Floret magnified. *a*, The Glume of the Calyx, with its long Awn fixed to the base. *c*, The Stamens. *d*, The Stigma.
- Fig. 3. A Floret of the natural size separated from the Spike.
- Fig. 4. The Stigma and Seed.
- Fig. 5. The Germ and Styles of *Póá triviális*. *e, e*, The Nectary Glands.
- Fig. 6. The Seed with a woolly substance at its base.
- Fig. 7. Part of a Spike of *Anthoxáanthum*.
- Fig. 8. The Stamens, Styles and Seed, with the adhesive Nectary Glumes.
- Fig. 9. The Nectary Glumes at the moment of protruding the Anthers.
- Fig. 10. A Floret of *Avéna Fatua*, Animated Oat.



DIALOGUE THE SIXTH.

Anthoxanthum described. *Specific Distinctions, and double Flowers.*

Harr. We have brought a few grasses, that we may examine their fructification through a more powerful microscope, and with your assistance. We think we have made out the parts pretty distinctly by our small one. The nectary we should not have discovered, if you had not shewed it us in a magnified drawing. We have not attempted to make out any of the genera in our first trial, except that of the anthoxánthum; its two stamens and sweet leaves made us acquainted with it immediately.

Hortensf. There are some peculiarities in the fructification of anthoxánthum odoratum, which are worth attending to; we will dissect your specimen, and compare the parts with a magnified plate. It agrees with many other grasses in its small spikes, containing only one flower, but differs from the whole tribe in the following particulars: one of the valves of the glume, or calyx, is small

and membranous, the other large ; and wrapping up, as it were, the whole of the fructification. These glumes have been observed not to open and expand themselves, as in the *avéna* genus, and other grasses, but the stamens and pistils have the appearance of pushing themselves out of the glumes, which remain closed ; the glumes of the corol are not like those of other grasses, but are remarkably hairy, each having an awn, the longest of which springs from the base of the glume, and is at first straight ; but as the seed becomes ripe, the top of it is generally bent horizontally inward ; the other awn arises from near the top of the opposite glume or valve. The nectaries also differ as much from their common structure, in this order of plants, as the other parts of fructification ; they are composed of two little oval shining valves, one of which is smaller than the other : these closely embrace the germ, and are difficult to be seen, unless they are observed at the moment of the anther's protruding from between them, at which time they are very distinct : as soon as the anthers are excluded, they again close on the germ,

and

and form a coat to the seed, which remains with it.

Charles. Now I find why we could not discover the nectaries, though I wonder that they escaped us, as we observed your rule, ma'am, which has been of great use to us, of examining flowers in all their different states of maturity.

Hortensf. The similitude of calyx, corol, and nectary, in the grass tribe, and the minuteness of them all, will frequently prevent your accurately distinguishing them from each other, till you are become familiar with the appearance of all these parts, and then you will find them not more difficult of investigation than the fructification of other plants.

Jul. We gathered this wall-barley on the road side, as we were walking, and looked for it in the System of Vegetables, but were puzzled by finding it described with an involucre. Pray, mamma, explain it to us?

Hortensf. The term involucre, on the first view of the *hordeum* genus, to which the wall-barley belongs, does not seem properly applied; but if you separate the florets from their receptacle, the spike-stalk, you will see

six longish, narrow, pointed leaves, at the base of each, which will immediately give you the idea of an involucre. What are those grasses which you have put into that hyacinth glass?

Harr. We do not know, ma'am, but we brought them, that we might see them through the microscope.

Hortensf. This is the *hólcus mollis*, (soft) which when magnified, shews the fructification very distinctly. Linneus has placed this grass in the class polygamia, even with more impropriety than the *lanatus* (woolly), as the flowers of this species have all both stamens and styles. Mr. Curtis seems justly to think, that it ought to have been placed in the *áira* genus, but that is not our present enquiry; and as you enter further into an acquaintance with the tribe, you will find all peculiarities noted, which give cause of any difference of opinion from Linneus, in Dr. Withering's botanical arrangements; in that publication much pains have been taken with the subject. By studying the plate with its explanatory table, which he gives from a work of Linneus, and attending to the remarks inserted from other authors, you will
not

not be long, before you can refer a grass to its genus, as readily as you can a compound flower; added to which you have the great advantage of consulting Mr. Curtis's London Flora. Your other grasses are the *lólium* perenne, perennial darnel, and the *dáctylis glomerata*, glomerate cock's foot: you shall dissect their flowers, and afterwards, as you seem to have clear ideas of the mode of investigating their parts of fructification, we will proceed to the study of the specific characters, by which every individual is distinguished from others of the same genus.

Charles. I should expect to find the attainment of that knowledge difficult, if we had not so lately seen the power of Linneus in the discrimination of the *généra*.

Hortensf. In the part of botany, upon which we are now entering, we are even more obliged to Linneus for the order, that he has introduced, than in any other. He was the first, who began to form essential specific characters. Before his time there were no specific distinctions worthy of notice; from which deficiency arose great confusion. Now the knowledge of the species consists in some essential mark or character,

by which it alone may be distinguished from all other species of the same genus. These distinguishing characters are noted by Linneus after every individual of a genus, and this is called the specific description. To each species he has given a name appropriated to itself, which he has termed the *Trivial Name*. Sometimes this name expresses some quality of the plant, to which it belongs, but as frequently is arbitrary; and perhaps it would be better, that it was always so, as the names by which we distinguish the individuals of a family. You are all Montagues; but when I wish to make it known to which particular person I address myself, or speak of, I say, Charles or Harriet Montague, which makes me immediately understood: whereas, were I to say Montague with the dark brown, or Montague with the yellow curling hair, the person to whom I spoke would have these circumstances to recollect, and to consider whether they really existed.

Harr. Yet I think I could more easily remember a name, that gave me some idea, than one which had no particular signification.

Hortens. It may require some trouble at first

first to acquire the use of arbitrary names, but the advantage of them when acquired is every day demonstrated. Of this you cannot doubt, if you attend to the confusion occasioned in common conversation, by people who will not use the proper name of whatever they attempt to describe: they introduce all kind of circumstances to make themselves understood, and at the end of their endeavours leave the person, whom they would inform, in despair of ever acquiring any knowledge from their descriptions. Could the distinguishing mark of each plant be expressed by one word, and that word be used as the name for the individual, or what is called the trivial name, it would greatly facilitate the knowledge of plants; but this we cannot at present hope, though I have no doubt, that we shall see great improvement take place in this part of the Linnean system of botany, as well as in some others.

Harr. I promise to make use of the trivial names, as I acquire them, with as much assiduity as I have done of the generic ones, and all the botanic terms. I assure you, mamma, we make quite a point of using them.

Hortens.

Hortensf. I dare say you do ; and you will find the advantage of it, when you hear botanists converse, or study botanical descriptions. The excellence of the Lichfield translation is, that by acquiring the language of it, we cannot be at a loss, when we meet with accounts of plants given in latin ; whereas when the terms are attempted to be made more english, we cannot use them, except when conversing with an english botanist. When we began with the généric names, I pointed out this inconvenience to you ; the same objections occur against forming trivial names in our language, in preference to a literal translation of those given by Linneus. One or two instances will shew you what I mean. Out of six species of plantágo described in the botanical arrangements of british plants, there are only two, which have their trivial names translated, so that a student, who formed his language from that work, would find it almost equally difficult to understand a Linnean botanist, when he spoke of plantágo media (middle), or plantágo lancéolata (lanced), one being termed hoary, and the other rib-wort, as if he was ignorant of the science. Also rúmex pulcher, or beautiful, has

has the trivial name fiddle given to it; and *pulmonária officinális*, officinal, is called broad-leaved. Many more such false names could I enumerate, which are equally awkward and injurious to the science, and what every true botanist ought to avoid. I warn you strongly from the use of such terms, as I hear them not unfrequently defended, as being easy to acquire; but such defenders are too idle to think much on the subject, and of course are little aware of the narrow extent to which their botanical knowledge can carry them, if founded only on the language of their own country, and of the plants contained in it.

Henry. Mrs. Pratt always make Juliette and me call every thing by its proper name, and will not understand us, if we do not.

Hortens. She is quite right. We will now consider from what circumstances Linneus has taken his specific descriptions: he lays it down as a fundamental rule, that they are to be formed from such parts of plants, as are not subject to variation; great inconvenience having arisen from the want of observance of this rule among former botanists; every variety being ranked by them as a distinct species.

species. Colour is decidedly one of the least permanent characters to be found in plants, consequently not to be admitted into the specific character; however I must acknowledge, that in contradiction to more than one of his own rules, Linneus has made use of colour, and other variable properties in plants, to distinguish them individually one from another.

Harr. Though, mamma, you always defend Linneus, you never scruple to acknowledge his faults.

Hortens. Not to do so would be a very dishonest conduct. Besides that, we never injure our friends so much, as when we weakly defend them; a candid acknowledgment of both our own faults, and of theirs, is the best method of disarming severity, when we are obliged to bring them forward. I wish to prepare you for the flippant attacks, which you will meet with on this great man, both in books and society: besides that, if I omitted to point out to you the defects of his system, I should in many respects mislead you. In treating of the errors into which botanists have fallen, among other excuses, he mentions the shortness of human life, than
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which there cannot be a better apology for his own failures. Such a system, as he has formed, is too great to allow of being brought to perfection in the short period which one man can be said to live, if we subtract from his date infancy and old age.

Charles. We are all obliged to you, ma'am, for always having guarded us against violently praising, or censuring any body; and when I feel myself inclined to do either, I am checked by the recollection of your kind admonitions. I am very desirous to enter further into the subject of specific differences.

Hortens. Linneus esteemed the root of plants a true specific mark, but from the difficulty of obtaining a sight of it has never made use of that part as such, if any other, equally permanent and more obvious could be found. The trunk and stalks of vegetables in many instances afford such essential differences, that they serve to ascertain the species beyond a doubt. In the genus *hypêricum*, three of the species are accurately distinguished by their stems being round, two-edged, and square. The different kinds of inflorescence and fulcra furnish also permanent marks. Linneus has too made use of parts
of

of the fructification for the purpose of discriminating the species, which is done with good effect in many instances, though certainly in a few cases, in contradiction to the principle, on which the classes are founded, if considered with strictness, as in some of the grasses; but where the characteristic mark of either class or order are not interfered with, the parts of fructification form obvious and agreeable marks of specific distinction, as in some of the *hypéricums*, the species are distinguished by their number of styles; and in *gentiána*, the form and division of the corols afford an obvious and permanent difference, which cannot be mistaken by the most superficial observer.

Jul. I know three or four species of *gentiána* by the divisions and forms of their corols. I wish all plants were as easy to be distinguished.

Hortensf. Many of them are, though others are difficult to ascertain. Before you can hope to arrive at a ready discrimination of them, you must study leaves under all their various forms. It is from leaves that the most elegant and natural specific distinctions are taken. Nature delights in variety in none
of

of her works more than in that of leaves. The different sorts are exceedingly numerous, and ought to be attentively studied by every pupil in botany. In the present part of the subject, we are to consider them only as marks of distinction, by which the individuals of a genus are known from each other. Their use and formation belong to another part of our study.

Harr. I admire leaves so much, that I am sure I shall have great pleasure in studying the various kinds.

Hortensf. We must take them methodically, and shall then find them not difficult to understand, with the assistance of the plates, and botanical terms, and definitions given at the beginning of the system of vegetables. We are first to consider the form of leaves, by which you are to understand their external structure. Respecting their form, they are divided into simple and compound leaves. Simple leaves are those, which have only a single leaf on a petiole, or foot-stalk. These simple leaves may differ in respect to many circumstances, but they are still simple, if the divisions, however deep, do not reach to the mid-rib. There are sixty-two ways in
which

which a simple leaf may be diversified, all of which you must study with the plates, and the terms of explanation annexed to them. The genius of Linneus is more conspicuous in this part of his subject, than even in any other. He has formed a language, which in the most concise expressive manner possible depicts such a variety of forms of leaves, fruits, flowers, stems, and seeds, as no other was ever before made to describe. The introduction of these excellent terms to english botanists we owe to the Lichfield translators of Linneus's works. I have requested Mr. Wilson, Charles, to read with you the preface and advertisement prefixed to the translated system of vegetables: I shall read them with Harriet, and you may both receive much information from them.

Charles. Thank you, ma'am. It will require a great degree of practice to get acquainted with that amazing variety of form in the simple leaves, in many of them too there appears to be so very little difference.

Hortens. Attention and habit will make them familiar to you. I must enter a little further into the Linnean language as applied to the species of plants, and then you will

will soon understand it without much difficulty. He has taken words expressive of well known figures, as the words oblong and egg, which simply used signify that the leaf or seed is one of those forms; by compounding those words a form between both is expressed; if it partake most of the oblong, that word precedes the egg, and contrariwise; so that the two words, oblong and egg, are made to represent forms of four kinds very nearly allied. Thus has Linneus compounded all the different forms under which leaves can appear; and by having done so has been able in a few words to present before our eyes the essential specific characters of a variety of plants; which by other authors are described with so little precision, and so diffusely, that we are bewildered by the innumerable distinctions, to which we have to attend.

Harr. I now understand the merit of this, since I have profited by it in the generic descriptions. The difficulty will be to attain a precise idea of these forms.

Hortensf. You must begin by comparing the natural leaves with their forms given in

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the plates. The leaves of daisie (*béllis*) are oblong, those of beech (*fáguſ filvatica*), and pepper-mint, (*méntha piperita*), egg-form, of violet heart-form, roſemary, *roſmarinus officinalis*, and *crócuſ*, linear; or every where of an equal breadth. When you have well ſtudied the ſimple forms, you muſt then endeavour to underſtand thoſe, which are compounded from them; and by drawing compound the forms yourſelves, till they become familiar to you. *Pulmonária officinalis*, commonly called jeruſalem cowſlip, has its radical, or root leaves, of the form betwixt egg and heart; in expreſſing which, and the reſt of the compound forms, the Lichfield tranſlators have moſt happily imitated the conciſeneſs of their author; and in their language you will find the terms, egg-hearted, heart-lanced, uſed inſtead of between-egg and heart-ſhape, heart and lance-ſhape, and ſo of them all. The term arrowed is uſed for arrow-ſhape; lyred for lyre-ſhape; twoed, or threed, for growing two together, or three together: indeed inſtances occur ſo frequently of the agreeable conciſeneſs, with which the language of the tranſlated System

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of Vegetables is formed, that it would be difficult to enumerate them all : it is a work of the highest value to an english botanist.

Henry. I do not think the language odd now ; but it did seem very strange, when first we began to learn it in the générique descriptions.

Hortensf. So it is in every thing, with which we are not acquainted. I think you understand the outline of the forms that you may expect to find in leaves, both in their simple and compound characters, well enough to enable you to begin the study of them. We will now consider, what circumstances constitute a compound leaf. I have shewn you in speaking of simple leaves, that they continue to be so denominated, be their divisions ever so deep, provided those divisions do not extend to the mid-rib ; but when that takes place, the leaf becomes compound ; so that it is in fact a small branch composed of a number of individual leaves, which separate leaves are frequently furnished with each a petiole, uniting them to the common petiole, or foot-stalk ; which, running through the whole, is called the mid-rib. In some instances it may not to a young botanist be

very easy to distinguish a compound leaf from a branch ; but there are two rules, by which they may always be known asunder ; 1st, buds are never found at the base of the lobes, or divisions of a compound leaf, but are formed in the angle made by the whole with the stem, from which it issues ; 2dly, the branches of woody plants continue, after the leaves are fallen : this never happens with a compound leaf ; for, however nearly the common foot-stalk, from which it is formed, may resemble the other in appearance, it always falls off, either with or after the leaves it supports.

Charles. Pray, ma'am, are not the leaves of the robínia pseud-acácia compound ? I observed them last autumn, as they decayed : the common petiole continued some time after the leaves were dropped from it ; and there was a very small hairy bud at its base.

Hortensf. The leaves of robínia, rose acácia, afford a good example of the compound character, and also of the two rules, that I have just now mentioned to you. There are three kinds of compound leaves, the compounded, decompounded, and super-decompounded. The first I have explained to you, though
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there be but two divisions from the same common petiole, it is a compound leaf. The terms decomposed, and super-decomposed, are applied to different modifications of the compound leaf; and again these modifications admit of such a variety of others, which are distinguished each by an appropriate term, that nothing but practice, and the method I recommended in regard to the study of simple leaves, can bring you acquainted with them.

Harr. I will no longer say I am afraid of the difficulties, which occur in our study, since, mamma, you have shewn me, that such fear arises from idleness.

Hortensf. You are very right. Whatever has idleness for its source, we ought to be ashamed of, as it is much in our own power to get the better of it. The feathered, footed, winged, paired, are all different forms of the compound leaf; so is the fingered, of which you have an example in the horse-chestnut, *æsculus hippocastanum*, and lupine, *lupinus*; as these various modes frequently enter into, if not entirely form the specific character of plants, it is necessary they should be well understood. But, before you attempt the compound leaves,

I advise you to become perfectly acquainted with the different forms, which exist in the simple leaves ; as the form of the single leaves, of which the compound leaf consists, is a circumstance generally noted. The System of Vegetables, methodically studied, will carry you through this difficult part of botany ; or, if sometimes you are perplexed, an explanation of the same terms in other books will be of service to you, as you will probably find different words used, which may elucidate the point on which you are in doubt.

Charles. I will acknowledge, ma'am, that, till you shewed me the method of studying the System of Vegetables, I have thought it perfectly unintelligible, when I happened to look into it, as it lay on your table.

Hortens. I am not surpris'd at this ; its excellence can only be understood when studied ; if taken up as a book to read, it must appear a confused jargon ; and such I have frequently heard it called ; but I have convinced several people of the contrary, who, when they were capable of understanding it, have thought as highly of its merits, as I do. To teach botany from any other book is like teaching latin with english on the opposite page ; the lan-
guage

guage is never completely understood, though sometimes, when judiciously used, such an assistance may be advantageous ; so in botany advantage may be reaped from the more diffuse explanations of other authors.

Harr. I remember every thing, that I learn from the System of Vegetables ; and now the parts, I have learnt, are quite easy to me ; and sometimes Charles hides the english descriptions in the London Flora, and I can make out the latin ones very tolerably. When we understand the specific differences of plants, I shall wish, I could read the species plantarum.

Hortensf. You may with little trouble learn a sufficient quantity of latin to enable you to do so ; and, as all your other studies are so well attended to, I shall have no objection to it next spring, if the desire then continues.

Harr. Thank you, ma'am ; I promise you it shall not interfere with any more useful occupation ; and I have no doubt of the desire being still stronger, as my knowledge of botany increases.

Hortensf. We are now to consider some other circumstances relative to leaves, which it is equally essential to understand as those, of which we have been treating : these are the

determination, or disposition of leaves, which comprehend four particulars alike belonging to the simple and compound kind, the *place*, *situation*, *direction*, and *insertion*. By the place, we are to understand the particular part of the plant, to which the leaf is attached. Situation regards the respective position of leaves one to the other : so leaves are called alternate, when they come out singly, and are ranged gradually on both sides of the stem, as in ivy toad-flax, antirrhinum cymbalaria ; or opposite, when they come out in pairs, as in myrtle, myrtus, and many other plants. These two circumstances of leaves being alternate, or opposite, furnish constant and invariable characters, which are generally found in plants of the same genus, or even of the same natural order. Direction contains the different ways, in which a leaf bends from its stem, the various modes of its doing so are arranged under the general term direction, and must be studied to be understood. Insertion comprizes the diversity of manner, by which leaves may be attached to their parent plants, each of which has an appropriate term, briefly and expressively explained in the botanic terms and definitions at the beginning of the System
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of Vegetables, with plates at the end of each volume to illustrate them. I have now only to speak of such flowers, as are commonly called double ; to enter far into an account of them belongs rather to the natural history of plants, than to that part of the science, which ought to engage the attention of a pupil in the beginning of his studies. It will be sufficient to acquaint you with the unnatural varieties, under which flowers appear, that you may not be misled by the monstrous forms, they frequently assume, to look for a genus, where there is only a sportive variety.

Henry. You told me, mamma, that double flowers were monsters, like calves with two heads, or hands with six fingers. I one day told the gardener so, and he was very angry.

Hortensf. That was because he did not perfectly understand the word monster, which strictly means only a deviation from the common mode of nature's productions ; and thence may sometimes imply an increase of beauty, as at others a departure from it. Double flowers are the pride of a florist, as they manifest the art of culture ; many of them being formed by over luxuriancy of nourishment. Gardeners imagine, that by
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placing a double stock-flower near a single one, they can thereby procure such seed as will again produce double flowers : but that this is a vulgar error, a very slight knowledge of botany may convince us ; for, when a flower is completely double, it is deprived of its stamens, which commonly expand into petals ; by which transformation the flower no longer possesses the anther-dust, or essential part to the fertilization of seeds. There are various ways, in which vegetable monsters are formed, most of which generally exclude all, or part of the stamens. The unchangeable parts of double flowers are the calyx, and the lower row of petals, by which the genus may be often discovered. Some flowers are only half-double ; in which case the stamens and pistils often remain perfect, and hence produce fruit. This happens in the double peach, the fertility of which is sometimes brought as an objection to the Linnean system.

Fuliette. What do you call the rose in rose polyanthos, mamma ? Is that a double flower ?

Hortensf. It is one kind of the double, or multiplied flowers, and is termed proliforous ; of this sort is the *béllis prolífera*, hen

and chicken daisy ; this is one of the most curious of vegetable monsters, as well as the most beautiful, *Plantago rosea*, or rose plantain, is wonderfully disguised by its bracts becoming enlarged, and being converted into leaves. Many flowers become double by the multiplication of their nectaries, and in so many various ways, that it would at present engage us too long to enumerate them. I will, at a proper time, read to you some parts of a translation of Linneus's philosophy of botany by Mr. Rose, which will give you information on different parts of the subject, for which you are not yet ready.

Harr. I have often looked for the stamens in a provence rose, and could not discover them.

Hortensf. The petals are so profusely multiplied, that they have entirely excluded them. In some other roses, you will find stamens, though the flower has a luxuriance of petals, as in damask rose. The many-petalled flowers are the most subject to multiplication. The one-petalled rarely go beyond a double corol, which is very often seen in them. The compound flowers also are liable to become double ; and their beauty is often improved
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by it ; as daisie, béllis, sneez-wort, achilléa, and chrysanthemum sílphium ; but, if we except a few instances, I think single flowers are much to be preferred to double ones.

Harr. Roses, stocks, and hyacinths, are much improved by being double ; do not you think so, mamma ?

Hortensf. The two first undoubtedly, and often the last. Besides the varieties occasioned by multiplication, there are others arising from many accidental causes ; but the most general cause may be esteemed culture : it is from the gardener's art, that we receive so many delicious fruits and vegetables for our tables ; culture too is the test, whether a plant be a true species, or a variety. By a change of soil we can produce the most valuable varieties, or oblige them to return to their original form ; by refusing them our nourishing care. The ingenuity and industry of mankind is not seen in any thing more conspicuously than in his culture of corn, which, without the science of agriculture, would be of small value ; with it, we must esteem it the first blessing of life. Botanists are careful to distinguish between varieties obtained from seed, and the genuine species, from which they deviate. Such plants

you

you will not find noted in the System of Vegetables, which contains only the généra, and the permanent species : in the Species Plantarum, the varieties are distinguished by a capital B being placed immediately before the descriptions of them. What I explained to you respecting the changes, which take place in the fructification of plants, is equally applicable to leaves, and to every other part of them; by which they are frequently so metamorphosed, that it requires no small degree of botanical knowledge to ascertain the real plant. Many of these appearances may be effected by art, and have been so by the curious, in order to discover the true cause of such deformities, or of diseases, which are found destructive of vegetation.

Harr. That will be the last part of botany, I shall be desirous of investigating.

Hortensf. Those studies are certainly the most agreeable, which lead to the discovery of beauties, rather than of defects. No science can be more productive of such discoveries than botany. You have now gone through the various parts of the Linnean system, and may be said to understand it well in the outline. The remainder of the summer will afford
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DIRECTIONS TO THE BINDER.

Please to place the Plates with their Explanations, facing each other, the Explanations on the Left of the Plates, according to the following Directions :

PART I.

PLATES I. and II.	to face Page	28.
III.	- -	60.
IV.	- -	120.
V.	(No Explanation.)	128.
VI.	(Ditto.)	141.

PART II.

PLATE I.	to face Page	218.
II. and III.	- -	240.
IV.	- - -	282.
V.	- - a	306.