Botanical dialogues, between Hortensia and her four children, Charles, Harriet, Juliette and Henry / Designed for the use of schools. By a lady [i.e. Miss M.E. Jacson].

Contributors

Henry, Mary Jackson. Lady.

Publication/Creation

London : Printed for J. Johnson, 1797.

Persistent URL

https://wellcomecollection.org/works/ddyt37bp

License and attribution

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

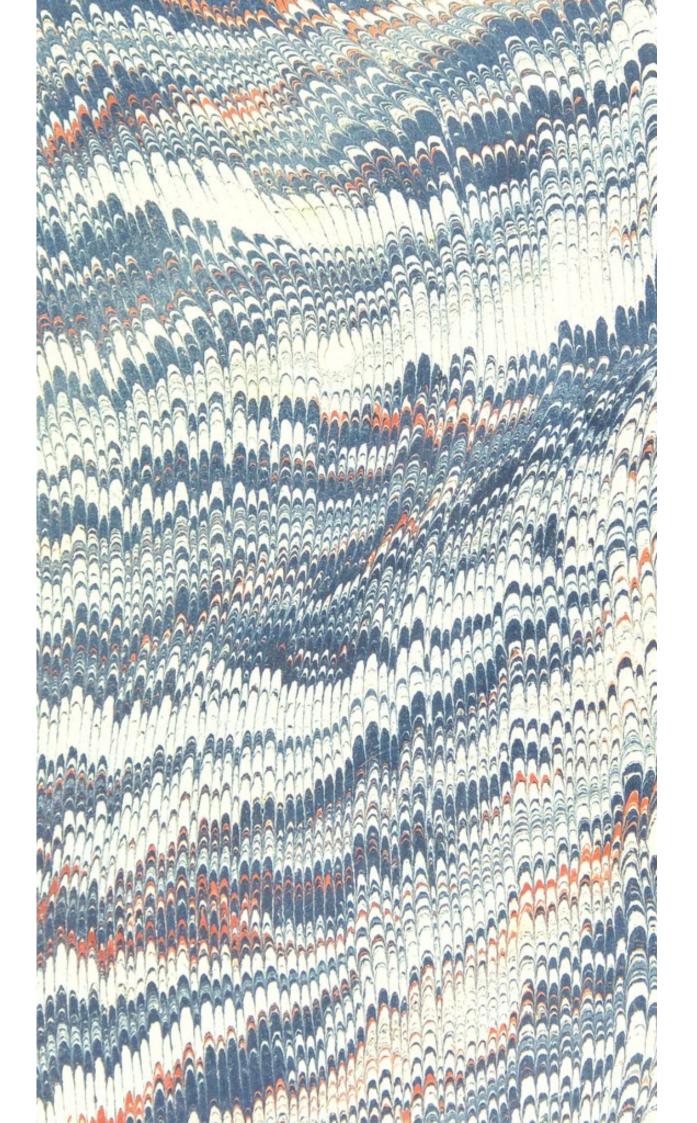
You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection 183 Euston Road London NW1 2BE UK T +44 (0)20 7611 8722 E library@wellcomecollection.org https://wellcomecollection.org





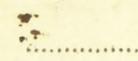


30,079/B By Mrs. Maria Elizabeth Jackson





BOTANICAL DIALOGUES.



[PRICE 75.6d. IN BOARD'S.]

Digitized by the Internet Archive in 2016 with funding from Wellcome Library

https://archive.org/details/b28762514

BOTANICAL DIALOGUES,

BETWEEN

HORTENSIA AND HER FOUR CHILDREN,

CHARLES, HARRIET, JULIETTE AND HENRY.

DESIGNED

FOR THE USE OF SCHOOLS,

BY A LADY.

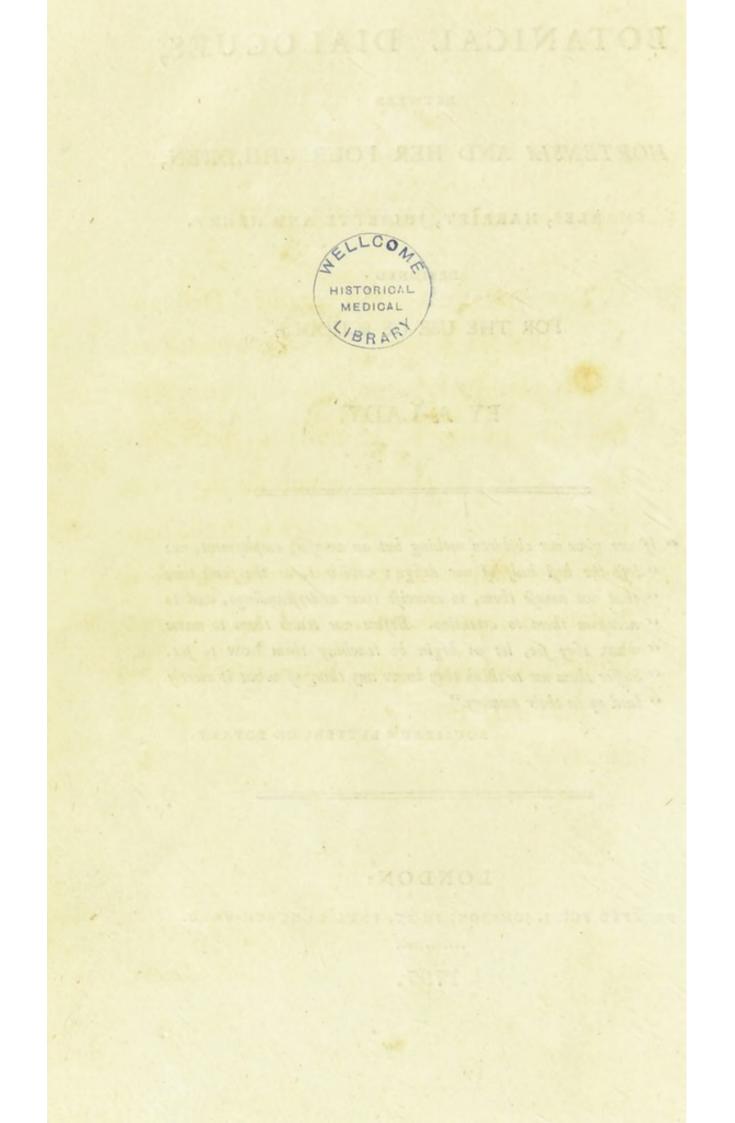
If we give our children nothing but an amufing employment, we consider the best half of our design; which is, at the same time that we amuse them, to exercise their understandings, and to accustom them to attention. Before we teach them to name what they see, let us begin by teaching them how to see.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

ROUSSEAU'S LETTERS ON BOTANY.

LONDON:

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

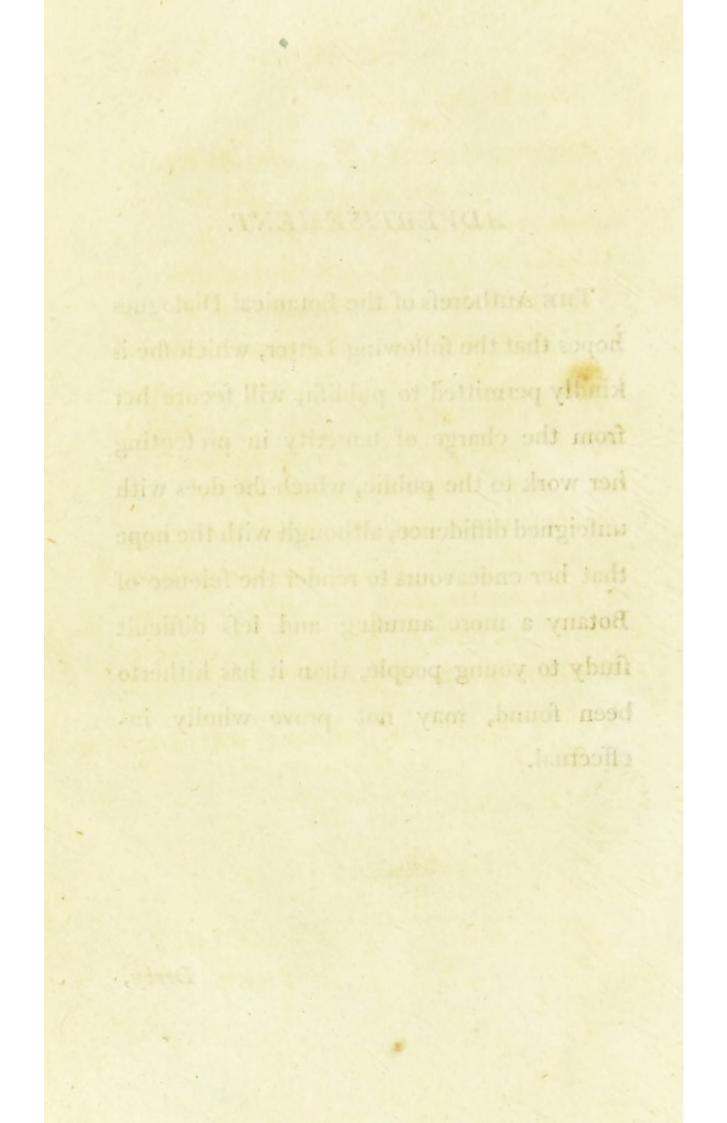
1797.



ADVERTISEMENT.

THE Authorefs of the Botanical Dialogues hopes that the following Letter, which fhe is kindly permitted to publifh, will fecure her from the charge of temerity in prefenting her work to the public, which fhe does with unfeigned diffidence, although with the hope that her endeavours to render the fcience of Botany a more amufing and lefs difficult ftudy to young people, than it has hitherto been found, may not prove wholly ineffectual.

Derby,



Derby, Aug. 24, 1795.

Dear Madam,

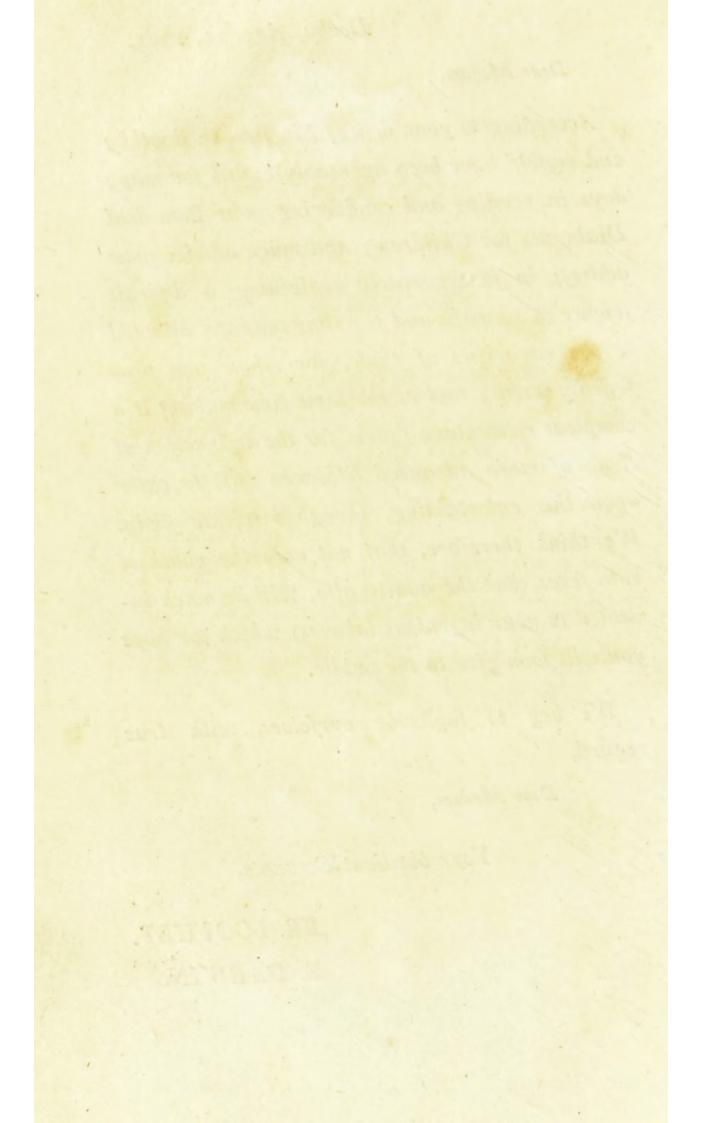
According to your defire, Sir Brooke Boothby and myfelf have been agreeably bufied for many days in reading and confidering your Botanical Dialogues for Children; and much admire your addrefs in fo accurately explaining a difficult fcience in an eafy and familiar manner, adapted to the capacities of thofe, for whom you profeffedly write; and at the fame time making it a compleat elementary fystem 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 fexes, but the adults alfo, will be much indebted to your ingenious labours, which we hope you will foon give to the public.

We beg to fubscribe 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 ift, Introduction. 2d, Rudiments of a science or language neceffary to be underftood before much proficiency can be made in either. 3, Explanation of Linneus's fystem. 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 itfelf; an agreeable study. 6, Term Fructification explained; all parts of it not effential to the product of perfect feed; feven parts of Fructification. Calyx, feven different kinds. 7, Fool's Parsley diffinguished from all other known umbelled plants. Different kinds of Calyx explained. 8, Male Bloom of Willow, called Yellow Goflings by children. Red Taffel on Hazle Trees the Female Bloom. 9, Spathe explained. Spathe of Narciffus resembles Indian paper. Calyptre, the Calyx of Moss beautifully shewn in Mr. Curtis's London Flora. 10, The fludy of Nature affords amufement at all feafons of the year, improves the mind. Volve the Calyx of Fungules. 11, Corol explained, its leaves called petals. Marks by which the different kinds of Corol are diffinguished. Polyanthos a one-petalled Corol. Method of knowing a one-petalled Corol from a Corol of many Petals. 12, Génera of Plants distinguished by the form and position of their Petals. Seven different formed Corols. 13, Refemblance of the Corol b

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 effential part of Fructification, confifts of three parts. Anther, wrongly called the Seed, explained. 15, Nature has provided for the fecurity of the Dust. On its prefervation depends the continuation of the species. Wet injurious to the Anther-dust. Supposition of the Anther-dust being preferved from injury by a waxy fubstance furrounding it, erroneous. Mr. John Hunter's experiments prove that the Anther-dust is not Wax. Collected by Bees for Food to the Bee-maggots. Piftil of equal importance with the Stamen; confifts of three parts. 16, Anther and Stigma, in botanical language, conftitute a Flower ; essential to the production of Fruit-late investigations feem to make the Nectary an effential 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-veffel of ' Touch me not' burfting. Two kinds of Silique explained. 19, Diffinction between the Silique kind of Seed-veffel 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 fystem of Lynneus few. 21, Strobile, the Strobiles of Larch beautiful, commonly called Firapples. 22, Seed, definition of it. Seed confifts of three parts. Young plants supported in a fimilar manner to young animals. By foaking a Bean in Water, the three parts of the Seed may be well feen. 23, Young Plants perifh, 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 difpersion of Seeds. Muslin made from Cotton. Cotton

VIII

THE FIRST PART.

Cotton the foft Cradle of Seeds, as Silk is that of Infects. Aril, 24, that part which furrounds the Seed within its Veffel, may be feen in Fraxinella, Wood-forrel, and Spindle Tree. Dispersion of Seeds. 25, Beauty of the Seed of Feathergrafs; most curious of the Flying Seeds. Tillandfia, a parafite Plant, manner in which its feeds are conveyed fimilar to the migration of Spiders. 26, Beautiful lines in the Botanic Garden, on the migration of the feeds 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 diffeminating fome kind of feeds. 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 diflodged 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 Syngenefia, 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 diffinguished by that peculiarity. Hollow protuberance at the base of the Petals of Ranúnculus, the Nectary. 32, The effential Mark of that Genus, conftant, even in the double Flowers. Flowers more eafily to be diffinguished 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 diffinguished; rule given by Linneus for diffinguishing them;

1%

bz

them; his transgreffion 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 fummit of the Stigma fits it to receive the Anther-duft. Germ, the term for the immature Seed-vessel; Pericarp, for that which is mature. 37, Only fix 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 fhew the Stigma and Germ without a Style. Great encrease of plants from Seed. Beauty of Seeds; 39, Great variety in the fize, shape, and furface 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, Diffinction 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 Planetree add to its beauty in fpring. Weak Plants generally furnished with Tendrils. All climbing Plants injurious to the. Trees which fupport them. 43, Dodder feems intended by Nature to draw nourifhment from other vegetables. By its growth, ftrangles the Plant by which it was fostered. 44, Few inftances of this in the Vegetable Kingdom. The injury fuftained by the fupporting Plant generally fmall. Orobánche 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 fevere 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 refembles it; 49, Eafily found on heaths by the red colour of its Scape, a particular kind of Flower-stalk. Inleaves. florescence, 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 fystem. 53, Philosophical pursuits prefervative from idle company. 54, The fludy 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. Thyrse and Raceme 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 imprefling what is taught, upon the memory. 60, The art of making learning agreeable; the more deeply the fludy of Botany is entered into, the more pleafing it will be found.

DIALOGUE THE THIRD. From Page 61 to 87.

62, Botanical names ought to be acquired as foon as poffible; great confusion arising from the neglect of them. 63, Many objections against an English Nomenclature. 64, Instance of the aukwardness of the attempt to establish English Géneric 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.

xì

66,

b 3

66, Explanation of the term Clafs, may be compared to z Dictionary. Characteristic mark of a Class arbitrary. On the number and fituation of the Stamens; the Claffes of Linneus founded; 67 what conftitutes a natural Clafs; most of the Classes of the Linnean fystem artificial; their being fo of little consequence; the great advantages of his fystem. 68, Labours of many ingenious Botanists of little use from want of arrangement. Much useful knowledge of the ancients loft to the world from their ignorance of the fcience of Botany. Dr. Grew's book very informing. His opinion of the use of the parts of Fructification 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 fcientific terms of Botany. 71, The translated System of Vegetables found difficult from not being properly studied. 72, Ten first Classes diftinguished by their number only. 73, Eleven Stamens not found fufficiently conftant to form a Clafs. Titles of the last three Numerical Classes would mislead if they were not explained. 74, Linneus aware of the defect in the titles. Diffinctions of the class Icofandria and Polyandria necessary to be attended to. 75, Fruits belonging to Icofandria have their Calyx remaining when ripe, like a little crown on their fummit. Great number of Stamens in the class Polyandria. 76, Classes eafily underftood, 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 Piftils within the fame cover. Effential Character of the Eleventh Class. Effential Character of the Twelfth and Thirteenth Claffes. 78, Attention to minute circumstances in the position of the parts of Fructification necessary in the fludy of Botany. 79, Character

of

xii

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 fimilar in their appear-80, Clafs Tetradynamia or Four-powers explained, ance. a really natural Class; no exception to this, except the Genus Cléome. Divided into two orders from the form of the Seed-veffels. 81, A good deal of variety in the form of the Silicle. Two divisions of the Silicle Order. Seedvessel of Lady Smock, a Silique. 82, Class Monadelphia or One-brotherhood explained; beauty of the polition of the Stamens and Piftils of this class; peculiar structure of the Anthers. Stamens and Piftils of China Rofe particularly beautiful. 83, Orders of the Class Monadelphia founded on the number of Stamens in each Flower. Clafs Diadelphia or Two-brotherhoods perfectly natural. Peculiar Structure of the Flowers belonging to it. Claffic character difficult to be traced. 84, Genus Sophóra feparated from the Twobrotherhood Clafs, from its Stamens being not united in two fets; the Orders founded on the number, only, of Stamens; each part of the Corol diffinguished by different names. Shape, &c. of these parts of use in marking the Génera, 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 Clafs. The Orders of Polyadelphia depend on the number of Anthers in each Flower. 86, Anthers and Stigmas the effential parts of the Stamens and Piftils. The Classes 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 Graffes too difficult for young botanists; b 4 should

should be studied by themselves; best time of examining flowers, when their Stamens are ready to burft forth; number of Anthers not eafily diffinguished 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 botanifts; its Fructification cannot be accurately examined without taking the root out of the earth. Stamens of Plantago, (Plaintain) curioufly 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 fame Plant should be examined. Umbelled Plants not proper fubjects to begin with. Large Flowers of fimple construction should be first examined. 94, Parfley (Apium) belongs to the class Pentandria. Advantages derived from the art of gardening. Only two species of Apium. Celery procured from a fpecies of Apium by cultivation. 95, Specimens of Plants belonging to different classes. Class Enneandria (nine Stamens) contains only fix 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 Piftils. Lythrum subject to vary in its number of Stamens; neceffity of examining many Flowers of the fame genus. 97, Examination of Euphórbia deferred till the Génera of Flowers are begun with. Marks of the twelfth and thirteenth Claffes. Specimens of different Classes and Orders, not depending on the number of

xiv

of Stamens. Seed-vessel of Snap Dragon a Capsule; 98, Cause of its peculiar appearance. Seed-vessel of Draba (Whitlow Grafs) a Silicle. Seed-vessel of Hésperis (Purple Rocket) a Silique. Many Plants of the class Tetradynamia, Four-powers, eaten, fome without cookery; variety of eatable plants from the genus Braffica. 99, Change produced in plants by the art of gardening an amufing part of the fludy of botany. Specimens of the clafs Monadelphia, One-brotherhood. Stamens firmly united at the bafe. 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 Citrus, comprizes Orange, Lemon and Citron. Different appearance of their Stamens to those of Hypéricum. 102, Explanation of the class Syngenéfia, or United Anthers, explained. Elasticity of the Filaments in the Flowers of this clafs; confifts of the Compound Flowers; natural, if a few Génera be excepted; this exception a fault in the fystem. 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 fimple. Perhaps from that circumstance ought to have been feparated 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 alfo to his predecessors. Tournefort's fystem 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 Tetrandria, Four-ftamens. Marked diftinctions

tinctions between them. Scabious, a specimen of an Aggregate Flower. 107, Specimens of the orders of the clafs United Anthers should be studied according to their orders. 108, Florets of the fourth order having Stamens and Piftils not the only circumstance to be attended to. Having feeds or not, the effential character of the fourth order. Globe Thiftle (Echinops) like net-work. 109, Difference in the Stigmas of Violet and Panfie. Jasione cannot belong to an order of Simple Flowers; its Anthers united only at the bafe; 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 feeds 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 feeds furnished with a Pappus. Extraordinary structure of the Flowers of the class Gynandria; its effential character. The Piftil must be first attended to. Contains nine orders, founded on the number of Stamens. First order natural. 112, Structure of the Fructification explained. Refemblance of the Flowers of the first order to infects; fanciful names given them. Ophrys genus contains feveral fpecies refembling infects. Nectary, the principal feature in their different forms. 113, Bee Ophrys (Cypripedium) has its name from its refemblance to a flipper. 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 fummer. Plants growing commonly on the hedge-banks fhould be well understood. Explanation of the class Monoecia, or One-house. 115, Orders founded on the number, union, and fituation of the Stamens. Eleven orders of the class Onehouse. Names by which they are diffinguished. Effential character of the first twenty classes. Description of the true Nutmeg, Myristica, first given by Dr. Thunberg. 116, Nutmeg

xvi

Nutmeg ufed in cookery the feed of the plant. Mace the material by which the feed is enclofed within the outer hufk. Clafs Dioecia, Two-houfes, explained. Flowers of Vallifnéria thought to be a flrong argument for the fenfation of plants. Hemp, Cánnabis, and Willow, Salix, belong to the clafs Two-houfes; contains fifteen orders founded on the number, union, and fituation of the Stamens. Contradictions in the fyftem of Linneus; 117, A removal of its defects may be expected from the liberal fpirit of the prefent age. Mifletoe, Vifcum Album, a parafitical plant. Can be propagated only by one method; curious manner of the feed germinating. 118, Superflitious regard paid to it in the time of the Druids; believed of great efficacy in epileptic cafes; not peculiar to the oak; difregarded now as a medicine; fill hung up in our kitchens at Chriftmas.

DIALOGUE THE FIFTH. From Page 121 to 157.

Page 121, Explanation of the clais Polygamia. Many plants of this clafs difperfed into the claffes Monoecia and Dioecia. 122, Difficulty of afcertaining by what manner the Anther-dust of the Fig, Ficus Carica, was conveyed to the Stigmas of the Piftils. Fruit of the Fig a Receptacle enclosing the Stamens and Pistils. Fertilization of its feed fupposed to be effected by the intervention of a Gnat. Procels 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 feeds. 124, Caprification effeemed by many authors a firong argument for the fystem of Linneus. First doubted of by

XVII

the

the author of the Botanical Garden : his conjecture concerning it. Apples wounded by worms ripen fooner than others which are not fo. Fig-trees of Malta bear two crops in the fame seafon; last crop ripened by Caprification. Figs of Provence and Paris ripen fooner by being wounded with a itraw. 125, Probable that the fecond 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 fcanty, 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. Infide of a Fig beautiful. Anther-dust may be seen in the Figs cultivated in England, if opened when they gape at top. 127, Clafs Cryptogamia explained; confifts of four orders. The fystem of Linneus may have retarded a more diffinct knowledge of this class. Definition of Ferns. 128, Leaf of Fern termed by Linneus a Frond. Curious mechanism of the feed 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 (Ptéris 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 Génera are marked. Their feeds have no Cotylédons. Linneus doubted whether what he termed the Anthers were really fo. Dillenius the first who attempted the arrangement of the Mosses. Many curious circumstances belonging to the tribe of Moss; 131, Recover their verdure on being moistened, after having been long dried. Fructification of the Alga, Flags, too obfcure to admit of precife arrangement; two divisions of them. Terrestial and Aquatic, their

xviii

their Génera distinguished by the outer structure. Many curious and ufeful 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. ufed in dying. A fpecies of Ulva ufed for food by the Japanefe ; 133, Some kinds used for pickles in England. Curious structure of some of the Aquatic Algæ. Conférva Ægagróphila, Vagabunda, and Fúcus Natans, itinerant vegetables. Byffus Flos-aquæ, floats on the fea all day and finks at night. 134, Conférva Polymórpha, lines upon it in the Botanic Garden; grows on the British shores. Last order of Cryptogamia confifts of the Fungufes, Fungi, divided by Linneus after the method of Dillenius. Method of Dillenius explained. Fungus tribe divided into ten Génera. Funguses produced from feed ; 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 inveftigations valuable on this fubject. 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 Monfieur Trembley. Hydra, the Linnean name of the Polypi genus. Reproduction of Plants from Strings and Suckers, fimilar to the encrease of Polypi. 138, Regularity essential to obtaining clear ideas of any fubject. Information to be gained of the class Cryptogamia very small. Parts of Fructification not only to be confidered. 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 preferving Fungules an impediment to the investigation of them; method of preferving them lately difcovered. Mr. Bolton's plates and hiftory of Fungufes, with the drawings of other botanifts,

botanists, must be studied by those who wish to acquire & knowledge of the Fungus tribe. 140, Star-jelly not a vegetable. Account of Star-jelly, Tremélla Noftoc, from the Botanic Garden. Extraordinary structure of Lycoperdon Fornicatum. 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 Fructification 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, Phenix Dactylifera, Palms. Anther-dust of Date-tree, and Piftácia, faid to retain its virtues more than a year. Great height of Corypha Umbraculifera. 143, Erroneoufly named Cabbage-tree. True Cabbage Palm, Aréca Oleracea, 144, Ufed by the inhabitants of the Weft Indies as a rarity; fent pickled to Europe as fuch. Cutting away the Cabbage-fhoot deftroys the tree. 145, Cabbage obtained from most of the Palms. Breadfruit-tree, Artocarpus 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 difhes 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 leaft fort without feeds, the larger produce great numbers of feeds; fize of the feeds; 147, Several varieties of the Artocarpus in the South-Sea ifles, all without feeds; this deficiency attributed by Mr. Foster to the effects of cultivation. The Bread-fruit-tree of Ceylon inppofed to be of the fame genus with that of Otaheitee. 3

XX

Otaheitee. 147, Seeds of the Bread-fruit of great value; saten by the rich; prepared in different ways; eaten plain roafted by the poor; fimple 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 Bânana, 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 feeds by cultivation. 149, Leaves of Banana made use of for shade in warm climates. Cocoa-nut-tree deferves a place in the first rank amongft the vegetables which are useful to mankind. Leaves of Borafius Flabelliformis, and Licuála Spinofa, ufed by the inhabitants of Ceylon, in the flate in which they grow, for writing upon. Ingenious method of writing upon them; books made of them. Leaves of Licuala used for umbrellas; fix perfons 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 fuch 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 fociety from the exertion of them. A life really favage must be diftinguifhedfrom what is commonly called fo. Dr. Franklin's effay on that fubject. 153, Man derives his fuperiority over brutes from laws. The greater portion of voluntary power possesfield by mankind one of their chief diffinctions; the more fuch power is exerted the more they rife above the brute creation. Digreffing from the fubject under confideration to one that arifes out of it teaches to think. A blackfmith's fhop fhews the use of the knowledge of fire. 154, Children should be led

ANALYSIS.

led to reflect on caufes of the effects which are daily prefented to their view. Iron, a vegetable production; may be found in plants by a loadstone. Happiness may be encreased by knowledge. Writing-paper produced from flax; blottingpaper 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 hardnefs. Superiority of the European world over that of America thought to arife 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 Plantárum. 156, Natural method attempted by many botanists not without fuccefs. Merit of artificial fyftems generally allowed. Opinion of Linneus concerning natural fystems. Fifty-eight natural orders of Linneus. These orders well explained in Mr. Milne's Botanical Dictionary. 157, Artificial fystem must first be learnt. Order in which a young botanist ought to proceed.

xxii

ANALYSIS

ANALYSIS OF THE SECOND PART.

DIALOGUE THE FIRST. From page 160 to 1894

PAGE 160, By teaching others we learn ourselves. Gé* nera of Plants, the third division of the fystem; 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. Effential characters. 163, Géneric character of Hippúris. 164, Language of Linneus excellent from its concisenes. Terms Two-cleft and Above explained. Permanent, as applied to the parts of Fructification, explained. Géneric characters of Canna. 166, Length of the Géneric defcriptions confusing. Curious position of the Anther and Style of Canna. Géneric descriptions of the Génera Plantarum compared with the Géneric descriptions of the System of Vegetables. Method of fludying the System of Vegetables. 167, Difficulties in the fludy 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

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. Lonicé1a, Woodbine, referred to its Genus. 172, Specific divisions explained. Remarks in the Génera Plantárum, after the géneric characters of Lonicera, of use in diffinguishing the species. Flowers of the most simple construction ought first to be studied. The tube of Crocus deeply covered by the earth. Crocus defcribed. 173, Crocus Genus diffinctly marked by its convolute Stigmas. Term Six-petal-like explained. Seed-veffel of Crocus rifes out of the ground as the other parts of Fructification begin to decay. Corol of Iris diffected. The Stigma of Iris best feen by taking off the fix-petalled Corol. The Genus diffinctly marked by the Stigma. 174, Beautiful ftructure 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 Capfule in different species. Useful observations in the Génera Plantárum on the Iris. The Génera placed in order, according to their affinity. Colour, fmell and tafte of Plants too variable to enter into their géneric or specific characters. 175, Variable marks of Plants noted in the Species Plantárum ; fuch marks useful. Nectaries of great importance in the diferimination of the génera. 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, Althaéa Officinalis referred to its Genus, in the System of Vegetables. Arils, nice order of the feeds round the Receptacle. System of Vegetables not difficult when the method of fludying it is underftood. 177, Minute distinctions in the Génera of the class Diadelphia. Geranium Genus investigated. First defeription of Geranium not just; fecond very exact. Seeds, Arillede

XXiv

Arilled. English name of Crane's Bill, from the long threads to which the feeds are attached: 178, Seeds difperfed by the twifting 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 Pelargónium. Botanical names foon become equally familiar with common ones. Four species of British Geranium ought to be arranged under the Genus Eródium of L'Heritier. Artichoke diffected. 180, Diffection of the Artichoke continued. Pappus of the feed beautiful. Receptacle and bafe of the leaves, the parts eaten. Botanical names of Artichoke, Cynara Scólymus. 181, Dandelion, Leóntodon, diffected. Receptacle, the prime mark of the first division of the first order of the class Syngénefia. Receptacle of Leontodon not covered with down or chaff. The Calyx marks the Genus of Leóntodon. Hairy and plumy Pappus, how diftinguished. The Pappus of great use in difcriminating the Génera of class Syngénefia; should be perfectly dry when examined. 182, Linneus faw all the parts of flowers without the affiftance of glaffes. Leóntodon Taráxacum, Dandelion, differs from the rest of the Genus in its Pappus. This difference not fufficient to feparate it from the Genus. The variety in its Pappus noted by Linneus, in the Génera Plantárum. 183, Many Génera of the Compound Flowers more eafy to diffinguish than the Cynara and Leóntodon. Excellence of the Linnean method, fhewn in the minute and decided diffinctions of the Génera. Constant marks discovered by Mr. Curtis in the Génera of class Syngenefia. Curious mechanism of the Calyx of Onopórdon Acanthium. Differs from the Calyx of molt 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.

XXV

6 2

185,

185, Explanation of the terms Flofculous and Fertile, Radiate and Abortive. The particle Sub, as used in botany, explained. Genera of Umbelled Plants frequently marked by the form of their feeds. 186, Flowers and feeds generally found at the fame time on Umbelled Plants. Term Egged explained. System of Vegetables not difficult to understand. Subdivisions marked by the Involúcres. Scandix inveftigated. 187, Terms Difk and Ray explained. Specific name of Scandix; Pesten taken from the long beak of its feeds. Gentianélla and Centaury diffected. Method of finding the number of Cells in a Capfule. Diffinction between a Valve and a Cell. 188, Form of the Corol of Gentiana; varies in different species. Gentianella and Centaury not alike in their flructure. Peculiar flructure of fome 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 Prunélla diffinctly marked by the twoforked Filaments. 191, Extraordinary appearance of the Stamens of Houfeleek explained, by Mr. Curtis. Advantage of examining flowers in different flates of maturity. 192, Diffinction betwixt Sempervivum and Sedum. Genus Euphórbia accurately deferibed by Mr. Curtis. Linnean characters of Euphórbia defective. 193, Inveftigation of Euphórbia, on the Linnean principles, extremely difficult; a diffinct idea may be attained of the Genus by the diffection of fome of the larger species. The part, called by Linneus, the Corol, Mr. Curtis names the Nectary. Singular appendage of the Seeds of Euphórbia; the use of this appendage not yet difcovered; taken notice of by Mr. Curtis. Great benefit derived by the botanical world from the labours of Mr. Curtis. Effential characters of many Génera difcovered

6 3

by

XXVI

by him. 194, Genus Euphórbia diftinguished by its milky juice and outer habits. Curious structure of its fructification. Many beauties in plants loft to superficial observers. Clafs Polygamia, peculiar ftructure of the Filaments of Pariétaria Officinalis. Curious manner in which the Anthers difperse their dust. 195, Minuteness of the fructification of Centúnculus. Corol of Centúnculus opens only when ftrongly shone upon by the fun. 196, Corol permanent, contrary to most other wheel-form Corols; the Genus marked by its round Capfules feated in the bosom of its leaves. Neccaries of particular confequence in Paffion 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 diffinctions of those Nectaries, which adhere to the parts of fructification. Nectary of Fritillaria, most obvious in the Species Imperialis, Crown-imperial. 198, Different kinds of Nectary. Nectary, the term applied by Linneus, to every fingularity of fructification, which cannot be reduced under the feven 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 diffinguished, 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 Fraxinélla, Nectar-bearing. Refinous matter on the filaments not of the nature of honey; fimilar to that with which the stalks abound; reafon why the stalks remain unburnt, when the refinous substance which covers them is fet fire to. 201, Nectaries placed apart from the fructification; the ftructure of them merits the ftricteft attention. Nectaries of Columbine refemble the parts of a bird. Beauty of the Nectaries of Helléborus and Parnássia; Globules not the

true

XXVII

\$3

true Nectaries. 202, The base of the petals of Pinks fweetish. The base of the Calyx replete with honey. Difficult to determine by what part of fructification the honey is fecreted. Fanciful structure of the flower of Monk's-hood. 203, Beautiful structure of the Nectary of Mignonette, Quick motion of bees in their fearch for honey; industry of bees. 204, Economy and laws of bees generally taken notice of; equalled, or furpaffed, by those of other infects. The economy of infects imperfectly underflood; their ingenuity not the refult of inftinct. Nice fense of touch of some infects gives them the fuperiority of ingenuity over other species. Spider pre-eminently ingenious. 205, The filky material within the body of a fpider 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 fpider'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 inftinct, 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. Diffection of Paffion-flower. 210, Nectaries form the principal feature in the Genus Passifiora; in fome species refemble a bead-basket. Linnean description of Passifiora not just. 211, Difficulty of attaining a diftinct idea of the Gynándria class. Extraordinary structure of fructification peculiar to the Orchis tribe. Orchis flower diffected. Twifted germ of Orchis; curious ftructure of the ftamens, and the cafes by which they are contained; may be drawn out of their cafes by the most gentle touch. 212, Globule

xxviii

Globule at the bafe of each ftamen difficult to be feen in the natural fize of the flower. The Globules and Anthers fhewn in the plate. Anthers composed of Corpuscles; fame effect, probably, produced by them as by Anther-duft. Seed of Orchis apparently perfect. 213, Smallnefs of feed no argument against its vegetating. Ferns propagated from feed, Orchifes not yet decidedly fo; encreafe fparingly by the root. Patience and impartiality requisite to make experiments. 214, Very young perfons not equal to making experiments. Early purple Orchis obvioufly diffinguished 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 diffinguished by their Nectaries. 216, Bee-órchis an Ophrys. Characters of the Ophrys Genus fhould be examined with magnified drawings. Different structure of Orchis and Ophrys. The character of feveral species taken from the Nectary. Leaves of Ophrys Apífera, and Ováta, differ materially from the leaves of the Orchis Genus. Roots of Ophrys Apífera refemble thofe of Orchis. Roots of Ophrys Ováta fibrous. 217, Supposed error in the character of the feed-veffels of Orchis, Saty . rium, 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 ourfelves 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 64 degrees

XXIX

degrees of maturity. Arum, a plant of extraordinary fructure. Nature not limited in her modes of re-production. 220, Singular fituation of the flamens of Arum, respecting the Piftil. 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 fome 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 tafting plants, the qualities of which are unknown to us. Mercurialis Perénnis, a good specimen of the class Two-houses. Description of the flower of Mercurialis. Hydrócharis eafily referred to its Genus. 223, The leaves and whole ftructure 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 flamens are fallen off. Spikes of flowers Aments, or Catkins, Cylindric form of the fpikes marks the Genus Typha. Gulm, the Linnean term for the ftraw of Graffes. Difference of position of the male and female flowers on the Gulm. Magnificent appearance of the flowers of Typha Major; every part of the plant worthy of attention. 226, Species of Carex not eafily diftinguished from each other. Carex Péndula diffinctly marked by the long pendant Aments of its flowers. The Catkin tribe of flowers merits attentive examination; manner of investigating Ament-bearing plants. 227, Cryptogámia

XXX

togamia class. Brown spots on the under fide of the leaves of Fern, a most important part of the plant. Plants of the Fern-tribe wonderfully conftructed. Stamens and piftils not yet discovered in the Cryptogamian class. Meaning of the term Fructification, as applied to the plants of Cryptogamia. The Filices, or Ferns, divided into three fections, by the disposition of their fructifications. Radical fructification explained, well seen in Pilularia. 228, Hedwig's botanical researches, in class Cryptogamia, of great importance. Equifétum Sylváticum, a good specimen of the spiked fructification of Ferns. Extraordinary appearance of the fupposed seeds of Equifétum ; magnified, draws a great assistance in the investigation of obfcure plants. Plates not wholly to be relied on. Little progrefs made in any fludy by those who rely on the authority of others. 229, Diffidence proper in young perfons. Method of fludy recommended to them. The rule, ' See for yourfelf,' to be observed in all studies ; ' Mr. Curtis's works rendered valuable by the observance of this rule. 230, Inconvenience arifing from reliance upon authority. Candid correction of the few errors of Linneus, of effential fervice to the botanical world. Queftions, properly asked, not impertinent. Account of the progress of Equifétum, 231, Greenish powdery mass shook from the spike. Particles of powder appear regular formed bodies, viewed in the microfcope; account of their form. Regular organization of the parts of plants. Curious appearance of the powder shook from the spikes of Equifetum. Hedwig's opinion of this powder; circumstance in favour of his opinion. Scales of the protruded fpike of Equifétum, protected the fpikes before protrusion. 233, Knowledge of the fructification of Equifétum 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 fize of Hart's-tongue, thews the fructification diffinctly.

XXXI

234, Fructification described; wonderful mechanism of the feeds, with their apparatus. Benevolence of nature in all her works. Mechanism of the capfules of Fern. 235, Seeds produced by a plant prove that it poffeffed other parts of fructification. Difficulty of viewing the capfules of Fern through a microfcope. Capfules 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 inftructors of youth may induce their pupils to attend to their fludies. Polypódium Vulgare. 237, Root of Polypódium Vulgare refembles the large kind of caterpillars. Error in the defcription of Polypódium Vulgare by eminent botanists; afcribed by Mr. Curtis to too great deference to authority. Error of Tournefort in delineating the capfules of the Polypódium Genus without rings; one of the many inflances of the fallacy of authority. 238, Polypódium Vulgare appears destitute of the membrane by which the capfules of all the other fpecies are enclosed, The Fern tribe opens an ample field of discovery to modern botanists. Education of women should not be superficial ;public diffinction 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 diffinguishes them, at prefent, above their companions; liable, from fuch distinction, to render them vain ; danger of vanity decreafed by liberal education becoming general. 240, Practice can alone make us acquainted with the different Génera of Ferns. Similarity of their fructifications. Capfules varioufly placed on the fronds; precife géneric character not cafily attained. Plates and remarks of Mr. Curtis, in his London Flora, particularly useful in the fludy of Ferns. 241, Roots of Ofmunda Spicant refemble the large kind

xxxii

of

THE SECOND PART.

of caterpillars. Ferns ornamental in all fituations, 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 Moss. The opinion that they impoverish the ground on which they grow, erroneous. Roots of Moffes penetrate little way into the earth. 243, Fuel, called Peat, formed from the roots of Mofs. Peat-fuel not, exclufively, derived from Mols. 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 diffinct fructifications of Moffes well established fince the time of Linneus; their fituation not yet determined. A revifal of the works of Linneus defirable. Clafs Cryptogamia improved fince his time. Génera of Mosses distinguished by their outer habits, and fituation of their capfules. Refemblance of Moss to the Pine tribe; slowness of their growth. 245, Difference in the leaves of Mosses. Male and female flowers placed feparately. Calyx, termed by Linneus Calyptre. From the prefence or absence of the Calyptre Linneus has diftinguished the Génera. Opérculum of Mosses, a curious microfcopic object ; fhould be examined with magnified drawings. The most beautiful objects of nature viewed with indifference when not underftood. 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; efteems the bud-leaves true involúcres; encrease in fize as the capsules grow towards maturity. Hedwig's refearches promise great information on the fubject of Moss. His refearches not of much use to young botanists. Mr. Curtis's figures and defcriptions

XXXIII

feriptions accurate and plain. Mr. Curtis does not venture to decide whether the powder contained in the capfules of Moffes is anther-duft or feed. Hedwig afferts that the capfules are true feed vessels. 248, Young plants raised from the capfules of Mosfes, by Hedwig; fowed, by Dillenius, without fuccels. Caufe from whence these different refults of the fame experiment may arife. The parts of the fupposed fructification must be well understood before we reason apon their use. Description of Curled Bryum. Hedwig's observation upon the expansion and contraction of the fringe of the capfule in dry and moift air ; closes, even from the moisture of the breath. 249, Curious mechanism of the capfule of Moffes; contents of the capfule protected by the fringe found under the Calyptre. Calyptre of Bryum Undulatum defcribed. Mechanism of the supposed fructifications of Moffes and Ferns equally curious; both feem formed for the protection and difperfion of their feeds; the manner in which the feed is produced unknown, unless Hedwig's refearches may be relied on. 250, Magnified leaf of Bryum Undulatum shews its undulated edges. Bryum Undulatum produces its capfules from November to February ; fituations in which it is found. The leaves curl up foon after the plant is gathered; method of examining the plant, Bryum Hornum placed by Linneus among the Mniums; diftinguishable from Undulatum by its bending peduncles. 251, Star-like appearance on Moffes fuppofed, by fome authors, to be the piftil-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 affented to. Inveftigation of the Cryptogamia clafs impeded, perhaps, by too ftrict adherence to the enquiry after reproduction from feed. May not the supposed feeds of Mossies be bulbous

TEXIE

pro-

THE SECOND PART.

progeny? Bryum Hornum produces capfules from February to March. Peculiar appearance of the capfules of Bryure Trunculatum. 253, One of the least of the Moss, distinguishable by its great number of little brown capfules, from. September to February. Bryum Trunculatum and Viridulum known from each other by the form of their capfules. A knowledge of the outer habit and ftructure of Moffes thould be attained by botanical fludents. 254, Regular experiment can alone lead to discoveries of importance. Hypnum and Bryum Génera diffinguished, by Linneus, from the fituation of their peduncles. The part, termed Anthers by Linneus, now known by the name of capfule. Singular ftructure of the leaves of Hypnum Proliferum, found by Linneus under the shade of thick woods. 255, Rare appearance of fructification im Hypnum Proliferum. Time of fructifying, from December to February. Structure of capfules nearly the fame in all the Mosses. Peculiarities, discovered by Mr. Curtis, in the capfules of Bryum Subulatum and Polytrichum Subrotundum. The use of these peculiarities not understood. 256. Great nicety requisite in making experiments. 257, Curious and beautiful ftructure of the capfules of Polytrichum Sabrotundum discovered to be a constant mark of the Genus-Structure of the capfules defcribed. 258, A cheap publication of the figures of the plants of clafs 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 Pilofum made use of for beds, by the inhabitants of Lapland; curious method of preparing thefe beds. 260, Reflections on the wants of others, should render those who are placed in happier fituations, contented and chearful under flight inconveniences. Algæ, or Flags, not treated of by Mr. Curtis. The root, ftem, and leaf of Algæ scarcely admit of diffinction. 261, Deftitute of obvious flowers; manner of diffinguishing the Génera. Algæ of great importance

xxxvi

portance in the economy of Nature; vegetate upon the bareft rocks. Lichen Pascalis found by Dr. Smith on a torrent of hardened lava; peculiarly fitted for the beginning of vegetation on a hard furface. Thread-form Lichens infinuate their roots into crevices of the barks of trees. Cruftaceous kinds vegetate on fmooth furfaces. 262, Procefs of Nature in forming vegetable mould apparent upon the fmooth and barren rocks upon the fea-fhore; account of the process. Lichens made use of in dying; fed upon by goats and rein-deer. 263, Cup-mofs, a Lichen. Numerous fpecies of Lichen difficult to diffinguish. Hedwig's investigations of them; his opinion of their parts of fructification. Fringes from Lichen Céliáris put forth roots ; diftinct from the fuppofed parts of fructification. Hedwig's plates of the Algæ tribe. Algæ not well underftood. Sea-wrack, a Fucus. 264, Prolific property of the leaves of Fucus Vesículous. Black hair-like tufts found growing upon Fúcus, a Conférva. Some species of Fúcus, perhaps not true vegetables. Sea-anemóne falfely efteemed a vegetable. Green films on water and on trees not thoroughly underflood. Clafs Cryptogamia requires new arrangement. 265, Génera of the third order diffinguished by no obvious common character; peculiarities of them worth attending to. Beauty of the Lichens. White Mofs, on heaths, Rein-deer Lichen; many varieties of it; diffinetion between them and the true species. 266, Mols on trees a Lichen. Lichens, Mosses, Ferns, and Funguses, form a complete winter garden. Fungufes eafily diftinguished from each other by the attentive fludy of good plates. Generality of Fungules not offensive either to the fmell or taste. Much information gained, concerning them, within the laft twenty years; not yet perfectly understood. 267, Hedwig's refearches into the Fungi tribe, fuppofed, by him, to poffefs stamens and pistils. Curtain of Funguses, not found in every species. Curtain described. Hedwig's account of the fupposed pistils. 268, Seeds of Fungi. Globules uniformly found

4

xxxvii

found in the Génera Agáricus and Bolétus believed, by Hedwig, to be ftamens. A diffinct knowledge of plants which present themselves' daily to our eyes, agreeable to attain. 269, Parts which can be feen only with powerful magnifiers cannot be used for the diffinction of Génera. Excellence of géneric 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 feed. Short continuance of fome of the Agáric species. Investigation of an Agáric. Genus Agáricus defcribed ; three first divisions of the Genus founded on the polition of the flipes. 170, Diffinction betwixt the Volte 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 Fungules formed from the remnants of the Curtain. Ring uncertain in its appearance ; cannot be used for a permanent mark. Stem of Agáricus either folid or hollow; varies much in its degrees of folidity. 271, Colour of the gills varies in different fpecies ; vary much in their refpective lengths. Seeds formed between the membranes of the gills. Situation of the gills. Peculiarity of ftructure difcovered, by Mr. Curtis, in the gills of Agáricus Ovátus; use of that structure. 272, Secondary fubdivisions of the Agarics, 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 fpecies taken from the colour and ftructure 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 fide of the gills, that which must be attended to. 273, Hat of the Agarics, the part least to be depended on. Viscous juice of the hat depends on the flate of the atmosphere. Acrid juice in Agarics, not conflant. 274, Structure of Agáricus nearly the fame as that of the other Fungi Génera. Dr. Withering's arrangement of the Fungi. Exception to the uniformity of colour

2.18

xxxviii

in the gills; in Angáricus Aurántius. Beautiful colours of the Agarics. Agaricus Cafareus 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 Ruffians. 276, Doubtful whether the common mushroom be poisonous, if properly prepared. Many vegetables rendered wholefome by fire. Neceffitous fituation 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 confidering the creation for the use of man only, numerous tribes of infects fustained by the Fungi. Extensive use of the Pinus Sylvéstris. Scoth fir; roots of Scotch fir used in the Scotch Highlands for candles: 279, Ropes made by fishermen of the inner bark. Pinus 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 feeds. 280, Appearance of this powder when viewed through a microscope. Puff-ball, the Lycopérdon Bovista of some Authors. Species of Fungi not diffinctly underflood. Truffe and Morel, different species of Fungi. Trufles, Tuber Cibaria, grow underground; dogs taught to hunt them; dug up by pigs in Italy. 281, Mould a regular plant; its parts diffinctly feen through a microfcope. 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 purfuit to a gentleman, as it employs himself and the poor.

DIALOGUE

24

THE SECOND PART.

ac=

DIALOGUE THE FIFTH. From Page 284 to 307.

Page 284, The knowledge of the outer habits of the Cryptogamia plants fufficient for young botanists. Inveftigation of the Génera made eafy by plates of low price. 285, Lichen Candelárius, Golden Lichen, well figured by Sowerby; his numbers of British plants a useful and agreeable publication. The Grafs tribe requires a particular mode of investigation. 286, Without energy nothing can be learnt. Vague idea conveyed by the vulgar term Grafs. 287, Graffes imperfectly understood until late years. Names by which they have been diffinguished not in general use; fubject greatly elucidated by Mr. Curtis; his practical obfervations on British Graffes; useful knowledge to be acquired from that work. 288, Graffes form one of the natural orders of Linneus. Corn arranged under the fame order. Similarity in the parts of fructification of Graffes. Striking agreement in their outer habits. Whole class characterized by fimplicity of structure. 289, Seed of Grass does not divide into lobes when it germinates; termed, by Linneus, One-cotylédoned; the huík of the feed may be feen adhering to the fibres of the young plants of wheat. 290, Peculiarities of Graffes shewn in Alopecúrus Praténse, Meadow Fox-tail; better feen in the plant than in plates. London Flora amufing and informing on Graffes. Leaves and fheaths of Graffes often furnished with briftles. Specific characters taken from the presence or absence of briftles. 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 Graffes. Arifta of Graffes. Awn of barley particularly ftrong; not conftant in every species. Corol of Graffes termed glume. 292, Divifions of the outer glume often mark the Genus. Difficulty of diffinguishing 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. Nectary of Grafies diffinctly shewn in Mr. Curtis's plates; not difficult to be feen in the natural flower. 293, May be feen at the base of the germ in wall barley; nearly refembles the corol; furnishes no géneric distinction. Three stamens, the number commonly found in Graffes. Two piftils. Exceptions to this number. Styles beautiful; feen with advantage through a microscope. 294, Close spiked Grasses do not shew their fructification well. Seen well in feather-grafs. Should be examined before the Anthers have discharged their dust. The flowers of Graffes have no feed veffels. Seeds emitted from the calyx in various ways. Seeds of feather-grafs difperfed by the twifting of their awns. Receptacle of Graffes. The stem lengthened out. Awns of feather-grafs twist after they have been gathered. 295, Spikes of quake-grass ornamental in drefs; derives its name of quake-grafs from the tremulous motion of its peduncles. The parts of fructification obvious in quake-grafs. Briza Máxima. 296, Wilful ignorance the only kind of which we ought to be ashamed. Characters of fructification nearly conftant in Graffes of the Triandria class. Strict adherence of Linneus to the classic character of Graffes. 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 flamens not uncommon in feveral species of Grafs; inconftant in their variation. Strict adherence to the classic character perhaps advantageous in an arbitrary fystem. 298, Anthoxánthum judiciously placed in the class Diándria from its constant number of two-stamens. No other Grafs found with two-flamens. Named vernal-grafs, from its early appearance in the fpring. Much effeemed by farmers, 299, Experiment makers in agriculture should affociate with fenfible practical farmers. Fragrant fcent of hay derived from the leaves of Anthoxanthum; not the only English Grass which is fragrant. Flowers of annual I ba faid to be So

x1

fo by Mr. Swayne. 300, Anthoxanthum, viviparous, many Alpine Graffes viviparous. Canary birds fed on the feeds of Phálaris Canariénfis. Ribbon-grafs, a species of Phálaris. Genus Avéna, marked by the twifted awn on the back of the corol. Motion of Avéna Fatua, 301, Named Animated Oat. Curious circumstance respecting the feed of barley; may be faid to walk. Automaton ingenioufly made on the principles of the awn of barley. 302, Merit of experiments depends on their usefulness. Makers of experiments not fufficiently refpected. 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 whofe difcoveries mankind had received benefit. Ofyris the inventor of the plough. Straw of oat the first musical instrument. Objects familiar to us not fufficiently reflected upon. Inventors of uleful arts have only a fecondary claim to gratitude. Beneficence of God fhewn 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 fame wheat in a more mature flate. Rice of the natural order of Graffes ; feparated from them in the artificial fystem of Linneus; chief food of the inhabitants of most eastern climates; converted into poifon by the fpirit 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 prefervation of Graffes. 306, The structure of Graffes to be studied with a microfcope.

d z

DIALOGUE THE SIXTH. From Page 307 to 335.

Page 307, Nectary of Grafs difficult to difcover. Marked characters of Anthoxánthum. Peculiarities in the fructification. Anthoxanthum dissected. 308, Glumes do not expand themfelves as in other Graffes. Nectaries differ from the common structure. 309, Rule of dissecting flowers in different ftates of maturity neceffary to be obferved. Similarity of the parts of fructification of Graffes. Involucre of wall-barley. 310, Hólcus Mollis, when magnified, fhews the fructification diftinctly; improperly placed in class Polygamia; thought to be an Aira, by Mr. Curtis. Dr. Withering's botanical arrangements contain much information respecting Grasses. 311, Graffes not more difficult to refer to their respective Génera than compound flowers. Mr. Curtis's London Flora of great use in the fludy of Graffes. Linneus first begun to form essential specific distinctions of plants. Confusion arifing from the want of fuch diffinctions. 312, Specific diftinctions of Linneus. Trivial name, given by him, generally arbitrary; refembles the name given to the individuals of a family; advantage of fuch names in preference to defcriptive names. 313, Confusion arising from the neglect of the ufe of proper names. Perfection of Nomenclature may be hoped for. 314, Great advantage of the use of the proper names and the terms of fcience. Excellence of the language of the Lichfield translation of the System of Vegetables. Aukwardness of forming English trivial names. 315, Such names injurious to the science of botany; defended only by fuperficial botanists. Children should not be allowed to defcribe 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

xlii

of the Linnean fystem. 317, Shortness of life fufficient excufe for the imperfections of fo great a work. Children thould 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 fuch. Trunk and stalk afford ftrongly marked characters. Fulcra and inflorescence furnish permanent marks. 318, Parts of fructification sometimes used with advantage in specific distinctions. Some Hypericums and Gentians diffinguished by their parts of fructification. Such diffinctions 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 fludying leaves. Form of leaves first to be confidered; divided into fimple and compound; fimple leaf defined; fixty-two ways in which a fimple leaf may be diverfified. 320, Various forms of leaves must be studied with plates of them, and terms of explanation. Genius of Linneus fhewn in the conftruction 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 tranflators 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 Pfeud-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 thould be conquered. Different modifications of the compound leaf enumerated. Fingered leaf feen in horfe-chefnut and lupine. Specific characters frequently formed from the various modes of compound leaves. 326, Various forms of fimple leaves should be fludied before those of the compound kind are attended to. Language of the System of Vegetables not intelligible until it is fludied. 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, eafily acquired. 328, Determination of leaves explained, Belongs to fimple and compound leaves equally. Alternate leaves shewn in ivy-toad-flax. Opposite leaves, in myrtle. Manner of leaves being placed on the ftem common to the whole Genus. Direction of leaves explained. Various modes of direction must be studied. Infertion, 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, fome knowledge of them requifite for young botanists. Term monster, not necessarily expressive of ugliness. Double flowers, the pride of florifts, the product of culture. 330, Vulgar error of gardeners respecting double flowers. Completely double flowers lose their flamens. Various modes of vegetable monfters being produced. Calyx and lower row of petals unchangeable in double flowers. Half-double flowers bear fruit. Rose in Rose Polyanthos, a proliferous flower. 331, Hen and Chicken daisie, 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. Rofe's Elements of Botany should be selected for the instruction of young botanical pupils. Provence Rofe destitute of stamens. Damask Rose does not lose its stamens by becoming double, Many-

xliv

Many-petalled flowers most liable to become double. Onepetalled flowers rarely multiply beyond a double corol. Beauty of compound flowers encreafed by multiplying. 332, Single flowers generally more beautiful than double ones. Various caufes from which plants depart from their true fpecies; culture the most prevailing cause. Fruits and vefculent vegetables derive their excellence from the art of gardening. Culture the best test of a true species. Ingenuity and industry of mankind confpicuous in the culture of corn. Botanists should attend to distinctions arising from feedling varieties. 333, Varieties of plants not noticed in the System of Vegetables, marked in the Species Plantarum with a capital B. Leaves fubject 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 fcience more agreeable to fludy than its defects. 334, After the outline of the Linnean fystem is attained, practical study must make the complete botanist. The study of botany renders every plant interesting. Pleafure the confequence of reflection. Evil effects of a bad method of education; happiness the refult of a good one. Objects of education, bappinefs, utility, and agreeablenefs. 335, Philosophy of botany may be studied, after a fystematic knowledge of the science is attained. Philofophy of botany the most agreeable part of the fcience. Gratitude to God must refult 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 funk as in English. Thus, Agave, is pronounced A-gave; and Acre, A-cre.

Cb in thefe 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 *fce* and *fci*, the *c* is generally pronounced foft. In words from the Greek, the *g* should be pronounced hard, as in Syngenésia and Storge.

ERRATA.

· ·				
Pag	-	1.4	12.00	
100	-		IIC.	

19 6. For Allyfum, read Alyffum.

- 23. 15. For Goffypum, read Goffypium.
- 24. 6. For oxális, read óxalis.
- 24. 29. For Acér, read Acer.
- 26. 24. For Ilex, read Ilex.
- 32. 22. For Tulipa, read Túlipa.
- 38. 18. For 800, read 8000.
- 9. 15. For Muffel-shell, read Murex-shell; place the stop after cable net, instead of after shell.
- 50. 22. For Lavendula, read Lavándula.
- 52. 1. For is an example, read are examples.
- 57. 27. Place a femicolon after nature.
- 58. 1. Place a comma inftead of a period after suppose.
- 63. 3. For Fritilaría, read Fritillária.
- 81. 23. For Genéra, read Génera.
 - 24. For she, read the.
- 110. 20. Erafe when.
 - 23. For it is, read they are.
- 116. 13. For Seem, read feems.
- 122. 3. For contains, read contain.
- 140. 23. For Lycopergon, read Lycopérdon.
- 140. 26. For Umbraculiferæ, read Umbraculifera.
- 151. 7. Put a femicolon instead of a comma, after digestion; a comma instead of a femicolon after fire.
- 154. 23. For blot-paper, read blotting-paper.
- 186. 4. For Sium, read Sium.
- 197. 11. For Uned. read Unédo.
- 203. 6. For Mignionelle, read Mignonette.
- 209. 11. Ditto.
- 222. 25. For Frog's bet, read Frog's bit.
- 226. 8. Erafe to.
- 227. 8. Erafe for, and the laft it.
- 254. 14. For Finished, read Furnished.
- 205. 8. For just as, read the fame as
- 232. 1. After oval, read bodies.

BOTANICAL DIALOGUES.

PART THE FIRST.

DIALOGUE THE FIRST.

The Seven Parts of Fructification explained.

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

Hortenfia. I fhall fulfil my promife with pleafure. I am happy to fay, that the laft year you have given me reafon to be fatisfied with your application ;—and of you, Charles, your tutor gives fo good an account, that I have no longer any caufe to diftruft your induftry.

Charles. Indeed, ma'am, you made me afhamed, when we parted, of my idling character; and Harriet and I refolved, that we would no more give you reafon to fay, that you could not attempt to inftruct us in botany, becaufe we did not ferioufly apply to our more neceffary ftudies.

Hortensia.

Hortenfia. Having found the advantage and pleafure, which may be derived from an industrious performance of your duties, I am perfuaded, that you will not again relapfe into those indolent and defultory manners, which have given me fo much uneafinefs. I am not ambitious of making you fhining characters; but I am anxious to prevent your eftablishing fuch habits, as would render you triffing ones. There can be nothing learnt; there can be no ftrength, 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.

Hortenfia. So you will find it with every thing; if we do not make a point of underftanding well the rudiments, either of a language or a fcience, we fhall never make any great proficiency in it .--- I have prepared this little room, which opens into my flower garden, for our fludy. Hither you may at any time come; and you will find books and glaffes, and every thing that you may want. We

5

We will begin our lectures this morning. I have promifed Henry and Juliette that they fhall be of our parties; they are never idlers either at leffons or play, and will, I dare fay, find both amufement and inftruction from the fludy.

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.

Hortens. I am a little afraid, left the hard names fhould be too difficult for my younger pupils; however I will endeavour to make them eafy .--- Now for our first lecture .--- Linneus, the great fwedish naturalist, whom I have already taught you to refpect, has divided the vegetable world into 24 class; these classes into about 120 ORDERS; these orders contain about 2000 families; and these families about 20,000 species, befide the innumerable varieties, which the accidents of climate or cultivation have added to thefe fpecies. The fystem of Linneus is called the fexual fystem 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 ftamens

are

are termed males, and the piftils females : thefe most frequently exist in the fame flower, but are fometimes in different flowers, and fometimes even on different plants; and from their number, fituation, and other circumftances belonging to them, he has formed his classes and ORDERS; his families, or genera, are formed from all the parts of the bloffom 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 feeds of these varieties do not always produce plants fimilar to the parent, but frequently fuch as refemble that species, to which the parent belonged. Having given you a fketch of the philosophy of the fystem, we will proceed to the examination of the different parts of a bloffom, which now, if you pleafe, we will accuftom ourfelves to call the fructification; and pray obferve, that I intend ftrictly 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 fufficient to have frightened me from the study.

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

Hortenf. In fome things he may; but the language of botany may be learnt without any fuch affiftance, and perhaps more readily by not being confused with a knowledge of the more common fignification of those words which Linneus has appropriated to this fcience : for inftance, Charles will know that calyx means cup; but that will not affift him in the various species of calyxes, which he will have to retain in his memory; the common meaning of words is not fufficiently precife for the purpofe of fcience, 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 itfelf; that language is, I think, fomewhat lefs difficult to learn than any other language, and, when learnt, introduces us to fo delightful a fludy, 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,

B 3

ma'am,

[5]

[6]

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 bloffom, which are intended for the production and prefervation of the feed, and which, having brought that to perfection, wither and fall off. All thefe parts, however, are not effential to the production of perfect feed, as we shall fee hereafter, or are all these parts present in every flower. There are seven parts of fructification. Ift, the calyx; 2d, the corol; 3d, the stamen; 4th, the pistil; 5th, the pericarp; 6th, the feed; 7th, the receptacle. The calyx is the termination of the outward bark of a plant; of it there are feven 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; primrofes (primula) and rofes (rofa) have their calyxes of the Perianth kind. 2d, Involucre, which is a calyx, growing at a diftance from the flower. Moft flowers which have Involucres have alfo Perianths,

[7]

Perianths, as the primula genus. These flender leaves, which grow at the bafe of the numerous flower-ftems of this polyanthos (which is a prímula) are termed Invólucres; the fame in meadia dodecátheon, in parfley, apium, and all that tribe of plants which is termed umbelled. The plant called fool's parfley, æthúfa, by eating of which, miftaking it for garden parsley, some persons have been faid to be poifoned, may be diftinguished from all other umbelled plants by the Involucres, which belong to the fmall umbels, and which confift of three long, narrow, pendulous leaves, placed at the bottom of each of them: thefe are called partial Involucres; that which grows at the bafe of the whole collection of umbels is termed the general Involucre. 3d, Glume chiefly belongs to graffes, and confifts of one, two, three, or more valves, folding over each other like fcales, and frequently terminated by a long stiff-pointed prickle, called the Awn, or beard. 4th, Ament is, what is commonly called a catkin; it confifts of a great number of chaffy fcales, difperfed along a flender thread, or receptacle, and has obtained the name of catkin from it's refemblance to a cat's tail. These Aments (we must

B 4

110

no longer call them catkins) are composed both of male and female flowers; what Henry calls goflings in fpring are the Aments of the willow tree; his green goflings are female Aments, and, when mature, have the appearance of little tufts of wool, which appearance is caufed by the downy material that crowns their feeds; 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 feeds of the piftils. This you will better understand prefently. The female Aments of the birch (Bétula) are beautiful; the tips, we have not yet learnt their fcientific name, being of a bright crimfon, and the other part of a light green. The female bloom of nut trees is alfo very pretty, but fo minute as generally to escape common observation.

Jul. O mamma, is it that pretty red taffel that looks like ravellings of crimfon filk? Henry and I admired it yefterday, but did not gather it; for he faid, perhaps it might be the nut, for that you had told him, that the catkins only made the nuts perfect, and did not themfelves *produce* nuts.

Hortens. He was right; but remember in future to use the terms of the science, that you are learning. The 5th fpecies of calyx, called a Spathe, wraps round the flower or flowers contained in it, till they are ftrong enough no longer to require it's protection, and then they burft forth. Sometimes the Spathe confifts of one piece, as you may fee in the fnow-drop, galánthus nivalis, and daffodil, narcíffus pfeudo-narciffus, and in most plants which have this kind of calyx; fometimes of two, as in the Japan lily, amary'llis formosíffima; and fometimes of many. I have frequently feen you pull off the Spathes of fnow-drops and daffodils, and have heard you call them indian paper, which they much refemble in their texture. 6th, Calyptre is the term for the calyx of moffes. Calyptre is defined by Linneus to be the cowled calyx of mofs, covering the anther; which definition ftrongly expreffes this fpecies of calyx; it may, however, be neceffary to give you fome more familiar idea: the calyptre refembles a very fmall extinguisher of a candle, which covers the flower of mofs, and protects it's duft, or feed, from injury : in Mr. Curtis's London Flora I can fhow you fome beautiful specimens of this

[10] alvx: in November and D

kind of calyx; in November and December I can fhow you the calyx itfelf.

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

Hortens. In the study of nature you may at all times find both amufement and inftruction; the nice economy of all her works muft lead the mind with praife and gratitude to God, who is the first great cause of all : that perfon must have a dull, sluggish mind, who, feeing the care that is taken throughout the creation for the good of the whole, is not ftimulated to an endeavour to perform his part as an individual; and it is much, that an individual may perform, be he ever fo infignificant, if he do all the good, that the fituation, in which he is placed, brings within his power .- Butto return to our 7th and laft fpecies of calyx :--- Volve is the term used by Linneus for the calyx of fungufes, 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 fuch flowers as are now in bloom,

[II]

bloom, and then proceed to the other parts of fructification. The Corol is that part of a flower, which most attracts our notice, confifting generally of beautifully coloured leaves. Linneus fays, 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 neceffary 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 diffinguished; a Corol is called one-petalled, when it confifts 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 fhould call it five-petalled.

Charles. So fhould 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.

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

the one-petalled flowers, be their divisions ever fo deep, have their petals united together at the bafe, forming a tube, fometimes very short, but long in polyanthos, as you may fee by taking off the petal. In flowers of many petals they are fixed by the claw to different parts of the fructification, which circumftance

is frequently of use in diffinguishing one flower from another. Linneus has availed himfelf 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 fhould be accurately underftood; a more clear idea may be given by plates than by defcription. I will enumerate the various kinds, and then we will look them over in our plates, and compare them with flowers. There are feven different forms of the corol: bell-form, of which there are great varieties; funnel-form; falver-form; wheelform; crofs-form; gaping and grinning corols, which may be confidered as different kinds of the fame 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 thefe that I have mentioned, and is properly called an irregular

irregular flower; of this kind are the monkfhood (aconítum napéllus), violet (víola), larkfpur (delphinium), orchis, and fraxinella (dictámnus). Campánula is an inftance of the bell-form; of the funnel-form, henbane (hyofcy'amus) and oleander (nérium); of the falver-form, periwinkle (vinca); of the wheelform, mullein (verbáfcum), and pimpernel (anagállis); the crofs-form may be feen in wall-flower (cheiránthus), and in candy-tuft (ibéris), and confifts of four petals nearly equal, and fpread at the top upon claws, the length of the calyx, in form of a cross. The butterfly form is feen in peas; the gaping and grinning in white archangel (lámium), and fnap dragon (antirrhínum).

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

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

[14]

the fancied refemblance to the fabled liquor of the gods, concerning which you remember that we were reading yefterday. The Nectary frequently makes a part of the corol, but as frequently is diffinct from it : in honeyfuckle (lonicéra) you have often tafted the fweet drops at the bottom of it's tube, and alfo in cowflips (prímula). I could amufe you on this fubject, but at prefent it is fufficient to inform you, that there is fuch a part belonging to moft if not to all flowers.

Harriet. We will be very diligent in learning the rudiments of the fcience, that we may the fooner come to the amufement of it. I long to diffect a flower.

Hortenf. That you may foon do, if you are attentive. A most effential part of fructification is the *ftamen*; as by it the fine dust, or powder, is prepared, which makes the feeds capable of producing young plants. The Stamen confists 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 feed; it contains the Dust, and, when ripe, bursts and fcatters it abroad for the use to which nature

nature has deftined it. You have often feen it fly about nettles (urtica), and the fweet gale (myríca). Nature has guarded with nice care this precious duft, as on it's prefervation depends the continuation of the fpecies. The apparatus, by which in many flowers it is defended from injury, is very curious, and often gives a fingular appearance to the corol. In wet years it fometimes happens, that the excess of moisture causes the anthers to burft, before their contents are ripe, and thus we lofe our cherries and apples. It has been fupposed, that the anthers were preferved from harm in rainy feafons by a fine waxy fubftance enclofing their contents. This idea was believed by Reaumur to be erroneous fome years ago, and the experiments of the late Mr. John Hunter confirm his opinion. Mr. Hunter affirms, that the fubftance gathered by bees from the anthers of flowers is not wax, as is generally fuppofed, but that it is collected by them as food for the bee-maggots, and is what you call the bee-bread. A part no lefs important is the Piftil, as it contains the feed, which is to be fertilized by this Duft. The Piftil alfo confifts of three parts, the Germ, the Style, and the Stigma. Germ

Germ is the term for that part, which contains the feeds, before they are mature ; when mature, the fame part takes the name of Pericarp. The Style is that fmall pillar, which grows from the Germ, the top of which is called the Stigma. This part is of great importance, as it receives the Duft of the Anthers, and conveys it through the fine veffels of the Style to the feed contained in the Germ. Indeed the Anther and Stigma are by Linneus confidered as the effential parts of a flower, and in the language of botany they conflitute one; thefe parts being prefent are fufficient to the production of fruit, without them there can be none: the prefence of the Stigma implies that of the Germ, as the Anther does of the duft: there is however another part, which the late inveftigations of a celebrated philosopher feem to make an effential one; this is the Nectary; from his reafoning it appears, that the honey contained in it is intended for the nourifhment of the Anthers and Stigmas; confequently whenever thefe are found, it will be found alfo, as I believe it commonly is, though fome flowers are faid to be without it; this, however, may not be the cafe, 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?

Hortenf. That enquiry does not belong to the prefent part of our fludy; but I will fo far tell you, that I mean to make my favourite flowers not only beautiful objects of fight, but agreeable companions : before I have done with them they fhall eat, drink, fleep, and have a will of their own.

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

Hortenf. I shall use no magic art; and, I affure you, I am not in jeft. I do not tell you that I shall make them of the first order of animals, but, I think, I can convince you that thay deferve a place among the animated creation.

Charles. This Mr. Wilfon has told me, and I thought fo too, when he talked to me about it; but having only been told the fact, and not having ftudied the fubject, I had forgot it again.

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

C

fhould

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

[81]

Hortens. The past cannot be recalled ; be industrious henceforward, and make up the time that you have loft. 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 Seedveffel; 1ft. Capfule, 2d. Silique, 3d. Legume, 4th. Follicle, 5th. Drupe, 6th. Pome, 7th. Berry, 8th. Strobile. Capfule is a little cheft or cafket, a dry hollow feed veffel, when ripe, which fplits in different ways, and difcharges its contents, sometimes with great force, fo as to difperfe them to a confiderable diftance; you have all amufed yourfelves with the feed-veffel of Touch-me-not, which is a Capfule. From the violent manner in which this plant difperfes its feeds, Linneus has named the genus or family, Impátiens, the feed-veffel of viola, violet, and panfie is a Capfule; before this species of feed-veffel is. ripe, it is frequently flefhy and fucculent, like a berry, which pulpy fubftance probably is intended for the nourishment of the young feeds. Silique is a Pericarp of two valves, but as fome are long and larger, others round

OF

or broad, and lefs, Linneus has diftinguished them by their form into Silicle and Silique, and has founded on this circumftance the orders of one of his classes: the Silicle is roundifh; the feed veffels of allyfon of crete. (allyfum faxátile) is an inftance; and candytuft (ibéris), the common wall-flower (cheiránthus), and cabbage (bráffica), are examples of the Silique. The Legume is diffinguished from the Silicle and Silique by the manner in which the feeds are fixed to its edges; in the Silicle and Silique the Seeds are fixed alternately on each fide of their edges, in Legume they are fixed on one fide only; the Silique feed-veffels belong to the crofs-form flowers, the Legume to the papilionaceous; it is this part that we eat of french-beans, and of fome kind of peas. Follicle is a bag, which opens on one fide, and has its feeds fixed to a receptacle or thread within this bag, inftead of being fastened to the edges of the bag itfelf; when the feeds are ripe, it opens lengthways on one fide; the bladder fenna (colútea) has a Follicle for its feed-veffel. Drupe is a Pericarp, or feed-veffel, that is generally fucculent or pulpy, having no valve or external opening, and generally contains within its C 2 fubsubstance a stone or nut, within which lies a kernel, that is, a feed : there are exceptions to this definition, but it would confuse you to name them at this time; all the ftone fruits are properly Drupes. Pome belongs to those fruits, which contain within their fleshy pulp the other kind of feed-veffel called Capfule; the apple (pyrus) is an inftance of the Pome: the core of the apple is the Capfule; the pippins contained in it are the feeds; this kind of Pericarp, or feed-veffel, has no valve or outward opening. What you call the bloffom of the apple was the calyx. Berry is a pulpy fubftance containing feeds, difpofed promifcuoufly through the pulp, without other covering, rafberries (rúbus), Strawberries (fragária), gooseberries (ríbes), anfwer well to this definition : in many génera, or families, the berry and the drupe feem to have been imperfectly defined; as we proceed, I shall point out to you the defects of Linneus in his most ingenious fyftem, but they are fo few as fcarcely to caft a fhade upon the light which this illustrious naturalist has introduced into the fcience of botany; indeed fome of his definitions, which have been treated as obscure, have been proved,

[21]

proved by late experiments to be moft exact. I tell you this to warn you from being too haftily led to think flightly of the merits of this great man, by a book* which I fhall put into your hands, and which will give you much information; but, at the fame time, you will find the fmall failings of Linneus pointed out in it with an ungenerous acrimony. The Strobile is defined to be formed of an Ament with hardened fcales; this, when you underftand the fubject, you will find to be a juft definition, at prefent it conveys no precife idea to you; this kind of feed-veffel is found in the fir tribe.

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

Hortenf. That is their fcientific name; the Strobiles of the larch (pinus larix) are beautiful.

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

Hortenf. 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

to be the rudiment of a new plant : a Seed confifts of 1st. the part which is to be the new plant, and, 2d. of nourifhment for that new plant till it has attained fufficient ftrength to provide for itfelf: the young plant confifts of what are termed the Plume and the Radicle; the Plume rifes into the air, and conftitutes the trunk and branches; the Radicle penetrates into the earth, and forms the roots. The Cotyledons, which are the mealy fubftance of the feeds, are converted into a fweet juice by the growth of the plant, and are abforbed by it; thefe fweet ftores of nourifhment last long enough for its fustenance, till by having thrown out roots it collects its own food; as lambs and the young of the higher order of animals fuck milk, till they are able to feek their own nourifhment. The Plume, the Radicle, and the Cotylédons of a bean (vícia faba) we will examine. By foaking a bean in water they may be well feen. I will fhew you a drawing of a cucumber (cúcumis) feed. If you fplit an almond (amy'gdalus), you may fee, lying within the kernel, which makes the Cotylédons, two beautiful fmall leaves fawed round their edges, growing upon a little stalk, which is the Radicle, as

the

[22]

the leaves are the Plume. If the Cotylédons of a bean be cut off, the young plant is ftarved and dies, or becomes very weak; grafs has its Cotyledons under the ground, which preferves them from destruction: fo has corn, which however is not fafe from all enemies; the wood-pigeon digs with her bill till fhe finds the Cotyledon of the corn, and then eats it, pleafed, as I conclude, with the fweet tafte that it has acquired, as the plant or Plume has fprouted. The care that nature has taken for the prefervation and difperfion of feeds is admirable; in fome plants they are wrapt up in foft down; as for inftance in cotton plant (goffy'pyum); the part, of which we make our muflin dreffes, was originally the foft cradle of feeds; as the material, of which our filks are made, was the cradle of an infect. Some feeds you have feen nourifhed and kept warm by the pulp of our fruits; others are protected by foft hairs: in thiftles (cárduus) they lie in a foft filk-like fubstance, the down of the feed of artichoke (cy'nara) is particularly beautiful; others are furrounded by what is termed an Aril, which is of a substance very like parchment,

C4

Harr.

[24]

Harr. I have feen it, I think, in fraxinella: pray does not it line the outer hufk, that has fo fweet a fmell?

Hortenf. It does, and burfts fuddenly, when the feeds are ripe. That little white cafe, out of which the feeds of wood-forrel (oxális acetofella) leap, when you have warmed them by holding them in your hands, is an Aril. You may alfo find it in the fpindle 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 difperfion of the feeds?

Hortenf. By various methods; fome fhe has enabled to fly by a fmall light crown fixed on their tops, others have fingle feathers, others fmall feathery tufts: you are all well acquainted with the feathered feeds of dandelion (leóntodon), and have proved by blowing on them, how fmall a degree of air is required for their difperfion, when ripe; fome have an appendage like a wing, as the feeds of fycamore (acér); the centaurea has a feed furnifhed with a tuft fo nearly refembling a camel-hair pencil, that it might be miftaken for

for one; feather grass (ftipa) 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 fhining like filver; but the most curious of the flying feeds is that of the tillandfia; this plant grows on trees, like the mifletoe (vifcum), and never on the ground ; the feeds are furnifhed 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 fimilar to the migration of fpiders on the goffamer, who are faid to attach themfelves to the end of a long thread, and rife thus to the tops of trees or buildings, as the accidental breezes carry them. Thefe flying feeds are carried to a very confiderable diftance from their parent plant; others have hooks, by which they attach themfelves to the hair or feathers of animals, or by a glutinous fubstance, in which the feed is lodged, as mifletoe. The feeds of aquatic plants, and those which grow on the banks of rivers, are carried many miles by the currents, into which they fall; fome of the American fruits, among among which is the cocoa-nut (cocos), are annually thrown on the coafts of Norway. Charles shall read to us some beautiful lines out of the Botanic Garden, to which this wonderful fact has given rife.

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

Hortens. 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 fubject, or any one where that knowledge is fo clearly and agreeably given; I have learnt much from it. Birds are the means of diffeminating fome kind of feeds, either by dropping them as they carry them from place to place, or by parting with them whole, after they have fwallowed them. In this way feeds are frequently dropped in the hollows of trees, where, if they meet with a fufficient quantity of foil and moisture, they vegetate, and make an extraordinary appearance : fuch is the holly (ilex) growing in the birch tree, which you fee every day, and which in winter is peculiarly beautiful from its deep green foliage and scarlet berries, being intermingled

[26]

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

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

Hortens. I do not exactly know in what manner fuch trees receive their nourifhment; they become, I imagine, parafite 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 neceffarily do, which grow out of rocks or walls, where there is not earth fufficient for their fustenance; lastly, feeds are disperfed by an elastic force in the feed-veffel, or in fome part belonging to the feed. Stipa (feather grafs), as its feeds arrive at maturity, diflodges them, by twifting the bafe of the long feather by which they are crowned, till it flies from the receptacle, and carries the feed to a confiderable diffance from the plant : thus are the feeds of geranium and barley difperfed by the

[28]

the twifting of the awn which crowns them ; this is faid to be effected by moift 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 confider; it is that part, by which all the other parts of fructification are connected, and by which they are fupported : it is called a proper receptacle when it supports the parts of only one flower, as in prímula, anemóne, and tulip; a common receptacle, when it fupports feveral florets. This laft kind of receptacle belongs to what are called the compound flowers, which you will understand hereafter; an inftance of a common receptacle you may fee in scabious (scabiósa), dandelion (leóntodon), and daisie (béllis); all those parts, which you suppose to be the leaves of one flower, are flowers themfelves, and are arranged under a particular clafs. The various circumftances belonging to this kind of receptacle are made use of by Linneus to difcriminate the génera, or families of this clafs. 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.

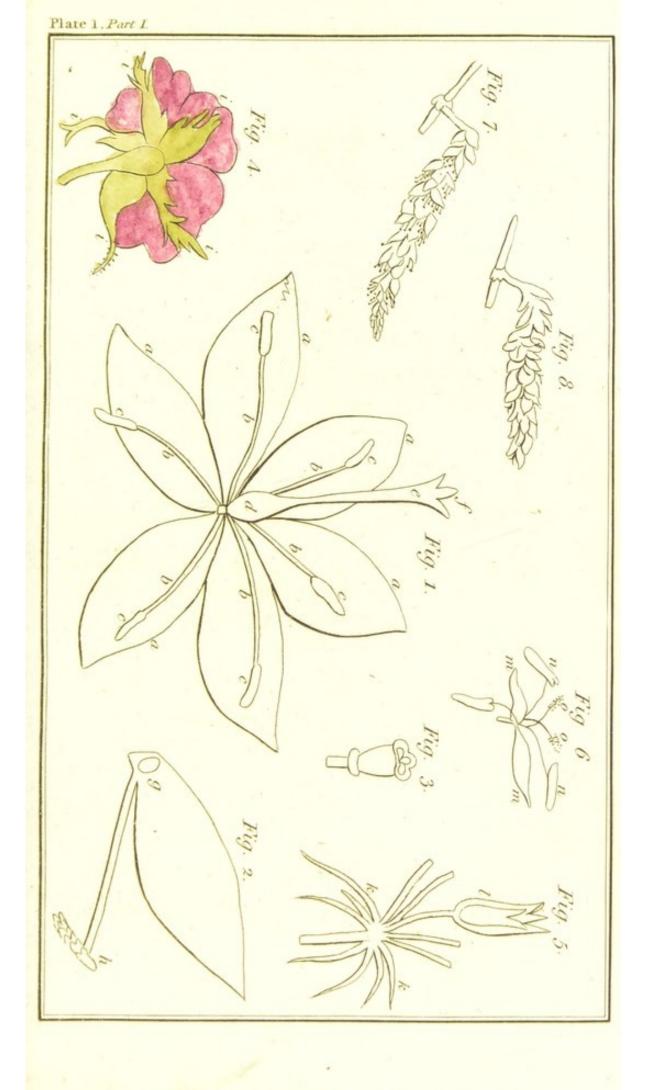
d. The Germ.

e. The Style.

f. The Stigma.

- Fig. 2, A Petal and Stamen of Crown-imperial. g, the Nectary. b, the Anther fcattering its Duft.
- Fig. 3. The Pericarp of Crown-imperial cut across to shew the three Cells.
- Fig. 4. The Perianth of a Rofe, i, i, i, i, i.
- Fig. 5. The Involucre of Primula, k, k, with the Perianth of the fingle Flower, l.
- Fig. 6. A Flower of Grafs. m, the Glume. n, the Stamens. o, the feather'd Stigmas of the Piftils.
- Fig. 7. A Male Ament, containing the Stamens only.

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



London, Published May 1.1797, by J Johnson, StPauls Church Yard.



. A CONTRACTOR OF A CONTRACTOR OF

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 Mols, Calyptre, 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, flewing the very flort tube.
- Fig. 10. Crofs-form.
- Fig. 11, 12, 13. Gaping and Grinning Corols.
- Fig. 14. Papilionaceous, Butterfly-form.
- Fig. 15. A Capfule, with three Valves opening at top, a, a, a.
- Fig. 16. A Capfule 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 infide Capfule,
- Fig. 22. A Berry (a Grape) cut across, shewing the Seeds.
- Fig. 23. A Strobile, cut lengthways,

Plate 2. Part I. Fig. A.5. Fig. 6. Fig. 1. Fig. 3. a Fig. 4. Fig. 2. Fig 10. Fig. 8. ig. 9. Fig Fig. 18. Fig. 12. Fig. 11 Fig. As. 16. Fig. Fig. 13. Fig. 17. 0000 Fig. 14. 0 Fig 19. Fig. 20. Fig. 22. Fig. 21 Fig. 23. London Published May L1797, by J.Johnson SPauls Gurch Yard.



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

DIALOGUE

[30]

DIALOGUE THE SECOND.

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

Hortenfia. 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.

Hortens. If I find you are for the most part fo, I shall think you have done very well: this verónica and crowfoot certainly have the Perianth kind of calyx; this earthnut (búnium) of the Involucre, and at the fame time the fingle florets flew the Perianth, which may have escaped your notice from being fo minute. This walnut bloom (júglans) fhews the Ament; this narciffus the Spathe. The other three kinds of calyx, the Glume, the Calyptre, and the Volve, as they belong to peculiar and difficult claffes of plants, we will not at prefent think about. Your flowers are all equally right: pray what fhare had Henry and Juliette in making the collection ?

Harr.

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

Hortenf. The wheel-form of the verónica is lefs decided, from the inequality in the breadth of its petals. You perceive, that the loweft petal is narrower than the other three; this circumftance is a mark, which diftinguifhes that family of plants. The curling divisions of the corol of the hare-bell difguife its form alfo; but in neither of these genera is the form of their corols the effential character; that circumftance therefore is of less confequence.

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 fomething shines in it like honey, is it the nectary?

Hortenf. I rather fuppofe the fhining appearance is caufed by the rich texture of the petal; that notch is the nectary, and is the effential effential character of the ranúnculus family, the proper name of your crow-foot being ranúnculus; this mark you will find alfo in the double flowers. The minute circumftances, which Linneus has availed himfelf of for the difcrimination 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 finall appendage to the petal; he found it to exift uniformly in the individuals of the genus; and we are now no longer at a lofs to diftinguish a ranúnculus from other families, which in their outward appearance much refemble it.

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

Hortenf. You will find them more eafily to be diffinguished from one another than you imagine, though rarely by fo obvious a character as this of the ranúnculus; yet when you understand how to study the fystem 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 fo fure I could find two alike, though you, ma'am, told me I could not.

Hortens. The lefs we know, the more apt we are to be positive .--- But to return to our general fubject :--- This ladyfmock (cardámine) is a right fpecimen of a crofs-form flower; this lung-wort (pulmonária) of the funnel-form; this thyme (thy'mus) of the grinning; this broom (fpártium) of the butterfly. As a reward for your great attention, we will diffect a flower; the parts of crownimperial are fo large, that it is well fuited to our purpofe. Be fo good to gather one, Charles, alfo bring a poppy and a tulip at the fame time.

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

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

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, becaufe it is not green.

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

Hortenf. In most cases the Corol may be known by the gayness of its colour, or by its not inclosing the feeds; but there are too many exceptions to these rules for them to be relied on. The petals in paffion flower (Paffiflóra) are not coloured ; the corol in Selago incloses the feeds; they may however be diffinguished by the following rule: the ftamens and petals are found to be ranged alternately in the complete flowers; that is, fuch as have both Calyx and Corol of the fourth and fifth claffes of Linneus's fyftem; hence this is concluded to be their most natural fituation, while the stamens are placed opposite to the divisions of the Calyx; Linneus feems to confider this as a conftant mark; yet he terms the fingle cover of many plants of the fixth class a Corol, in contradiction to it. Here is only one cover prefent in this crown-imperial; examine it, and determine whether it be a Calyx or a Corol.

010.02

Harr.

[34]

[35]

Harr. The ftamens and petals are not placed opposite, fo I should fay it was a Corol.

Hortens. According to the rule, you would be right; however, as I have told you that a clofe observance of this rule would lead you into error in examining many of the beautiful flowers of the fixth clafs, 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 fystem are removed by the attention of those, who, knowing its great merit, are more defirous 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 fix-petalled, and belled; obferve with what grace thefe 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 fmall 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 ftop to look at those pretty drops; they are the Nectaries, I suppose; we have wondered the honey did not fall out.

Hortenf.

Hortenf. The quantity is fo 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 ftay in ; nor will it do fo if the cavities are filled by art as full as they are by nature, fo poor and clumfy are our imitations of her in even the most fimple of her works. The Stamens and Piftils are very confpicuous in this flower; the Dust from the Anthers is beautiful when feen through a microfcope : we will look at it. You will be furprized to observe the perfect form of its separate particles; the Stigma and Style we will alfo examine, though with the naked eye we may fee that moisture at the top of the stigma of this large flower, which fits it to receive the Duft of the Anther, and from thence to convey its effence through the Style to the Germ; when this Germ becomes a Pericarp, that is, when it becomes mature, it is a Capfule filled with large flat feeds. Now we have taken off these five parts separately; tell me, Henry, what name belongs to the fixth part which remains?

2 2

Henry.

[37]

Henry. I think, the Receptacle.

Hortenf. You are right.---Here are only fix 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 ?

Hortenf. It is, my dear; I am much pleafed by the attention of you all; and am particularly fo, 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 Floralleaves; they are fituated on the petiole, or flower-stalk, and often fo near the fructification as to be confounded with the Calyx. Examples of the Bract may be feen in tilia (lime-tree), monárda, paffiflora, paffion-tree; the Bracts may be diftinguished from the Calyx by their longer duration; they differ in fize, fhape 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 confists of a tuft of leaves, which terminates the flower-ftem; we have just now admired this tust in the

crown-

crown-imperial. There is a fpecies of fage (falvia) whofe Bracts are beautifully coloured; fometimes they are red, and fometimes of a deep blue. Linneus has made great ufe of thefe fingularities in determining the fpecies of plants; therefore you fhould be well acquainted with them. The Bract is ranked amongst the Fulcra, or fupports of plants, of which I shall treat prefently. This poppy and tulip fhew you the ftigma attached to the germ, without the intervention of the ftyle: the germ of poppy with its fligma is very beautiful; the fligma fhuts up the germ, like the lid of a box; when the germ is mature, it is a capfule, and opens at the top in feveral places to let out the feeds, which are very numerous. From one head of white poppy, 800 feeds are faid to have been produced in one fummer. This has been afcertained by counting the number of feeds, which would weigh a grain or two, and then by weighing the whole. Your trouble will be well repaid, if you examine feeds of all kinds through the microfcope; they have much beauty, which from their minuteness escapes common obfervation.

Harr. Violet feeds Ihave often admired.

5

Hortens.

Hortenf. They are worthy of admiration; the variety, that may be found in feeds, is very great, both in fize, shape, and furface, also inthe veffels which contain, and the fubftance. which encloses them, before they are ripe. If you confider the difference in the fize of the cocoa-nut feed, and that of the poppy, you may imagine there must be many different fizes between these two extremes. The appendage, which nature has given to feeds for their diffemination, also adds much to the beauty of many of them. The feed of the common chick-weed is worth looking at through a microfcope, the furface of it being like the muffel-shell. In my cabinet I can shew you the pictures of various feeds elegantly given in Mr. Curtis's London Flora.

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

Hortenf. 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 inftruct you in what is termed the Fulcra and Inflorescence of plants, and then we may begin with the claffes.

Harr. That we shall like.

Hortenf,

[40]

Hortenf. I am afraid that you are rather more apt to expect pleafure from your fludies than to find it; the fludy of either a fcience 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 amufement begin.

Charles. I have a great deal more pleafure in looking at flowers, now I know their feparate parts, and have fome idea of the ufe of those parts, than I had before, when I was wholly ignorant of them.

Hortenf. I dare fay you have; and the more you apply the knowledge you have gained, the readier you will find yourfelf in learning, what remains for you to be inftructed in. Linneus has named those parts of plants, whofe chief use is to ftrengthen and fupport them, Fulcra, or Props; fupports is the term given them in the translation of the fystem of vegetables: they are defined to be, affistances for the more commodious fupport of the plant. There are feven 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 footfoot-flalk of the flower. Petiole is defined to be a prop fupporting the leaf. Peduncle, a prop fupporting the fructification. Stipule is a fcale, or fmall leaf flationed on each fide of the bafe of the Petioles, or Peduncles, when they first begin to appear, as may be feen in the Papilionaceous, or butterfly fhaped flowers: I dare fay you have obferved the Stipules of the tulip-tree (liriodéndron).

Henry. Juliette and I have often obferved them, and amufed ourfelves with pulling them off, and examining the very little leaves which are fo pretty within them; I did not know thofe two blueifh fcales had any particular name; I will always call them Stipules now.

Hortenf. Pray do. The Stipules of all plants fhould be attended to, as they frequently ferve to diftinguifh one fpecies from another; I admire as much as you do the fmall leaves of the tulip tree enclofed by their Stipules; it is pleafing to contemplate the care which nature has taken to preferve thefe infant leaves from all outward injury, and how perfectly they are formed in every part, though you may find them fo minute as to require a microfcope to examine them accurately; thefe two

two Scales, or Stipules, protect and cherift them till they acquire fufficient ftrength to fupport themfelves. The Stipules of the plane tree (platanus) add much to the beauty of the tree in fpring, being formed like little ruffs which furround the branches. In peach (amy'gdalus) and bird-cherry (prúnus) the Stipules refemble two very finall narrow leaves, and are feated at the bafe 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 firong enough to fupport themfelves. Vines (vitis) twift themfelves round other trees by their claspers or tendrils, and thus raife themfelves 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 feafon; their natural place of growth is in hedges, where they readily find fupporters; all thefe climbing plants are in fome degree injurious to the tree of which they take hold for fupport, as they deprive it of that fhare, of light and air, to which it has a natural right. There are however fome climbing plants, which feem

in-

[43]

intended by nature to receive their nourifiment from other plants, as dodder, cufcúta, The feed of this plant fplits without Cotyledons, fo that the young plant, having no ftore of nourishment laid up for it by nature, feems neceffitated inftantly to find a foster mother, or to perifh; when the feed fplits it protrudes a fpiral body, which, without making any attempt to root itfelf in the earth, afcends the vegetables in its neighbourhood, twifting round them, and abforbing its nourifhment by veffels apparently inferted into its fupporters: this must injure the plants it lives upon materially; and I am forry to find an inftance of fo much ingratitude in the vegetable kingdom, for the fequel of the hiftory is, that after it has been afforded fupport and nourifhment by a ftranger plant, it overpowers and fmothers its protector: in this refembling those vicious human creatures who, being too idle to work for their own fupport, bring their parents to poverty and death, by the efforts their tenderness induces them to make for their fubfiftance.

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

Hortenf.

Hortenf. We will hope not, my dear: I am happy to fay there are but few inftances of fuch plants as cufcúta in the vegetable kingdom. In most fituations the injury is finall, which the fupporters of the climbing plants fustain from the affistance they afford, as generally the climbers have roots which ftrike into the earth, and from thence draw nourifhment.

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

Hortens. They are. Climbing plants are of fuch quick growth, that there tops are always tender, and, when rendered mild by boiling, are agreeable food. The tops of white bryony (bryónia) are faid to be fweet and pleafant to the tafte, but I have never eaten of them. There is one plant of the parafite kind, which appears to be fo from choice, as it first vegetates in the earth, and is fometimes found growing in it; nor has it any want of fupport from its neighbours, being a stiff short stemmed plant; this is the orobánche major, it grows upon the roots of other plants, chiefly upon the butterfly-flowered tribe; it has an extremely fmall feed, which

which makes it difficult to fhew its vegetation by experiment, more particularly as it requires a peculiar foil and fituation for its culture. Mr. Curtis, in his London Flora, gives a plate of it, and fuppofes, that when the feed has firft vegetated in the earth, that the Radicle fhoots downwards, till it finds a proper root to attach itfelf to, that it then quits its parent earth, and becomes parafitical.

Charles. I dare fay this is the plant I once faw when I was with the gardener digging up broom. Pray, ma'am, does it not look like a plant dried in fand? and is it not of a purplifh colour? The gardener fhewed it to me, and faid, look how clofe it flicks to the roots; but I never thought it grew upon them.

Hortenf. No doubt it was the orobánche, as it is generally in its parafitical ftate, found upon broom hills; though when it contents itfelf with the earth for its nourifhment, it grows in corn fields, and on hedge banks. I wifh you had brought me a plant of it, but you were carelefs at that time about fuch curiofities. We will now confider the fifth kind of Fulcra, *pubefcence*, which however may more properly be called a defence than a fupport.

fupport. 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 ftems, we shall find almost all of them covered with hairs: this clothing in their tender state feems intended to preferve them from fevere 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; thefe arms confift of Prickles, Thorns, Forks, and Stings. The thrubs and trees which have Prickles and Thorns for their defence, are grateful food to animals, as gorfe (úlex) and goofeberry (ribes), 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 fmooth leaves above; which is a curious circumstance, as it would feem to imply a confcioufnefs 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 preferve their lower branches from the attacks of the deer, they cannot defend themfelves from the

de-

depredations of the keepers, who lop their upper boughs in winter, and ftrew them on the ground, and thus furnish their herds with a grateful food, when herbage is fcarce; the deer peel off the bark from these branches with great dexterity; and this with the fmooth leaves forms a great part of their fustenance in fevere winters. Stings, as in nettles (urtica), are the pipes of a fmall bag furnished with a venomous fluid; when the fling, 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 accidently 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?

Hortenf. You may then answer the queftion yourfelf. I imagine the amusement you find in feeking the dock leaves, and repeating the lines of—In dock, out nettle—rather ferves to divert your mind from the evil than to cure it. There are many curious contrivances for the defence of plants, which may be confidered as arms. On the leaves of Venus's fly trap (dionæa muscípula) there is a won-

a wonderful contrivance to prevent the depredations of infects; the leaves are armed with long teeth, and lie fpread upon the ground round the flower-ftem, and are fo irritable, that, when an infect 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 mechanifm greatly refembles the fo much celebrated flytrap; this is the fundew (drófera): its round flat leaves are thickly befet with hairs, both on their upper furface and on the margin; each of these hairs is crowned with a little purple globule, which in the funshine exudes a pellucid drop of mucilage, and gives the whole plant a beau-Thefe hairs with their tiful appearance. vifcous juice entangle the flies, which attempt to plunder the leaves, fo completely, that, when once enclosed by them, it is not poffible they fhould efcape. It is alfo fupposed, that the leaves of the drósera posses a power of folding themselves upon the infect, that they would deftroy, in a manner fimilar to those of the flytrap; but these refearches do not belong to the prefent part of our fubject; I will, however, fhew you a plate of the fun dew, and when we walk out we will endeavour

endeavour to find fome plants of it; they commonly grow upon marshes, but I have found them on the wet part of heaths, and on ditch banks; in thefe fituations they are not difficult to difcover, as they form a little red patch, which immediately attracts the eye. There is a vifcous juice which furrounds the ftems of fome plants, and which effectually defends them from the depredations of infects, as they no fooner approach them than they are deftroyed; from this circumstance a species of filéne has obtained the common name of catch-fly. I could enumerate many more extraordinary arts, which nature has used to preferve the vegetable kingdom from it enemies, particularly from infects, but at prefent I wish only to make you fo far acquainted with them as to give you an intereft on the fubject. 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 flowerstart flem, which raises the fructification without

E

the

[50]

the leaves; it is a naked ftalk proceeding immediately from the root, and terminated by the flowers. Hyacinth (hyacinthus), 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 fignifies the various manners in which flowers are joined to their Peduncles. There are feven different modes of Inflorescence, diftinguished by the following terms: Verticil, Head, Spike, Corymbe, Thyrfe, Raceme, Panicle. The Verticil is that kind of Inflorefcence, where many flowers furround the ftem like a ring, or ruff, the individual flowers standing upon very short peduncles, deadnettle (lámium), and lavender (lavendula). bear their flowers in a Verticil, or Whorl. Head has many flowers collected into a globe on the fummit of the common stalk, fometimes with, and fometimes without diffinct peduncles. Clover and globe amaranthus (tri-

(trifólium and gomphréna) fhew this kind of Inflorescence; it is diftinguished into various kinds by its shape and other circumstances. Sweet William (diánthus barbatus) has its flowers in that fpecies of head, which is called a fascicle, though I think that the mode, in which the flowers of fweet william are put together, places it more properly under the term corymbe than Head; but I always diffent from Linneus with great diffidence. The Spike has its flowers placed alternately round a common fimple peduncle, without any partial ones, which is called being feffile, or fitting clofe on the ftem. Many of the graffes have their flowers in Spikes; it is called one-ranked, or a fingle rowed fpike, 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 darnel (lolium). The Spike, like the Head, is diffinguished into various kinds by its shape, and other varieties. The Corymbe is formed by the partial peduncles produced along the common stalk on both fides, which, though of unequal lengths, rife to the fame height, fo as to form a flat and even furface at top. Spi-

E 2

ræa

ræa opulifolia, candy-tuft (ibéris), alfo is an example of the Corymbe.

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

Hortens. Their manner of flowering retembles that of the Corymbe; there is however this diffinction, the flowers which form the general bunch of parfley (ápium) and earth nut (búnium), which is called an umbel, all grow from the fame centre; whereas those of the Corymbe grow from different parts of the common flower-ftalk.

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

Hortens. 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 refearch; hence he discovered those innumerable minute and wonderful varieties in every part of a plant, which has enabled him to give the world a fystem, from which by attentive fludy we may arrange every plant, that grows, under its proper class, order, genus, and species. We can now converse in one language

[52]

guage with botanifts in every part of the globe. The labours and knowledge of every individual are preferved, and added to the general flock. All this we owe to Linneus; yet I advife you not to indulge yourfelf in envy of his great abilities, till you have been as ufeful to the world, as the abilities, which nature has given you, will allow of your being. I always fet down for idlers those perfons, whom I hear envying diffinguished characters; they are themselves commonly weak and indolent.

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

Hortenf. I hope, and now believe you will not; but as you are born in that clafs of fociety, which exempts you, as my eldeft fon, from the neceffity of a profeffion, it will require more exertion to avoid this character, than you may be aware of; on this account I wifh particularly to cultivate your tafte 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 neceffary, for the civility of focial life to idle and profitles company; you will be eager to return to your feeds and roots,

or

E 3

or to your laboratory; finding yourfelf refpected among men of science, you will

feek their company.

Charles. I have already found the pleafure and benefit of fludying 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 faid I was quite changed.

Hortenf. You are now nearly what I with you to be: a few years paffed in a courfe of industrious habits will, I truft, 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 prefent studies may be of much use to him; in any fituation the study of a science teaches us to think, which is the soundation of all acquirements, and in my opinion of more value than all the train of accomplishments commonly taught at schools.

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

Hortenf. One is the confequence 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 5 fcience,

fcience, 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 fhould lay afide?

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

Hortenf. There is no fituation of life, where a knowledge of work is not requifite; there are various flates, which will not allow of our time being fpent in purfuits, that cannot be put into daily practice; your fituation admits of both acquirements. I have however not allowed of your beginning the fludy of an amufing fcience, while you were idle at that most neceffary one, arithmetic, and carelefs with your needle.

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

E4

Hortens.

Hortenf. I have endeavoured to do fo, and have found the advantage of it, in all other things I have had to inftruct you in. Had you not been accuftomed to compare one object with another, which is thinking, you would not have underftood fo readily, what I endeavoured to explain to you on the fubject of botany: but we have wandered far from our ftudy; 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 rife from the different parts of the common stalk of the Corymbe, but all from the fame part of the Umbel.

Hortenf. Very well, Henry; you prove that I have not thrown my time away in teaching you the art of thinking. The Thyrfe is the mode of Inflorefcence, we have now to confider. The flower of lilac (fyringa), and of butter-burr (tuffilágo) are examples of the Thyrfe. Linneus calls it a panicle condenfed into an egged form; the lower peduncles, which are longer, extend horizontally, or crofs-way; the upper, which are florter, mount

mount vertically, or perpendicular. The raceme has its flowers placed on fhort partial peduncles, proceeding like little lateral branches from and along the common peduncle; it refembles a fpike 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 fhortnefs and equal length of its peduncles, not forming a regular furface at top. The vine (vitis) and the currant (ríbes) bear their flowers in Racemes. The Panicle has its flowers dispersed upon peduncles, varioufly fubdivided; it is a branching diffufed fpike, composed of a number of fmall fpikes, 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 Inflorefcence. Flowers too are fometimes found growing on the leaves, as in the rúscus genus. Dr. Thunberg takes notice of this fingular kind of inflorescence, in his account of Japan, having feen it in the Ofy'ris Japonica, and calls it a most rare circumstance in nature, from its rarity,

rarity, I suppose. Linneus has not thought it neceffary to diffinguish 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 fpadix he has ranked under the general term receptacle. The cyme and umbel are much alike, both having a number of flender peduncles growing from one common centre, which rife to the fame height; they differ in the cyme, having its partial peduncles difperfed without any regular order. Elder (fambúcus) and lauruftinus (vibúrnum) are fpecimens of the cyme. The term fpadix is used to express every flower-flak, that is protruded from a fpathe or fheath; the family of palms have their flowers in a fpadix, which is branched. The fpadix of all other plants is fimple. There is another term, which Linneus makes use of, which is rachis; this means only the flem, on which the flowers grow that form a fpike; he calls it a threadform receptacle, connecting the florets longitudinally into a fpike.

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

Hortenf.

Hortenf. I do not even expect that you fhould underftand them, until by examining the definitions of them with the plates of the different kinds of inflorefcence they are made more intelligible to you; and when they are become fo, you will with eafe make them familiar to you, if, as you walk out with your brothers and fifter, you examine fuch flowers, as you meet with, by those definitions, of which you have made yourfelf mistrefs.

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

Hortenf. The hard names will become familiar to you by degrees. You muft affift one another; we are all interefted in the ftudy; we fhall converfe upon it, which will contribute more to your improvement than twenty leffons 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 queftion and anfwer, fuch as, What is fructification? How many parts of fructification are there? &c. &c. this will amufe and improve you at the fame time. Botany is reckoned a dry ftudy of names and terms; if the pupil finds

11

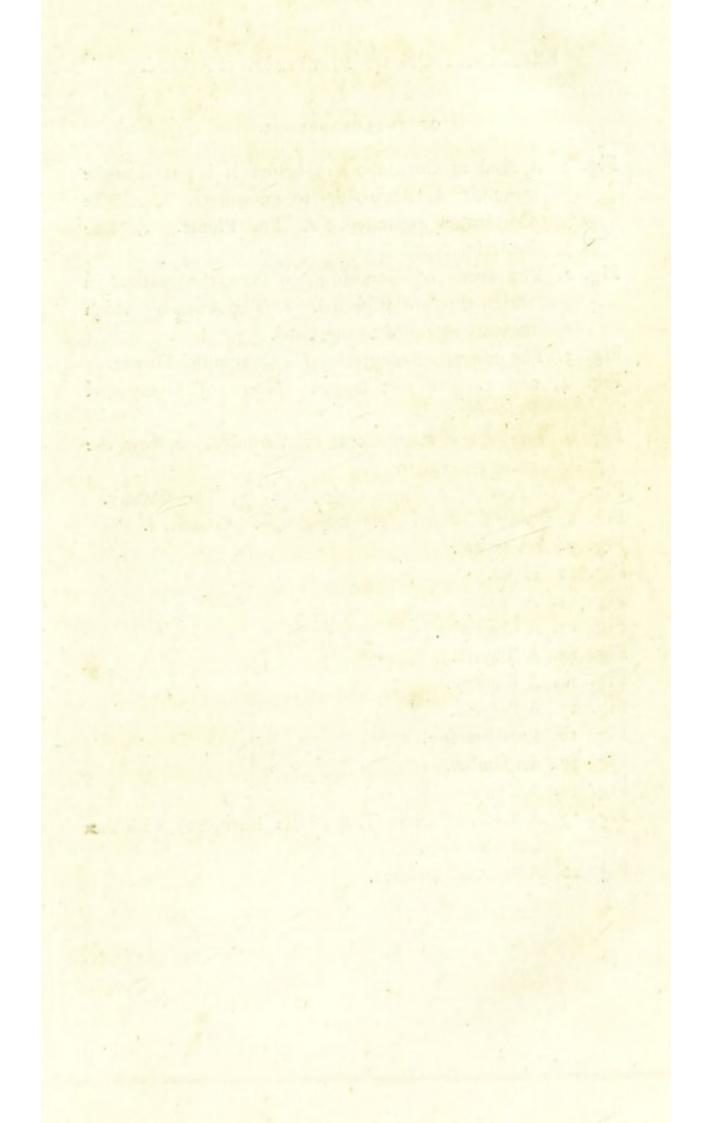
it fo, it must be the fault of his teacher. You would not, any of you, have given your attention to me, if I had begun with teaching you only out of a book, and required you to remember all the numerous distinctions, without at the fame time shewing you the natural objects, and acquainting you with their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

Charles. I did not expect the amufement I have found fo early in the ftudy. I am impatient to tell Mr. Wilfon how much I like it.

Hortenf. You will like it ftill better the farther you enter into it. We fhall have the whole feafon before us; and, I doubt not, fhall be great proficients, if we make as good use of our time henceforward, as we have hitherto done. We will part for the prefent, as you have learnt fufficient for one day.

Henry. I wifh 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 queftion each other in turns.

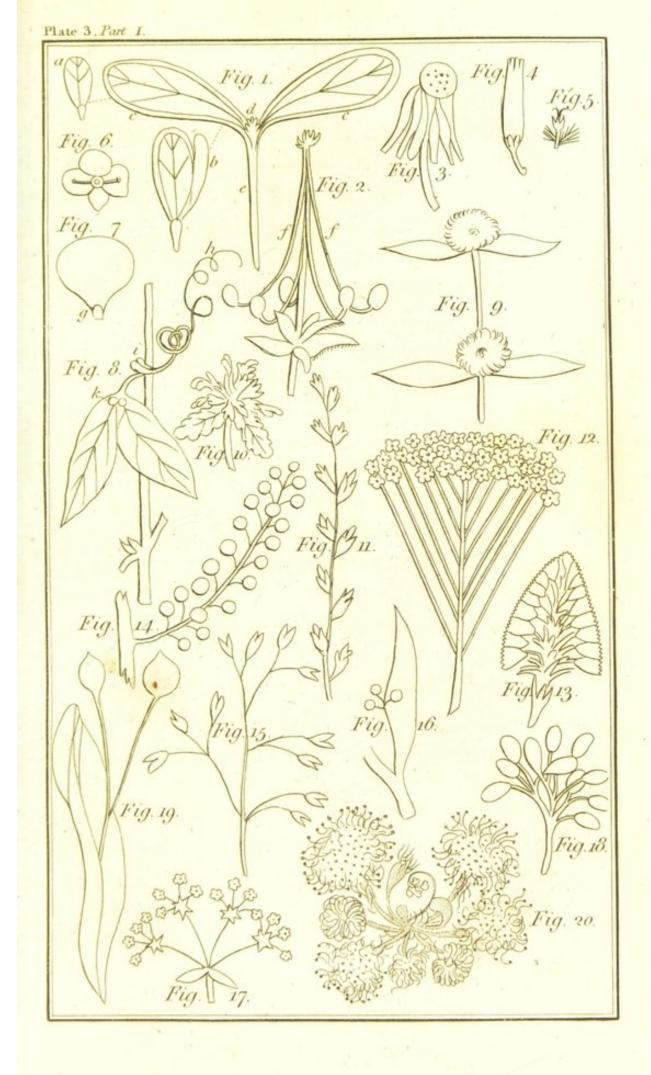
DIALOGUE



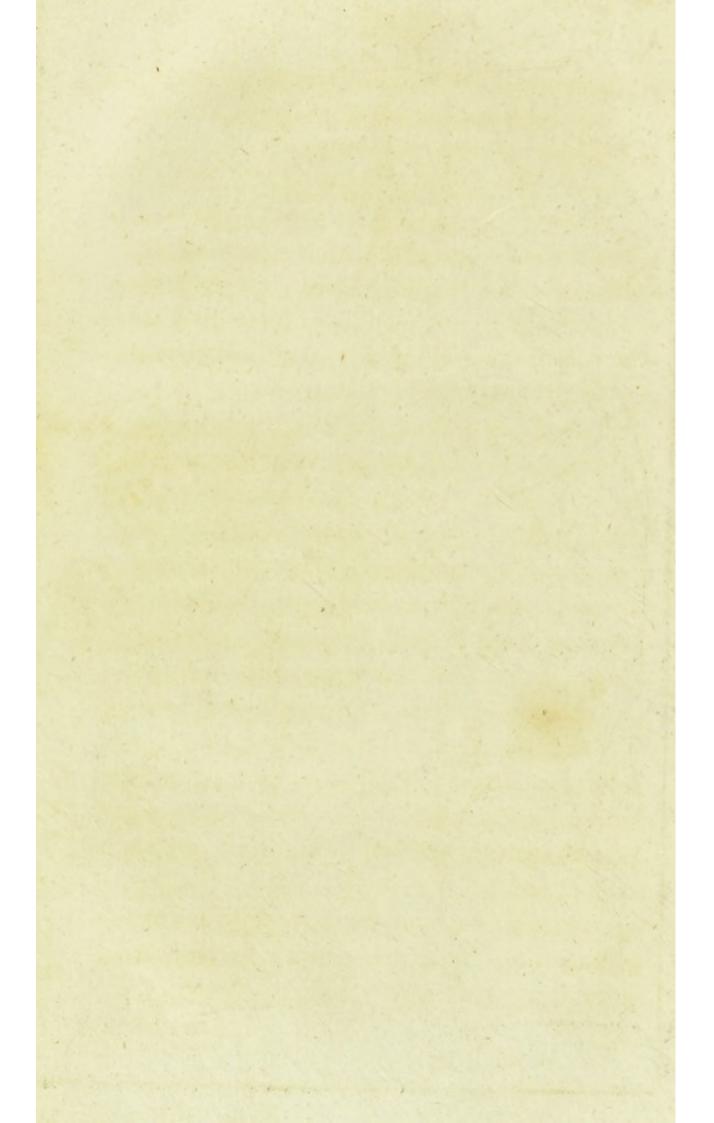
EXPLANATION OF PLATE III. PART I.

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 fhew the manner in which they are difperfed. *f*, The Awns by which they are attached to the Piftil.
- 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 fhew the narrow division.
- Fig. 7. A Petal of common Crow-foot. g, The Nectary.
- Fig. 8, Shews a Tendril, b. Stipules, i. Glands, k.
- Fig. 9. A Verticil.
- Fig. 10. Head.
- Fig. 11. A Spike.
- Fig. 12. A Corymbe.
- Fig. 13. A Thyrfe.
- 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 Capfules mature.
- Fig. 20. A Plant of Drófera.



London Published May 1. 1797, by J. Johnson StPauls Church Yard .



[61]

DIALOGUE THE THIRD.

LAT LEDGER

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

Hortenf. I am glad to meet you all again in our botanical room; by your countenances I judge that you have gone through your fchool bufinefs well, and that we may proceed with our fludy of amufement.

Henry. Yes, indeed, we may; Juliette and I performed our tafks fo 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 afking each other queftions from the paper we formed yefterday; 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.

Hortenf. You have managed it very well indeed, and I am pleafed to fee that you have rigoroufly obferved 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 anfwered our trouble; for finding them accented in the translated Génera Plantárum, we were no longer afraid of pronouncing them, and in a little time I dare fay, we shall find the botanical names as eafy to remember as the common ones.

Hortenf. I with 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 Englifh names; I fhall be afraid of fpeaking the botanical names though they are accented, left I fhould be thought conceited.

Hortenf. You may avoid that evil by a difcreet 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 univerfally fally known by their common ones: for inftance, if inftead of talking of a crown-imperial, you fay you have gathered a fritilária imperiális; or for lily of the valley you fay convallária, you will defervedly be ridiculed both by the ignorant and well informed.

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

Hortenf. This has been attempted, and has only ferved to make more evident the difadvantages of fuch a plan. Genéric names are merely arbitrary, and ought to be equally familiar to botanists of every nation, which could not be the cafe, 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 miflead. In regard to an english genéric nomenclature, many objections may be made to it; first, there are but few english genéric names, which comprize all the plants belonging to the fame family, fouthern-wood, mug-wort, and wormwood, have all an equal claim to become the family name of that genus, but have all been too long appropriated to each individual fpecies

cies to be now affumed for the name of the genus. The Linnean genéric name for this family, artemífia, 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 confidering them as diffinct families. So the genéric name of clary does not feem to include the fages, nor the genéric name of fage to include the clary. Sálvia comprehends them all, and may be retained by the memory with as much eafe as the english names. I will give you an inftance, in which this attempt to establish english genéric names is productive of fo uncouth an effect as, I think, will put an end to your defire to have it become general. The genéric name py'rus 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 fpecific names; hence we must fpeak of the pear-apple, the pear-quince, which could convey no diffinct idea to a Linnean botanist, and must confuse an english one.

Harr. That would be very awkward indeed. I will no longer wifh for the general use of english names; I always find, mamma, you [65]

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

Hortens. I also like to have you enquire : I never with you to take any thing upon my authority, when objections arife in your mind against my opinions; this however requires diferetion, and an attention to making your queftions 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 eftablish an english génera; and in imitation of the Lichfield. translators, in their useful publication of the Génera Plantarum and Syftem of Vegetables in an English Drefs, the botanical names are accented. This must greatly facilitate the use of them; and it is much to be wifhed, 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 bringbringing them into univerfal ufe; even without thefe affiftants we hear thofe very people, who object most to the difficulty of them, speak without hesitation of convolvolus, geránium, 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 Clafs is the first and highest division of every fystem. It may be compared to a dictionary, in which all the words having the fame initial letter are arranged together, every word may be compared to a genus; the claffic character is conftituted from a fingle circumftance, as the words are arranged by a fingle letter; this one circumstance must be poffeffed equally by every plant admitted into the Clafs, how different foever they may be in other refpects. This fingle character is arbitrary, and has been taken from various parts of the fructification by different authors; fome have chosen the petals, others the fruit ; Linneus has made choice of the stamens, and on their number and fituation has founded his claffes; he makes the excellence of the claffic

claffic character to confift in its greater or lefs approximation to the natural one. The classes called natural are those, which contain plants agreeing in a variety of circumstances, fuch as habit, manner of growth, uses, and fenfible qualities. The graffes are a natural class; the compound, the pea-bloom, the crofs-form, the umbelled, and the verticilled plants are natural claffes; fo are the ferns. Though some of Linneus's classes are natural, most of them are artificial; this however I think of little confequence; his fystem has opened to our view a diftinct knowledge of every plant that grows; it has given us a clear and ready method of referring an unknown plant, Ist, 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 fystem 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 fcarce any affinity, from a fancied refemblance in imaginary virtues. Much useful knowledge has been loft to the

F2

[68]

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 fay, what an ingenious man Dr. Grew was; and you are always entertained, when you look for plants in Gerrard's Herbal.

Hortens. Whoever is fond of the study of plants must feel grateful to Dr. Grew; he made his inveftigations with fo 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; befides, it is pleafing to obferve 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 ftrong, and his language amufing; but, for want of arrangement, I am bewildered, when I look for a plant in his Herbal; the various fystems of modern botanists have defervedly had their partifans; but it now feems 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 Claffes; the first ten Claffes include the plants. in whofe flowers both ftamens and piftils are found, and in which the ftamens are neither united nor unequal in height, when at maturity. These Classes are therefore diftinguifhed from each other fimply by the number of ftamens in each flower, and may be known upon the first view by their numbers, as expressed by the words prefixed to the Claffes : the first Clafs is known by the name of monandria, which fignifies one-male, or one-stamen, the stamens being the part of fructification, which Linneus calls the male; fo that the numerical word joined to the word andria forms the titles of the first thirteen claffes. Perhaps, Charles, you can with this previous information enumerate them to 115 ?

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

Hortens. 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 tranflate

[70]

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

Charles. I am to enumerate the titles of the first thirteen Classes :---monándria, onestamen; diándria, two-stamens; triándria, three-stamens; tetrándria, four-stamens; pentándria, five-stamens; hexándria, stx-stamens; heptándria, seven-stamens; octándria, eightstamens; enneándria, nine-stamens; decándria, ten-stamens; dodecándria, twelve-stamens; icosándria, twenty-stamens; polyándria, many stamens,

Hortenf. We thank you; you have performed your tafk well; and we will not enquire whether your previous knowledge of language, or memory, has had the greateft fhare in your doing fo.

Harr. Will it be neceffary for me to learn thefe hard names to the Claffes? I could readily remember the titles of one-ftamen, two ftamens; for they give me fome idea of the flowers.

Hortenf. I do not wifh you to perplex yourfelf with them; but it will be ufeful to make yourfelf a little acquainted with terms, which you will meet with in most botanical books; and if you will take the trouble to familiarize miliarize yourfelf 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 eafy.

Hortenf. There are fome books, which pretend to do it; but the fcientific terms are ftill 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 converfe with botanists of all nations, and to understand any botanical descriptions of plants, that we may meet with. Those who have not industry fufficient to fludy those books, will learn the fcience but superficially from any. The complaint, that the translated works of Linneus are hard, arifes from not knowing how to study them. I have feveral times removed this difficulty by pointing out a method, and have been affured by my pupils who have F4 adopted

adopted it, that they have learnt more readily from them than from all the pretty roundabout ways, which have been adopted to level the fcience to the capacity of ladies, and which, I think, ferve only to confufe. The method, by which I teach you, is the fame, which I recommend for ftudying the Lichfield tranflation.

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

Hortens. That is true; and in confequence of my affistance, you find the study more amufing to you; but there are few perfons, who have not fome friend, to whom they can apply, who can either refolve thefe difficulties, or recommend books by which they may be removed. I am rather amufed 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 fystem of vegetables, they who wished to make any proficiency in the fcience of botany, were first obliged to learn Latin .--- But to return to our Claffes, the ten first of which, as I can fhew you by a plate, are known by their number only; the eleventh Clafs is called

called dodecándria, which you know fignifies twelve-ftamens. The reafon of paffing from ten to twelve is, that the number eleven has not been found fufficiently conftant in any flowers to form a Clafs. In the genus reféda eleven stamens are sometimes found, but oftener more; yet they never exceed fifteen. The effential character of the eleventh Clafs is, that the flowers belonging to it shall not have fewer than eleven ftamens, nor exceed nineteen; added to this may be, that in this Clafs the ftamens are fixed to the receptacle; whereas in the next, which has the title of twenty-stamens, icofándria, though no more determined in point of number than the preceding one, they are attached to other parts of the fructification; their polition it is also neceffary to attend to in the thirteenth class; fo that if we regarded only the titles of thefe three claffes, we should find ourselves much confused.

Harr. Why then did Linneus give fuch names to his claffes, as were fure to miflead a young botanift?

Hortenf. I am forry I cannot answer that question fatisfactorily; it feems that he might have given such titles to the three last of the numerical

numerical claffes, as would have been expreffive of the circumstances which diftinguish them. I am ready to believe he had good reasons for not doing fo, as he was evidently aware of the defect in the titles he did give them, and as he has obviated the inconvenience, which would arife from the first character expressive of a decided number of ftamens, by adding in the Key to his fyftem the fituation of their growth, and by which circumstance alone we can diftinguish these three claffes one from the other. The twelfth class, icofándria, has generally twenty stamens, often more, which are inferted on the calyx; there are alfo other more obvious characteriftic marks, which may ferve to diffinguish 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 confifts of fuch plants as are poifonous. The plants of the twelfth clafs have a hollow calyx of one leaf, the corol fastened by its claws to the infide of the calyx, and, as I told you before, the stamens placed on the infide of the calyx or corol.

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

[75]

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

Hortens. Your conclusion would probably be right, and might be of fervice 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 infertion of the stamens on the inner part of its leaves. The thirteenth clafs, many stamens, polyándria, has its stamens inserted on the receptacle; their number being from twenty to one thousand in the fame flower. This class is the last of the numerical ones, or, more properly, of those which have numerical titles; for we have feen that the character of the laft three claffes depends nearly as much on their fituation as those of which we are about treat. However we will proceed no further, till we have well understood thefe 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.

Hortenf. You have yet only gone through the ceremony of introduction, and have not had [76]

had time to form an acquaintance with them, which you will not find very difficult, if you will be content to fludy only a few of them at a time. I will introduce you to the first fubdivisions of the thirteen classes, which are called Orders, and then we will examine our plates, and fome flowers with them. The fubdivisions or orders are founded on the number of piftils, 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 fecond; and fo on to any number that it may contain. The Linnean term for the orders is formed from the Greek word, which fignifies a female, joined to another word expressive of the number; fo that, as monándria fignifies one-male or stamen, monogynia means one female or piftil; digy'nia fignifies two piftils, which refers the plant to the fecond order ; trigynia fignifies three, and fo on to polygy'nia, or many piftils. Do you think you can remember the titles of the claffes and orders.

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

[77]

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

Hortenf. 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.

Hortenf. 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 clafs icofándria, or the twelfth clafs, has generally twenty ftamens, often more, inferted upon the calyx, which is of one leaf with the claws of the corol faftened on the infide of it.---Now, Harriét.

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

one

one thouland, which are inferted on the receptacle. The orders depend on the number of piftils. In all the numerical claffes, the ftamens muft be of an equal height when mature, and the ftamens and piftils muft be found in the fame flower; but I will own, that I repeat more than I underftand; for, finding myfelf confused, I refolved to apply wholly to retaining what mamma told us, and trufted to underftanding it when we came to look at the plates.

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

Charles. I dare fay I fhall underftand them better, when we have feen fome flowers and the plates; but I think I have a clear idea of the position of the flamens in the three last class.

Henry. I have often feen the flamens growing on the infide of the calyx in apple and pear bloom; and yefterday Charles and I pulled off the petals of a crow-foot, and the flamens all grew on the receptacle.

Hortenf. You will find that an attention to thefe finall circumftances will be of much use to you, as we proceed in our study.---When

you

[79]

you are fatisfied with examining the plates, we will go on with the claffes.

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

Hortens. The character which diftinguishes the clafs didynamia, or the fourteenth clafs, is this, viz. that the flowers, of which it confifts, 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 circumfance, but that which Linneus has arranged them under, viz. the curious polition of their ftamens. This class contains two orders, which are ftrongly marked; the first gymnofpermia, or that in which the flowers have their feeds naked, being contained in the bottom of the calyx; and the fecond order; angiospermia, having the feeds covered or contained in a pericarp. The whole appearance of the flowers belonging to thefe two orders is perfectly different : what can be more

more fo than the fox-glove (digitalis), and lavender (lavéndula), or thyme (thy'mus). Yet the crofs-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 clafs, has fix ftamens, and is called the clafs of four-powers: thefe fix ftamens not being of an equal height, four being taller, and the two lower growing opposite to each other. This class contains the crofs-form flowers, and is a really natural clafs. Linneus has admitted only one genus into it, which can be at all objected against, that is the genus cleóme, in many fpecies of which there are more than fix ftamens, and thefe not in the regular proportion of length, which gives the name of four powers to the class, fo that it feems that the family of cleóme has no right to be admitted into it, unlefs the affinity of its nectaries to those of the cross-form flowers may be allowed a fufficient title. This clafs is divided into two orders, which are diffinguished by the form of their pericarps, or feed-veffels; the first order having its feed-veffels of the Silicle kind, the fecond of the Silique; the Silicle

Silicle being furnished with a style, often the length of itfelf, the Silique with a ftyle fcarcely visible. What is the difference, Henry, betwixt the fhape of a Silicle and a Silique ?

Henry. The Silicle is roundifh, but the Silique is long; I think honefty has a Silicle for its feed-veffel, and that the feed pod of muftard is a Silique.

Hortens. You are quite right. The filicle of honefty, when mature, is a great ornament to the plant; from its fhining appearance, like white fattin, it has received its botanical name of lunária, or moonwort. There is a good deal of variety in the forms of the filicle kind of feed-veffel; that of Iunária, you know, is nearly round; there are others which are oval: the fmall filicle of fhepherd's purfe (thláfpi) is triangular, and notched at the top, and refembles a little heart; the circumstance of being notched or plain makes two divisions of the filicle order, and thence renders the investigation of the genéra belonging to it a lefs difficult tafk. She feedveffel of lady fmock (cardamíne) is a filique, and alfo that of radifh (raphanus), Some of thefe

these filiques form very pretty skeletons, in the fame manner as the holly leaves that you pick up in winter, and which you fo much admire. The fixteenth clafs, monadélphia, or one-brother-hood, is fo called from the flowers belonging to it having all their flamens united at the bafe into one company, furrounding the piftils. The ftamens and piftils in the flowers of the fixteenth clafs add much to the beauty of the fructification; they fland 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 fhaped like a fmall kidney, and attached to the filaments by the middle in fo flight a manner, that they appear rather to lie upon than to be fixed to them. The piftils are enclosed by the ftamens, till they begin to advance towards maturity, when they burft forth, and form an elegant taffel, a little above the furrounding anthers: in the china rofe (hibifcus) this taffel is particularly beautiful; the rich crimfon piftil rifes rather higher than usual above the golden anthers, which

which encircle it, and dividing into five filaments at top bends down its round ftigmas amongft them; thefe ftigmas then have the appearance of the richeft crimfon velvet fpangled with gold.

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

Hortenf. You shall see the first, that we can gather. The double hibifcus most people are fond of cultivating, but it is very inferior in beauty to the fingle. As the fixteenth class is founded on the fituation of the ftamens, fo are the orders on their number, beginning with the number three, and ending with that of eleven. The clafs diadelphia, or two-brotherhoods, the feventeenth clafs, is perfectly natural, and the ftructure of the corol fo remarkable, that the outer habits of its flowers are fufficient to diffinguish them; but, according to the Linnean fystem, it is neceffary to have recourse to the fituation of the stamens, which is their being united into two fets; this claffic character is however to

G 2

be

be traced with difficulty, for what is termed one of the fets confifts only of a fingle filament; but Linneus has made this feparation of the stamens of such essential consequence, that he has not admitted into this clafs the genus fophóra, 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 fecondary divisions of the feventeenth class, are founded upon the number of stamens, without any reference to their union ; the fingular ftructure of the corol having made it neceffary to diffinguish each separate part by a name peculiar to itfelf, the broad fpreading petal at the back of the corol is called the Banner; the fide petals, the Wings; and the two petals, by which the ftamens are enclofed, are termed the Keel, from the refemblance of their form to the keel of a boat. The shape, and other circumstances attending these different parts, are found of use in diffinguishing the génera of this class from each other ; but the calyx is of most fervice in this important office; it is to this class of plants that the legume feed-veffel belongs. Henry explained

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

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

Hortenf: 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 defcriptions, which I have given you of them. We will now go through the eighteenth clafs, and then leave the remaining fix claffes for our next meeting. The eighteenth class is called Polyadélphia, or many-brotherhoods, the flowers contained in it having their stamens united into distinct sets. St. John's wort (hypéricum) 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-G 3 thers

[85]

thers in each flower, as fome of the genera have five anthers on each filament: indeed this is a circumftance, which ought always to be attended to, the ANTHERS and STIGMAS being the effential parts of the STAMENS and PISTILS. If they are prefent, it is fufficient to place the flower, they belong to, in the clafs or order, to which their number refers it. I am afraid you do not find the claffes fo amufing, as you flattered yourfelves you fhould have done.

Harr. I acknowledge, that I am not fo well amufed by them, as I was with what we before learned; but I am not at all tired, and fhould like to go on, only I think I fhall better underftand, what we have now heard, by fludying the plates, before we proceed further, than if we attempted to learn the outline of all the claffes together.

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

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

Ful.

[87]

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

Hortens. If you do, I shall think you great proficients; it gives me pleasure to find, you all fo 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 confidering.

ect is special to data the finwers quite rea-

rundly; a few years miniteachingun, that with

[88]

DIALOGUE THE FOURTH.

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

Hortenf. I have obferved, you all very bufyin your alcove, and have great expectations from the refult of your refearches, particularly as yefterday you were all fo ready in the theory of the claffes.

Jul. Ah, mamma, you laugh at us, when you fay, you expect great things. You knew the difficulties we fhould find in practifing our knowledge: I boafted too foon; but indeed I expected to clafs the flowers quite readily; now I am afraid I fhall be a great while, before I can make any thing of them.

Hortenf. 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 feize upon knowledge in a moment. You now feem to doubt your powers as much too haftily, as before you trufted in them; and, I dare fay, when I come to know what you have all done, I fhall be fatisfied. Harr. I do believe, mamma, you will; but it is becaufe you will not expect much; if Juliette had not been difcontented, I fhould have been a little vain of our performances. We cannot make out, to what clafs the plantain belongs; and fome grafs, we have gathered, puzzles us, and Juliette thinks this very flupid.

Hortenf. The graffes I advife you not to think about at prefent; they muft be fludied at firft by themfelves. Plantain (plantágo) you have probably been puzzled with, by not taking it in a good flate for inveftigation; the beft time to examine the number of flamens is juft before they burft forth; after the anthers are mature, it is difficult in many flowers to diffinguish their number. Be so good to give me your plants in order according to their claffes.

Charles. We have had great doubts about this mare's-tail; firft we thought there was no flower; then we recollected, that an anther and ftigma muft be efteemed a flower; and, on very clofe examination, we difcovered a ftamen and piftil at the bottom of each leaf, which grows round the ftalk; but we are not yet quite fure, whether we muft confider

fider this as one flower, or reckon the number altogether, that forms the whorl; but we

think it belongs to the first class and order.

[90]

Hortens. You are right in your conjecture; greater fimplicity in the ftructure of a flower can fcarcely exift than in this plant, which is the hippúris vulgáris, or mare'stail; it has neither calyx, corol, nor feedveffel ; and those parts, which are most effential to the fructification, are as few as poffible; there is one ftamen, one piftil, and one perfect feed; the ftalk cut acrofs is a curious microfcopic object; we will look at it prefently. Juliette may confole herfelf for not being able to clafs the plantain and grafs, as, on the first effay, I should not have expected any of you to have claffed the hippúris; but your having done fo proves, how much we may learn, when we have a real defire to understand a fubject, and give proper attention to it. These verónicas are right, they belong to the class two-ftamens, diándria, and the order one pistil, monogynia. Thefe graffes belong to the third clafs, 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

2

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

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

Hortenf. The deep divisions of the fligma give the flower the appearance of having three piftils, if however you take off the other parts of fructification, to do which you muft take the root out of the ground; you will find one very long piftil within the tube of the corol; your plaintain like the graffes you have gathered too ripe. You fhould collect feveral flowers of the fame 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 clafs.

Henry. I have brought feveral in different ftates; I think I fee four ftamens now.

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

[91]

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

Jul. We cannot class this parfley.

Hortens. 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 difpofition proceeds from pride rather than modefty; and much wish you to get the better of it. I fhould be forry to be obliged to lofe you from our party; but if this difcontent 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 parfley (ápium), the flower in question, is a difficult one to class: it is not eafy in the umbel-bearing plants to find the ftamens in a proper flate for invefligation; they also differ in number, in which cafe the flower, which terminates the umbel, is to be examined, and, according to the number of ftamens contained in that, is to be claffed. The difficulty of variety in the number of stamens in the

the fame fpecies too frequently occurs in the flowers of the class pentandria, and is a perplexing circumstance to young botanists; but as nature commonly preferves a certain proportion through all the parts of the fame work, you may generally difcover the clafs 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 confifting of five petals, though its ftamens 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 fame species, or even of the fame plant, you will see, that five stamens are the most constant number belonging to fuch flowers, and need no longer hefitate to refer them to the class pentandria. The umbelled plants are improper fubjects to begin with from the minuteness of their parts of fructification. I advife you to choose the larger kinds of flowers, and those of the most fimple conftruction; and when you are become familiar with their claffes and orders, then endeavour to make yourfelves acquainted with those, which are more complicated. In

this

this unopened umbel of parfley I can fhew you plainly, that your plant belongs to the class five-stamens (pentándria), and to the order two-piftils (digy'nia). The two rough feeds, you obferve, have no veffel 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 apium genus, diftinguished by the specific name petroselinum. Linneus gives only two species of the apium genus; the fecond, apium graveolens, is the fmallage, which, though in little request in its natural state, is of much confequence, when it has undergone the process of cultivation, as from it we derive our celery; but whether from the fpecies, which grows on the fides of brooks in our own country, or from what has originally been brought from a warmer climate, is not decided. You have, I dare fay, 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 foil converted into folid 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 clafs five-ftamens, and the order one piftil?

Hortenf. They are; fo are this fnow-drop (galánthus), chefnut (ésculus), and mezereon (daphne), of the fixth, feventh, and eighth classes, and of their first orders. The class of nine-stamens (enneandria) contains only fix génera. There is but one british species known, which belongs to this class, that is the butomus, or flowering rufh, and this is not to be commonly met with. Your specimens of the ten-stamens, decandria, and the fecond and fifth orders, monogynia, and pentagynia, one pistil, or five pistils, are right in this faxifrage (faxifraga) and wood-forrel (oxalis). You are puzzled, I fuppofe, by those campions (ly'chnis), as you have let them lie on the table?

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

[95]

[96]

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

Hortens. By a strict observance of Linneus's rules this lychnis could not be placed in the tenth clafs, as that requires the prefence of both stamens and pistils in the fame flower; however he has himfelf placed it there, being found to agree with the reft of its family in every particular but that of its stamens and pistils being on the fame plant; rather than separate it from them, he has taken this circumstance for its specific character. This, and a few more inftances of the fame kind, may certainly be confidered as defects of the fystem; but the inconvenience that might arife from fuch a violation of the general rule, by which the claffes are characterized, is obviated, as much can be, by being noted, whenever fuch contradiction occurs.

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

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

[97]

which fhews you the neceffity of examining many flowers of the fame genus. The churnftaff (euphórbia) belongs alfo to the eleventh, or dodecándria, clafs; 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 pofition of their ftamens: take this hawthorn (cratœgus), and this pheafant's eye (adónis), Juliette, and refer them to their proper claffes.

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

Hortenf. Very well anfwered, now let me look at your fpecimens of the fourteenth, fifteenth, and fixteenth claffes, with their orders, which, as they no longer depend on the number of piftils, will require more attention.

Charles. We gathered a dead-nettle, and a fnap-dragon, to fhew both orders of the clafs two-powers; the four naked feeds of the dead-nettle place it, I fuppofe, in the first or-

der;

[98]

der; and the feed-veffel of the fnap-dragon refers that to the fecond.

Hortenf. Certainly. Of what fpecies of pericarp, or feed-veffel, is this of the fnapdragon (antirrhinum), Henry ?

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

Hortenf. Those two holes, which open at the top to let the feeds out, give it a curious appearance. This whitlow-grafs (drába) is right, both as to its clafs and order; its filicle referring it to the first division of the clafs four-powers (tetradynámia), as this filique of purple rocket (hésperis) places it in the fecond. We eat many of the plants belonging to this clafs; fome without cookery, as water-crefs (fify'mbrium) and mustard (finápis); others are rendered mild by boiling, as cabbage, turnep, brocoli, cauliflower, and fome others; all of which are the produce of cultivation from one genus, bráffica.

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 fame time, learning to think.

Horten[.

5

[99]

Hortens. And you have found it fo. The change produced in vegetables by the art of gardening is curious, and will not be the leaft amufing part of our ftudy. The flowers of the three last classes, we have to confider, are ftrongly marked. The geránium and mallow (málva) are right specimens of the one-brotherhood class (monadélphia); attempt to take off the stamens, you will fee they are firmly united at their bafe; this genus has many flamens, therefore is of the order fo 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 feventeenth class; but we must examine its fystematic character. You see nine of the ftamens are feparated from the tenth, and closely united at the base; this Linneus calls two-brotherhoods, though by that term we fhould be led to expect a more equal division of the number of stamens. I will shew you a curious circumftance refpecting the flowers of common broom (spártium scopárium)-The males, or stamens, which are ten in number, are more equally divided into two fets, one rifing a quarter of an inch above the other; the upper fet does not arrive at H 2

maturity

[100]

maturity fo foon as the lower, and the ftigma, or head of the female, is produced amongft the upper or immature fet; but as foon as the piftil grows tall enough to burft open the keelleaf, or hood of the flower, it bends itfelf round in an inftant like a French horn, and inferts its head, or ftigma, amongft the lower or mature fet of ftamens, as you may fee by touching the keel-leaf; the piftil continues to grow in length, and in a few days arrives again amongft the upper fet, by the time they become mature. This wonderful fact is given in the note on genífta in the botanic garden, and might, I think, have made fome agreeable lines in the poetry.

Harr. This is very curious: how quick the piftil moves, when I touch the keel-leaves! Hortenf. 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 fide petals the wings; and thefe two petals, which fhut up the two fets of ftamens and

[101]

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

Hortens. You are fo ready in your leffon, that I am not furprized, that you should be defirous of repeating it. Pray give me the fpecimen you have gathered of the eighteenth class? Polyadélphia, or many brotherhoods.

Charles. We could not find any flower, except the hypéricum, that feemed to belong to that clafs; and you know, ma'am, you had told us it did fo; however we brought it: how beautiful its stamens are ! They are like a fine yellow filk taffel with the ends tip'd with crimfon beads.

Hortenf. It is a handsome flower : the hypéricum is the only British genus which belongs to the clafs of many-brotherhoods; it must also be of the fourth order polyándria, or many ftamens. When you walk out, you may gather fome orange flowers in the green houfe; the orange, lemon, and citron all belong to the genus cítrus, which is of this clafs, 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 fuppole

H 3

[102]

pofe them to be of the fame clafs, though on inveftigation the ftamens will be found feparated into fmall bundles. We must now quit this more agreeable practical part of our ftudy, and return to the theory of the class.

The clafs fyngenefia, or united anthers, is founded on the very peculiar fituation of the anthers, which are joined together in the form of a cylinder, while the filaments remain diftinct; by flightly preffing this cylinder of anthers at the top, you may bend their filaments fo as to have the appearance in the larger flowers of those open paper baskets, which Juliette was cutting laft night; the number of flamens fo united is five; they form a ring round the piftil, which rifes in the midft of them, and feems confcious of the homage fhe is receiving. This clafs confifts of what are called the compound flowers, and is certainly a natural one, if we except a few génera which are contained in the last order, and which are placed in this class from the fingle circumftance of having their anthers united in a cylinder; one of thefe génera is the víola, under which the violet and panfie are ranked : we will allow this to be a fault in the fystem, and at prefent confider

fider only the compound flowers: Linneus makes the effence of a compound flower to confift in the union of its anthers into a cylindric form, one feed being placed on the receptacle beneath each floret. A compound flower is fo 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 fome florets is tubular, in others flat, which is called tongued. In the fame flower fometimes the border of the corol is wanting, and fometimes 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 ftamens, or piftils, or both, are founded the first four orders. If all the florets of a compound flower are found to contain ftamens 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 fecond order : to the third it will belong if the florets in the centre have both stamens and piftils; and if those in the circumference be H4 destitute

[104]

destitute of either. The fourth order depends alfo on the florets in the centre having both stamens and pistils; but from some defect in the piftils, producing no feed, the florets in the circumference having only piftils, and producing feed. The fifth order is not diftinguished by any circumstance belonging to the ftamens and piftils, but by the florets being feparated from each other, by being enclofed in a partial calyx, all the florets being contained in a common one, fo as to form one flower. The character of the fixth order is derived from the form of its flowers being fimple, which perhaps ought to have excluded them from this class; but as they agree with the compound flowers in the effential character of the united anthers, Linneus has placed them in it ; and as the principle of the fystem on which he has founded his claffes does not pretend to make them natural, I do not fee any great objection to it.

Harr. Mamma always defends Linneus.

Hortenf. I have received fo much amufement from his labours, that I fhould be ungrateful not to confider his defects with candour; his life was fpent in laborious refearch into natural hiftory, by which the botanical world

[105]

world has been fo 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 predeceffors, and you will fometime have pleafure in understanding the ingenious fystem of Tournefort, but at prefent we are to think only of Linneus as our great mafter. The characters of the orders of the clafs fyngenefia, United Anthers, are too complex to retain in your minds without having examined fome flowers belonging to them, therefore we will do fo before we proceed further. Pray gather fome dandelions (leóntodon), thiftles, cárduus, and a few of any flowers which, from their outward habits, you fuppofe to be of the compound kind; also a few panfies and violets.

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

Hortenf. I perceive you have brought fome flowers of the fcabious (fcabiófa). Its mode of inflorefcence in outer appearance nearly refembles the compound flowers; it however

be-

[106]

belongs to the fourth of the numerical classes. On examination you will find marked diftinctions of character between them: the scabious, and several other génera of the same habits, have their four stamens separate; the compound flowers, as you fee in this thiftle (cárduus), have their five anthers united in a cylinder; there is also another difference, thefe flowers of the fourth class have the florets, of which they are composed, attached to the common receptacle by a fmall peduncle, or foot-ftalk; the florets of the compound flowers are feffile, or fixed to the common receptacle by their bafe, without the intervention of a peduncle; the scabious, and that tribe of flowers, which have not the effential mark of the United Anthers belonging to the compound flowers, are called aggregate.

Charles. I fee a very great difference betwixt the ftamens of this thiftle and those of the fcabious. I am glad, I brought the fcabious, having compared them will mark the character of the fyngenefia class on my memory.

Hortenf. This thiftle (cárduus) and dandelion

[107]

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

Charles. The florets of this thiftle all contain both flamens and piftils, and that, I believe, refers it to the first order.

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

Hortenf. I will give you the flowers according to their orders, and you will then more eafily remember the marks, which diftinguifh them. Here is a flower for each of you. The daifie (béllis), blue bottle (centauréa), mary-gold (caléndula), and globe thiftle (échinops).

Charles. The daifie has florets, with ftamens and piftils in the centre; but those in the circumference have only piftils, this must go to the fecond order.

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

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

[108]

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

Hortens. You are perfectly right, fo 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 feeds in the central florets, but in those of the circumference you will fee large ones, flat, and in the form of a heart. This circumstance of the florets with and without feeds, is the effential character of the fourth order. I did not expect you to retain these minute distinctions; to remember the clafs and orders of fyngenefia, it is neceffary to make ourfelves acquainted with the flowers. Now, Henry, tell us the character of the fifth order, to which your globe-thiftle belongs?

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

Hortens. The fixth order, you all recollect,

[109]

lect, depends on the fingle circumstance of the United Anthers. Observe the stigmas of this violet and panfie; they are both of the genus víola, which is feparated into two divisions from the peculiarity of their ftigmas; that of common violet being reflected into a fimple hook, and that of the panfie (or threecoloured viola) being round and perforated. Jasíone, or sheep scabious, is placed in this order of fimple flowers, to which it certainly cannot belong, being composed of many florets; nor is there any circumftance refpecting its fructification, which gives it any pretence to be claffed with the compound flowers, except that of its five anthers being flightly connected at their bafe, for they are not united in a cylinder : from the first view of this plant it feems to be of the tribe called aggregate, but, on examination it differs effentially from them in the numbers of its fructification, and other circumstances. The Jasíone puzzled me much, when first I studied botany, and I am not now fatisfied about it. Have you studied this class fufficiently to make you understand it?

Harr. I dare fay we have, ma'am; though prefently,

[110]

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

Hortens. You shall do so. There is a curious circumftance 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 burft open the common calyx, which contains them; as foon as the ftamens and piftils of these florets have done their office, they wither with the corols, the common calyx then rifes, and encloses the remaining parts of fructification, till the feeds arrive at that flate of ripenefs, which makes them ready for difperfion; the hairy down, by which they are crowned, then expands, and again burfts open the calyx, fo as to bend its leaves quite back, and, by the help of this down, the feeds are carried by the wind to a confiderable diftance.

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

Hortenf. Those compound flowers which have

[111]

have their feeds 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 eurious mechanism of its flowers. The ftructure of the stamens and pistils of the class gynándria, or twentieth class, is fo extraordinary as to be fupposed by Linneus to occasion the unufual appearance of the flowers belonging to it. The orchis tribe, paffion flower, (paffiflóra) and árum, which you call lords and ladies, are of this class: the effential character of which is the ftamens growing on the style, or on the receptacle elongated into the form of a style, bearing the pistil with the flamens, and becoming a part of the piftil, which part you must first consider to obtain a diffinct idea of the fituation 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 fingular; for the germ, always beneath, is contorted : the petals are five,

[112]

five, of which the two inner converge, fo as to refemble an helmet : the under lip conftitutes the Nectary, which occupies the place of the piftil and fixth petal : the ftyle grows to the inner margin, and can fcarcely be diftinguished with its stigma : the filaments are always two, very fhort, elaftic, 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 capfule, with three valves gaping at the angles. The génera of this first order afford flowers which, in outward appearance, fo nearly refemble the animal kingdom, as to have occasioned a variety of fanciful names being given to them. The family of ophrys contains feveral fpecies, which refemble a variety of infects, the Nectary being the principle feature in their different forms; fometimes their flowers refemble a gnat, a butterfly, a bee, a fly, or a bird : the Nectary of the bee-ophrys is a large thick leaf of a footy colour, and, when feen in the light, feems varied with three bright yellow circular lines, with ruft coloured fpaces between them, and fo exactly reprefents a drone,

[113]

drone, or bee, that it might be miltaken for them. This curious tribe of flowers requires very accurate inveftigation to enable us to underftand 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 orchifes, and wished to understand them; there is one very like a flipper.

Hortens. That is a plant belonging to the genus cypripedium, and has its name of lady's flipper from the refemblance 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 bafe. The ftamens are affixed to the receptacle, amidft 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 confidered as a diftinct floret, and thence that the genus ought to be removed from the class gynandria, to

the

I

[114]

the following one monœcia, or ftamens and piftils feparate. I cannot decide on this fubject, but hope as this opinion of the younger Linneus opens a new principle of inveftigation, fome ingenious botanift of the prefent age may be able to difcover the fecret of the wonderful mode of fructification found in this family: its fruit ripens about the clofe of fummer. You have I dare fay often obferved a clufter of beautiful fcarlet berries growing on a fhort ftem on the ditch banks.

Charles. Frequently; but I did not know they were the feed of árum: if you pleafe, ma'am, I fhould like to examine fome flowers of this plant.

Hortenf. We will do fo. A plant, that grows commonly on our hedge-banks, we ought not to remain ignorant of; it is alfo in my botanic garden, but I could never fatisfy myfelf about it. The following clafs monœcia, the twenty-first clafs, contains fuch plants as have their stamens and pistils in feparate covers, but growing on the fame root, hazle (córylus), nettle (urtíca), are instances of the monœcia clafs, or clafs of onehouse: the orders of this clafs are derived from

from the number, union, and fituation of the stamens, circumstances which constitute the chief characters in the claffes, where the flamens and piftils grow together in the fame cover. There are eleven orders of the class one-houfe, which are diffinguished by the fame names that are given to the preceding claffes. Hazle (córylus) having feveral ftamens in each scale of its ament, or catkin, is placed in the order polyándria, many ftamens. Nettle (urtíca) in tetrandria, four ftamens, and cyprefs (cupréffus), which is alfo of this clafs, is arranged under the order monadélphia, one-brotherhood, having its ftamens united at their bafe, 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 effential circumstance of the first twenty classes, viz. their having their ftamens and piftils in one flower: to this clafs of one-house belongs the nutmeg (myriftica), the knowledge of which flower the world is indebted for to Dr. Thunberg, who has given a defcription 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.

[116]

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

Hortenf. You fhould call it the feed; the fruit, I imagine, fomewhat refembles a walnut: the inner material, which furounds the nut or feed, is what we call mace, and ufe in cookery.

The Clafs Diœcia, or two-houfes, contains those flowers, which have their ftamens growing on one plant, and their piftils on another. Vallifnéria belongs to this clafs; the wonderful progress of the flowers of this plant feem to furnish a strong argument for the fenfation of plants; but this is not the time to enter into the discussion of that part of our subject. Hemp (cannabis), hop (húmulus), mercury (mercuriális), and willow (falix), all belong to the clafs two-houfes: there are fifteen orders contained in this clafs, characterized from the fame circumftances with those of monœcia, or one-house, and named by words expressive of those circumftances. Great fault is found with the contradictions, that this occafions, and certainly this part of the fystem is open to cenfure, and in all probability would have been corrected, had Linneus's health during the latter

part

[117]

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 fpirit of the age inclines his fucceffors in this delightful fcience rather to render his labours perfect, than to hold out his failings to ridicule, we may hope that time will give us his fystem as free from defect, as fuch an undertaking can be expected to be.

The mifletoe (vifcum) belongs to the clafs two-houfes : this is a parafitical plant, or one which lives upon the juices of another vegetable, without fixing its roots into the ground; it can only be propagated by flicking the feeds upon the bark of trees, into which they ftrike their roots in a curious manner. A feed first fends out three claws, which fix themfelves on the bark of the tree, and begin to feparate at the centre of the feed, as if each claw was to become a diffinct plant; but in a year or two the three claws become fwoln and enlarged enough to meet at their points, and are fo ftrongly united, that they make the foundation but of one plant; the place of their first joining in the centre opens and divides, fo that three diftinet

[118]

tinct branches appear fpreading from the root; after this, it proceeds to bloffom and bear fruit, and will live to a great age, agreeing very well with it's fofter tree, which it ornaments, in grateful return for the fupport it receives; it grows moftly on apple-trees, but is fometimes found on the oak, though rarely, and on feveral other kinds of trees; the feeds are inclofed by fo vifcous a pulp, that they readily adhere to other vegetables, on which they are often dropped by birds, and thus the fpecies is propagated.

Charles. I always fuppofed the mifletoe grew upon oaks, we read fo much of it being found in the Druids groves.

Hortenf. Druids, oaks and mifletoe are ideas that we affemble together from infancy; but I imagine the caufe of mifletoe being fo much connected with the Druids, was, that in former ages it was effeemed a powerful remedy for epileptic complaints, which were looked upon in those fuperstitious times as visitations of the devil, the Druids being then the great healers of the difeased, 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 misletoe became facred; 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 fee refpect paid to mifletoe; I shall never lose my reverence for it.

Hortenf. Cherifh that as much as you pleafe,---1 had intended to have gone through the claffes this morning; but our lecture has exceeded already the time we can call our own; to continue it, we muft infringe either upon your hours of relaxation, or upon those which belong to Mr. Wilfon and Mrs. Pratt; therefore I am afraid we had better leave the two laft claffes, with the plants arranged by Linneus in his appendix, for our meeting tomorrow.

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

Hortens.

[120]

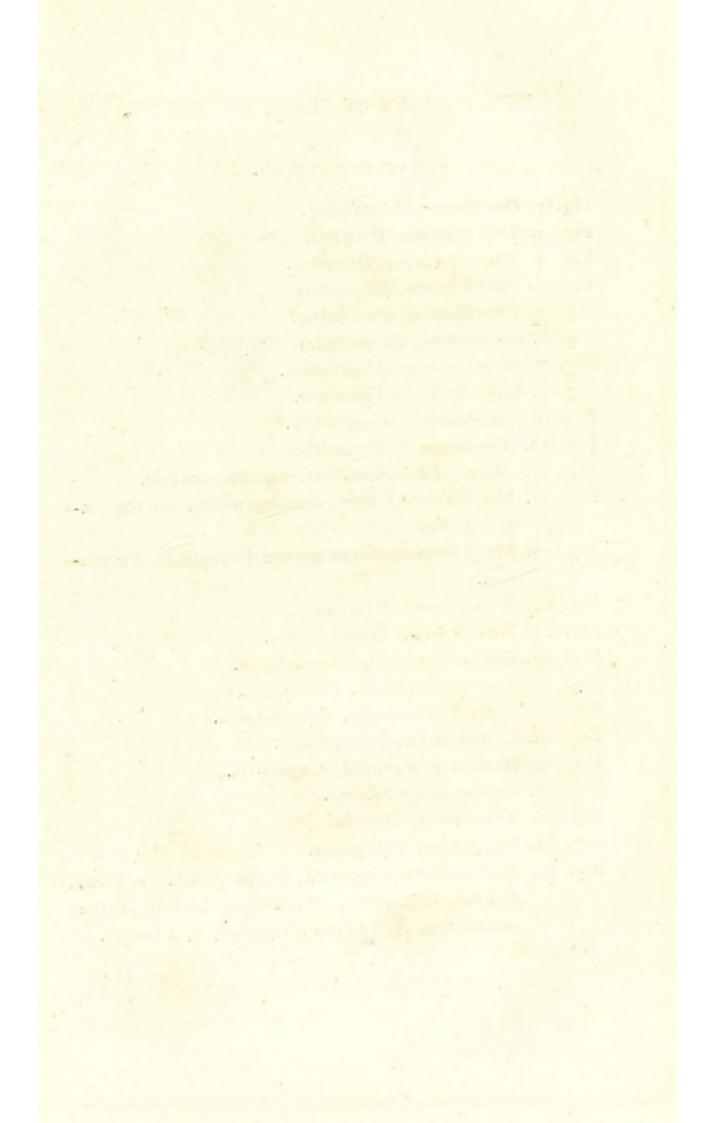
Hortenf. If you pleafe, my dear; and you may bring in a few flowers, which we will compare with our plates this evening; and then we fhall be ready to begin with the remaining claffes in the morning.

were lode my neverence for it.

use it, are mail intringe citing upon

with the planes employed by Lin.

DIALOGUE



EXPLANATION OF PLATE IV. FART 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, Icofandria.

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, Syngenefia.

Fig. 20. Stamens on the Piftil, Gynandria.

Fig. 21. One-houfe, Monoecia.

Fig. 22. Two-houfes, Dioecia.

Fig. 23. Polygamies, Polygamia.

Fig. 24. Fructifications concealed, Cryptogamia. *a*, Ferny b, Mofs, c, Lichens, c*, fringed Lichen of the natural fize, c, the fame mag nified, d, a fungus.

Plate 4. Part 1. Fig. 6. Fig. 5. Fig. 3. Fig. 1. Fig. 2. Fig. 1. Fig. 8. Fig "19 Fig. 9.13. 12. cug Fig. 19. Fig. 17. Figs#+16. Fig. 20. Fig. 21. Fig. 0.0 23. Fig Fig. 24 24 24 2 21

London Published May 1.1797, by J.Johnson St. Pauls Church Yard.

. .



[121]

DIALOGUE THE FIFTH.

Class Polygamia explained .- Caprification .- Class Cryptogamia explained.

Hortens. The specimens we examined laft night of the four claffes, you had learned in the morning, were fo just, that we have no rehearfals to make now, fo may immediately enter upon the twenty-third clafs, polygamia. The plants of this clafs muft, on the fame root, have flowers which contain flamens and piftils within the fame cover, and alfo other flowers, which bear either ftamens feparately, or piftils feparately; fometimes flowers are found on the fame plant, which contains ftamens and piftils, ftamens without piftils, and piftils without flamens; the prefence of the first kind marks the class; without flowers, which contained both stamens and pistils, the plant would belong to either the class onehouse, or two-houses. The plants of the polygamia clafs are many of them difperfed by the prefent botanic writers into monœcia and diœcia; fo that probably that clafs will foon be banished from the system. The orders, of which there are three, depend on the

the disposition of the stamens and pistils in the flowers of the different plants. The fig (ficus carica) long perplexed the botanic world, to difcover by what mode the duft of the ftamens could be conveyed to the piftil, as these parts of fructification are inclosed within feparate fruit, this fruit not being a feedvessel, but a receptacle furrounding the stamens and piftils, which grow upon it ; fome of them being fo 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 fuppofed to bear on its wings the anther duft of the ftamen-bearing fig, to the fligmas of that which bore only piftils. This process performed by the gnat was called caprification, and was fo ftrongly believed to be effential to the ripening of the cultivated fig, that the inhabitants of the Archipelago, who trade with their figs, fpent much time in obferving the critical moment of the gnat isfuing out of one kind of fig and entering the other, and fometimes gathered the fruit, in which the gnat was contained,

[122]

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 affent to the truth of the neceffity of it, there appear to me fo many objections against it. First, there is not any fpecies of fig known, which bears piftils only; confequently not any which is not fufficient in itself to its own fertilization. In Provence and Spain the cultivated fig is proved to be fo by being brought to perfection without the procefs of caprification. Secondly, thefe fruits generally open at the top, at the time that their stamens become mature; a circumstance analogous to all water plants, which rife to the furface, when their flamens are ready to fcatter their dust, in order that they may difperfe it in the open air; an element which feems neceffary for that process. But I fear tiring you on this intricate fubject, as we cannot examine the infect or its effects in this climate with our own eyes.

Charles. I fhall 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

[124]

neus's fystem of the anther dust being neceffary to the fertilization of the feed.

Hortens. So it has been confidered, 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, whofe inveftigations have thrown light upon many obfcure fubjects in botany, conjectured that those figs, which have their receptacles clofed on all fides, might be vegetable monfters cultivated for their fruit, as those grapes and barberries are, which are without feed; and that the procefs of caprification might be of imaginary ufe, or that it might contribute to ripen the fruit, as those apples ripen fooner which are wounded and penetrated by worms in our own climate; and this feems 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 fame year, the figs of the first being fweet, and arriving at perfect maturity without the affiftance of caprification; those of the fecond being much fmaller, and not ripening at all, if this process be not followed. Tournefort adds, that the figs in Provence and in Paris ripen

[125]

ripen fooner if they are pricked with a ftraw. dipped in oil, which feems to make it probable that the puncture of infects in caprification may caufe the fecond crop of fruit to arrive earlier at maturity in Malta; that is, before the inclement part of the feafon comes on; as in our climate the plumbs and pears wounded by infects frequently ripen fome weeks fooner 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 fpring, and arrives at maturity in the course of the fummer; the laft crop does not put forth till autumn, and proceeds from the fhoots of the preceding fummer. This crop can never ripen in our climate, and is carefully pulled off by the gardeners. It would feem that the tree has not power to bring two crops to perfection, even under the influence of more benignant fkies, as at Malta, as the fruit obtained by the procefs of caprification is fcanty and of bad quality.

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

[i26]

and wonder I did not find them out my-felf.

Hortenf. We will talk with Mr. Wilfon on the fubject; he may perhaps fhew us that our objections are not fufficient to overturn an opinion fo long and fo generally received. Where we find that men of acknowledged abilities have been miftaken, it will become us to helitate. The neceffity of caprification has obtained a general belief in the Eaft; but in this enquiring age, we cannot affent to facts, to which we think both reafon and analogy oppofed. We ought, however, to controvert them with great modefty. We will now releafe Henry and Juliette from this long differtation. You too, Harriet, I fear are tired.

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

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

Hortenf. 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 fee the florets arranged on the infide in a beautiful manner, and you may find

[127]

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

We will now begin with the laft clafs, cryptogamia, which confifts of fuch plants as have their fructification fo obfcure, that there are but few genera, in which it has yet been diftinctly feen. This clafs includes all those plants, which have a ftructure different from those comprized in the other three and twenty claffes, and is divided by Linneus into four orders, the filices, ferns ; mufci, moffes ; algæ, wrack, or fea-weed; fungi, fungules. The little knowledge, that has hitherto been obtained of these numerous tribes of plants, has been confidered a great reproach to the fcience of botany. Perhaps the fystem of Linneus may have retarded a more diftinct arrangement of them, that being founded upon the parts of fructification, which in most of the génera belonging to the class cryptogamia, are fo difficult to afcertain. The ferns are defined to be plants bearing their flowers and fruit on the back of the leaf or ftalk, which in this tribe of plants are the fame, the ftem not being diffinguishable from the common foot-stalk, or rather mid-rib of the leaf: fo that in strict propriety the ferns may be faid

to

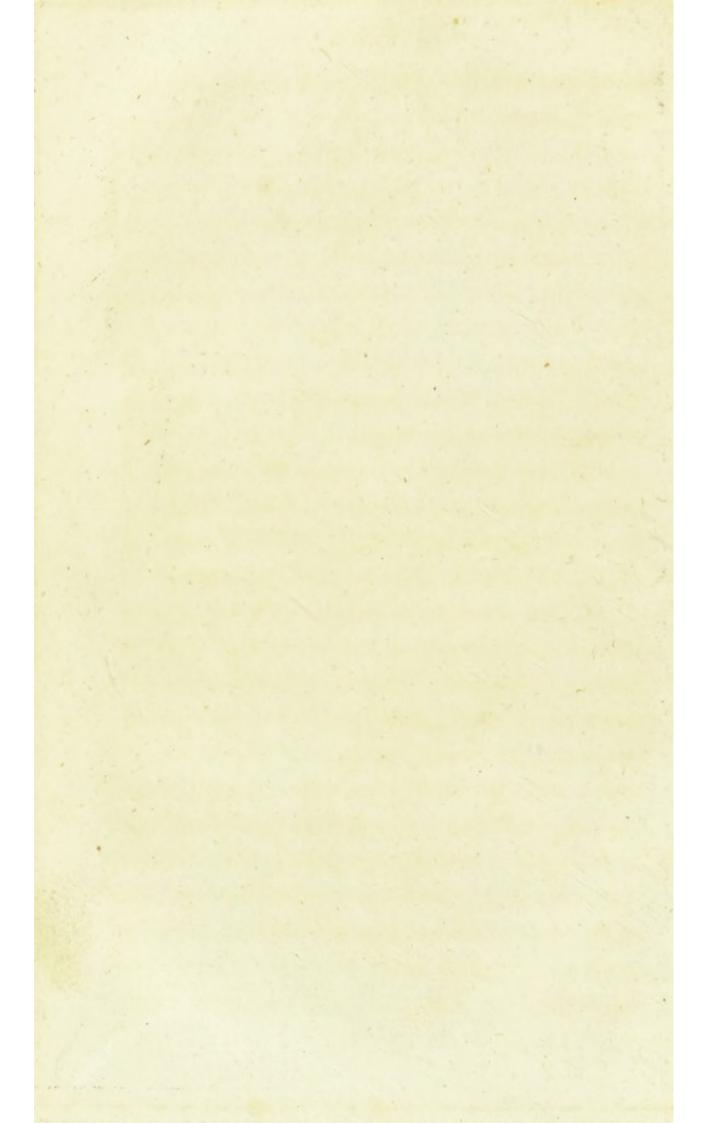
[128]

to be without stems. The stem and leaf thus united are termed by Linneus a frond. The feed of the ferns affords an inftance of the most curious mechanism, and will be well worthy of our attention, when we are become professed botanists; at prefent I shall only give you an outline of the characters of the génera contained in the class cryptogamia, and, by fhewing you fome of them with plates, enable you to form a clear idea of their extraordinary structure. The true fago powder is faid to be made from the pith of a fpecies of fern, Cy'cas circinalis; and that great vegetable curiofity, the tartarian lamb, is now known to be the root of the polypodium barometz, which, being pushed out of the ground in its horizontal fituation by fome of the inferior branches of the root, bears fome refemblance to a lamb ftanding on four legs, which is increafed by the thick yellow down, by which its root is covered. It is faid to deftroy all other plants in its vicinity. We will look at a print of it.

Charles. I have heard wonderful ftories of this vegetable lamb, and believed it to be fome extraordinary monfter.

Hortens.

Plate 5. Part I.P.128. um Barome 1 London Published May 1. 1797, by. J.Johnson S. Pauls Church Yard.



[129]

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 flockings and caps, growing in Caffraria; the report of which was fo general as to excite the attention of Dr. Thunberg, when travelling in that country. With his ufual affiduity he unveiled this mystery, and found all this wearing apparel to be nothing more than the downy leaves of the Bupléurum giganteum, which by a little dextrous management were converted into those various articles, which were afferted to grow upon the plant. Hence you fee the confusion, that arises from being too ready to believe or to relate, what we hear.

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

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

smit

[130]

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

Hortens. Pteris aquilina. Bread is also made from a species of fern by the inhabitants of Palma, one of the Canary illes, when corn is fcarce, and is faid to be little inferior to that made from wheat .--- But we must now begin with the fecond order of cryptogamia. The moffes, (mufci), are divided according to their anthers, being calyptred, or not calyptred, being on the fame, or feparate plants, and having the piftil florets folitary, or growing in cones. Their feeds have no cotyledons, or any proper coverings. Linneus doubts, whether what he has called anthers might not with greater propriety take the name of capfules, and their duft be confidered as true feeds, as in Buxbaúmia, and fome other génera, have been feen within the covers real dust-bearing anthers depending from their filaments, gaping at the top to difcharge their dust on the fringes, as on pistils. Dillenius, professor of botany at Oxford, was the first, who attempted an arrangement of the moffes. There are many curious circumstances belonging to the tribe of moffes, which fometime

time we will fully enter into. One I will now mention to you, which is their having this fingular property, that though preferved dry for feveral years, upon being moistened they refume 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 fo obfcure as not to admit of precife arrangement; they are only divided into terreftial and aquatic, and the génera diffinguished by their outer structure. This order contains many curious and ufeful vegetables; among the latter there is none more worthy of notice than the lichen rangiferinus. This little plant may be properly effeemed the fupport of millions of mankind, as it is the fole food of the rein-deer; without which ferviceable animal, the inhabitants of the northern regions could not exift. The rein-deer furnishes them with milk, butter and cheefe, draws them in fledges with eafe and fwiftness over vaft tracts of land buried in fnow; his flesh affords them food; his fkin, cloathing; his tendons, bow-strings; and his bones, spoons. All these benefits would be lost, had not nature formed this lichen fo as to enable it to

vegetate

[132]

vegetate beneath the fnow, 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 fulleft claim to.

Harr. It is very agreeable to know fuch particulars; they make the fludy of vegetables very interefting.

Hortenf. In the general fludy of nature, we cannot too much bear in our minds the advantage derived by one individual of the fame common flock from another. The contemplation of this general law of nature ftrongly points out to us, that we are not placed here to be idle and ufeless 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 fpecies 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 VERECUE rice,

rice, and fometimes put into foup. There are other species also of them, which are used for food or pickles by ourfelves. The formation of fome of the génera, which belong to the aquatic division of this order, is worthy of remark. The conférva ægagrópila is of a globular form, from the fize of a walnut to that of a melon, much refembling the balls of hair found in the ftomachs 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 feas, travelling along in the midft of the waves. Thefe may not improperly be called itinerant vegetables. In the fame manner, the fucus natans strikes no roots into the earth, but floats on the fea in extensive maffes, and may be faid to be a plant of paffage, as it is wafted by the winds from one fhore to another. The byflus flos-aquæ, water flower, floats on the fea all day, and finks a little during the night, as if to protect itself from the injuries of nocturnal air, or poffibly this may be its mode of fleeping or taking reft.

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

lines

[134]

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

Hortens. It is the Conférva Polymórpha, whofe extraordinary changes of appearance gave rife 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 lofing it's lower leaves, and lengthening fome of it's upper ones, fo as to be miftaken by unskilful botanists for different plants : it grows on the fhores of this country. The laft order of the clafs Cryptogamia, confifts of the Fungules, or Fungi. Linneus has divided this order of plants according to the method of Dillemius; indeed he does not feem himfelf to have attended to any of the orders of this obfcure clafs, with that indefatigable refearch, 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 himfelf indebted to Dillenius, and Micheli, for the information he is able to give the world refpecting them. The method of Dillenius, which Linneus has followed, is founded upon the figure of the Stipe, or Foot-stalk; the

L 135]

the hat, or upper part, with its plates, holes, and cavities, and from the variety of ftructure in these parts, has divided the whole Fungus tribe into ten Génera. The fudden appearance of thefe kinds of plants, in places where they had not been known before, gave rife 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 feeds; that their fpecies are conftant, 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 prefent age, who have elucidated the knowledge of thefe plants by many beautiful drawings. Now you are become botanists, I will make you a prefent of * Mr. Sowerby's English Botany,

* Sowerby's English Botany, published monthly in numbers, containing fix coloured plates, each number price 28.6d. which will affift 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 clafs particularly you will find the ufe of this publication, as by fludying the pictures of various plants belonging to that clafs, which in these numbers are elegantly represented, you will feel an intereft in the originals, and be led to fearch into their hiftories, in which no doubt we have much curious matter to difcover; the late difcoveries of the wonderful manner, by which various fpecies of the animal world are continued, may poffibly lead to fome equally extraordinary regarding vegetables. The hiftories of the Polypi or Hydræ aftonish us, particularly of the Hydra Stentorea, which multiplies by fplitting lengthways; in twenty-four hours thefe divisions, which adhere to a common pedicle, re-fplit, and form four diffinct animals; these four in an equal time again fplit alfo, and thus proceed, doubling their numbers daily, till they acquire a figure fomewhat refembling a nofegay; the young afterwards separate from the parent ftock, attach themfelves to the roots or leaves

of

[137]

of aquatic plants, and each individual gives rife 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.

Hortenf. I am no longer inclined to think that hiftory fabulous; at leaft we have facts from the experiments of Monfieur Trembley in regard to the fresh water Polypus, or Hydra, being fo named I imagine from the fable, which equal any ideas, that could occur to the imagination of the most romanic fabulist. Such inftances of propagation in animals have led me to the fufpicion, that fimilar modes may poffibly be found to take place in fome of the tribes of vegetables belonging to Cryptogamia; I mean exclusive of all others; for the increase of plants from fuckers and ftrings, may be confidered analogous to the re-production of the Hydra genus; but fuch analogies it is not our business to enquire into at prefent.

Juliette. You always quit the fubject, mamma, when you have excited our curiofity.

Hortenf.

[138]

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 fo fmall, that I can give you of the class Cryptogamia, that I fear milleading you, if I fix your attention on the fuppofed parts of fructification of the plants contained in it; however, what I have faid of the poffibility of their increase, by modes fimilar to that of the curious animals I have mentioned, is mere conjecture; but on fo obscure a subject light may be thrown from experiments founded on analogy. It is certain, that little progrefs 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 affemblage 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 referved for fome of us on this fubject.

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, moffes, flags and fungules, we

[139]

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

Hortens. That has been ever a great impediment to an accurate investigation of them. A method of preferving 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 inveftigating them, than has yet been acquired; but you must arrange, before you pretend to difcover, the plates of Mr. Bolton with his hiftory of Fungufes; and the elegant drawings of other ingenious botanists will affift you in this undertaking; but it is to be lamented, that fuch useful works as we fee frequently appear on this fubject, 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 eafy of access as poffible.

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

[140]

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

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

Harr. I never forget, what I read in the Botanic Garden. The frozen ftatue of the fair Tremella was in reality this ftar-jelly, which, becoming transparent after it has been frozen in autumnal mornings, is diftinguished by this property from other vegetable mucilage. The passe that we use in our works, is no longer of fervice 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?

Hortenf. They may read them this evening. There is a fpecies of fungus, the Lycopérgon fornicatum, or Turret puff-ball, which is of a very extraordinary form, having the appearance of an inverted mufhroom; it is well deferibed by old Gerrard, who fays, " It hath a fmall ftringy root, differing from all others,



Plate 6. Part I. P.m. Lycoperdon Fornicatum. Found growing in Mr. Rooke's Kitchen Garden, near Mansfield Woodhouse, September 1792. London, Published May Li797, by J.Johnson, St. Pauls Church Yard.

[141]

others, and a round white fungus at firft, which afterwards breaking open, divers reddifh branches do arife out thereof, which do all join together, making round arches of hollow netted bars or lattices, as it were feparated one from another."—I will fhew you his plate of it, and alfo one from the plant itfelf, which was found growing in Mr. Rooke's kitchen garden, near Mansfield. Gerrard calls it Fungus Coralloides.

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

Hortenf. He is certainly very prolix; but his defcriptions are expreffive : fuch prolixity we do not meet with in thefe days; but we are often confounded by the profusion of characteristic circumstances, which are crowded into a géneric description. One line of the fystem of vegetables will be frequently found to mark a plant as decidedly as a whole page of fome other books. The expressive concifeness of Linneus is yet unrivalled .- But we are amufing ourfelves, rather than learning .---It is time to think of the appendix, which is adjoined to the Classes. This confifts of plants, which Linneus rather chose to place apart, than 200

[142]

than to distribute them into the feveral classes of his system, and this on account of their fingular structure; he has arranged them all under the head of Palms, and defines them to be plants with fimple ftems bearing at their fummit leaves refembling 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 fpadix, protruded from a common calyx in form of a sheath, termed by Linneus a spathe. The terms fpathe and fpadix were originally applied to palms only, but are now used with much greater latitude, and applied to the narcíffus, árum, and many other plants, whofe flowers come out of a fheath ; the cocoa-nuttree (cócos nucifera) is a palm, fo is the datetree (phœnix dactylifera); and it is afferted by fome authors, that if the ftamen-bearing flowers of this plant are gathered in a proper ftate of maturity, and dried, the dust of the anthers will retain its virtues for more than a year; the fame alfo is faid of the Pistacia, which belongs to the clafs two-houfes (Dioecia) the cory pha umbraculiferæ belongs to this majestic order of vegetables being often

200

[143]

200 feet in height; it is a native of the West Indies, and has obtained the name of umbrellabearing, from the fhelter which it's large feathered leaves afford to the inhabitants of that fcorching climate from the ardent rays of the fun. This tree has also been called the cabbage-tree, but erroneoufly : Mr. Forfter informs us, that the true cabbage palm is a fpecies of aréca, the aréca oleracea, fo called I imagine from the use that is made of the kernel-like fubstance, which is found towards the top, and which is a most grateful and falutary food to failors, who have been long confined to falt diet; on which account, this fubstance has been celebrated by all navigators, and from them has obtained the name of cabbage, from its refemblance in tafte to that vegetable.

Charles. I have read an account of the cabbage-tree, wherein it is faid, that the part called cabbage is commonly used as food in the Weft Indies, though at the fame time it is observed, that the tree is deftroyed 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.

Hortenfia

ĩ

[144]

Hortenfia. I believe it to be an error, that this cabbage is generally made use of in the Weft Indies; I am well informed, that it is efteemed there only as a rarity, and fometimes fent as fuch, when pickled, to England; and fo far is it from being plentiful, that it is feldom obtained, except when by thinning the woods, or from fome other cogent reafon, it is neceffary, that the tree must be cut down: it is a fact, that the part called cabbage, cannot be procured but by the deftruction of the whole tree; and if we confider it's manner of growth, we shall not be at a loss for the caufe of this; the whole tribe of palms bear their leaves on the upper part of their ftems only; fome of which rife to the height of 200 feet; the part eaten as cabbage I believe to be the yearly fhoot; by cutting off which the leaves, which fhould form the buds for the enfuing year, are deftroyed, and with them the life of the plant : if you ftrip the leaves from any common tree, fo as to prevent the formation of buds, you will either entirely kill it, or at least fo far destroy it's vigour, as to render it of no value. This is an agreeable branch of the fludy of botany; but we are not yet ready to enter upon it.

1

[145]

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

Hortenf. The cocoa-nut palm, and feveral others, are faid to afford it; but the aréca oleracea is the only one, that has it in perfection; but the accounts we have of thefe trees are fo fhort, 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 philofophical botanist would be a work of the first value.

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

Hortenf. It is the artocárpus communis of Forfter, and belongs to the clafs monoecia, one houfe. The various attempts, which have been made to introduce this valuable tree into the Weft India Iflands, promife at length to be fuccefsful. There are now plantations of it in Jamaica, from which fruit has been gathered. Nearly twenty years ago Dr. Thunberg exerted his beft endeavours to bring it into Europe ; but at the time, when he flattered himfelf that he was on the eve of depositing his treasure with fafety, all his hopes were frustrated by a violent ftorm, which endangered the loss of

L

the

[146]

the veffel, on board which he was with his valuable cargo of more than an hundred breadfruit trees, and other rare plants, all of which were deftroyed. These trees he had brought from the ifland of Ceylon; the luxurious inhabitants of which place do not confine themfelves to the use of the fruit in the plain manner, in which it is eaten by the more fimple natives of Otaheitee (who, for food, bake it amongst hot stones, and for liquor, mix it with water.) The Cingalefe have a variety of high difhes 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 fmaller fruit, has no feeds, and is more rare : the other, bearing fruit from thirty to forty pounds weight, grows in all parts of the ifland, and produces feeds to the number of two or three hundred, each of which is four times the fize of an almond.

I

[147]

Charles. Then I suppose it is the first kind, that they have in the islands of the South-Sea; as I recollect Mr. Forfter fays, that the feeds of the fruit found in those islands are fhrivelled up, and loft in the pulp.

Hortenf. Mr. Forfter tells us, that the breadfruit tree of the South-Sea illes has four or five varieties, all without feed; which deficiency he attributes to the effects of cultivation; but as Dr. Thunberg, contrary to his ufual accuracy, omits giving the botanical names of the bread-fruit tree of Ceylon, I cannot afcertain to you in what particulars it differs from, or agrees with, those of the Pacific Ocean; but I fuppofe them certainly to be of the fame genus. If they are deprived of their feeds by cultivation, they lofe a part, which in Ceylon is much efteemed as a nutritious and palatable diet. They are prepared by the rich in different ways; fried in cocoa-nut oil, they are efteemed a great delicacy; by the poor they are eaten roafted like cheftnuts, alone, or mixed with the pulpy part of the fruit, which they frequently eat fimply boiled or roafted, or fometimes mixed with a little rice, rafpings of cocoa-nut, onion, and a fmall quantity of falt and turmeric. The bread-

L 2

[148]

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?

Hortenf. The banana and plantain tree, mufa fapientum, and paradifiaca, have obtained the name of bread-trees from the fame caufe that the artocárpus has been fo called; many hundred acres of them being cultivated in Jamaica for the ufe of the negroes, who are faid to prefer the fruit of the plantain tree, when roafted, to bread, and that most of the native whites ufe it in the fame manner. The banana is alfo found in the South-Sea is feeds by cultivation, as the artocarpus does; but it is not food only, that thefe trees fupply

4

to

to the inhabitants of the warm climates: the banana administers to their wants by the fhade of its leaves, the fize 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 feems to merit a place in the first rank; and Dr. Thunberg tells us of two fpecies of palm-tree in Ceylon, the boraffus flabelliformis, and Licuála spinofa, whose leaves are ufed without any further preparation than feparating 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 ftringing feveral flips of these leaves together, and ornament them by figures engraved in the fame 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 fingle leaf is faid to be fufficient to shelter fix perfons from the fun or rain; but it would take too much of our time at

L 3

pre-

[150]

prefent, were I to enumerate to you the various ways, in which the vegetable kingdom, from the majeftic palm to the humble graffes, leaves and roots, woven into mats and bafkets with peculiar ingenuity by the negroes on the coaft of Africa, has been made fubfervient to the wants of mankind; fince by our knowledge of fire and tools we have gained dominion over it.

Henry. How is that?

Hortenf. You may judge of the flate of mankind before the important difcovery 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 catched a ftream 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, whofe inhabitants are yet ignorant of the use of fuch inftruments, or but partially enjoy the benefit of them, these forests continue

tinue almost to exclude the growth of other vegetables, and to deny the use of the foil to man. Befides this, we make use of fire to render a variety of vegetables wholefome and agreeable food; fome of which in their natural state are either noxious, or difficult of digeftion, without fire ; for inftance, you could not eat potatoes, cabbages, or kidney-beans.

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

Hortens. There are some, who affect to do fo, and who declaim upon the fuperior virtues of man in an uncivilized flate. Were we to purfue their principle to the farthest, it is folitary man, whom we must extol; for he no fooner enters into fociety, be it ever fo fmall, than he begins to be civilized, and to lofe that virtue, fo much praifed, by the power he gains of committing vice; for the favage, pilfering betel-root, as much tranfgreffes the laws of his fociety, as a thief, who breaks a house, infringes those of our's. The faculties we poffefs are furely meant to be employed; the more we cultivate them, the more

more we gain the power of benefiting the whole creation; but if we mis-ufe that power, we fink ourfelves beneath the virtue of the poor favage, whofe life is divided between the care of procuring, and the pleafure of confuming his food. But if we exert it to the advantage of the fociety we live in, we fhall not feel ourfelves inclined to envy the fluggifh flate, in which even the moft civilized inhabitants of but partially cultivated countries are found.

Charles. Mr. Wilfon has never fo little patience, as when we read authors, who extol the life of favages above our's.

Hortenf. We must diftinguish betwixt what is really favage, and that which Europeans proudly call fo, because it differs from our own. We will read that fensible and humorous effay of Dr. Franklin's on this subject, wherein he pointedly fatirizes this general contempt of the various Indian nations, who we have stigmatized with the name of favages. Where we find a regular fociety, bound by the same laws, and united together by one common interest, we are not to call that state state favage, because it's modes and customs do not agree with our's. Without laws, laws, mankind are little fuperior to the brutes; it is their united ftrength, and their united wifdom, which makes them numerous and powerful. An eminent philosophic writer of the prefent age has remarked, that it is the fuperior portion of voluntary power poffeffed by mankind over brutes, and the greater energy and activity of the exertion of that power, which is one of the most distinguifhing marks between them: hence the more we exert that power, the more we raife ourfelves above the brute creation .--- But Henry's queftion has led us far away from our fubject; 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 prefent converfation ; and you know, mamma, you always allow us to digrefs a little, when a new fubject arifes out of the old one, that we are fludying ; you fay, 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.

[154]

Hortenf. Certainly not.---I with you to accuftom yourfelves to reflect on the origin of the different objects, which hourly prefent themfelves to your view; to reafon from the horfe-fhoe to the firft formation of iron in the earth, which the philofophic author of the Economy of Vegetation fuppofes to be a production formed from the decomposition of vegetables.---Charles, who is a chemist, underftands this.

Charles. Mr. Wilfon has fhewn me frequently by a load-ftone, that iron may be found in plants, and always leads me to reafon upon caufes. This made my tour with him through the manufacturing towns laft fpring very agreeable.

Hortenf. 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 fee a fheet of writing paper, I think of the fmall feed it came from; and when I fee blot-paper, I think of a fheep.

Hortenf. It is an agreeable contemplation to confider the many links, by which a fingle flax-feed is connected with a piece of writing paper; paper; and the fame in regard to that paper, which is made of woolen rags, and the fheep; and alfo to reflect on the advantages which may be derived to mankind by their exertions of ingenuity and induftry; but without fire and iron thefe exertions could not have proceeded to any great extent.

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

Hortenf. Iron is more valuable than other metals, as it is capable of being hardened by fire to fo great a degree as to render it proper for the most powerful tools. The difcovery 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 neceffarily feparated, and diftributed amongst the various classes in his fystem. To establish a natural method, or one founded on the numerous, permanent, and fenfible relations, that one plant bears to another, has been attempted by many eminent botanists, and with much fuccess in regard to many of the génera; but, unless the fpecies could alfo be arranged in the fame manner, a fystem cannot be established upon thefe principles. The fuperior excellence of an artificial fyftem feems now to be generally allowed, as more readily leading us to the knowledge of a plant, that we may wifh to be acquainted with, fo far as its clafs and order. However, Linneus was of opinion, that time would discover a natural fystem; and that all plants, of what order fo 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 génera, which he calls yet dubious. These orders are well explained in Mr. Milne's Botanical Dictionary, where we will ftudy the characteristic marks by which the plants contained in them are affembled; but

we

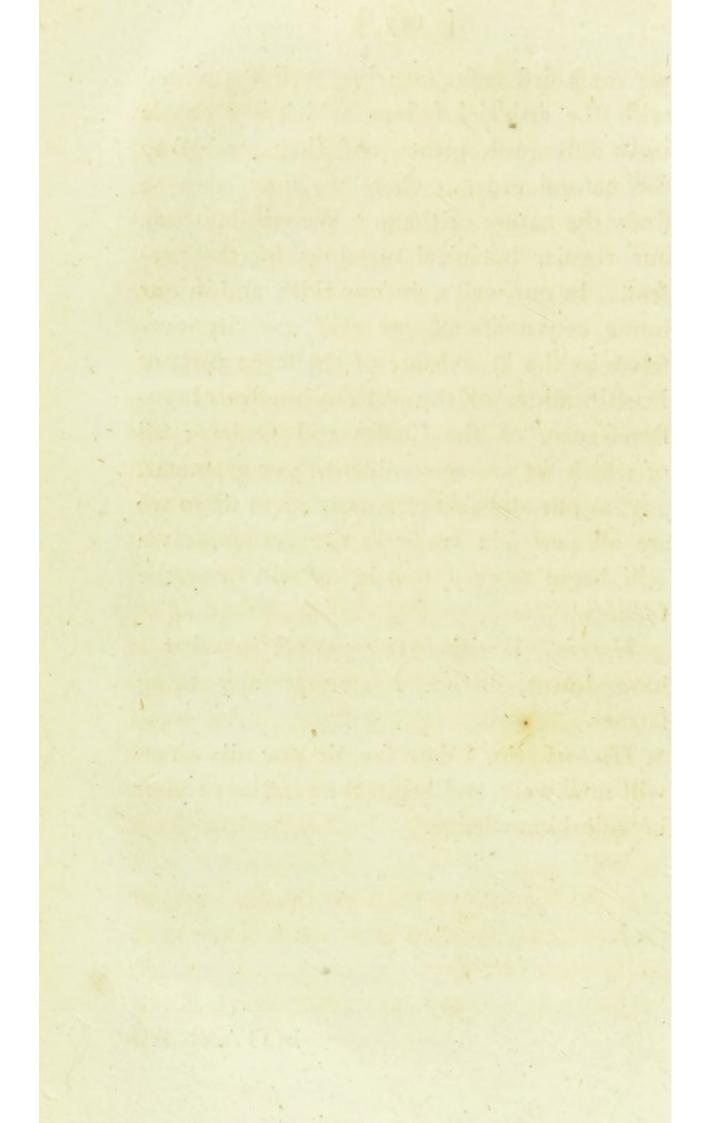
[157]

we must first make ourselves well acquainted with the artificial fyftem, which will enable us to diffinguish plants, and then proceed to the natural orders, where we may learn to ftudy the nature of them. We will lay afide our regular botanical meetings for the prefent. In our walks, in our rides, and in our home conversations, we will exercise ourfelves in the knowledge of the feven parts of Fructification, of the various modes of Inflorescence, of the Classes and Orders; all of which we are to confider 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 fludy the Génera.

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

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

BOTANICAL



BOTANICAL DIALOGUES.

PART THE SECOND.

DIALOGUE THE FIRST.

Génera of Plants.

Hortenf. After a month's difcontinuance of our fludies 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 pleafure, mamma, than we do: we have been a little impatient the laft week, but would not fay fo, for we knew you would let us begin our lectures again, as foon as you thought us ready for them. Juliette and Henry have had a pupil, they have taught Mrs. Pratt botany.

Jul. She is fo good natured, that fhe let us teach her, and faid it was the best way to improve ourselves.

Hortens. You are obliged to her; for it was

[160]

was certainly the beft method fhe could take of exercifing you in what you had learnt; and as fhe likes flowers, I hope fhe was amufed.

Henry. O, Mrs. Pratt liked it vaftly !

Hortens. I am glad to hear it. We are now to begin with the génera of plants, which is the third division in the fystem; and you are all fo well grounded in the parts of fructification, that I hope you will foon eafily attain a knowledge of vegetables, fo as to arrange them properly in the different families to which they belong. A genus is an affemblage of feveral species of plants, which refemble each other in their most effential parts, and has often been well compared to a family, the whole of which bears one common name, while a particular one, or a fpecific 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 efteemed the alphabet of botany, and by the fludy of which alphabet we may learn to read the génera. He enumerates 26 marks or letters; the first fix are taken from the calyx. Ift, the Involucre; 2d, the Spathe; 3d, the Perianth;

rianth; 4th, the Ament; 5th, the Glume; 6th, the Calyptre; 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 piftil three; 12th, the Germ; 13th, the Style; 14th, the Stigma. From the pericarp are derived feven; 15th, the Capfule; 16th, the Silique; 17th, the Legume; 18th, the Nut; 19th, the Drupe ; 20th, the Berry ; 21st, the Pome. From the feed are taken two; the Seed itfelf 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 underftand these distinctions about the receptacle; will you be so good as to explain them to me?

Hortenf. Willingly: it is neceffary that you should have diffinct 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 piftils, and the germ, which be-M long

[162]

long to one flower. When it is a bafe, to which the parts of the flower are joined, and not the germ, it is a Receptacle of the flower: in which cafe the germ being placed below the receptacle of the flower, has a proper bafe 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 fhape and furface; by which feveral of the génera of the clafs United Anthers are diffinctly marked.

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

Hortenf. With that alphabet, or 26 marks taken from the fructification, added to the number, figure, fituation, and proportion, Linneus has fo well diftinguished the génera from each other, that nothing more is wanting to enable us to read the whole vegetable kingdom. When an effential character could be obtained he has added it, as that taken from the nectaries in parnássia, hellebóre, ranúnculus, and aconíte. Could so diftinguished a mark be found in all génera, it would render the fludy of botany agreeable indeed; indeed; and we are not to defpair of time bringing about this much wifhed for improvement, and it more probably will be obtained, if we content ourfelves with making the principal point of our labours the perfecting the fyftem of our great mafter, than if we endeavour after fame by feeking to eftablifh a new one. I have brought fome flowers, that we may refer them to their proper génera. The hippúris (mare's-tail) and cánna (flowering reed) are of the firft clafs and order. Examine them with the defcriptions in the Génera Plantárum. You will fee that the hippúris has

Cal. None.

Cor. None.

- Stam. Filament one, fitting on the receptacle of the flower. Anther half-twocleft.
- Pift. Germ oblong, above. Style one, awled, erect, between the ftamen and ftem, longer than the ftamen. Stigma acute.

Per. None.

Seed. One, roundifh, naked. Henry. It is very odd language.

Hortenj.

[164]

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

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

Hortenf. The first expresses that the divifion of the anther is not very obvious. The germ being above or below, expresses its fituation in regard to the receptacle; in the rofe it is below, so it is in apples, and in the canna, which we will now examine, and obferve whether it agrees with the description given of it. Calyx, perianth three-leaved, the leasters lanced, erect, finall, coloured, permanent.

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

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

Cor. One-petalled, fix-parted : divisions lanced, coalefced at the base, of which the three *exterior* erect larger than 5 the

[165]

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

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

- Stam. Filament none. Anther linear, adhering to the fuperior margin of the nectary-bearing division.
- Pift. Germ roundifh, rugged, beneath. Style one, fword-form, adjoined to the anther-bearing nectary, lanced, the length and figure of the petal. Stigma linear, adjoined to the margin of the ftyle.
 - Per. Capfule roundifh, rugged, crowned, three-furrowed, three-celled, threevalved,

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.

Ful.

[166]

Jul. I am confused with the many different characters to which I have to attend.

Henry. So am I; and the canna is not fo eafy as fome flowers.

Hortenf. It is not. I brought it to fhew you the curious position of its anther and ftyle; alfo 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 Génera 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 easies to you. Examine both the canna and hippúris, that you may know their classes and orders.

Harr. They have one anther and one piftil.

Hortenf. Your 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 fecond One-feeded." Under which there are three plants; but pray what

am

[167]

am I to underftand from the valeriana rubra, and calcitrapa?

Hortens. They are two species of the valeriana, which have but one ftamen. When Linneus has thought proper to make the circumftance of an individual plant differing in the number of stamens from the rest of its genus, the mark of a fpecies, he has always noted fuch plants under the claffes to which in firict propriety, according to the rule of his fystem, they should have been referred, and marked them with an afterisk; fo you will find the lychnis dioíca noted in the clafs two-houfes; and feveral others in the fame manner. If your canna agrees with the character of the first division, examine it with the plants contained in it, and fee which of them it most refembles.

Charles. To the feven firft it cannot belong, their corols are not fix-parted; nor to the laft, the corol is grinning; nor to alpínia, for the corol is bellied and fixcleft; it muft be either kaempféria, or cánna, they have both corols fix-parted, lips twoparted, but here they ceafe to agree. kaempféria has its corol flat, that of the cánna is revolute, and the calyx three-leaved, My M 4

[168]

plant must be canna. This is eafy indeed!

Hortenf. Now you are convinced of the genus of your plant; obferve 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 fixparted, erect. Lip two-parted, revolute. Style lanced, growing to the corol. Calyx three-leaved.

Hortenf. You find under the genus canna three fpecies, diftinguished by the shapes and situation of their leaves; with which, as you have not yet studied them, you have at prefent nothing to do. Your plant is the canna indica. Do you, Harriet, refer the hippúris to its genus.

Harr. Having only one feed, my plant muft belong to the fecond 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 defcription is cal. 0, petals 0, stigma fimple, feed 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 vaftly, it is fo clear, and marks fo exactly the characters of the different flowers. I greatly prefer the fyftem of vegetables to the Génera Plantárum. Do not you, Charles?

Charles. Yes, indeed; but I fuppofe we fhould often find the fuller accounts in the Génera Plantárum of ufe.

Hortens. 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 affistance which you will not receive from the fystem of vegetables. There is another work of Linneus's, the Species Plantarum, which gives an account of the fpecies only, with their varieties; this work is not translated, which is to be lamented, though the fystem of vegetables in part fupplies its place, and is much to be prefered 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 fingle

fingle pages of it twenty plants accurately diferiminated from every other known plant; and more than 10,000 plants are deferibed 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 defirous of studying botany.

Jul. The division of the orders feems to make it fo eafy! May I try to find out the genus of woodbine? I do not know the botanical name, fo shall have no affistance from that circumstance.

Hortenf. 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.

Hortenf. Do not be discouraged. You will

will not find your wood-bine fo difficult to inveftigate 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 génera I do not think of, their pericarps not being berries. There are fourteen génera, all of which have berries.

Hortenf. First look at the forms of the corols, the cells of the berries are not very eafy to diffinguish.

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

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

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

Hortenf. They are divisions of the species, which reduce under one head as many of the génera

[171]

[172]

génera as agree in any one circumftance, from which the fpecific character is formed. If your lonicéra has a twining ftem, you will find it in the first division. If the peduncles are two-flowered, in the fecond. If many-flowered, in the third. But we must be perfect in the génera, before we attempt to understand the species. Look into the Génera Plantárum for number 233, which marks lonicéra. You will see many observations below the genéric 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?

Hortenf. It is better at first to examine flowers of a more fimple construction; and I recommend to you to make a point of this, when you are by yourfelves; 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 fo much of the tube is covered by the earth.

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

[173]

by its stigmas, how nicely they are rolled up. I do not quite understand fix-petallike.

Hortenf. Six-petal-like fignifies that the corol is fo deeply divided as to have the appearance of fix diftinct petals, which upon firft feeing the crocus, we fhould fuppofe to be really the cafe. Upon further examination thefe apparently fix petals are found to be only divifions of a one-petalled corol, connected together by a very long tube. I fhewed you the feeds of crocus laft fummer.

Henry. I remember them. The feed-veffel begins to rife out of the ground, as the other parts of the fructification begin to decay; and, when it is quite ripe, featters its pretty pink feeds about the borders.

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

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

Hortenf. It distinctly marks the genus of iris.

[174]

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, confisting of three honey-bearing dots externally, at the base of the flower. The capfule also varies in different species; in some it is three-cornered, in others fix-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 feparates them into diffinct families, is noted.

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

Hortenf. Those circumftances are liable to vary fo 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 top uncertain to be admitted as a decided character; but all these circumstances

[175]

of fmell, tafte, colour, fize, and fituation are noted after the fpecific characters in the Species Plantárum, and have their ufe, if taken in aid of the more decided marks of difcrimination. Linneus efteemed the nectaries of greater importance in determining the génera, than almost any other part; and by the ufe he has made of them, has eftabliss their confequence, though fo much neglected and overlooked before his time, that they had not even a name. As we have begun with the genéra of plants, it is time you should be acquainted with the various forms under which the nectaries appear.

Charles. Before we begin to inveftigate them, I fhould like to refer a flower to its genus in the clafs fyngenefia.

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

Hortenf. I have no objection to your doing fo; I was rather afraid of tiring you, or fhould have proposed it. You will not want much affistance. Bring fome mallows, and gerániums, and an artichoke; we will proceed in order. Harriet will first take her flower, as it belongs to the fixteenth class, one-brotherhood.

Harr.

[176]

Harr. I will begin with the mallow; its clafs I know; its order muft depend on the number of ftamens; here are many, fo I muft find it in polyandria. The génera contained in that divifion are again divided by the number of females or piftils, mine has many piftils; but I perceive that I muft look for fome other circumftance, as there are fix génera that have the fame character in the number of piftils. The outer calyx of my flower is cloven into nine parts, fo is the calyx of althæa, and of no other genus. Arils one-feeded and verticiled; my feeds are in arils, I think.

Hortenf. They are. You may readily take them out of their litle parchment-like cafes, which are called arils. In the fuller defcription you find that the calyx of althæa is double; fo is that of your flower, which is the althæa officinális. Obferve the nice order in which the feeds are placed round the receptacle. You will give Juliette leave to inveftigate the geránium.

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

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

[177]

you will not often find yourfelf at a lofs; t'ough between fome of the génera of the two-brotherhood clafs (diadélphia) the diftinctions are fo minute, as fometimes to puzzle able botanifts; therefore you muft not be difcouraged, if you do not always make out your plant as readily, as you have hitherto done. Juliette will now examine her geránium.

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

Hortenf. Look for the longer account of geranium.

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

Hortenf. I imagine from mistake, as in the Génera Plantárum there is faid to be no pericarp. The feeds are feparate; 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 feeds are

mature,

[178]

mature, thefe long threads, or awns, twift and carry them to the earth, where they vegetate, as I fhewed you, when we were confidering the various modes of difperfion, which might be found in feeds.

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.

Hortenf. Look again, and you will fee that the fub-divisions of the génera depend on the number of anther-bearing ftamens. However this equally perplexes a young botanift, and is now remedied by L'Heritier's new arrangement of the geranium family, which he has divided into three diffinct génera. Eródium, Pelargónium, and Geránium. The names eródium and pelargónium fignifying heron's-bill and ftork's-bill, as geranium fignifies crane's-bill. Eródium includes Linneus's division with five perfect, or antherbearing ftamens. Pelargónium thofe with feven anther-bearing ftamens. And geránium those with ten. It is doubted whether the genus geránium may with ftrict propriety be claffed with the flowers of one-brotherhood,

[179]

as it has not its ftamens decidedly united at their bafe; at prefent it remains in the clafs to which Linneus referred it, and probably will be continued there, as the appearance of the ftamens and piftils fo much refemble thofe of all the one-brotherhood flowers, that without very nice examination, the want of union at the bafe is not eafily difcovered. Your flower is a pelargónium, as you will fee, if you count the number of its anther-bearing ftamens.

Jul. There are feven. I am forry I must no longer call this plant the horse-shoe geránium.

Hortenf. The zoned pelargónium will foon become equally familiar to you. Four of our British species of geránium ought now to be arranged under the genus eródium, only five of their stamens bearing anthers; these are the cicutárium, the pimpinellisofium, the moschátum, 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 confists having all both stamens and pistils. The first divi-

fión

[180]

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

Hortenf. It has much the appearance of being fo; when you have examined it by the further defcription, we can then pronounce decidedly.

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

Hortenf. You are right in your decifion. Obferve the beautiful pappus which crowns the feed, and the fize of the receptacle, which is the part that we eat of the artichoke, or the cy'nara fcólymus; we alfo eat the flefhy bafe of the large leaves, which form the calyx. Will you, Harriet, diffect the dandelion?

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

[181]

the génera are feparated, 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 fee, is the first mark of all the génera of this division. The receptacle of dandelion is clear from either down or chaff, fo cannot belong to the feven first génera. I will pass the pappus, and obferve the calyx, which answers the defcription of that of leóntodon, being imbricated with loofe fcales; there is no other genus that this character belongs to. This pappus puzzles me; I do not diftinctly know the meaning betwixt plumy and hairy.

Hortenf. The pappus of feeds in the compound flowers is either formed of fimple hairs, or of hairs fet with other finer hairs; in the former cafe the pappus is called hairy, in the latter plumy or feathery. The pappus of artichoke, cy'nara, is hairy. This minute circumftance refpecting the pappus of the feeds 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 effected. • Harr. I fhould not fay that this pappus was plumy, but I fuppofe I do not look at it properly. Did Linneus obferve all the minute particulars, from which he has formed the génera, without glaffes?

Hortens. He tells us that he has not defcribed any parts, but those which he has feen with his naked eye. It is not from want of proper inveftigation, that you do not find the pappus of the dandelion feed plumy. Its deficiency in this particular of the generic character has been thought fufficient by Scopoli to make another genus of it, which he has named Hedypnois; however as Linneus has uniformly fhewn his difapprobation of multiplying the génera from the fingle 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 refpect. In the obfervations, which follow the géneric characters in the families of plants, you will find the leóntodon taráxacum, which is your plant, noted for having the pappus of its feeds fimple, or capillary. Some peculiarities in a few other fpecies are also marked, which might have feparated them from their

their genus with as much propriety as the taráxacum has been. You feem to be ready in the method of inveftigating the clafs of compound flowers; you will meet with many that may be more eafily diffinguished than those which we have now diffected. The burdock, arctium lappa, is ftrongly marked, by the outer fcales of its calyx being hooked at the extremity with very fharp fhining hooks. The onopórdon, cotton thiftle, is diftinguished from the cárduus, the true thiftle, by having a receptacle fomewhat 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 génera of this difficult class difcovered conftant marks, by which they may be diftinguished in different states of growth. In the onopórdon acanthium, when the flowering is over, he has observed that the innermost fcales of the calyx close strongly together, and preferve the feed, contrary to the calyx of cárduus, and most other génera of the compound flowers, which as I before remarked, expand and difperfe their feeds. The fmaller flowers of this clafs are more difficult N4

difficult to inveftigate, from the minuteness of their parts of fructification; but if you proceed in the fame manner, that we have done with the larger ones, which we have now diffected, you will foon obtain a competent knowledge of them. We will examine a few of the umbelliferous plants, and then, I think, you will be fufficienly entered into the manner of fludying your book. Juliette and Henry will like to examine the umbelled flowers. Here is the water-parfnip for you, Juliette, and the fhepherd's needle for Henry.

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

Hortenf. Both you and Henry have been fo attentive, that I have had great pleafure in inftructing you. Now take your flower, and examine those florets, which are nearly ready to open, as you will not eafily determine its class, if you attend only to those which are fully expanded, the anthers frequently dropping off as foon as they arrive at maturity.

Jul. Here are five anthers not united, and two

two ftyles; to the fifth clafs and the fecond order my plant muft belong; and to the division of flowers, five-petalled, above; twofeeded, umbelled. These flowers having also universal and partial involucres. Now begins the difficulty—Flowers *flosculous* and *fertile*. What does that mean?

Hortenf. Flofculous implies that all the florets are equal; the term radiate, that the florets of the circumference differ from those of the centre; fertile fignifies that the ftamens are furnished with anthers; abortive, that they are deficient in them; whereever you find the particle sub used, it means the fame as the english termination i/b; fo 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 flofculous and fertile, and the petals hearted, but fo are many others.

Hortenf. Attend to the form of the feeds of your plant, as from that circumftance the genus is frequently marked; and in the umbelled

[186]

belled plants you may generally find at the fame time both flowers and feeds in a fit ftate for inveftigation.

Jul. My flower, I think, is fium; the feeds are almost egged; that means, I fuppose, almost of the shape of an egg; and striated, that is *fcored*, is it not, mamma?

Hortens. You are perfectly right; go on.

Jul. I must look for number 348: here is no further defcription 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 fame clafs and order with your flower, but not to the fame divifion, as it has no univerfal involucre. I fhall look for the feeds firft. The feeds of fcándix are oblong, fo are thefe of the fhepherd'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 defcription. Cor, radiated; fruit, awled; petals, endnicked; florets of the difk, often male; thofe of my flower have only ftamens. Difk means centre, I fuppofe. This fruit is fhaped like an awl, and is very long.

Hortenf

[187]

Hortenf. The centre and circumference are named the difk and the ray, both of which terms are frequently used in the characters of the compound flowers. Your plant is a fcándix. Its species is diftinguished by the very long beak with which the feeds are furnished, and is called scandix pecten, or comb fcandix. We will diffect this gentianella and centaury, and then part for the morning. Both thefe flowers must belong to the fecond order of pentandria, or five ftamens. Their flowers are one-petalled, and beneath; their fruit, capfules; which reduces the number of genera to four; amongft those four you are to look for them. Cut the capfules across, and prefs out the feeds, you will then fee in how many cells they were contained.

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

Hortenf. The value is the coat by which the fruit is covered externally. The cell a hollow inward division, in which the feeds are lodged. So you will fee in the flowers that you are examining, the outer coat is divided

[188]

\$

vided into two parts, but that the feeds 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 faid to be indeterminate, that is, to vary in different fpecies, you may refer your centaury to the fame genus, as it agrees in all other particulars.

Harr. The gentianella and centaury are fo unlike in their appearance, that I fhould have been much puzzled if I had examined them by myfelf.

Hortens. It is on that account that I brought them. The ftructure of those fpecies of gentiána, which are known by the name of gentianella, is fo peculiar as to feem to give them a right to form a genus of themfelves; and the centaury is now placed by Mr. Curtis, in the genus chirónia, from its anthers being twifted, after having fhed their duft; a diffinguishing character of that genus, also from its outer habits fo much refembling those of chirónia. Such respectable authority as Mr. Curtis must have great weight; accordingly you observe that I have marked in my System of Vegetables, the gentiana centaurium,

[189]

taurium, as a chirónia. We will meet tomorrow, and ftudy the nectaries, and the flowers of a few more claffes. We have gone through our lecture to-day with great fuccefs.

[190]

DIALOGUE THE SECOND.

Nectaries of Plants.

Henry. We have been very bufy, mamma, and we think we have made out two or three flowers by ourfelves. Is this felf-heal, prunélla? and this houfe-leak, fempervívum? We have brought fome churn-ftaff, which you promifed to explain to us; and here is a flower, that we are not quite fure of its clafs; and there is fomething odd in the houfe-leek.

Hortenf. I must arrange your questions before I can answer them. Your felf-heal is prunélla. Your house-leek sempervivum tectórum. 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 génera to which these plants belong.

Henry. The two-forked filaments fhewed us the prunélla directly; and we luckily firft gathered a flower of the houfe-leek, that had not the odd appearance, which this bunch has, fo traced it to the eleventh clafs and fixth order,

[191]

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.

Hortenf. The appearance, which has perplexed you, is accurately defcribed 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 fubstance little oblong white corpufcles, like the eggs of some infect : the filaments thus enlarged, are more glutinous than those in their natural state, and have their anthers fomewhat 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 ftate they might be miftaken for the piftil. On cutting them through they appear hollow, and to contain fome of the fame corpufcles, which may be feen on the outfide of many of them, fo that it would be impoffible to know them to have been originally filaments. This fhews you the advantage of examining flowers in their different states of maturity, and before the full expansion

expansion of their corols. The fempervivum is nearly allied to the fédum, 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.

Hortens. We are obliged to Mr. Curtis for an accurate knowledge of the euphórbia, which is the botanic name of your churnstaff. 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 flamens are very minute; there are feldom more than two or three that appear above the calyx, the reft are concealed within it, and rarely amount to twelve in number, fo that it fails in the effential character of the eleventh clafs, 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 fmallnefs of the flamens, and the milky juice, which flows to plentifully from every part when bruifed, renders the investigation of the euphórbias,

phórbias, on the principles of the Linnean fystem, extremely difficult. I can however give you a clear idea of the flower and fruit of this fingular genus, by diffecting fome flowers of the large garden fpurge tree, or euphórbia lathyris. The part which Linneus had called the corol, Mr. Curtis has now named the nectary. There is a fingular appearance which crowns the feeds of thefe plants, and which I have long obferved, without being able to difcover the ufe of it; this extraordinary appendage has not efcaped 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 loofely on a fhortish foot-stalk. In the tree fpurge it gives beauty to the large black feed which it crowns. Mr. Curtis takes notice of the defects, which occur in the fystem of Linneus, with fuch candour, as must every one capable of judging of its general excellence, and who is a true lover of the fcience of botany. No one has done more towards rendering the knowledge of this agreeable fcience eafy of attainment, than he has done, having followed Linneus in his endeavour after the discovery of essential characters, and

in

[194]

in many génera having been fuccefsful in his purfuit. The outer habits and milky juice of the euphórbias are fufficient marks of diffinction in that genus; but the curious ftructure of their fructification well repays the trouble of inveftigation.

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

Hortenf. It belongs to the 23d clafs, polygamia, or plants containing flowers with flamens and piftils, flamens without piftils, and piftils without flamens. Your flower is the parietária officinális, and is remarkable for the curious manner in which its anthers fhed their duft. Each filament has a peculiarity of flructure, which renders it highly elaftic: there are four in number; on their firft appearance they all bend inward. As foon as the duft is ready to be difcharged, the warmth of the fun, or the leaft touch of a pin, will make them inftantly fly back with a degree of force, and difcharge a little cloud

of

[195]

of duft. We will observe this process tomorrow, if it is a bright day, as it is beft feen, when the fun is hot, and fhines on the plant.

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

Hortenf. I have brought it to fhew you the remarkable minuteness of its parts of fructification. It is the centúnculus mínimus, or least centúnculus, which however is an unneceffary appellation, as there is only one fpecies known; you may refer it to its clafs, order, and genus.

Jul. Here are four-stamens and one-pistil, it belongs to the fourth clafs and first order. Corol wheeled, calyx four-parted; capfule one-celled, circumfcifed, that is cut round, I fuppofe. The flowers are all clofed; but as the other parts agree with the defcription given of them, the corol is wheeled, I dare fay.

Hortenf. The extreme smallness of the corol, and the circumstance of its never opening, but when the fun fhines ftrongly upon it, makes the form difficult to be observed; it is however wheeled, and has this peculiarity at-0 2

tending

tending it, different from moft of the wheelform flowers. The corol remains after the ftamens have fhed their duft, and covers the top of the capfule. The diftinguishing circumftance of this little plant is that of its round capfules, feated in the boson of the leaves. We will now begin with the nectaries, before we proceed to investigate the paffion flower, orchis, and arum, as in those génera they are of particular confequence.

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

Hortenf. You are all fo ready in the botanical language, and have attained fo clear a knowledge of the method of reading your plants, that it is unneceffary to proceed with them in regular order, as a tafk; and it will be more amufing to refer a flower to its genus, as it excites your curiofity, than if you gathered a certain number every day for that purpofe.

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

for

[197]

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

Hortens. Linneus 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 fometimes feparate from them. The lower part, or tube, of one-petalled corols, generally is found to contain a fweet juice, which is the honey. In the flowers of árbutus únedo (ftrawberry tree) it is fo profuse, as to run out, when the corol is opened, and to give the flowers a ftrong fcent, refembling 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 diffinctions of the nectaries, which adhere to any of the parts of fructification, are, first, the fpur-form, which is found in one-petalled flowers, as fnap-dragon (antirrhínum), and valerian (valeriána); and in many-petalled flowers, as in órchis, lark-fpur (delphínium), and víola; fecond, fuch as are on the infide of the petals, as in crown imperial, and all the family of fritillária, though in none fo obvious as in

03

the

[198]

the species imperiális, in ranúnculus, and dog-tooth (erythrónium). The nectary in lily (lílium) is that raifed line which you fee run down the petal lengthways; third, the nectaries which crown the corol, as in paffion flower, paffiflora, narcíffus, ly'chnis; fourth, on the calyx, as in nafturtion (tropæolum), being a fpur attached to the calyx; fifth, on the stamens, which in bay (laurus nobilis) are three glands ending in two briftles, furrounding the germ; fixth, on the germ, as in fome fpecies of iris, and in hyacinth, and the plants of the class four-powers, tetradynamia; feventh, on the receptacle in fempervivum, and mercury, mercurialis; eighth, all those nectaries which are not apart from the corol, but whofe fingular conftruction does not admit of their being placed among any of the kinds I have enumerated, as in nettle (urtica), the nectary is fituated in the centre of the stamen-bearing flower, very fmall, in the form of a cup. In fact, the term nectary is applied by Linneus to every part of fructification, which from its fingularity cannot be ranked among the feven regular parts of a flower; it has been doubted whether this part exifts in every flower, and

cer#

[199]

certainly we find many deftitute of it, as a diftinct apparatus; but if any part, wherein this fweet 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 honeybearing part proper to the flower, diftinguishing it into two kinds, proper, when feparate from the petals and other parts. On the petals, when forming a part of the corol, it not being noticed in many of the génera may feem an objection to Linneus having confidered it as a conftant 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 confift, generally containing the juice in queftion, and yet he has not named it in any of the génera of the class united anthers (fyngenéfia), except those of the order monogamia, or fimple flowers, which have fpur-form nectaries; whence I conclude he omitted it in all those génera, where its structure was not fuch as to form a marked cha

04

[200]

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 fome of his works, called the tube of a one-petalled corol a true nectary. Among the nectar-bearing flamens, he enumerates those of the fraxinella (dictámnus), I fuspect however that the refinous matter, with which they abound, is not of the nature of honey, but fimilar to that we find upon the ftalks, which is fo inflammable as to take fire on the approach of a candle, and to burn like fpirit of wine, till it is entirely exhausted.

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

Hortenf. So long as any of this effential oil remains, it is caught by the flame, which runs rapidly along the furface of the flem till it finds no more food, and then is extinguifhed, not having force fufficient to burn the green ftalks, which you may underftand by efcaping unhurt from the flame of a fnapdragon, which runs along your fingers without fingeing them: but to return to the nectaries,

taries, which are placed feparate from all the other parts of fructification; the ftructure of which is an object that merits the ftricteft attention, not only as diffinguishing decidedly one genus from another, but from the artful manner in which they are formed for the purpose of preferving from infects the precious store contained in them. The most remarkable are those of the monk's-hood (aconitum napellus), of chriftmas role (helléborus niger), parnáffia and columbine (aquilegía), and of the órchis tribe. In aquilégia the nectaries have been thought to refemble the neck and body of a bird, and the two petals ftanding upon each fide to reprefent wings, whence its name of columbine, as if refembling a neft 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 parnáffia. I have not yet been able with certainty, to difcover the gland which bears the honey. The beautiful transparent globules which fringe the margins of the five fcales, called nectaries, may probably contain some viscous juice,

juice, which ferves to guard the honey from the depredation of infects; but that we have nothing to do with at prefent. If you have attained a knowledge of the different fpecies of nectaries, with their varieties, it is all that this part of our fludies requires.

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

Harr. So have I.

Jul. I often bite the bottom part of the petals of pinks, and tafte fomething fweetifh, must I therefore call the claws of those petals nectaries?

Hortenf. If you diffect a pink with care, when the flamens 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?

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

[203]

further, and I will shew you a store of honey, which from the finallnefs of its quantity, and the elegance of the apparatus to contain and preferve it, must belong to the queen of the fairies. Observe these flowers of mignionette, reféda odoráta; thefe twofringed petals growing close together form a little cafket, or box, the lid of which is this fmall fcale growing betwixt the stamens and petals, and preffing fo clofely on the latter as to fhut up fecurely a fmall drop of honey in the hollow formed by their union. I have frequently feen bees baffled in their attempts to plunder this honey, not being able to open the lid fufficiently to allow of the infertion of their trunks.

Henry. I like watching bees about the flowers, but they go fo quick from one flower to another, that I can feldom fee their trunks.

Hortenf. They attend only to their bufinefs, and are fo provident of time, that they never lofe a moment in idlenefs. When we ftudy infects, you will be ftruck 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 hiftory, as every one has an opporportunity of observing their ingenuity to a certain degree. It is however equalled, if not excelled, by many other infects; but our knowledge of the general laws, by which many of their tribes are governed, is fo imperfect, that we cannot accurately compare one with another; but fo far we know of them as to give us caufe to believe, that they do not act from the blind impulse of inftinct, but that their fenfes enable them to vary their operations as occasion requires. Some evidently poffeffing the fenfe of touch in an exquifite degree, and their occupation requiring more conftant exertion of their powers, we are authorifed to believe, that those tribes are endued with a greater proportion of knowledge and ingenuity. You will be furprized to hear me mention the fpider, as

an infect which stands foremost in these qualifications.

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

Hortenf. Becaufe you are not acquainted with it. You obferve only its outer form, which is not very prepoffeffing, and do not confider

[204]

confider the merits, which may be found under that form. If you will take the trouble to obferve a fpider, when fhe is making her web, you will feel more refpect for that poor little infect. This web is a net, which she forms to entangle her prey, from a material given her by nature to fupply her want of wings in travelling from place to place; and when used for the purpose of migration is formed into a long line, fpun from her own body. When employed to make her web, you will find her affiduoufly adapting the form of each net to its fituation, and ftrengthening those lines that require it, by joining others to the middle of them, and attaching those others to distant objects; with the fame individual art, that you have feen your brothers use in supporting the masts, and extending the fails of their fhips. You must all have feen another wonderful circumstance of management in this little creature, which is her counterfeiting death, when put into terror; and as foon as the object of terror is removed, recovering and running away.

Henry. I have feen that, when I have put my finger near a fpider, it has rolled itfelf up like a little ball, and as I have taken away

[206]

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 fo, or I would have let it alone.

Hortenf. I dare fay 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 confider the numerous tribes of infects, which furround 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 confufion.

Henry. I have taken great care not to tread upon ants, fince you told me their hiftory, mamma. The fpiders nets feem fo flight, that they cannot hold any ftrong infect, I fhould think.

Hortenf. The nets of the fpiders of this country have the appearance of thin gauze, but from the art with which they are conftructed, are perfectly well adapted in ftrength to the prey, that they are intended to entan-

gle,

I

[207]

gle, which confifts of different kinds of flies. In South America there is a large fpider, which conftructs nets of fo ftrong a texture, as to entangle fmall 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 the lines with a tough thick web, which when taken out refembles a leathern purfe; but what is most curious, this house has a door with hinges, like the cover I have fhewn you in fome fea-fhells; and herfelf and family, who tenant this neft, open and fhut the door whenever they pass or re-pass. But we have digreffed widely from our fubject, and we will now think of the curious plants, which belong to the class gynandria, or ftamens growing upon the piftils.

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

Hortenf. I promife to treat you, by letting Charles read to us to-night fome parts of a fection on the fubject of inftinct, in a book entitled Zoonomia, lately publifhed by an eminent philofopher, who is not more celebrated for the depth and acutenefs of his refearches, than for

[208]

for the agreeable and diffinct manner, in which he gives them to the world. We shall there find fome amufing and instructive histories of the economy of different animals, which will ferve 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 fo well as what we read in the Natural Hiftory of Birds.

Hortenf. * There are few books fo well managed as that you fpeak of. The fubjects are fcientifically arranged, and made interefting by the manner in which they are treated. You may look over a whole library for children, in general, and not find a fubject to which you with to refer; but in your book of the Natural Hiftory of Birds, the

* Natural Hiftory of Birds by Mr. Galton, intended for the amufement and inftruction of children, with copper-plates, coloured, Il. IS. fold by J. Johnson, St. Paul's Church-yard.

[200]

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

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

Hortenf. Very well. In this paffion flower, from the large fize of its parts of fructification, we may eafily examine the polition of the stamens and pistils, its botanical name is paffiflóra. The petals and calyx nearly refemble each other in front, both being of the fame form and colour; thefe beautiful rays are the nectaries; the ftamens are five, at first view having the appearance of being placed on the piftil, but in reality growing from the bottom of the germ, where it joins the little pillar on which it is elevated. The P three

[210]

three large styles are very evident, and from their purple colour, and that of their fligmas, give much beauty to the flower. The nectaries form the principal feature in the flowers of this genus, and in fome of the species have the appearance of a bafket made of blue and white beads ftrung upon wire. The generic characters of paffiflóra, given by Linneus, do not agree with any of the fpecies which I have feen, and there is fome doubt whether the ftamens can be properly faid to grow on the germ. Perhaps the fmall pillar, to which both the flamens and germ adhere, may with more propriety be confidered a receptacle. Linneus calls this pillar a ftyle, but if it be one, we are at a loss to know what part of the flower thefe three apparent ftyles, with their ftigmas, must be called, and to which he gives the name of ftyles. This is one of the few génera that we find not juftly defcribed. Be fo good to give me that fpotted orchis, or king's thumb, as you call it. I fee you have diffected fome of its flowers. Have you been able to gain a diffinct idea of the parts of fructification.

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

[211]

fpend much time over them, as we knew we fhould underftand the parts fo much better, if we examined them with you, ma'am.

Hortens. It is not an easy matter to obtain a diffinct idea of the parts of fructification of the orchis tribe : a peculiarity of ftructure runs through the whole of them, fo different from what we commonly meet with in other plants, as to make them well worth inveftigating. Attend to the natural flower, and to the plate before us, which, as it fnews all the parts magnified, will be of great affiftance to you. I have in my hand a fingle flower on its peduncle, with its bract, or floral-leaf, in which you fee the twifted germ, the petals, the lip and form of the nectary of their natural fize. I will open it, and fhew you the anthers, but you will understand them better from the plate. Each flower contains two flamens, the flructure of which is very curious. Each of these stamens is contained within a bag or cafe, 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 cafes, towards the ftigma, on the flighteft pull they are drawn

out.

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

Jul. Here is a transparent globule, but fo fmall, I cannot see it distinctly.

Hortens. Compare the stamens with the drawings; in them you plainly fee the globules at the bottom of the ftamens, and at the top a club-shaped fubstance, of a yellow colour, in the flower we are examining, and generally fo in others; the furface of which is covered with fmall grains, thefe we muft confider the anthers. We will now lay all the parts before our microfcope, and you will find the reprefentation, given in the plate, to be most exact; and that the anthers are compofed of irregularly fquare corpufcles, united together by fine elaftic threads: that thefe corpulcles produce the fame effect of the anther-dust of common flowers, feems highly probable, though at prefent the manner of their doing fo is not known.

Charles. This feed-veffel is full of good looking feed.

Hortenf. Many of the orchis tribe have their feed-veffels large, well formed, and filled with feeds, which though extremely minute,

[212]

[213]

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

Harr. You have fowed the feed, I think, ma'am.

Hortenf. I have done fo, but not with fuccefs. However, I am of opinion, that the orchifes are propagated from feed, 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 fatisfaction from accurate and repeated observation. Next year I hope you will understand enough of the fubject to establish an experiment-garden.

Jul. That will be charming.

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

Jul. Ah, mamma, you doubt my pa-P 3 tience!

[214]

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

Hortens. If you watch a bed of orchifes, in the hope of finding feedlings on it, you will eagerly catch at every circumftance that can favour this hope. It is the bufinefs of an experiment-maker to be always looking for circumftances which make against his theory, and not for it; and to ftate as ftrongly what he remarks unfavourable, as favourable to his wifhes. But you are at prefent too young to enter deeply into this part of the fludy. You will however be equal to affifting your brother and Harriet, when they begin experiments, and in time become an able experiment-maker yourfelf. You have an industrious application in all you do, which is an excellent foundation; a little impetuofity, and impatience under difappointment, is what we have to get the better of; and I flatter myfelf, I fee them combated with good effect. You cannot be at a lofs to know the fpecies of orchis, that we have just now been examining; its spotted leaves and bright purple flowers will generally be marks fufficient: but that glafs, which is filled with fuch a feeming variety of them,

you

[215]

you will be furprized to find contains only one fpecies.

Harr. Indeed I fhall, ma'am; for I gathered them for fo many different kinds.

Hortenf. They are only fo many varieties of the órchis morio, which fhews you, how little to be relied on are the colours of the corol, which in this fpecies affumes all the changes of colour, from a deep purple to a white; yet it is obvioufly diftinguifhed from all our other órchifes, as through every variety it retains more or lefs ftrongly the character of having its two outermost petals marked with green, parallel lines. In this órchis the anthers are green.

Henry. I fee the lines; they are fo 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?

Hortenf. There are ten diffinct british species of the real orchis; but by common obfervers 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

P4

bee

[216]

bee orchis belongs to the genus of ophrys, the distinguishing character of which is the nectary hanging down longer than the petals, and being flightly 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; alfo we will ftudy this tway-blade, or egged ophrys, with the plate of its parts magnified, which will make the inveftigation of it eafier to you, and you will fee 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 twayblade, or ophrys ováta, is marked by its nectary being two-cleft. The leaves of thefe two species of ophrys differ materially from those of the orchis tribe. The root of the óphrys apífera refembles 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, faty'rium, óphrys, and ferápias, which are all clofely allied, marks the circumftance of the germ being twifted as a peculiarity common to them all. It certainly does not run through all the fpecies, and I fufpect 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 inveftigations of thefe extraordinary flowers.

Harr. When we have gathered orchifes, we have frequently left the tway-blade, becaufe we thought its flowers not handfome; but we are now attentive to every thing that is like a plant, be it ever fo ugly; and we often think of what you always fay, mamma, that there is no fuch thing as an ugly flower.

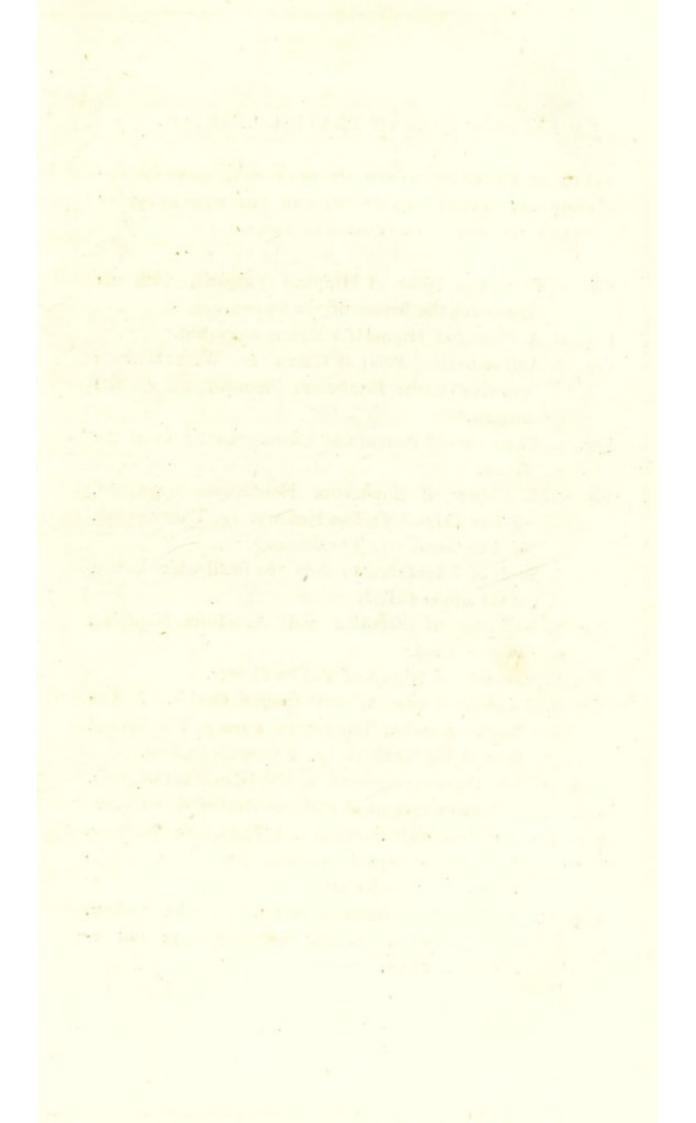
Hortenf. I am really of that opinion, and extend it to every product of nature, that we make the fubject of our thoughts; it is to those who observe only with their eyes, that any of her works can appear ugly, or even indifferent. How often have you passed the leóntodon taráxacum, dandelion, as a flower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

[218]

the mechanism of its fructification, I dare fay 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 feeds with their down, and all the curious opening and shutting of its calyx: fo that I have not a thought of its clumfy yellow flower, which before I underflood the parts it was composed of, I did not like.

Henry. And I just now faw 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.



EXPLANATION OF PLATE I. PART II.

- PARTS OF FRUCTIFICATION OF HIPPURIS, CANNA, EU-PHORBIA, 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 bofom of the leaves, a.
- Fig. 2. A Flower of Hippúris Vulgáris magnified.
- Fig. 3. Anther-bearing Petal of Canna, b. With the Style growing to the Petal-form Filament, c. d, The Stigma.
- Fig. 4. Three-leaved Perianth of Canna growing upon the Germ.
- Fig. 5. A Flower of Euphórbia Heliófcopia magnified.
 e, The Calyx. f, The Nectary. g, The Stamens.
 b, 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 Aconitum Napéllus, Monk's-hood.
- Fig. 8. Stamens and Stigma of Paffion 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 Stamensmagnified. r, The Glands at their bafe.
- Fig. 11. A Stamen magnified with the Anther drawn out.
- Fig. 12. A Flower of Ophrys Ovata. s, The Cloven Nectary.
- Fig. 13. A Flower of Ophrys Apifera, Bee-ophrys. 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.

Plate 1. Part II. Fig. Fig. 2. Fig. 3. a Fig. 4. d Fig. 6. k Real Fig. 5. Fig. 7. Fig. 8. Fig. 9. m n Fig. 13. Fig. apro 11. Fig. 12. Fig. 10. Fig. 14.

London, Published May L'1797, by J.Johnson, St Pauls Church Yard.



[219]

DIALOGUE THE THIRD.

Investigation of different Génera of the Classes One-bouse, and Two-bouses, of Ferns.

Jul. We have brought feveral flowers of the árum. Pray, mamma, look how different the colours of the tongue are; here is one yellowifh green, and another deep purple, the leaves and hoods too, are fome fpotted, and fome plain.

Hortens. 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 fome degree depend on the different state of ripeness in which you gather it. This is a wonderful flower, and feems intended by nature to fhew us, that fhe is not confined to any one method of renewing her productions. Here are berries produced with perfect feeds, which germinate and continue the fpecies, as certainly as those feeds formed in plants, which we call of a more natural structure, becaufe they are of one more common: I have taken out the club-shaped receptacle, which you call the tongue, and feparated the fpathe

care-

3

[220]

carefully from it. You will find an advantage in referring to the plate of this plant, though not fo neceffary as in examining the orchis tribe. All other known plants have their piftils placed within the ftamens. In the arum the stamens are fituated rather more inward than the piftils, and above them on the receptacle. These stamens are not raifed by filaments, but are a collection of anthers four-cornered, and growing to the clubform receptacle; above and below thefe anthers are placed feveral roundifh bodies, terminated by a tapering thread, thefe Linneus calls the nectaries. Beneath the lower order of nectaries, the feed-buds are placed, furrounding the bafe of the fpadix, or tongue, of an oval shape, without styles, and their ftigmas bearded with foft hairs. These feed buds become berries of a beautiful bright fcarlet colour, corresponding in number with the germs; are round and have one cavity. I mentioned an opinion of the younger Linneus, when first we confidered the class gynandria, that the arum did not properly belong to that clafs, 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 myfelf, but do not venture to remove it from the clafs, in which it is at prefent placed, till farther observations of respectable botanists have determined more decidedly its proper fituation. The root of this arum is extremely acrid; but that property does not prevent its being dug up and eaten by the thrushes. Some fpecies have their roots fo mild as to make a part of the food of the inhabitants of the hot countries, where they grow; and fome of the forts are cultivated by the inhabitants of the South Sea ifles, and of the fugar colonies, as esculent plants. The leaves of one of the fpecies, called indian cale, are boiled to fupply the want of other greens. The roots of the arum maculatum, which is the fpecies that we are examining, were formerly used for ftarch; Gerrard mentions it having been fo, and adds, that it was fo extremely acrid, that the people who made use of it had their hands fo much chapped, that they were healed with difficulty.

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

[222]

Hortenf. The whole plant abounds with an acrid juice. You fhould be cautious of putting any parts of plants into your mouths; thoughtleffnefs in this particular has fometimes been attended with dangerous confequences. Have you difcovered the genus of that plant in the china jar ?

Harr. We think it is mercurialis.

Hortenf. You are right; it is the mercuriális perennis, and is a good fpecimen of the clafs two-houfes. It is an elegant plant; its yellow ftamens, 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 fmall pointed filaments, placed on each fide of the germ, and preffed into the furrows of it. The other plant, which you have laid with fo much care into that deep difh 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 fuppofe it to be the hydrócharis, or the frogs-bêt; but there are fome appearances about it, that we hope to hear explained by you.

Hortens.

Hortenf. The leaves, the whole ftructure, and economy of this plant are exceedingly curious, and deferve minute attention. Which are the parts that you do not underftand?

Charles. It is an appendage of the flamens, which we thought might be a piftil, but we could not difcover any thing like either a fligma or germ.

Hortenf. The male flowers of the hydrócharis have nine ftamens, difpofed in three rows. The filaments of the middlemoft row put out from their bafe, on the infide, a ftylelike fubftance, which is placed in the centre of the flower. The two other rows are connected at the bottom, fo 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 obferved 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 fomething really curious in the appearance that puzzled us. We admire

[224]

admire the fpathes of the flowers; they are fomewhat like fea-wrack.

Hortenf. Thefe buds, from their transparency, have the appearance of bubbles; and are, you fee, very numerous, both in the male and female plants, and chiefly grow near the root. In the male, there are alfo a pair of thefe fpathes, which grow out about the middle of the flower-ftalk, and look like little bladders, containing the tender unopened flowers. Mr. Curtis differs from Linneus in defcribing the female flowers as enclosed by a fpathe, which contains only one flower, that of the male three or four. The water plants feem to have engaged your attention particularly this morning.

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

Hortenf. They are the greater and leffer ty pha. Their flowers confifting 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 onehouse-

houfe-clafs, and by Linneus are placed in the order three-ftamens; but as on one filament are found one, two, three, or four anthers, it feems that they might more properly have been arranged in that of polyándria, or manyftamens. What Linneus has called the calyx, from Mr. Curtis's obfervations, does not appear to be one, but rather fome hairs proceeding from the receptacle, which is covered by them after the flamens are fallen off. These spikes of flowers are aments, or catkins, and their cylindric form marks the effential character of the genus. The male flowers are numerous, and terminate the culm, which is the term that Linneus gives to the ftraw of graffes, and these reed-like plants. The female flowers are alfo numerous, and entirely furround the culm. The typha major, when its fpike of ftamens is nearly ripe, makes a magnificent appearance, indeed every part of this plant deferves 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 ground,

ground, and is very beautiful. Here is another plant, about which we have not fatisfied ourfelves.

Hortenf. This is a carex, one of a numerous tribe of plants, the fpecies of which it is not eafy to diffinguifh: this however may be known directly. As to the carex péndula, for in whatever fituation it is found, it is diffinctly marked by its long pendant female fpikes. Thefe are very flender, when young, but become much thicker as the feeds ripen. Its fructification merits examination, as indeed does that of the catkin tribe in general, the inveftigation 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 diffect the separate florets, as we do those of willow and hazle.

Hortenf. That is the only way; and after you have obferved it in a few génera, 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

[226]

[227]

attain fome idea of the ftructure of the cryptogámia plants, and begin with the fílices, or ferns.

Jul. I am glad of that, for I with to know fomething of the little brown fpots on the back of their leaves.

Hortens. 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 fpoken of, you must confine your ideas to the feed only, and the apparatus by which it is contained and difperfed. The whole tribe of the filices, or ferns, are divided into three fections, from the manner in which their fructifications are difposed. The first division confists of fuch as have their fruit in fpikes; the fecond, of those which have it placed on the under fide of their leaves; and the third, of what is termed by Linneus radical fructification, a specimen of which is well feen in the pepper grafs (pilulária). The botanical world is much indebted to the ac-

curate

[228]

curate refearches of Hedwig, for many important difcoveries in the obfcure families of plants belonging to cryptogamia: of the fpiked fructification we cannot examine a better fpecimen than the equifétum fylvaticum, at the time when it is beginning to difperfe its feeds; in the progrefs of which there may be obferved appearances, which feem to have a right to be confidered as ftamens and piftils. In our inveftigation of thefe plants, we must have recourfe to the microfcope; but you will find it more agreeable to view the parts through that glafs, when you have attained fome idea of their ftructure from the plate before us.

Harr. I would much rather fludy the plates, before we begin with the microfcope; for I am fure that I fhall then underftand better what I fee through it.

Hertenf. 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 progrefs, if we do not fee for ourfelves.

Harr. If when I look through the microfcope, I fhould fee any thing different from what Hedwig, or Mr. Curtis defcribes,

[229]

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

Hortenf. With due limitations, that is a proper way of thinking; but in fuch cafes accuftom yourfelf to ftate in writing the particulars, in which you differ in your obfervations, from what you have heard or read upon the fubject. You will by this means fecure the benefit of being better informed, if you are miftaken, and it may happen, that you may be right; and then you will have the pleafure and honour of improving by your inveftigations this most agreeable fcience of botany.

Harr. But, mamma, it is not likely that great and wife men, who have ftudied botany all their lives with every advantage fhould be miftaken.

Hortenf. I grant you, that it is much more likely, that you fhould be fo; but as we do not unfrequently fee great and wife 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 fee for yourfelf. It is the observance of this rule, that has rendered the works of Mr. Curtis fo valuable. Most of our botanical

Q3

pub-

[230]

publications are taken one from the other; and thus if an eminent botanift has in the courfe of his refearches fallen into a miftake, the error has been propagated. Mr. Curtis from his caution in this particular has done more towards the improvement of the fcience, 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 effential fervice 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 fubject, I will write them down, or make them known to you; but if I had not you to apply to, I fhould be at a lofs.

Hortenf. A queftion well and modeftly put can never be impertinent, if not obtruded at an improper time; and you will always find it thought leaft fo by those, who are most able to answer it. But we will begin with our equifétum: early in the spring this plant pusses out of the earth a little clubscale head; round this head are placed in circles target-form substances, each supported on a pedicle, and compressed into angles, in conconfequence of their refting againft each other before the fpike expands. Beneath each of thefe targets are from four to feven conical fubftances, with their points leaning a little inwards towards the pedicle. They open on the inner fide, and on fhaking them over a piece of paper, a greenifh powdery mafs falls out, which at firft is full of motion, but foon after looks like cotton or tow. All this we may fee without a microfcope; but by the affiftance of glaffes green oval bodies have been difcovered, and attached to them (generally) four pellucid and very flender threads, fpoon-form, at their ends, as you fee in the plate.

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

Hortenf. We may always be fure, that a nice and regular organization exifts 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 faid to contract themselves upon the least breath of moist air, and, when wet Q_4 with

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

Henry. I shall like to fee this.

Hortens. To do so, I am afraid requires greater magnifying powers, than we are yet able to manage; therefore at prefent we must content ourfelves with taking this curious hiftory upon truft. Hedwig makes no doubt that these green oval bodies are the feeds, as they gradually increase in bulk, and when they fall the fpike shrivels; that the projecting fpikes are the ftigmas, and the conical fubstances under the targets are the capfules, and the pellucid threads, with the fpoon-form fubstances attached to them, the filaments and ftamens; the feeds are numerous, egg-form, or globular, placed upon and lapped up within the filaments of the ftamens. Future observations must confirm or refute this opinion. The different appearance of the fupposed feeds, with their stamens, before the burfting of the anthers and afterwards, feems to be ftrongly in its favour. The scales, or ftipules, which furround the flowering ftalk at certain distances after its protrusion, ferved, whilft it was young, as a general fence to the fpikes.

[232]

fpikes. From your investigation of equifétum, 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 génera, which are arranged in the spiked division of ferns. We now come to that, which contains the leasy fructifications, or the little brown spots, which have fo 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?

Hortenf. 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 fyrup 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'stongue, asplénium scolopendrium, from its fize, will shew the fructification more diftinctly; the first appearances of which, that

[234]

can be observed, are some little bags, or cases of a yellowish or whitish green colour, placed in rows on the under fide of the leaves; if thefe are opened, almost as foon as they become visible, there will be found capfules, or feed-veffels, very numerous, ftanding 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 cafes open lengthways in the middle, and by the protrusion of the capfules, the two fides are turned quite back, and wholly difappear; this membranous fubstance may be confidered as the fame with the calyx in other plants, and ferves to defend the tender capfules with their feed till ripe, when their curious mechanifm strikes us with grateful astonishment at the benevolent and adequate care, that nature takes of the minuteft of her works. Each capfule confifts of three parts, the footstalk, which fupports and connects them to the leaf, as you fee in the plate, and the jointed fpring, which nearly furrounds the third part, or cavity containing the feeds. The feeds being ripe, this cavity is forced open by the elafticity of the jointed fpring, and

and the feeds fcattered and thrown to a confiderable diftance, one half of the cavity remains connected to one end of the fpring, 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 feeds; mamma had told us fo, but I fuppofed them like ftock feeds; but then, you know, we were ignorant of the parts of fructification. If there are feeds on a plant, we may guess there is generally fomething more.

Hortenf. You will feldom find yourfelves miftaken. These capfules are an agreeable fubject for the microscope, but it is difficult to manage them, fo as to gain a diffinct idea of their progress. They are placed to 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 capfules to open and discharge their feeds, gives them the the appearance of fomething alive. While you are intently looking at one, hoping to obferve the operation, the ftrength and elafticity of the fpring, at the moment of difcharging, will often carry it out of fight, fo that to fee the manner of opening requires fome dextrous management, and much patience; but we fhall be able, I dare fay, to overcome the difficulties, and obtain the amufement of viewing through the microfcope this curious arrangement.

Charles. Mr. Wilfon promifed to fhew me the wonderful mechanifm of the feeds of fern, when we had entered upon the inveftigation of them with you.

Hortenf. Very well; we will then invite Mr. Wilfon to our afternoon party, with Juliette and Henry's pupil, Mrs. Pratt; and we will fpend it in amufing ourfelves with the microfcope.

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

Hortenf. 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 polypódium vulgare. Observe its root, which

re-

refembles 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 de--fcribed by many eminent botanists, as being deficient in the elaftic ring, which furrounds the capfules, and by means of which they are burft open, and their feeds difcharged. It would be extraordinary to find any of the fern tribe deftitute of this feemingly effential part; neither has it yet been difcovered, that they are fo, by the accurate and diligent refearches of Mr. Curtis, who afcribes this error of defcription to the blindly following the authority of figures; for had those authors, who have falfely characterized the polypódium vulgare, from its want of the elastic ring, made use of their own eyes, affifted only by a common magnifier, they must have feen, what had long before their time attracted the notice of enquiring botanifts. At the fame time it is not eafy to account for the error of the ingenious tournefort, who has delineated the capfules of the genus polypódium without rings; but this is one of the many inftances, which ought to deter us from relying upon authority, be it ever

[238]

ever fo refpectable. There is one circumftance attending this polypódium, which does not run through the whole genus, that is the want of the membrane, which in the reft of the family, is found enclofing the capfules; of this however it may not be deftitute, but it may have efcaped.notice from early falling off, when the capfules are arrived at a certain degree of maturity. This tribe of plants not having been much attended to leaves to modern botanifts an ample field of difcovery; and I flatter myfelf it is referved for you, Charles and Henry, to diftinguifh yourfelves in it.

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

Hortenf. I do not doubt their abilities; and would have them as thoroughly informed upon the fubjects that they fludy, as I wifh 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

confequently female education. Some years ago a lady was ashamed to spell with accuracy; happily the matter is now reverfed, 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 exercife of those domestic occupations, which we ought never to lofe fight of, as our brighteft ornament, when properly fulfilled. At this time information in a woman, beyond a certain degree, diftinguishes her above her companions, and like all other diffinctions is liable to lead her into a vain difplay, of what she hopes will gain her admiration. Hence she becomes ridiculous, and brings, what in itfelf might be a credit, into a difgrace; whereas the difgrace ought to fall only on herfelf, 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 deferve blame.

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

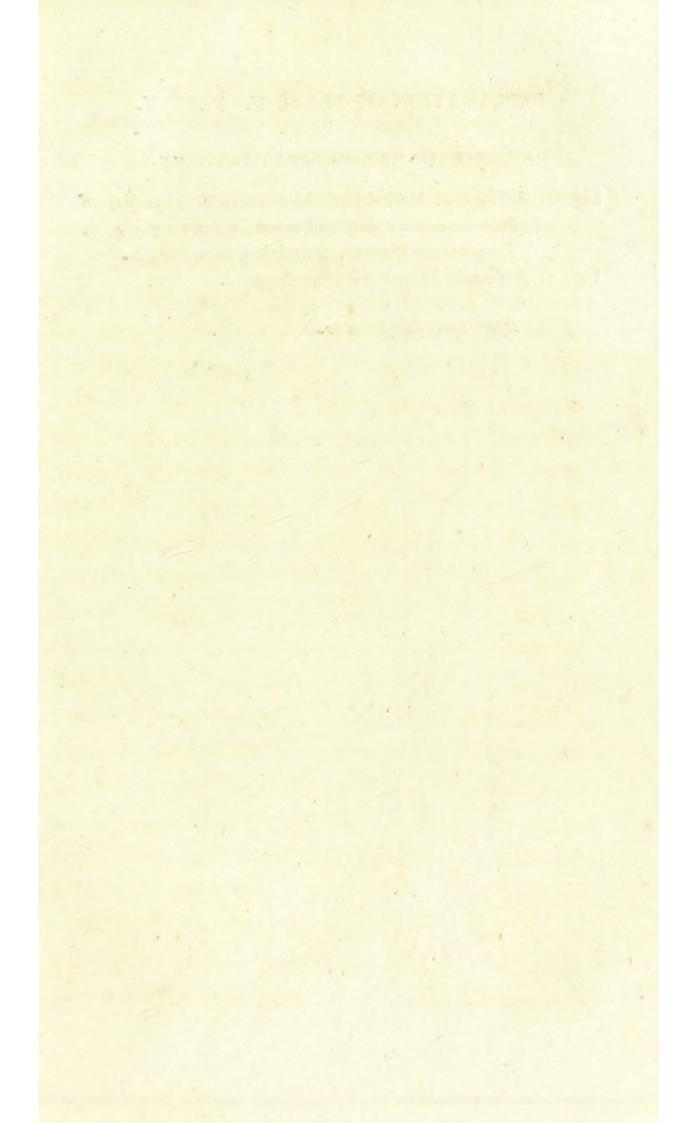
I

15

[240]

is much thought upon, and young people in general are well informed; when their being fo ceafes 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 fimilarity runs through the fructifications of them all, that the diffinction cannot be founded on that part of the plant. The various modes, in which the capfules are placed on the Frond, or leaf, in fome of them are firkingly different, and appear to form very diffinct and fatisfactory characters; but when as a tribe, they come to be more minutely inveffigated, the characters of one are frequently loft in those of another, and we in vain feek for a precife generic character. The plates and remarks in Mr. Curtis's London Flora are particularly pleafing and useful on this fubject. The elegance of the figures of fome of the génera is foarcely exceeded by their natural

ap-



EXPLANATION OF PLATE II. PART II.

HYDROCHARIS MORSUS-RANÆ, FROGS-BIT.

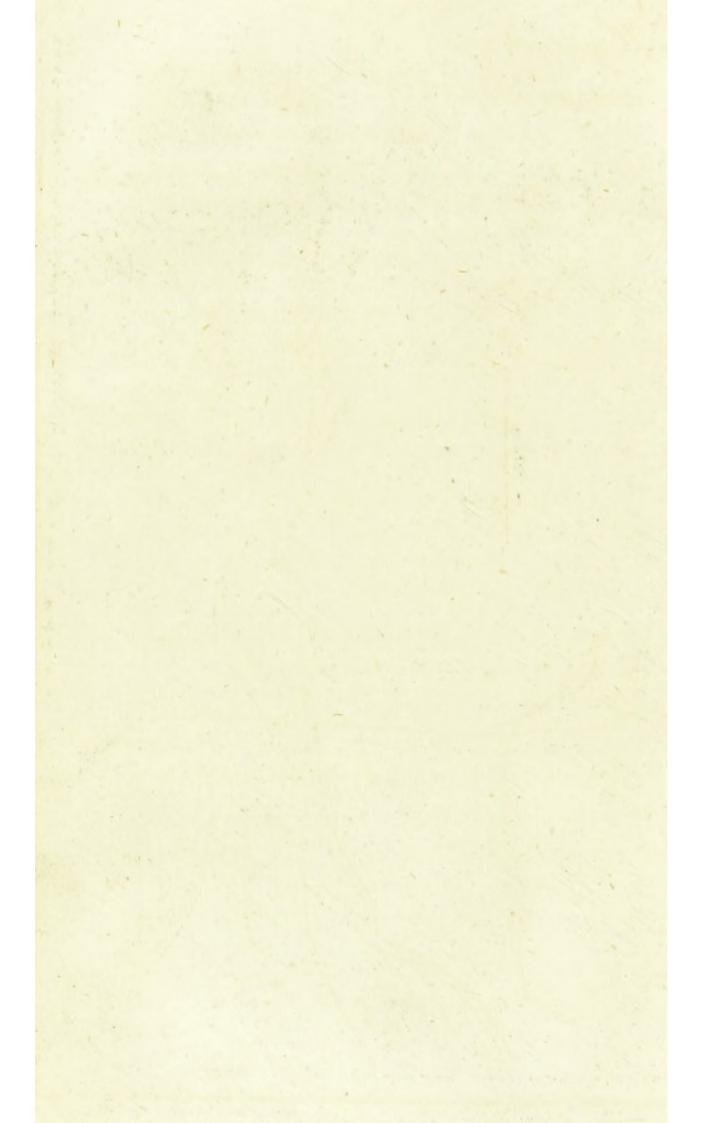
Fig. 1. A Plant of Hydrócharis Morfus-ranæ, Frogs-bit, to fhew its outer habits and mode of growing. a, b; Transparent Sheaths, containing Flower-buds.

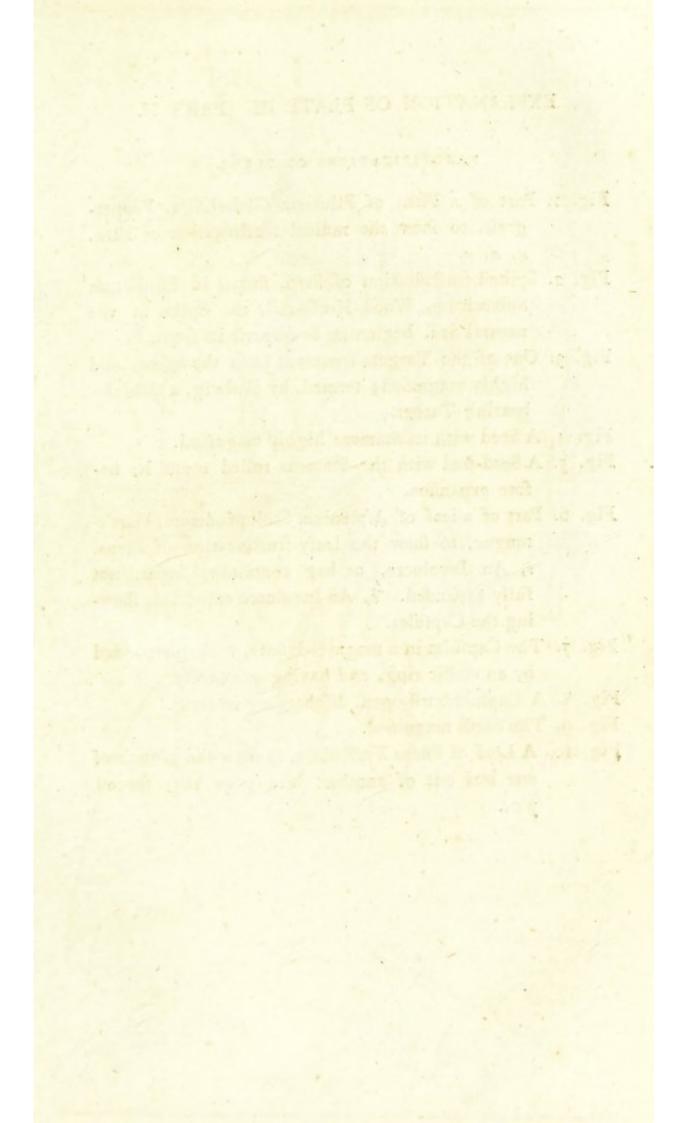
Fig. 2. A Female Flower with the Germ, c.

Hydrócharis Morfus-ranæ.

Plate 2. Part II. Hydrocharis morsus ranæ. Fig. 1. Fig. 2. a 6

London, Published May 1.797, by J.Johnson St Pauls Church Vard.

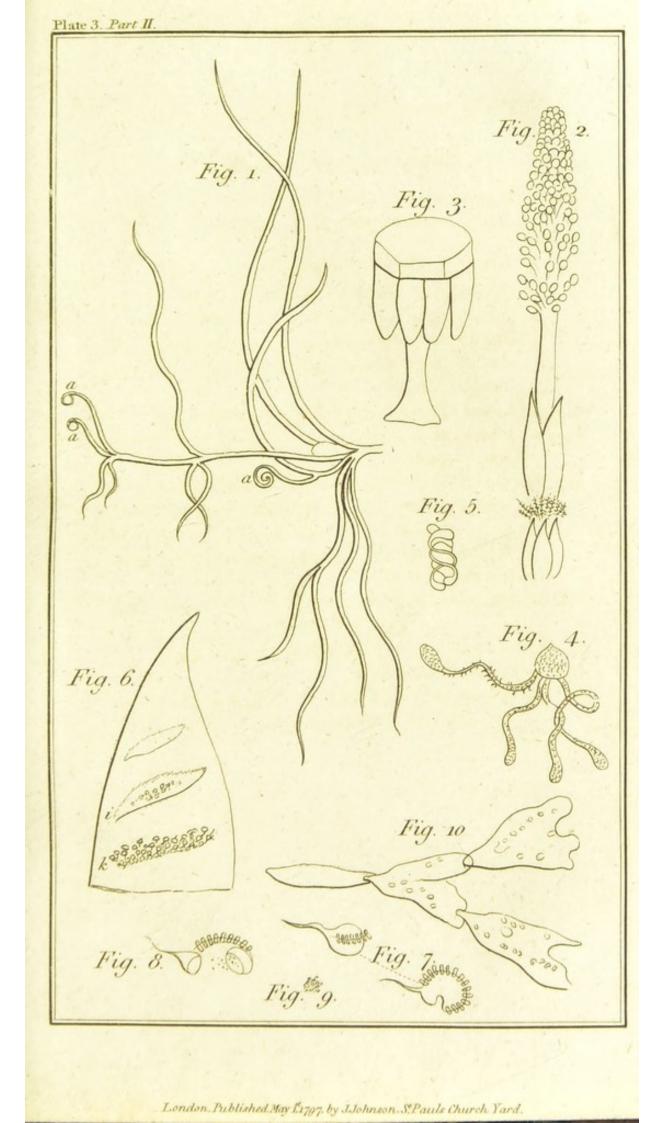




EXPLANATION OF PLATE III. PART II.

FRUCTIFICATIONS OF FERNS.

- Fig. 1. Part of a Plant of Pilulária Globulífera, Peppergrafs, to shew the radical fructification of Fern, a, a, a.
- Fig. 2. Spiked fructification of Fern, shewn in Equisetum Sylvaticum, Wood Horse-tail, the Spike of the natural fize, beginning to disperse its seeds.
- Fig. 3. One of the Targets separated from the Spike, and highly magnified; termed, by Hedwig, a Capfulebearing 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 Afplénium Scolopéndrium, Hart'stongue, to fhew the leafy fructification of Ferns. *i*, An Involucre, or bag containing Seeds, not fully expanded. *k*, An Involucre expanded, fhewing the Capfules.
- Fig. 7. The Capfules in a magnified state, each furrounded by an elastic ring, and having one cavity.
- Fig. 8. A Capfule burft open, discharging its seeds.
- Fig. 9. The Seeds magnified.
- Fig. 10. A Leaf of Fúcus Vesículous, to shew the growth of one leaf out of another. See page 101, second part.





[241]

appearance: you will find that the roots of the ofmúnda fpicant, given by Mr. Curtis, have the fame refemblance to a large caterpillar, that the root of the polypódium vulgare has.

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

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

[242]

DIALOGUE THE FOURTH.

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

Hortens. We are now to enter upon a tribe of plants, little understood, but which from their beauty and usefulness in the vegetable kingdom deferve every refpect and attention. The beauty of their leaves is too obvious to require any explanation; but many are fo infenfible to their use, as to suppose that they impoverish the ground on which they grow : this is by no means the cafe; they thrive beft in barren places, and love cold and moifture, and hence cover those lands with verdure, which would otherwife remain bare: fo far from injuring the plants, which are found intermingled with them, they afford them protection; their own roots penetrating to fo fmall a depth into the ground, that they take from it little nourishment; wherever a small quantity of grafs is found with moffes, there would be none without them; and if the land is drained and manured, it will be feen that the mofs is no impediment to the growth of the grass; for it foon disappears, and the grass flourishes; a yet more essential use is derived

[243]

derived from various fpecies of mofs, which grow upon the fides, and fhallow parts of pools and marshes; in process of time their roots occupy the fpace, which was before filled with water, and in their half-decayed ftate are dug up, and used for fuel, under the name of peat; of the importance of which, you cannot be duly fenfible, as you enjoy plenty of the beft coal. It is not however from mofs alone that peat is derived; fo that we must only give it a share of praise among other vegetables, feveral of which, even whole trees, form the composition of peat beds. You have found the benefit of covering young plants with mofs, as by doing fo, you have frequently preferved them from froft and burning heat ; it retains moifture a long time, without putrefying, and from that property is of great use in packing plants, that are to be fent to a distance.

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

Hortenf. That is owing to its power of retaining moifture; whilft the mofs continues damp, it prevents the juices of the graft from evaporating. Since the time of Linneus it has

been

been well established, that the musci, or mosles, have diffinct fructifications, though botanists are yet divided in regard to their fituation; but as these plants now have excited general attention, a few years will give us, I hope, a revifal of the works of Linneus, with the improved knowledge derived from modern investigation : already an improvement in the clafs Cryptogamia has, I believe, been attempted and received; which encourages us to hope, we may lee at no very diftant period, that division of extraordinary plants no longer a reproach to the fcience. At prefent, the outer habits, and fituation as to the growth of the flowers or capfules, are chiefly made use of to diffinguish the génera of mosses. These plants resemble pines, firs, and other ever-greens of that tribe, in the form and difpofition of their leaves, and manner of growth of their feed-bearing flowers, which are generally formed into a cone; most of the mosfes are perennial and evergreen; their growth is remarkably flow; their anthers, from their first appearance to the time of the difperfion of their powder, continue from four to fix months. In fome of the species the leaves are small and undivided,

[245]

divided, and have no visible foot-stalk, or mid-rib; in others, as in hypnum prolíferum, they refemble the fronds of ferns. Their stamen and feed-bearing flowers are fuppofed to be placed apart; fometimes on the fame, and fometimes on different plants. The calyx, termed by Linneus the calyptre, covers the tops of what he called the ftamens. From the prefence or absence of this cover, which falls before the opening of the fuppofed anthers, Linneus, after Dillenius, has diftinguished the génera. After the veil, or calyptre, 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 moss, first by the affistance of plates, and afterwards amuse yourfelves with viewing them through glaffes.

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

Hortens.

[246]

. Hortens. The eye of the body will not carry us far, unlefs affifted by that of the . mind .--- Before the parts of fructification are protruded, they may be feen by the affiftance of powerful magnifiers inclosed within those fmall buds, which terminate the leaves of moffes, and have the appearance of being only a continuation of them. Hedwig discovered, that the leaves, or fcales, composing these buds differed materially from the leaves of the plant, and confiders them as true involucres to the parts of fructification. He has alfo obferved, that in the capfule-bearing moffes, which have their cones fituated towards their extremities, the leaves adjoining the fruit-stalk are much more beautiful than those of the ftems. Sometimes the inner leaves become gradually fmaller, and those nearest the fructification fo very minute as to make it impossible to take them away without a microfcope. These involucres, like the calyxes of many other well-known plants, grow larger as the capfules advance towards maturity. Hedwig gives fo minute and particular an account of both the stamen and feed-bearing flowers of the whole family of moffes, that, if he has not been deceived in his refearches, we may ex-

pect

[247]

pect foon to fee a greater progrefs made in the knowledge of this difficult tribe of plants, than fome years ago it appeared probable would ever be attained; but as thefe refearches were made by the affiftance of the most powerful magnifiers, and with every advantage that could be procured, I do not think you will at prefent gain much information in regard to the natural plant by fludying his plates. Mr. Curtis's defcriptions and figures will immediately make you well acquainted with every fpecies, that he has delineated. We will therefore, if you pleafe, examine one or two of the fpecimens he gives, and will begin with the bry'um undulatum, or curled bry'um, which he recommends to the notice of young fludents, as it's parts of fructification are large and diffinct.

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

Hortenf. In regard to the moffes, he does not pretend to decide the queftion, whether the powder, from what is called the capfule, is the anther-duft or feed. Hedwig afferts, that these capfules are true feed-veffels, and

tells

[248].

tells us, he fowed them, and repeatedly procured from them a crop of young plants, fimilar in all refpects to the parent plant .----Dillenius fowed thefe cones frequently, but without fuccefs : it is probable that the fituation of the stamens and pistils under one or diftinct covers may have occasioned fuch different refults 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 ufe .--- In the curled bryum, the capfules or anthers are cylindrical, bent inward, and if magnified, they appear fomewhat ftriated. Their colour is first green, then livid brown, and laftly of a reddifh brown colour. The bottom of the opérculum, or lid, is convex and red; the top paler, very flender, and rather blunt; the mouth of the capfule is fringed, and the fringe bent inward ; the ring is red, and the powder, which iffues from the capfule, be it feed, or antherduft, is green. Hedwig has observed, that this fringe of the capfule in dry weather expands, and leaves the mouth of it open; but on the least moisture, even of the breath,

it

it clofes again. He remarks, the ring of the capfule of fome fpecies is elaftic; and, when the feed is ripe, throws off the veil with more or lefs force; and it is after this veil, or calyptre, is gone, that the fringe ferves to protect the precious contents of the capfule. The calyptre in bry'um undulatum is of a pale brown colour, terminating in a long point, firft upright, but afterwards, on the bending of the capfule, it becomes burft at bottom, and remains ftrait, with it's bafe at fome little diftance from the capfule. * We will now look at the plate, where we fhall fee all thefe curiofities well and elegantly delineated.

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

Hortenf. They both feem defined for the formation, protection, and difperfion of their feeds, or of fome fubftance equivalent to it; but, unlefs we credit the plates of Hedwig, we are equally ignorant of the manner in which this feed is produced in both tribes. In

* A plate is given of the different parts of moffes, for those who have not the advantage of confulting Mr. Curtis's London Flora. the magnified leaf of the bry'um undulátum you fee the circumftance, which has given it's fpecific name, the leaf being waved at the edge. This mofs produces it's fructification from November to February, and is commonly to be found either in woods or on heaths; it's leaves foon curl up, after the plant is gathered; feldom more than two peduncles arife from one ftem, generally only one; they are both longer than the ftem, upright, and of a reddifh colour.

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

Hortenf. Your beft way of knowing it will be to gather a patch of it, and feparate the plants one from the other: while the moffes are growing, you cannot obferve the leaves diftinctly.---We will examine another fpecies of mofs, 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 diftinguistable from the bryum undulatum; it's bending peduncles, which have occasioned it to be called the fwan'sneck bryum, are an obvious character in this species; added to this, is the ftar-like appear-

ance

ance, which terminates those ftems, from whence the capfules do not proceed : thefe ftars are fuppofed by fome authors to be the female parts of fructification. Mr. Curtis, with very accurate inveftigation, was not able to difcover any thing in their structure, in the least fimilar to any of the parts of fructification in other plants. Hedwig afferts, that thefe ftar-like appearances are the involucres of the stamen-bearing, or male flowers, and makes no doubt of the capfules containing the piftils, or female flowers. If the ftars and capfules are really diffinct parts of the fructification, it feems to me probable, from the fituation in which they grow, that the ftars contain the females, and the capfules the males; but, if I may conjecture, who have not inveftigated the fubject, I should suppose, that fome of the génera of moss might have. flowers of all kinds, like those plants which compose the class polygamia. On this obfcure fubject, I have thought it neceffary to give you fome idea of the opinions of different botanists, left, 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 fufficiently clear

[252]

clear to justify any thing further than conjecture.

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

Hortens. On all unsettled points every fystem has it's partifans. The best method of judging of the fact, whether the ftars found on feveral species of moss contain the male or female flowers, is repeatedly to fow them, and make accurate obfervations on the refult; but we may find, that we miflead ourfelves by too pertinacious an adherence to the enquiry after one mode of re-production; and that what we fuppofe to be feeds may partake more of the nature of buds, and that the moffes, and other plants of the clafs Cryptogamia, may be viviparous only, and not oviparous, or producing young plants without feed. The moss, that we have just now been confidering, produces its fuppofed fructifications in February and March. This little mofs, which we find almost upon every bank befet with capfules from September to February, is the bry'um trunculatum, or lopped bry'um, fo called from the appearance of it's capfules, after the opérculum is fallen off; which

which having no fringed margin, feems to be cut across: it is one of the leaft of the moffes, and diffinguishable on first view by the great number of it's little brown heads. This plant is evidently diffinguished from the bry'um virídulum, which in fize and outer habit much refembles it, by the difference in the figure of their capfules; those of the bry'um virídulum being in the form of an egg, after the opérculum is fallen off, and their mouths finely fringed ; fuch decided marks of diffinction are particularly agreeable, when found in plants which in fo many circumstances refemble each other ; but we are not far enough advanced in the knowledge of the génera to enter deeply into specific differences. I wish to give you fome idea of the outer habits, and of the curious structure of those parts, which are fupposed to be the fructifications of moffes, and thence make you ready to underftand them, though it is not now in my power to inform you on the fubject as I with.

Charles. From what you have fhewed us, Ma'am, we fhall be able to underftand what we read upon the fubject; and the knowledge I have gained about the capfules, makes me very defirous to inveftigate their true ufe.

Hortens.

[254]

Hortens. Regular experiment can alone enable you to make any important difcoveries. We will examine two other kinds of mofs, 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 confift; the one, that we are now about to confider, is the hypnum proliferum. The hypnum and bry'um families are feparated by Linneus from the fituation of the peduncle, which fupports, what he terms, the anthers, but which later writers have agreed to call the capfule. This in the bry'um grows out of the top of the ftem, and is finished at it's base with a little naked tubercle, or bulb. In the hypnum the peduncle grows out of the fide of the stalk; and the tubercle at it's bafe is covered with leaves. This elegant species of hy'pnum derives it's specific name, proliferous, from the fingular structure of it's leaves, or fronds; one large fhoot proceeding from the middle of another repeatedly ; and thefe fhoots extending themfelves along the ground, and taking root. Linneus found this beautiful plant in one of his journies through Sweden, growing in the thickeft woods, obfcured by

[255]

perpetual shade, and where no other plant could exist.

Charles. There is no appearance here of any thing like fructification, but in the cap-' fules.

Hortens. Nor in many other mosses. This plant is not often found in a state of fructification, though , by diligent fearch it may be fo. It's time of fructifying is from December to February. I do not know, whether it's capfules have ever been fown. The structure of the capfules will be found nearly the fame in all the moffes. Mr. Curtis has however difcovered fome peculiarities in those of bry'um fubulátum, or awled bryum, and in polytrichum fubrotundum, or dwarf poly'trichum, which are worthy of further attention. The bry'um, after it has loft it's calyptre and operculum, protrudes from it's mouth a fubstance, which by magnifiers is found to confift of a number of filaments, forming a thin spiral tube, loofe and unconnected at the top : this tube may be feen through the transparent opérculum, forming in it's young state a fmall fpiral line. Mr. Curtis does not even conjecture, what may be the use of this extraordinary appendage; it may perhaps be the 4 recep-

[256]

receptacle of the feeds within the capfule, which on arriving at maturity burfts open the covers, and difperfes it's contents; to afcertain this, when you begin with experiments, you muft fow a great number of the capfules with, and without thefe tubes, and the tubes without the capfules.

Charles. The refult of fuch experiments would prove the use of these tubes directly, I fuppose.

Hortenf. Such experiments repeated may do fo: but there would be great nicety required in the time of gathering these capfules; 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 fowing the capfules, 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 fee that it is not an eafy matter to make experiments; however, I will begin, and with your affiftance, Ma'am, hope to manage them.

Hortenf.

[257]

Hortens. There is no doubt of your doing fo, 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 capfules of the poly'trichum fub-rotundum, and which Mr. Curtis has found to be a conftant character belonging to the genus, as far as he examined the fpecies he could procure. The capfules of moffes in general have only one veil or calyptre; in this genus there are two within the woolly calyptre of the poly'trichum, which has the appearance of a little diftaff covered with flax, he found a membranous shining substance, closely connected by its top to the infide of the woolly one, which is peculiar to this genus, but which was fcarce vifible, except by totally inverting it; by doing fo, it is visible to the naked eye. This inner calyptre differs very little from that of other moffes; at first it wholly furrounds the unripe capfules; as they increase in fize, it fplits at the bottom, and finally becomes very fhort. We will here finish our inquiry in regard to the moffes, and now proceed to the third order of the obfcure clafs. cryptogamia, the algæ or flags.

Harr.

[258]

Harr. If we find them as agreeable as the moffes have been, we shall be very fortunate : the beauty and curiofity of their capfules, with their apparatus, have been very amufing indeed.

Hortenf. Their having proved fo has detained us longer on their fubject, than I had intended; that you have found the inveftigation of them fo particularly amufing has been owing to Mr. Curtis's accurate and elegant plates: but, with the affiftance of common figures, an account of his difcoveries cannot fail to be an interesting part of the study of botany; it is therefore to be wifhed, that he would give the world a cheap edition of his inveftigations of the cryptogamia plants, with unadorned, but accurate plates, as he has done of the most common graffes, and by which he would greatly facilitate the endeavours of those, who were defirous of becoming acquainted with them; his London Flora being a work of too much expence to be of general utility; befides, that by placing one tribe of plants together, they are more readily confulted.

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

[259]

fhould foon be acquainted with the cryptogamia plants, that grow within the compass of our walks.

Hortenf. You would, even with fuch affiftance, ftill find it difficult to difcriminate the fpecies, if not the genera of thefe extraordinary vegetables, fo nearly do many of them refemble each other. There is a fpecies of polytrichum, the pilofum, or fmall hairy poly'trichum, which will be rendered interefting to you, from a knowledge of its ufe, like the rein-deer mofs to the poor Laplanders; and this not through the medium of any other fubftance, but in it's own natural ftate, as it is found growing.

Henry. What do they do with it?

Hortenf. It ferves them for beds, and that in a curious manner. When obliged to fleep in defert places, which not unfrequently happens, they mark out with a knife about two yards fquare of the ground, where they find the poly'trichum pilófum growing thick together; then, beginning at one corner, they gently fever the turf from the ground; and as the roots of the mofs are clofely interwoven, they by degrees ftrip off the whole markedout turf in one entire piece; then they mark

out

out and draw up another piece, exactly correfponding 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 matrafs, between which they soft matrafs, between which they soft 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.

Hortenf. It would be well, if we made a point of improving ourfelves by the knowledge, that we gain of our fuperiority over too many other countries. Such reflections, as you have juft now made, muft arife; but we fuffer them to vanish again too haftily. If we governed our actions by them, we should increase the happiness of ourfelves, and all around us.---We will now begin with the alg α : I am forry that we cannot have Mr. Curtis's affistance in that tribe of vegetables; but we shall return to him again, when we enter upon the fungi, or mussions. The plants comprized under the description of alg α , or flags, fcarcely admit of a diffunction

of

[261]

of root, stem, or leaf; much less are their flowers fufficiently obvious to admit of a definition of their parts, though by the fituation of their fupposed flowers, or seeds, the génera are diffinguished, or fometimes by the refemblance of the whole plant to fome other fubstance 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 byffus, and feveral species of lichen, fix upon the bareft rocks, and are fupported by what flender fupply the air and rains afford them. Dr. Smith, in his tour on the continent, in the years 1786 and 1787, found near Mount Vefuvius, on a torrent of lava, which iffued in 1771, the lichen pafchalis, which covered it most copiously, and had the appearance of hoar frost, with no other plant near it. The lichen pafchalis is peculiarly fitted for the beginning of vegetation on the hard furface of lava, from its shrubby figure, and slender roots; in the fame manner, the thread-form lichens infinuate their roots into crevices in the bark of the oldest trees, while the broad cruftaceous kinds cover young bark, and the finoother

fmoother forts of stones and rocks. The lichen pafchalis being a perennial of very flow growth, many years elapse before it's crumbling branches fall into the cavities of the lava, and there decaying form vegetable mould for the nourifhment of other plants. By attentive observation the progress, in which fuch vegetable mould is formed, may be feen on the fmooth and barren rocks upon the feashore; and by a knowledge of the decaying plant we may know that, which will next fucceed. After the by'ffus and feveral fpecies of lichen have crumbled into dust, first appear other fpecies of lichen, which require a deeper foil for their fustenance. When these perish, and have again more thickly covered the rocks with mould, various kinds of the moffes appear; in their turn these also decay, when their places are fupplied by other plants, till a fufficiency 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 confiderable article of traffic ; they are a grateful food to goats, as well as to the rein-deer.

Juliette.

[263]

Juliette. I think, mamma, you have told us, that what we call the cup-mofs, is a lichen.

Hortens. 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 species of lichen, are to be efteemed the feed-bearing flowers; and the notches, and warts with black tops, those which contain the stamens : 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 génera of the algæ tribe; but the whole of these 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 fúcus 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

S 4

fracture,

[264]

fracture, if the plant be in a vigorous flate, abundance of young leaves are thrown out from the injured part, even if a fmall aperture be made in the middle of a leaf, a new one arifes from either fide of it.

Henry. I fhall like to obferve this, when we go next to the fea: I have gathered feawrack, with tufts upon it, like black horfehair.

Hortens. Those hair-like tufts are not any part of the fúcus, but are diffinct vegetables of the conférva genus, which attach themfelves to the bladder fucus, and appear to belong to the plant itfelf. There are fome fpecies of fúcus which perhaps on further investigation may be found to partake more of the animal, than of the vegetable kingdom, in the fame manner as the fea anemóne; which was believed, till lately, to belong to the latter. The green fcum, which we fee on ftagnant 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 confifts, requires it more than that, which we have now under - Wayber

under confideration; neither can I find amongst the génera contained in it a common character ftrong enough to affemble fuch a variety of families, which apparently differ in many firiking circumftances: they all feem to poffefs 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 confpicuous part of that elegant arrangement, which we always find in an affemblage of the cryptogamia families. That beautiful little plant, which you fee on heaths, and which is commonly called white mofs, is the rein-deer lichen; a knowledge of it's use to the starved inhabitants of the northern climates gives us an intereft in it, beyond what neceffarily arifes from its elegance of structure. There are many varieties of this plant, from which it is diftinguishable by its very different appearance, even when found in the fame places. The lichen fylváticus, wood lichen, which is only a variety of the rangiferinus, has uniformly its branches of a reddifh brown colour, and its stalks smaller, and sometimes befet with minute crifp leaves, and the whole plant with age turns brown; neither of which

ever

[266]

ever happen to the rein-deer lichen; its colour always being white. What we call mofs on trees, is alfo a lichen. This elegant tribe of plants well repays the trouble of inveftigation; and, with the moffes, ferns, and fungufes, furnishes the botanist with a complete winter garden.

Harr. The ferns and moffes are very agreeable; but when I have gathered fungufes, they have dirtied my fingers, and I have thrown them away.

Hortens. Now you are a botanist, these extraordinary plants will become interesting to you, particularly as by Mr. Curtis's, Mr. Bolton's, and Monfieur Buillard's plates, you may foon learn to diftinguish the génera from each other. There are fome of the fungus tribe, that are difgufting to the fmell, and difagreeable to the touch; but the generality of them are not fo, and may be diffected by perfons of the greatest nicety without giving offence. Within the laft 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 géneric characters continue

to be taken from their outer form. Hedwig's refearches tend to establish for a fact, that the fungi poffess all those parts of fructification, which in botanic language conftitute a flower, viz. ftamens and piftils. The ftamens he conceives to be a collection of pellucid fucculent veffels, 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 fome fungufes, and not in others. This is a thin membrane extending from the ftem to the edge of the hat; which is torn as that expands, and foon difappears; but the part attached to the stem often remains, and forms a ring round it. The parts fupposed by Hedwig to be the piftils, he found in examining a portion taken from one of the gills, which he divided with fome difficulty into two plates, the lower edge thickly fet with tender cylindrical fubstances; fome with globules at their extremities, and fome without : the gill itfelf appeared netted with larger and more diffinct fpots, a little raifed. In another fungus, a fpecies of agaric, after the curtain was torn, and the hat pretty fully expanded, with the gills turned yellow, he found the upper part

of

[268]

of the ftem beginning to be tinged by a brown powder, fhed from the gills. On examination he did not fcruple to pronounce this brown powder to be the feeds, and that it proceeded from the larger fpots, that he had before observed in the gills; the two folds of which now readily feparated. He afferts, that he has uniformly found in the génera of Agáricus and Bolétus the globules, which he believes to be flamens, either on their upper or inner furface. In those agarics, which have neither curtain nor ring, thefe globules with their threads are placed upon the ftem .---Having given you a sketch of the modern difcoveries, we will now examine the outward habits and ftructure of the fungus tribe, and from these circumstances endeavour to gain fome knowledge of the different génera.

Charles. That I shall much like to do; for feeing them daily makes me very defirous to have fomething 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.

Hortenf.

[269]

Hortens. Certainly what can only be feen with very powerful magnifiers, can never ferve for the diffinction of the génera; in which the character being obvious and clear conftitutes the excellence of it. It is however very defirable, that fuch refearches fhould be made. It is a decided fact, that fungufes continue their fpecies by a powder, which is visible in the gills of many of them, and which is generally allowed to be feed. Some fpecies of the agaricus have fo fhort 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 diffolving into a very black liquor, like ink, which dropping carries with it the feed; which may be feen in the liquor, if greatly magnified. We will inveftigate the ftructure of one of this genus, as it is the most numerous of the fungus tribe, and, if well underftood, will bring you acquainted with the bolétus, and other génera of this order. The agarics are composed of a pileus, or hat with gills underneath, and with, or without flipes or ftems; the position of the ftipes being either central or lateral; from whence arife the

L

[270]

the three first divisions of the genus; they have also a root, more or less obvious; and fome of them, while in their unfolded state, are wholly inclosed in a membranaceous, or leathery cafe, called the volve. This cafe muft not be confounded with that part fo termed by Linneus. Mr. Bolton has fhewed 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 thefe two parts, though in reality none can be more evidently diffinct, or applicable to different purpofes: the volve, wrapping round and protecting the whole plant in its infant ftate; the veil, apparently belonging to the fupposed parts of fructification only, and under which Hedwig afferts 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 fome years on the flipe, and not fo in others; confequently it cannot be used as a permanent character. The stem of an agaricus is either folid or hollow; the folid ftem differs much in its degree of folidity, fometimes being as folid as the flesh of an apple, and fome-

fometimes perfectly fpongy. Next to the gills, the flem of an agaric is the part leaft liable to vary. The gills are the part commonly known by that name, and with which every one is acquainted ; they affume different colours in different species, and vary much in their refpective lengths; each gill confifts of two membranes, and between these the feeds are formed; the gills are always attached to the hat, and fometimes to that only; fometimes they are not only fixed to the ftem, 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 obferved in any other fungus : the gills are connected together by numerous transverse bars, or filaments, the use of which feems to be to keep them at an equal diffance from each other, and thus to admit the air to the fructifications, which are fituated on the flat furface of the folds, and to prevent their being destroyed by preffure from their too great closenes. These bars make it extremely difficult to separate one of these folds entire: they are visible only when greatly magnified. The

The fecondary fubdivisions of the agarics are founded upon the folidity or hollownefs of their flipes 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 circumftance 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 diffinction of the fpecies; their colour is fuppofed to be principally, if not wholly caufed by that of the fructification or feeds, and is faid to have been found fufficient, with their ftructure, to afford permanent specific distinctions. These colours change, when the plant begins to decay; and of those agarics, which diffolve away in an ink-like liquor, the gills in their young flate are white, fo 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 fide of the gills which must be attended to in the fystem I am explaining to you, becaufe the colour at the edge in fome plants is different through all the ftages of growth; and

in

[273]

in others, it changes fooner than that of the fides, evidently from the discharge of the feeds, 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 conftantly varying in the fame plant before expansion, but not very changeable in the fame fpecies, 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 flipe, which is feen in many agarics, differs, according to their fituation, or to the state of the atmofphere, fo much, that the fame fpecies will fometimes be found glutinous, and at other times perfectly dry. Some of the agarics contain a milky juice, more or lefs acrid : this circumstance is not constant, it having been found in the agaricus rubescens, and the agáricus cæsareus, that plants equally vigorous, and in the fame fituation, will fome 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 T

[274]

nearly the fame in the other genera of the fungus tribe, you may, I hope, with the affiftance of plates form clear ideas of those parts, from which the various kinds are diftinguissed. 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 sections exists under almost every kind of colour, that can be imagined.

Henry. Then it is the agaricus aurantius, that we call the fcarlet mufhroom, and that is fo beautiful in autumn.

Hortenf. I rather fuppofe, that the fungus, which you have obferved, is the agáricus integer, or entire agáricus, as there is a variety of that fpecies, 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 fplendid 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 fale.

Juliette.

[275]

Juliette. Pray, mamma, what is the botanical name of the mushroom that we eat, and why do we eat only of one kind?

Hortenf. The plant, we eat under the name of mushroom, is agáricus campestris, which the gardeners propagate, either by fowing the gills, or by planting fmall fibrous fhoots, which are found about the bafe of the ftipe; and which produce tubercles, in the manner of potatoes. In regard to the reafon why this is the only fungus commonly ufed in cookery, I cannot perhaps give you one that is fatisfactory. The caprice of mankind, in their choice and rejection of particular kinds of food, is not eafy to be accounted for. The agáricus campeftris however feems to justify the diffinction, 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 fame pre-eminence in other countries; and the inhabitants of Ruffia devour almost every fpecies, even those which by other nations are efteemed most poifonous.

Harr. We hear stories in our country of people being poifoned by eating even the common mushroom.

Hortenf.

[276]

Hortenf. This feldom occurs; and when it has done fo, it has remained doubtful, whether the poifon proceeded from the mushroom, or from the veffel in which it was dreffed; but as mushrooms make a part of our diet, which is more palatable than nutritive, it can never be neceffary to eat them; therefore when you find them hard, I would recommend to you not to do fo, as it is probable the poifonous effects which are recorded of them, may have arifen from want of fufficient flewing; as you know we have before fpoken upon the falutary use of fire to many of our vegetables, which in their fresh state would be fo far from affording wholefome food, that they could not be eaten without producing pernicious confequences.

Harr. I think I have read an account of fome part of the scotch fir being eaten; but I have not a clear recollection about it.

Hortenf. From the highly civilized flate in which we now live, we can form but faint ideas of the neceffitous fituation, under which many of the inhabitants of the globe exift, and in comparifon of whom our pooreft cottugers may be confidered in a flate of eafe. It is in the rigorous and unfertile climates of Sweden,

[277]

Sweden, Lapland, and Kamfchatka, that neceffity obliges the inhabitants to make ufe of the inner bark of the pinus fylvestris (fcotch fir) for food. In the fpring feafon they choofe the faireft and talleft trees, and, ftripping off the outer bark, they collect the foft white fucculent interior bark, and dry it in the fhade. When they have occasion to use it, they first roast it at the fire, then grind it, and after fleeping the flour in warm water, to take off the refinous tafte, they make it into thin cakes, which are baked for use. The poor inhabitants are fometimes conftrained to live upon this food for a whole year, and are faid to be fond of it; and it should be nutritive, as Linneus afferts, that it fattens fwine.

Charles. Here we fee the great advantage to be derived from the knowledge of fire: the poor people of Kamfchatka muft be ftarved, if they were ignorant of its properties. The fcotch fir, I think, Ma'am, has many ufes, befides this. I remember once expreffing my diflike of it ftrongly, and wifning there was no fuch tree, when you enumerated fo many of its virtues, that I have felt refpect towards it ever fince,

Hortenf.

[278]

Hortens. It is always a mark of ignorance to condemn any thing indifcriminately; and of arrogance, to defire to deprive it of existence; and this kind of arrogance is too often found amongst the inconfiderate part of mankind. When we do not find a particular vegetable useful to the human species, we are apt to regard it in too infignificant a light; fo by many are efteemed most of the fungufes, whereas they afford fuftenance to a numerous tribe of the animal creation, a variety of infects. The pinus fylvestris has been applied by mankind to more uses than most other trees. The tallest and straightest are taken for the mafts of fhips ; the timber is refinous, durable, and applicable to many domeftic purpofes; fuch as making floors, wainfcots, boxes, and all those things, which are made of deal; which is the name given to the wood of this fir-tree, when fawn 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 incifion. In the highlands of Scotland, the refinous roots are dug out of the ground, and divided into fmall splinters, which are burnt

by

[279]

by the inhabitants to fupply the place of candles. The most important use, we have observed, is made of the inner bark by the Swedes, Laplanders, and Kamfchatkans; of the fame material, the fifhermen at Lockbroom in Rofs-fhire make their ropes. This fpecies of fir has acquired the name of fcotch, from being the only one which grows naturally in Scotland. It is found fcattered in many places amongst the highland mountains; and large natural forefts of it are feen of many miles extent in various low-land districts. From the cones of this fir a refinous oil is extracted, which is faid to poffefs virtues fimilar to those of the balfam of Peru. This tree lives to a great age; Linneus affirms four hundred years. The anther-dust in fpring has been carried away by the winds in fuch quantities, as to have alarmed the ignorant with the idea of a fhower of brimftone.

Henry. That reminds me of the cloud of duft, which flies from the puff-ball, when I prefs it. What fungus is that, mamma? and is the duft that comes out the feed ?

Hortenf. This powder is believed to be the feeds; when viewed through a microfcope,

the

the feparate particles appear of a fpherical form, and annexed to elaftic hairs. The puffball is the lycopérdon bovista of Lightfoot and fome other authors; but we have not yet a diffinct knowledge of the species of these extraordinary plants. The trufles and morels, which we eat in ragouts, are different fpecies of the fungus tribe. The trufle, tuber cibarium, is effeemed by fome 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 ftructure is worthy of observation, having the appearance of a net, from the tubular honeycomb form of the whole head of the plant. The truffes gathered in Britain are apt to be gritty, as they grow under the furface of the earth, at the depth of four or five inches. Dogs are taught to hunt them; and when they perceive their fcent, they bark a little. and begin to fcratch up the earth. Pigs in Italy are taught to root them out of the ground, accompanied by a perfon, who takes up the prey.

Juliette. That is hard upon the poor pig to disappoint him of the fruit of his labour.

Hortens.

[281]

Hortenf. We will hope the pig is allowed his fhare, or that he is bartered with, and fed well with fome other diet, after having procured the trufles for his mafter.—The laft genus of the Cryptogamia clafs, that we have to confider, is mucor or mould.—Should you fuppofe that the mould, you find on bread, fruits, leaves, and various other fubftances in a decaying ftate, was a plant fubject to all the laws of the vegetable kingdom ?

Charles. Indeed I should not have sufpected it; but I recollect, Ma'am, that you have told me it was a plant.

Hortenf. By the affiftance of a microfcope of common magnifying powers, you may fatisfy yourfelf, that it is fo; you may fee it growing in clufters; the ftems a quarter of an inch high, pellucid, hollow, and cylindrical; each fupporting a fingle globular head, which at first is transparent, afterwards dark grey; these heads burst with elastic force, and eject fmall round feeds, which are easily difcoverable by the microfcope. 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

its

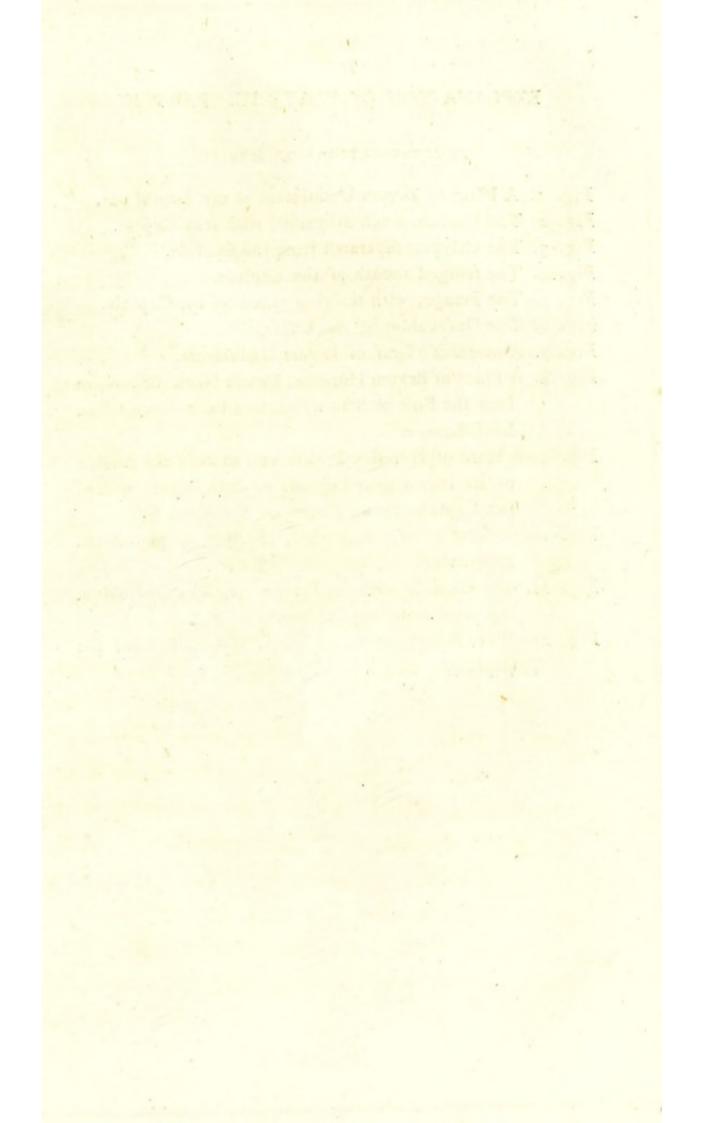
[282]

its brilliant yellow colour, covers the whole furface of plants, on which it grows, and ftains the fingers yellow, if touched. It is generally found upon the plants belonging to the bolétus family, and has the property of repelling moifture. It is faid to remain free from wet, though immerfed in water for a year. You are not yet fufficiently advanced in your botanical ftudies, to enter deeply into enquiries concerning thefe wonders of nature; but you know enough of them to intereft you in their hiftory.

Harr. I feel myfelf much interefted in it, and hope, that when we become proficients in the other claffes, you will ftudy the cryptogamia clafs with us.

Hortenf. With pleafure; and in the mean time I will endeavour to underftand it better myfelf, that I may be able to inftruct you in it.—At our next meeting we will begin with the Graffes, which make an important part of botanical knowledge, and which to you, Charles, will be particularly ufeful, when you enter upon Farming purfuits.

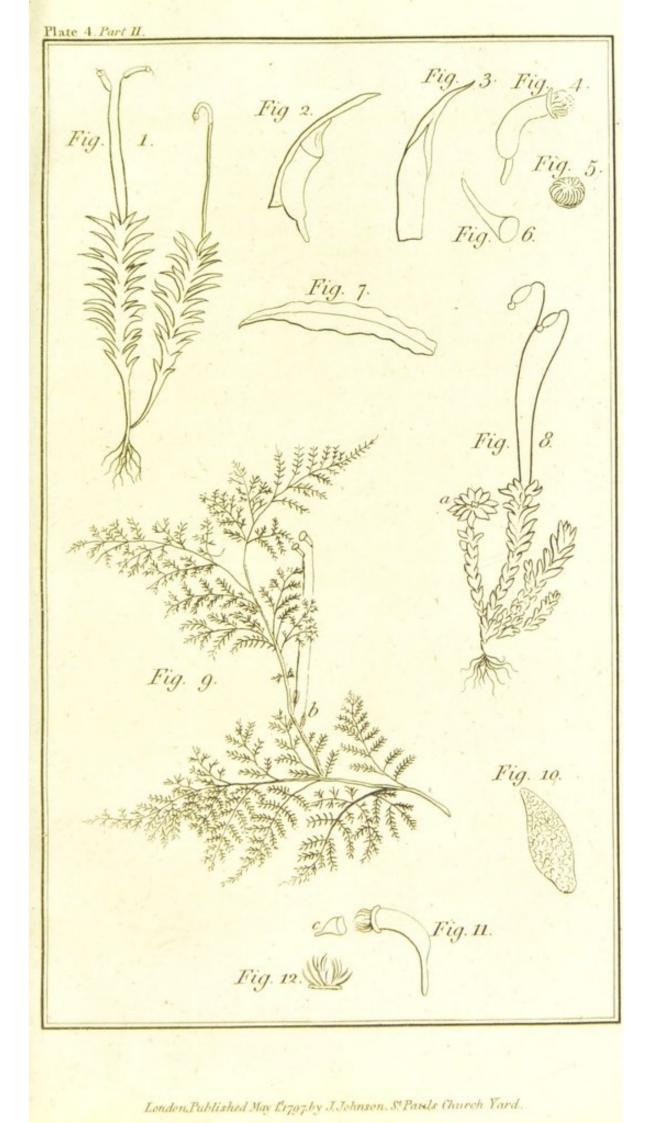
Charles. They are the plants, which I am the most defirous of understanding, as I always



EXPLANATION OF PLATE IV. PART II.

FRUCTIFICATIONS OF MOSSES.

- Fig. 1. A Plant of Bryum Undulatum of the natural fize.
- Fig. 2. The Capfule much magnified with its Calyptre.
- Fig. 3. The Calyptre feparated from the Capfule.
- Fig. 4. The fringed mouth of the Capfule.
- Fig. 5. The Fringe, with the ring taken off the Capfule.
- Fig. 6. The Opérculum of the Capfule.
- Fig. 7. A magnified Leaf of Bryum Undulatum.
- Fig. 8. A Plant of Bryum Hórnum, Swan's Neck Bryum, to, fhew the Rofe or Star which terminates fome of the Leaf-ftems, a.
- Fig. 9. A Plant of Hypnum Proliferum, to fhew the manner of its leaves growing out of each other, and of the Capfules being placed on the Stem, b.
- Fig. 10. A Leaf greatly magnified, to fhew its granulated appearance.
- Fig. 11. The Capfule with its Fringe. e, The Opérculum feparated from the Capfule.
- Fig 12. The Fringe with its Ring, feparated from the Capfule.





[283]

ways think of being a farmer with great pleafure.

Hortenf. It is a purfuit, which a gentleman may enter into with much amufement to himfelf; and, though he fhould not find it immediately profitable, the refult of his experiments may in future become fo to mankind; which is a higher confideration; and there is the certain and immediate good attending it, that it affords employment to himfelf, and to the induftrious poor of his neighbourhood.— I have bufinefs this morning, which prevents me walking with you; but if you meet with any vegetable curiofities, you will not fail to bring them home with you.

vultigation of the genera more ealy, as we

fo that mold people, can afford to purchase

DIALOGUE

[284]

DIALOGUE THE FIFTH.

On the Graffes.

Hortenf. On your return yesterday from your walk, you fo 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 Graffes.

Charles. I think, ma'am, we all pretty well underftand the ftructure of the plants belonging to the four orders of cryptogamia; and we did attempt to make out fome of the génera, but found ourfelves not equal to that, except by comparing them with different plates.

Hortenf. I do not wifh you to attempt any thing beyond a knowledge of their outer habits at prefent. Every year makes the inveftigation of the génera more eafy, as we now fee them given in plates among other plants, with accurate defcriptions of them; and thefe plates publifhed at a moderate rate, fo that most people can afford to purchase them. I fee Henry wishes to ask fome queftion.

Henry. I fcraped this cruft off the bark of a tree this morning; laft week I paffed it, and thought it was a part of the bark, but now

[285]

now I think it is a plant: pray what is it, mamma?

Hortenf. It is one of the lichens, the lichen candelarius of Linneus, but from its yellow colour called the golden lichen by englifh authors; you may fee it well figured in Sowerby's numbers of british plants, to which agreeable publication we must often have recourfe. We will now, if you please, begin with the graffes; 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 as a being with them.

Hortenf. The grafs tribe certainly requires a particular mode of inveftigation; and the plants contained in it are not fo eafy to underftand as flowers, which have larger, and thence more obvious parts of fructification; but the method of accurately diffecting them once adopted, you will find a knowledge of them more eafily attained, than you imagine. Recollect the confusion that appeared to you in the compound flowers, before you underftood the feparate parts, and the regularity of arrangement, when you became

[286]

came acquainted with them, and you will be encouraged in your prefent undertaking.

Harr. You always encourage me, mamma, and make fo much allowance for dulnefs, that I learn what you wifh to teach me much more eafily, than I expect to do. But whenever I am to begin with any thing new, I feel afraid, and if left to myfelf, perhaps fhould give it up.

Hortens. Such feelings are common, particularly in young people, and in those whohave not very active minds; and are thence incapable of weighing the pleafures of indolence against the vacancy, in which the neglect of improvement leaves the mind. We can do nothing without energy; perhaps I find fometimes as much need of exertion to meet you on the fame fubject 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 perfuaded, that the pleafure on both fides predominates; fo we will shake off all indolence, and enter at once upon our morning's businefs. The term grafs, as it is vulgarly ufed, conveys but a vague idea; and the common observer is furrounded, when walking in a hay-

[287]

hay-field, by a variety of fpecies, when he is not confcious of the precife exiftence of one individual.

Charles. I am fure this has often been my cafe; every plant in a field, of which I did not fee the flower, I remember to have called grafs.

Hortens. It is only of late, that this useful and curious tribe of plants has been attended to; fo 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 diffinguished by a particular appellation, are far from being univerfally known by it. Mr. Curtis in this part of the vegetable kingdom, as in every other, has applied his refearches to the most useful purposes. He has attracted the notice of the rich by his more fplendid delineations of a variety of graffes in his London Flora; while he has diffused through all ranks a knowledge of those génera, which are every to be met with, by the low priced publication of his Practical Observations on British Graffes; a work from which a general knowledge of the outer habits of our most common

mon meadow graffes may eafily be attained. We will now endeavour to gain a diffinct one of fome of the genera. This tribe forms one of the natural orders of Linneus, and poffeffes a variety of common characters, by which feveral forts of corn are arranged with those génera, which are more commonly known by the name of graffes. You will find a striking agreement in the parts of fructification of all the graffes that you may examine; but this is not more remarkable than the fimilarity of their general air, their manner of growth, and their whole appearance. A fimplicity of ftructure characterizes the whole clafs; they have uniformly a fimple, ftraight, unbranched, hollow ftem, ftrengthened with knots at certain intervals; this, which is commonly called the ftraw in corn, is termed by Linneus the Culm. At each knot there is always a fingle leaf, which ferves as a fheath to the ftem to fome distance; when it spreads out into a long narrow furface, 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 fpecies, has neither veins nor branching vessels, being only marked longitudinally with lines parallel to the

[289]

the fides, and to a nerve or ridge, that runs the whole length of it. Another curious circumftance, almost peculiar to this tribe of plants, and common to them all, is the feed not splitting when it germinates, but continuing entire, till the young plant is fufficiently nourisfied by its mealy substance to feek its own food; at which time there remains of the parent feed 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 feed flicking amongst the fibres.

Hortenf. If you had prefied the feed, you would have found, that the fkin only remained; the nourifhing part having been abforbed by the young plant, but this part of the fubject we must refer to future enquiry; it is fufficient to know, that every plant that comes under the denomination of a grafs, has its feed 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 juft. I gathered this morning a few graffes for the

[290]

purpole. The common meadow fox-tail, alopecurus pratenfis, will fhew the peculiarities, that we are to look for, as well as any other; and it is better to make yourfelf acquainted with them in the real plant than by plates, though Mr. Curtis's London Flora will afford you much amufement and information on the fubject.

Harr. I find all the characters, that I am to look for in the leaf and flem of this foxtail; and I recollect having feen the fame knots, fheaths, and leaves, in oats, barley, and wheat. We have often amufed ourfelves by flipping the flraw out of its cafe in corn; but the flems of grafs are fo flender, that they bend, and are fpoiled, before the fheath can be taken off.

Jul. And fome are fo rough, that they prick the fingers.

Hortenf. Upon examining the leaves and fheaths by a microfcope, you will find many of them furnished with briffles, which give them the appearance of a faw; from this circumstance, or the contrary, the species are frequently diffinguished one from the other. The parts of fructification are what you have now to attend to; from their want of splendour

[291]

dour they commonly pafs unnoticed, though their beauty and ftructure are fuch as muft excite our higheft admiration, when known. The natural character of the flowers of graffes is their having a glume, or hufk, 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 finaller one flat. Thefe valves are a kind of fcales, with their edges commonly transparent, and moft frequently terminated by a pointed thread, termed by Linneus arifta, or awn.

Henry. I have often obferved that briftle in barley.

Hortenf. It is particularly firong in the hordeum genus, of which barley is a fpecies; but you may find it in a lefs degree in various other génera, though not conftant through every fpecies; from whence its prefence or abfence is ufed by Linneus as a fpecific diffinction. The corol of graffes is alfo termed a glume, and in reality is only a dry fkinny hufk, confifting of two valves. You may compare the calyx and corol with a magnified drawing, and look at the natural plant through a microfcope, and you will then

U 2

un-

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 génera.

Harr. I fhould have been puzzled to have determined, whether the graffes had corols or no; I fhould have fuppofed all thefe hufks to have belonged to the calyx.

Hortens. Call them glumes, as that is the proper term. We have before feen, that the limits between the calyx and corol-are not fufficiently defined; therefore we are to understand them at prefent, according as Linneus has diftinguished them. The inner glumes of the graffes we are to confider as the corol, the outer as the calyx. The flowers of this tribe have also universally a visible nectary, confifting fometimes of two very fmall oblong leaves, placed at the bafe of the germ, and fometimes different kinds of fcales in the fame fituation, which are diftinctly thewn in Mr. Curtis's plates of both the hóleus mollis, creeping foft grafs, and mélica uniflora, fingle flowered melic grafs, and mélica cærulea, blue melic grafs, and are not difficult to be feen in the natural flowers. Though very minute, you may fee the

[293]

the leaves, of which the nectaries are compofed, at the bafe of the germ of the flowers of wall-barley.

Charles. I fee two very fmall transparent leaves, very like the corol, but lefs; they are the nectaries, I fuppofe.

Hortenf. They are fo named by Linneus, but as they furnish no géneric distinction, they are not noted in the characters of all the génera. The number of stamens, that you will generally find in these flowers, is three, with two piftils, within the fame cover. But there are exceptions to this rule, which I will explain to you prefently. The ftamens have three hair-like filaments with oblong anthers of two cells. The ftyles of the piftils are downy, bent back, with their fligmas beautifully feathered, in fome species large and branching, which, with the anthers waving on their long filaments, form a most elegant appearance; but their parts are fo delicate and minute, that they are feen to greater advantage, if viewed through a microfcope.

Harr. The anthers of this fox-tail, alopecúrus I must now call it, are very pretty; but I do not see the pistils.

Hortenf.

U 3

[294]

Hortens. The close spiked graffes do not fhew the parts of fructification fo well as those with loofer spikes, or the panicled kind. In feather grafs, stipa pennata, they are very well feen, if examined in a proper flate; but it is even more neceffary to inveftigate thefe flowers, before their anthers have difcharged their duft, than those of the other claffes; for as foon as the cafes containing it are burft, the whole plant affumes a withered afpect, and all parts, except the feed, fall to decay. These flowers have no feed-veffel, and only a fingle feed; which is enclosed by either the calyx or corol, from which, when ripe, it is emitted in various ways. The twifting of the long awn of feather-grafs, in order to extricate itself from its receptacle, which in this tribe is the ftem lengthened out to ferve that purpofe, gives it a very peculiar appearance. This will also happen if you gather a bunch of the feeds, and bind them tight together; they will twine themfelves into all kind of directions, till they get loofe from the bondage, that you have imposed upon them, and thus commit themfelves to the earth, where they vegetate and produce a new progeny.

Fulo

[295]

Jul. I remember last fummer gathering fome 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 flood different ways, and I pulled it out.

Hortenf. Had you fuffered it to twift, as much as it pleafed, and then cut off the feeds, you would have found it more manageable. I recommend briza to you, as ftill more ornamental than the feather-grafs. The beautiful drooping fpikes of the briza maxima are peculiarly elegant from their tremulous motion, caufed by their flender peduncles, and from whence the genus derives its common name of quake grafs. In the flowers of this fpecies you may alfo fee the parts of fructification to advantage.

Henry. I think I have feen it. Yefterday I feparated the joints of one of the fpikes, and faw ftamens, and two pretty little feathers, like what you juft now told us were the ftigmas. I intended to afk you about them, mamma, but I forgot.

Hortenf. I fhall always be ready to refolve any difficulties that may occur to you in botany, or on any other fubject that I am able; and though I may not be acquainted with it U_4 myfelf, myfelf fufficiently to inform you, as much as I wifh, I may probably find fome method of attaining the knowledge, we are feeking after, in a more effectual manner, than you can yourfelf. I am never ashamed of confessing my ignorance, where I have not neglected opportunities of improving myfelf, by which means I generally acquire fome information, whenever I enter fociety qualified to give it. But to return to our graffes. Though the characters I have given you of the parts of fructification are all found nearly conftant in, those génera, which are placed in the class triandra, or three-ftamens. There are others which fail in the claffic character of the number of flamens, and are thence placed by Linneus in different classes; which separation of plants, manifeftly of the fame natural order, is the more extraordinary, as in fome cafes he has not thought it neceffary ftrictly to adhere to the observance of the claffic character, when it has fo directly militated against an obvious fimilarity 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 foft grafs, having some of its flowers

flowers deficient in the proper number of ftamens and piftils, which would rank it in the clafs and order triandria digynia. Linneus has torn it from all its natural connections, and placed it amongft a tribe of plants, in the clafs polygamia, to which it has no affinity.

Harr. I dare fay, mamma, that you can make fome good excufe for Linneus.

Hortens. His most flagrant faults, of which this must be esteemed one, admit of this excufe, namely, the greatness of the work, with which he has enlightened the botanical world. We ought to be lefs furprized, that we find in it a few imperfections, than that there are not more. This regarding the hólcus, I am inclined to think, efcaped by fome accident his correction, as it is not uncommon to find the fame imperfection in the flowers tríticum and hórdeum, wheat and barley, and fome other graffes, which cannot be confidered as conftant, but may arife from a variety of caufes: though I am in doubt, as the character of the claffes is purely arbitrary, whether in all cafes it would not have been better to have observed it uniformly, than ever to have deviated from it. So, for for inflance, the genus anthoxánthum, which in every particular agrees with the character of the grafs tribe, except that of its number of ftamens, which are only two, and that without variation. From this circumftance Linneus has placed it in the clafs diándria, two-ftamens. Had he done otherwife, a young botanift muft have found himfelf much perplexed; the claffic character being the firft that he would refer to, he could never find the anthoxánthum in a clafs, the effential character of which was three-ftamens, though, from its general appearance, he could not expect to find it feparated from the reft of the graffes.

Harr. I always first look for the number of stamens in the flowers of all the simple class; fo I should certainly be missed if the anthoxanthum was placed in the third class.

Hortenf. There is no other known grafs that has only two ftamens. Its common name of vernal grafs is given to it from its early appearance in the fpring, it being the fecond of the english graffes that comes into bloffom; from which circumstance it is valuable to farmers, and also from its readiness to grow in all foils and fituations.

[299]

Charles. I remember the plant vernal grafs. Mr. Johnfon of the Park Farm once shewed it me, and faid, you will be glad to fee this grafs, when you are a farmer.

Hortens. Mr. Johnson is so civil and intelligent, that you may gain much improvement from him : we must beg his affistance, when you enter upon agricultural experiments. His found practical knowledge may be very useful to you; the danger of experiment-making is too ftrong an attachment to theory. The anthoxánthum is the grafs, which gives the fragrant fcent 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 fpecific name given to it by Linneus, of odorátum. It has been faid to be the only english grass that has fragrance; and this may be true respecting the leaves. But Mr. Swayne in his account of pasture graffes informs us, that the flowers of the annual pea have a fweet fmell like those of the reféda adorata, mignonette; and that the scent remains in the flowers, when dried. The anthoxánthum is faid to have two modes, by which it is propagated; first, the common

[300]

way by feeds; and fecondly by bulbs formed upon its ftems, which fall off when mature, and ftrike root into the ground. This circumftance is faid alfo to take place in many of the alpine graffes, by which means their fpecies are preferved, which would otherwife be annihilated, fo perpetually are their feeds devoured by fmall birds.

Jul. Pray, mamma, from what grafs does the feed, that I give my canary-bird, come ?

Hortens. The name of the genus is phálaris, the fpecies with which you feed your bird is called canarienfis, for the fame reafon that the bird is fo named, being a native of the Canary iflands. The ribbon grafs, with which you are fometimes fo fond of adorning yourfelf, is a variety of another fpecies 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 obvioufly marked by a twifted and jointed awn, which iffues from the back of the corol. The feeds of avena fatua, fool's oat, or as it is commonly called, wild oat, exhibit an amufing spectacle. If placed on a table, after having been moistened in water, they

they twift themfelves about with fo much appearance of life, that the plant has been called the animated oat. There is alfo a curious circumftance belonging to the feed of barley; its awn being furnifhed with ftiff briftles, which will all turn towards the point, like the teeth of a faw. As this long awn lies upon the ground, it extends itfelf in the moift air of the night, and pufhes forward the barley-corn, to which it adheres: in the day it fhortens, as it dries; and as thefe 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.

Jul. This is extraordinary indeed, the barley-corn walks! Did you ever fee this, mamma?

Hortenf. I cannot fay that I have feen it, but the fact is related by fuch refpectable 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 fucceeded fo well, that it walked acrofs the room, in which it was kept, in the fpace of a month or two.

Charles. I recollect Mr. Wilfon shewing me

[302]

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.

Hortenf. Such experiments are very amufing, but are of little value till applied to fome ufeful purpofe. Such ought to be the object of all our exertions, and the teft 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 perfon, who bestowed fo great a benefit on the world. Pray tell me, mamma, to whom I must feel obliged?

Hortenf. 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 ufeful arts, it is to her that we muft pay our tribute of gratitude; not however as to a goddefs, but as to a human creature, whofe ufeful difcoveries defervedly placed her in a high rank as a mortal, and in thofe dark ages caufed her to be revered as divine. The

[303]

The deities of the heathen nations will frequently be found to originate from men, who by the fuperiority of genius over their cotemporaries benefited mankind by ufeful and important difcoveries. Such was Ofyris, who invented the plough. The ftraw of the oat is alfo believed to have been the first mufical inftrument, invented in the pastoral ages of the world, before the difcovery of metals.

Harr. It is very agreeable to trace to their origin things, that are now fo familiar to us, that we are apt to enjoy them without reflection. I will never forget Ceres.

Hortenf. Remember however, that fhe has a claim to only a fecondary gratitude. We cannot contemplate the fruits of the earth, which are fo bountifully beftowed on all climates, and the faculties with which man is endued to difcover their ufes, but we muft adore in filent and grateful praife, the beneficent Creator of all things. Wheat, triticum hybernum, the most nutritive of the various grains, which are applied to the ufe of food, is found in most parts of Europe and Afia; where the climate is too hot for its cultivation, as in the torrid zone, its place is well fupplied by what you call indian and turkey

[304]

turkey wheat, which is a fpecies of zea; a genus placed by Linneus in the clafs monoecia, one-houfe. At dinner you may obferve the long threads, which are fo great an ornament to the pickled wheat, amongft the weft indian pickles. Thefe are the piftils of the feparate florets of the zea: in a riper flate you have feen the fame corn at Mrs. Armitage's, who feeds her parrot with it.

Jul. I have often feen it at Mrs. Armitage's: when the fpike is entire, it looks fomething like a pine-apple. Mamma, you have not mentioned rice, is that a grafs?

Hortenf. It is arranged amongft the graffes in the natural orders of Linneus; but wanting the effential claffic character of his artificial fyftem, it is there feparated from them, and placed in the clafs monoecia, one-houfe; it belongs to the genus ory'za. In moft eaftern countries rice is the chief fupport of the inhabitants; and fo far, as it is ufed for food, is wholfome and nutritive: but as we too often convert what, if properly ufed, would be a bleffing into a curfe; they are not content with that, but make from it a fpirituous liquor, called by the englifh arrack; which, like all other fpirituous liquors, may

be

[305]

be efteemed a flow poifon. Most of the plants belonging to the natural order of graffes afford plentiful and nutritive food not only to mankind, but to beafts, birds, and infects, and have the remarkable property of not being deftroyed, though continually trampled upon: indeed they are conftantly renewed by feeds; as their flowers, just as in other plants, are never eaten by cattle, which, if left at liberty in the pasture, uniformly reject the ftraw on which the flower grows, devouring only the herb of the plant, fo that the feeds which efcape the fmall birds, ripen, fall to the ground, and renew their species. For those graffes, which are more liable to have their feeds deftroyed, or which from the coldness of the climate, that they inhabit, cannot bring their feeds to perfection, I have just now told you, that nature has provided another mode of encreafe, 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 graffes?

Harr. I think I am, and I dare fay we fhall all be able to affift each other in accurately diffecting them.

X

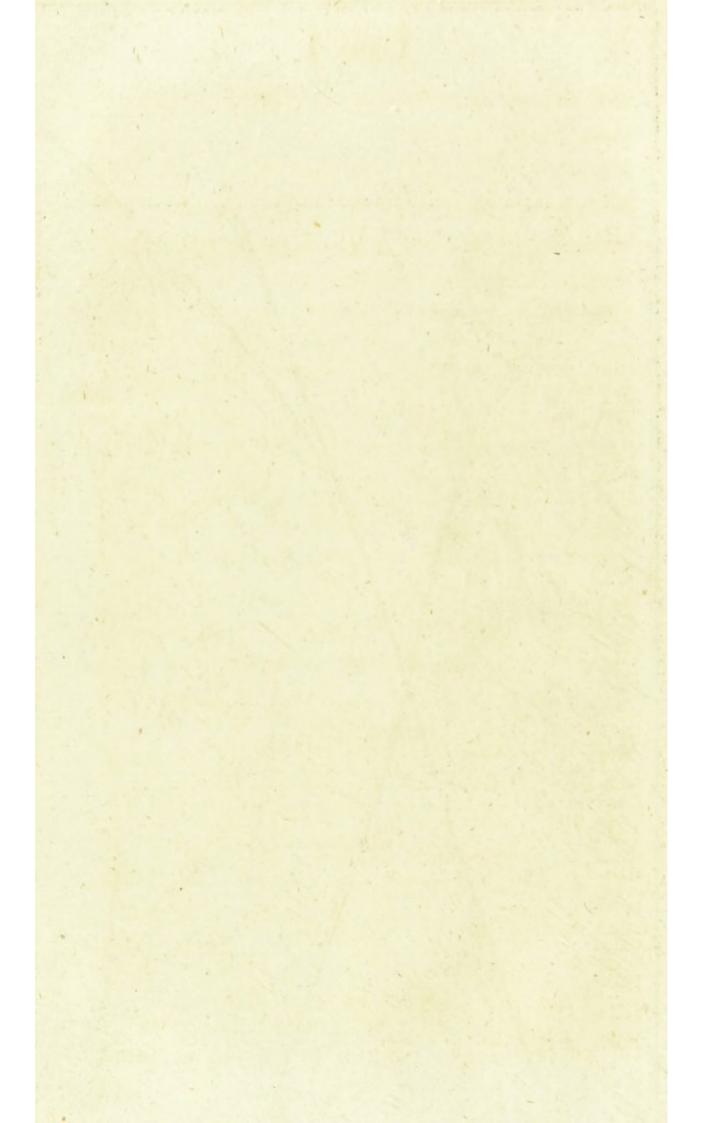
Hortens.

EXPLANATION OF PLATE V. PART II.

FRUCTIFICATIONS OF GRASSES.

- Fig. 1. A Spike of Alopecúrus Praténfis, Meadow Fox-tail.
- Fig. 2. A Floret magnified. a, The Glume of the Calyx, with its long Awn fixed to the bafe. c, The Stamens. d, The Stigma.
- Fig. 3. A Floret of the natural fize feparated from the Spike.
- Fig. 4. The Stigma and Seed.
- Fig. 5. The Germ and Styles of Póa triviális. e, e, The Nectary Glands.
- Fig. 6. The Seed with a woolly fubftance at its bafe.
- Fig. 7. Part of a Spike of Anthoxanthum.
- Fig. 8. The Stamens, Styles and Seed, with the adhefive Nectary Glumes.
- Fig. 9. The Nectary Glumes at the moment of protruding the Anthers.
- Fig. 10. A Floret of Avéna Fatua, Animated Oat.

Plate 5. Part II. Fig. 4. Fig. 1. Fig b Fig. 2. ig 5 8. Fig 6 Fig. Fig. 7 Fig. 10. London, Published May 1. 1797, by J.Johnson, St. Pauls Church Yard.



[307]

DIALOGUE THE SIXTH.

Anthoxanthum described. Specific Distinctions, and double Flowers.

Harr. We have brought a few graffes, that we may examine their fructification through a more powerful microfcope, and with your affistance. We think we have made out the parts pretty diffinctly by our fmall one. The nectary we should not have discovered, if you had not shewed it us in a magnified drawing. We have not atempted to make out any of the génera in our first trial, except that of the anthoxánthum; its two stamens and fweet leaves made us acquainted with it immediately.

Hortens. There are some peculiarities in the fructification of anthoxánthum odoratum, which are worth attending to; we will diffect your specimen, and compare the parts with a magnified plate. It agrees with many other graffes in its fmall fpikes, containing only one flower, but differs from the whole tribe in the following particulars: one of the valves of the glume, or calyx, is fmall and [308]

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 themfelves, as in the avéna genus, and other graffes, but the ftamens and piftils have the appearance of pufhing themfelves out of the glumes, which remain clofed; the glumes of the corol are not like those of other graffes, but are remarkably hairy, each having an awn, the longeft of which fprings from the bafe of the glume, and is at first straight; but as the feed becomes ripe, the top of it is generally bent horizontally inward; the other awn arifes from near the top of the oppofite 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 fmaller than the other: these closely embrace the germ, and are difficult to be feen, unlefs they are obferved at the moment of the anther's protruding from between them, at which time they are very diffinct: as foon as the anthers are excluded, they again close on the germ, and

bus

[309]

and form a coat to the feed, which remains with it.

Charles. Now I find why we could not difcover the nectaries, though I wonder that they efcaped us, as we obferved your rule, ma'am, which has been of great ufe to us, of examining flowers in all their different flates of maturity.

Hortenf. The fimilarity of calyx, corol, and nectary, in the grafs tribe, and the minutenefs of them all, will frequently prevent your accurately diftinguishing 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 fide, as we were walking, and looked for it in the Syftem of Vegetables, but were puzzled by finding it deferibed with an involucre. Pray, mamma, explain it to us?

Hortenf. The term involucre, on the first view of the hordeum genus, to which the wall-barley belongs, does not feem properly applied; but if you feparate the florets from their receptacle, the fpike-ftalk, you will fee X_3 fix

[310]

fix longifh, narrow, pointed leaves, at the bafe of each, which will immediately give you the idea of an involucre. What are those graffes which you have put into that hyacinth glafs?

Harr. We do not know, ma'am, but we brought them, that we might fee them through the microfcope.

Hortenf. This is the holcus mollis, (foft) which when magnified, fhews the fructification very diffinctly. Linneus has placed this grafs in the clafs polygamia, even with more impropriety than the lanatus (woolly), as the flowers of this fpecies have all both stamens and styles. Mr. Curtis feems justly to think, that it ought to have been placed in the áira genus, but that is not our prefent enquiry; and as you enter further into an acquaintance with the tribe, you will find all peculiarities noted, which give caufe of any difference of opinion from Linneus, in Dr. Withering's botanical arrangements; in that publication much pains have been taken with the fubject. By fludying the plate with its explanatory table, which he gives from a work of Linneus, and attending to the remarks inferted from other authors, you will not

[311]

not be long, before you can refer a grafs to its genus, as readily as you can a compound flower; added to which you have the great advantage of confulting Mr. Curtis's London Flora. Your other graffes are the lolium perenne, perennial darnel, and the dáctylis glomerata, glomerate cock's foot : you shall diffect their flowers, and afterwards, as you feem to have clear ideas of the mode of investigating their parts of fructification, we will proceed to the fludy of the fpecific characters, by which every individual is diffinguished from others of the fame genus.

Charles. I should expect to find the attainment of that knowledge difficult, if we had not fo lately feen the power of Linneus in the difcrimination of the génera.

Hortens. 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 effential fpecific characters. Before his time there were no specific distinctions worthy of notice; from-which deficiency arofe great confusion. Now the knowledge of the species confifts in some effential mark or character, by

by which it alone may be diffinguished from all other species of the same genus. These diftinguishing characters are noted by Linneus after every individual of a genus, and this is called the fpecific defcription. To each fpecies he has given a name appropriated to itfelf, which he has termed the Trivial Name. Sometimes this name expresses fome quality of the plant, to which it belongs, but as frequently is arbitrary; and perhaps it would be better, that it was always fo, as the names by which we diffinguish the individuals of a family. You are all Montagues; but when I wifh to make it known to which particular perfon I addrefs myfelf, or fpeak of, I fay, Charles or Harriet Montague, which makes me immediately underftood: whereas, were I to fay Montague with the dark brown, or Montague with the yellow curling hair, the perfon to whom I fpoke would have thefe circumstances to recollect, and to confider whether they really exifted.

Harr. Yet I think I could more eafily remember a name, that gave me fome idea, than one which had no particular fignification.

Hortenf. It may require fome 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 occafioned in common conversation, by people who will not use the proper name of whatever they attempt to defcribe : they introduce all kind of circumftances to make themfelves understood, and at the end of their endeavours leave the perfon, whom they would inform, in defpair of ever acquiring any knowledge from their defcriptions. Could the diffinguishing mark of each plant be expreffed by one word, and that word be ufed 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 prefent hope, though I have no doubt, that we shall fee great improvement take place in this part of the Linnean fyftem of botany, as well as in fome others.

Harr. I promife to make use of the trivial names, as I acquire them, with as much affiduity as I have done of the géneric ones, and all the botanic terms. I affure you, mamma, we make quite a point of using them.

Hortens.

Hortenf. I dare fay you do; and you will find the advantage of it, when you hear botanifts converse, or fludy botanical deferiptions. The excellence of the Lichfield tranflation is, that by acquiring the language of it, we cannot be at a lofs, 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 converfing with an english botanist. When we began with the géneric names, I pointed out this inconvenience to you; the fame objections occur against forming trivial names in our language, in preference to a literal translation of those given by Linneus, One or two inftances will fhew you what I mean. Out of fix species of plantago defcribed in the botanical arrangements of british plants, there are only two, which have their trivial names translated, fo that a fludent, who formed his language from that work, would fund 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

[315]

has the trivial name fiddle given to it; and pulmonária officinális, officinal, is called broad-leaved. Many more fuch falfe names could I enumerate, which are equally aukward and injurious to the fcience, and what every true botanift ought to avoid. I warn you ftrongly from the ufe of fuch terms, as I hear them not unfrequently defended, as being eafy to acquire; but fuch defenders are too idle to think much on the fubject, and of courfe 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.

Hortenf. She is quite right. We will now confider from what circumftances Linneus has taken his fpecific deferiptions : he lays it down as a fundamental rule, that they are to be formed from fuch parts of plants, as are not fubject to variation ; great inconvenience having arifen from the want of obfervance of this rule among former botanifts ; every variety being ranked by them as a diffinct fpecies.

[316]

fpecies. Colour is decidedly one of the leaft permanent characters to be found in plants, confequently not to be admitted into the fpecific character; however I muft 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 diftinguish them individually one from another.

Harr. Though, mamma, you always defend Linneus, you never fcruple to acknowledge his faults.

Hortens. Not to do so would be a very difhonest conduct. Besides that, we never injure our friends fo much, as when we weakly defend them; a candid acknowledgment of both our own faults, and of theirs, is the best method of difarming feverity, when we are obliged to bring them forward. I wifh to prepare you for the flippant attacks, which you will meet with on this great man, both in books and fociety : befides that, if I omitted to point out to you the defects of his fystem, I should in many respects mislead you. In treating of the errors into which botanists have fallen, among other excuses, he mentions the fhortnefs of human life, than 3 which

[317]

which there cannot be a better apology for his own failures. Such a fyftem, as he has formed, is too great to allow of being brought to perfection in the fhort period which one man can be faid to live, if we fubtract from his date infancy and old age.

Charles. We are all obliged to you, ma'am, for always having guarded us againft violently praifing, or cenfuring any body; and when I feel myfelf inclined to do either, I am checked by the recollection of your kind admonitions. I am very defirous to enter further into the fubject of fpecific differences.

Hortenf. Linneus efteemed the root of plants a true fpecific mark, but from the difficulty of obtaining a fight of it has never made ufe of that part as fuch, if any other, equally permanent and more obvious could be found. The trunk and ftalks of vegetables in many inftances afford fuch effential differences, that they ferve to afcertain the fpecies beyond a doubt. In the genus hypéricum, three of the fpecies are accurately diftinguished by their ftems being round, twoedged, 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 diferiminating the fpecies, which is done with good effect in many inftances, though certainly in a few cafes, in contradiction to the principle, on which the claffes are founded, if confidered with strictness, as in some of the graffes; but where the characteriftic mark of either class or order are not interfered with, the parts of fructification form obvious and agreeable marks of fpecific diffinction, as in fome of the hypéricums, the fpecies are diftinguished by their number of ftyles; and in gentiana, the form and division of the corols afford an obvious and permanent difference, which cannot be miftaken by the most superficial observer.

Jul. I know three or four fpecies of gentiána by the divifions and forms of their corols. I wifh all plants were as eafy to be diftinguifhed.

Hortenf. Many of them are, though others are difficult to afcertain. Before you can hope to arrive at a ready difcrimination 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

[319]

of her works more than in that of leaves. The different forts are exceedingly numerous, and ought to be attentively fludied by every pupil in botany. In the prefent part of the fubject, we are to confider them only as marks of diffinction, by which the individuals of a genus are known from each other. Their ufe and formation belong to another part of our fludy.

Harr. I admire leaves fo much, that I am fure I fhall have great pleafure in ftudying the various kinds.

Hortenf. We must take them methodically, and shall then find them not difficult to underftand, with the affiftance of the plates, and botanical terms, and definitions given at the beginning of the fystem of vegetables. We are first to confider the form of leaves, by which you are to understand their external structure. Respecting their form, they are divided into fimple and compound leaves. Simple leaves are those, which have only a fingle leaf on a petiole, or foot-stalk. These fimple leaves may differ in refpect to many circumstances, but they are still simple, if the divisions, however deep, do not reach to the mid-rib. There are fixty-two ways in 11.19 which [320]

which a fimple 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 confpicuous in this part of his fubject, than even in any other. He has formed a language, which in the most concife expressive manner possible depictures fuch a variety of forms of leaves, fruits, flowers, ftems, and feeds, as no other was ever before made to defcribe. The introduction of these excellent terms to english botanists we owe to the Lichfield translators of Linneus's works. I have requefted Mr. Wilfon, Charles, to read with you the preface and advertisement prefixed to the tranflated fystem 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 fimple leaves, in many of them too there appears to be fo very little difference.

Hortenf. 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

[321]

will foon understand it without much difficulty. He has taken words expreffive of well known figures, as the words oblong and egg, which fimply used fignify that the leaf or feed is one of those forms; by compounding those words a form between both is expreffed; if it partake most of the oblong, that word precedes the egg, and contrariwife; fo that the two words, oblong and egg, are made to reprefent forms of four kinds very nearly allied. Thus has Linneus compounded all the different forms under which leaves can appear; and by having done fo has been able in a few words to prefent before our eyes the effential specific characters of a variety of plants; which by other authors are defcribed with fo little precifion, and fo diffufely, that we are bewildered by the innumerable diffinctions, to which we have to attend.

Harr. I now underftand the merit of this, fince I have profited by it in the generic defcriptions. The difficulty will be to attain a precife idea of these forms.

Hortenf. You must begin by comparing the natural leaves with their forms given in

the

the plates. The leaves of daifie (béllis) are oblong, those of beech (fágus filvatica), and pepper-mint, (méntha piperita), egg-form, of violet heart-form, rofemary, rofmarinus officinalis, and crócus, linear; or every where of an equal breadth. When you have well ftudied the fimple forms, you must then endeavour to understand those, which are compounded from them; and by drawing compound the forms yourfelves, till they become familiar to you. Pulmonária officinalis, commonly called jerufalem cowflip, has its radical, or root leaves, of the form betwixt egg and heart; in expreffing which, and the reft of the compound forms, the Lichfield tranflators have most happily imitated the concisenefs of their author; and in their language you will find the terms, egg-hearted, heartlanced, used instead of between-egg and heart-fhape, heart and lance-fhape, and fo of them all. The term arrowed is used for arrow-fhape ; lyred for lyre-fhape ; twoed, or threed, for growing two together, or three together: indeed inftances occur fo frequently of the agreeable concifeness, with which the language of the translated System of

[323]

of Vegetables is formed, that it would be difficult to enumerate them all: it is a work of the higheft value to an english botanist.

Henry. I do not think the language odd now ; but it did feem very ftrange, when first we began to learn it in the géneric defcriptions.

Hortenf. So it is in every thing, with which we are not acquainted. I think you underftand the outline of the forms that you may expect to find in leaves, both in their fimple and compound characters, well enough to enable you to begin the fludy of them. We will now confider, what circumftances conftitute a compound leaf. I have fhewn you in fpeaking of fimple leaves, that they continue to be fo denominated, be their divisions ever fo deep, provided those divisions do not extend to the mid-rib; but when that takes place, the leaf becomes compound; fo that it is in fact a fmall branch composed of a number of individual leaves, which feparate 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 fome instances it may not to a young botanist be very

[324]

very eafy to diffinguish a compound leaf from a branch; but there are two rules, by which they may always be known afunder; ift, 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 issors; 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 refemble the other in appearance, it always falls off, either with or after the leaves it states.

Charles. Pray, ma'am, are not the leaves of the robinia pfeud-acacia compound? I obferved them laft autumn, as they decayed: the common petiole continued fome time after the leaves were dropped from it; and there was a very fmall hairy bud at its bafe.

Hortenf. The leaves of robinia, rofe acacia, afford a good example of the compound character, and alfo of the two rules, that I have juft now mentioned to you. There are three kinds of compound leaves, the compounded, decompounded, and fuper-decompounded. The firft I have explained to you, though there

[325]

there be but two divisions from the fame common petiole, it is a compound leaf. The terms decompounded, and fuper-decompounded, are applied to different modifications of the compound leaf; and again these modifications admit of fuch 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 fay I am afraid of the difficulties, which occur in our fludy, fince, mamma, you have fhewn me, that fuch fear arifes from idlenefs.

Hortenf. You are very right. Whatever has idlenefs for its fource, we ought to be afhamed 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; fo is the fingered, of which you have an example in the horfe-chefnut, æfculus hippocáftanum, and lupine, lupínus; as thefe various modes frequently enter into, if not entirely form the fpecific character of plants, it is neceffary they fhould be well underftood. But, before you attempt the compound leaves, Y 3 I advife

[326]

I advife you to become perfectly acquainted with the different forms, which exift in the fimple leaves; as the form of the fingle leaves, of which the compound leaf confifts, is a circumftance generally noted. The Syftem of Vegetables, methodically fludied, will carry you through this difficult part of botany; or, if fometimes you are perplexed, an explanation of the fame terms in other books will be of fervice to you, as you will probably find different words ufed, which may elucidate the point on which you are in doubt.

Charles. I will acknowledge, ma'am, that, till you fhewed me the method of fludying the Syftem of Vegetables, I have thought it perfectly unintelligible, when I happened to look into it, as it lay on your table.

Hortenf. I am not furprifed at this; its excellence can only be underftood when ftudied; if taken up as a book to read, it muft appear a confufed jargon; and fuch I have frequently heard it called; but I have convinced feveral people of the contrary, who, when they were capable of underftanding it, have thought as highly of its merits, as I do. To teach botany from any other book is like teaching latin with englifh on the oppofite page; the language

guage is never completety underftood, though fometimes, when judicioufly ufed, fuch an affistance may be advantageous; fo 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 eafy to me; and fometimes Charles hides the english defcriptions 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.

Hortens. You may with little trouble learn a fufficient quantity of latin to enable you to do fo; and, as all your other ftudies are fo well attended to, I shall have no objection to it next fpring, if the defire then continues.

Harr. Thank you, ma'am; I promife you it shall not interfere with any more useful occupation; and I have no doubt of the defire being ftill ftronger, as my knowledge of botany increases.

Hortens. We are now to confider fome other circumftances relative to leaves, which it is equally effential to understand as those, of which we have been treating : thefe are the deter-

determination, or disposition of leaves, which comprehend four particulars alike belonging to the fimple and compound kind, the place, fituation, 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 refpective polition of leaves one to the other : fo leaves are called alternate, when they come out fingly, and are ranged gradually on both fides of the ftem, as in ivy toad-flax, antirrhinum cymbalaria; or opposite, when they come out in pairs, as in myrtle, myrtus, and many other plants. Thefe two circumftances of leaves being alternate, or oppofite, furnish constant and invariable characters, which are generally found in plants of the fame genus, or even of the fame natural order. Direction contains the different ways, in which a leaf bends from its ftem, the various modes of its doing fo are arranged under the general term direction, and muft be studied to be understood. Infertion comprizes the diverfity of manner, by which leaves may be attached to their parent plants, each of which has an appropriate term, briefly and expreffively explained in the botanic terms and definitions at the beginning of the Syftem

of

[329]

of Vegetables, with plates at the end of each volume to illuftrate them. I have now only to fpeak of fuch flowers, as are commonly called double; to enter far into an account of them belongs rather to the natural hiftory of plants, than to that part of the fcience, which ought to engage the attention of a pupil in the beginning of his ftudies. It will be fufficient to acquaint you with the unnatural varieties, under which flowers appear, that you may not be mifled by the monftrous forms, they frequently affume, to look for a genus, where there is only a fportive variety.

Henry. You told me, mamma, that double flowers were monfters, like calves with two heads, or hands with fix fingers. I one day told the gardener fo, and he was very angry.

Hortenf. That was becaufe he did not perfectly underftand the word monfter, which ftrictly means only a deviation from the common mode of nature's productions; and thence may fometimes 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 placing

[330]

placing a double ftock-flower near a fingle one, they can thereby procure fuch feed as will again produce double flowers : but that this is a vulgar error, a very flight knowledge of botany may convince us; for, when a flower is completely double, it is deprived of its ftamens, which commonly expand into petals; by which transformation the flower no longer poffeffes the antherdust, or effential part to the fertilization of feeds. 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 difcovered. Some flowers are only half-double ; in which cafe the stamens and pistils often remain perfect, and hence produce fruit. This happens in the double peach, the fertility of which is fometimes brought as an objection to the Linnean fystem.

Juliette. What do you call the role in role polyanthos, mamma? Is that a double flower?

Hortenf. It is one kind of the double, or multiplied flowers, and is termed proliferous; of this fort is the béllis prolífera, hen

and

5

and chicken daify; this is one of the moft curious of vegetable monfters, as well as the moft beautiful, Plantágo rofea, or rofe plantain, is wonderfully difguifed by its bracts becoming enlarged, and being converted into leaves. Many flowers become double by the multiplication of their nectaries, and in fo many various ways, that it would at prefent engage us too long to enumerate them. I will, at a proper time, read to you fome parts of a translation of Linneus's philofophy of botany by Mr. Rofe, which will give you information on different parts of the fubject, for which you are not yet ready.

Harr. I have often looked for the flamens in a provence rofe, and could not difcover them.

Hortenf. The petals are fo profufely multiplied, that they have entirely excluded them. In fome other rofes, you will find flamens, though the flower has a luxuriancy of petals, as in damafk rofe. The many-petalled flowers are the most fubject to multiplication. The one-petalled rarely go beyond a double corol, which is very often feen in them. The compound flowers alfo are liable to become double; and their beauty is often improved by

[332]

by it; as daisie, béllis, fneez-wort, achilléa, and chryfanthemum sílphium; but, if we except a few inftances, I think fingle flowers are much to be preferred to double ones.

Harr. Rofes, flocks, and hyacinths, are much improved by being double; do not you think fo, mamma?

Hortens. The two first undoubtedly, and often the laft. Befides the varieties occafioned by multiplication, there are others arifing from many accidental caufes; but the most general caufe may be efteemed culture : it is from the gardener's art, that we receive fo many delicious fruits and vegetables for our tables; culture too is the teft, whether a plant be a true species, or a variety. By a change of foil we can produce the most valuable varieties, or oblige them to return to their original form; by refufing them our nourifhing care. The ingenuity and industry of mankind is not feen in any thing more confpicuoufly than in his culture of corn, which, without the fcience of agriculture, would be of fmall value; with it, we must esteem it the first bleffing of life. Botanists are careful to diftinguish between varieties obtained from feed, and the genuine fpecies, from which they deviate. Such plants

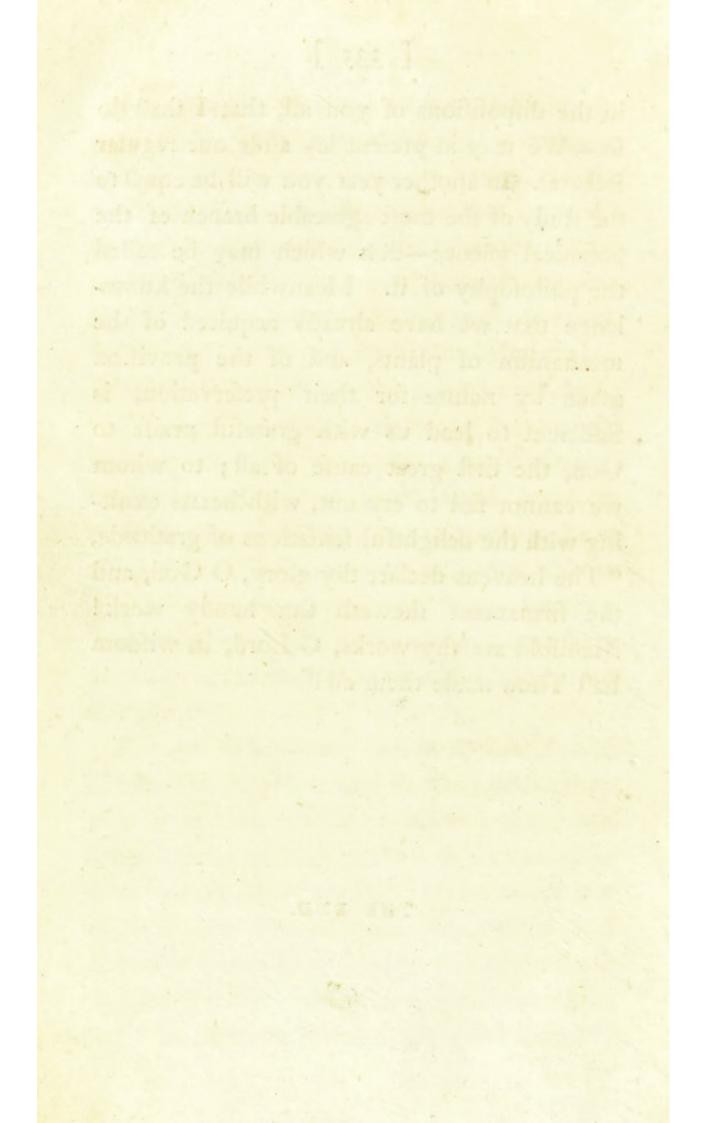
you

[333]

you will not find noted in the System of Vegetables, which contains only the génera, and the permanent species : in the Species Plantarum, the varieties are diffinguished 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 fo metamorphofed, that it requires no fmall degree of botanical knowledge to afcertain the real plant. Many of thefe appearances may be effected by art, and have been fo by the curious, in order to discover the true cause of fuch deformities, or of difeafes, which are found destructive of vegetation.

Harr. That will be the last part of botany, I shall be defirous of investigating.

Hortenf. 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 faid to understand it well in the outline. The remainder of the summer will afford ample



DIRECTIONS TO THE BINDER.

Pleafe 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. (1	V. (No Explanation.) VI. (Ditto.)			
	VI.				

PART II.

PLATE	I.		to	face	Page	218.	
	II. and	III.		-	-	240.	
	IV.	-		-	-	282.	
	V.	-		-	97	306.	

