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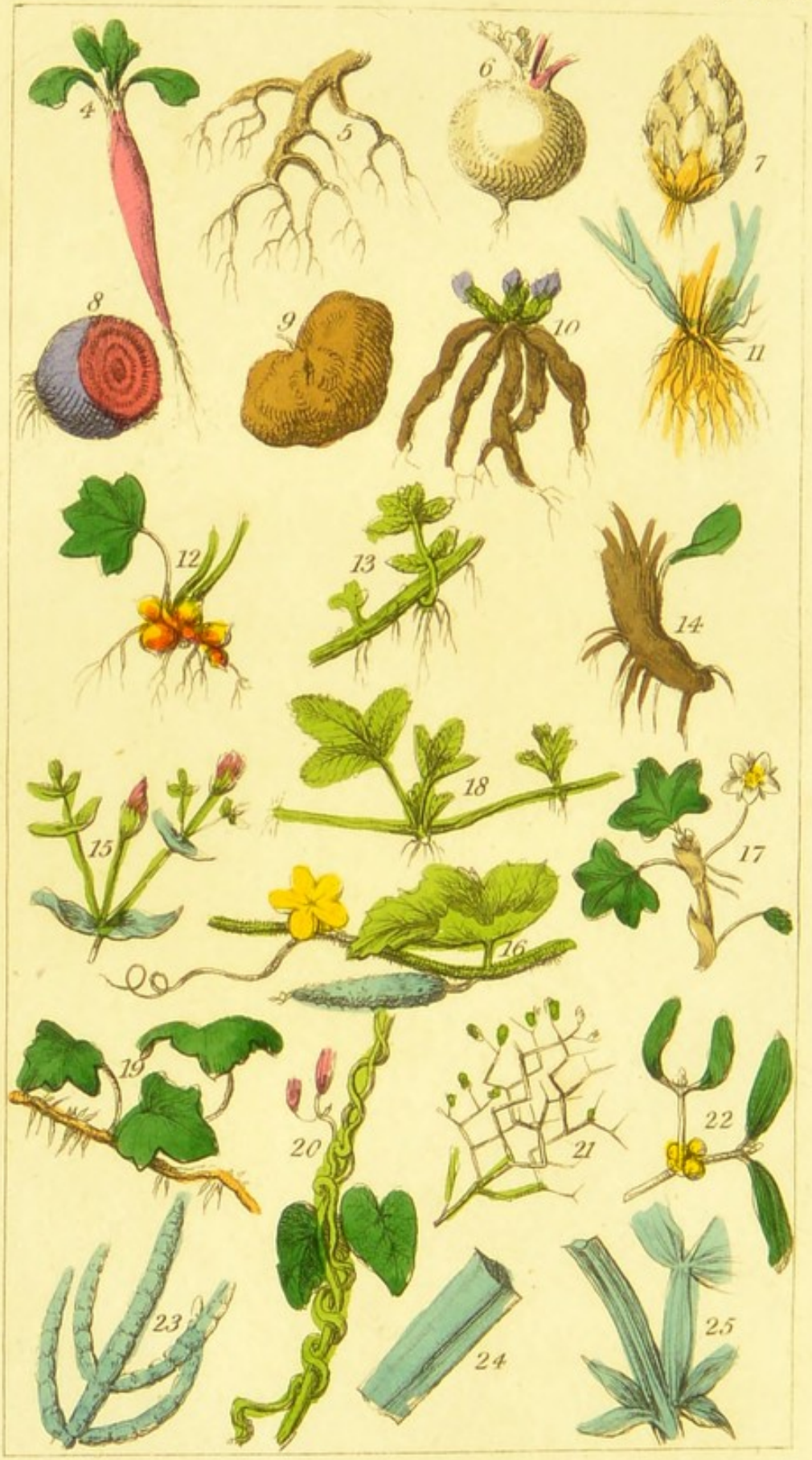


Roots and Stems.

BINGLEY'S

PRACTICAL INTRODUCTION

TO

BOTANY;

ILLUSTRATED BY

REFERENCES UNDER EACH DEFINITION TO
PLANTS OF EASY ACCESS,
AND BY NUMEROUS FIGURES;

COMPRISING ALSO

A GLOSSARY OF BOTANIC TERMS.

THIRD EDITION,

WITH SOME ACCOUNT OF

THE HISTORY OF THE SCIENCE,

BY

JOHN FROST, F.A.S. L.S. AND H.S. M.R.I.

LATE OF EMMANUEL COLLEGE, CAMBRIDGE,
Honorary Member of the Royal Botanical Society of Ratisbon; of the Medical Society of Baltimore;
and of the Philosophical Society of British Guiana,
Knight of the Imperial Brazilian Order of the Southern Star,
and of other Orders.

LONDON:

PRINTED FOR BALDWIN AND CRADOCK.

1831.

G. WOODFALL, ANGEL COURT, SKINNER STREET, LONDON.

TO HIS ROYAL HIGHNESS

OSCAR,

CROWN PRINCE AND PRINCE ROYAL OF SWEDEN AND NORWAY,

CHANCELLOR OF THE UNIVERSITY OF UPSAL,

ETC. ETC. ETC.

SIR,

THE patronage which Your Royal Highness deigns to bestow on the Science of Botany, and the object of this work being to promote a knowledge of the Immortal System of Linnæus, have induced me to inscribe its pages to a Prince who is respected by every man of science throughout the world.

That Divine Providence may grant Your Royal Highness length of days and every earthly happiness, is the fervent desire of,

SIR,

Your Royal Highness's

Most obliged and obedient humble Servant,

JOHN FROST.

London, November 1830.

ADVERTISEMENT.

In consequence of the death of the Reverend William Bingley, the author of this useful Introduction to the Study of Botany, I have been induced to undertake the revision of the work; having used it for several years past as a text-book to my Lectures on Botany, both at the Royal and London Institutions, and to the Students of St. George's and St. Thomas's Hospitals, the Medico-Botanical Society, and Medical School, Little Windmill Street.

This work should be read as a prelude to Sir James Edward Smith's inestimable Introduction to Botany. Of all the elementary treatises extant, I have considered this the most eligible, because the *principal* definitions of Botanical Terminology are well arranged, and illustrated by familiar examples. The descriptions are short, and sufficiently explicit, without entering into unnecessary detail.

If reference be made to the Index, and thence to the definitions, the illustrations, and figures, this work will be found to supply the place of a Glossary of Botanic terms.

The reader, on perusing my Introductory Remarks, will, I trust, find reason for adopting the Linnæan method of classification instead of that of De Jussieu. I have made such alterations only as were absolutely necessary, and have added some account of the History of the Science, which I hope will be found of some utility to the student.

J. F.

London, November 1830.

INTRODUCTORY REMARKS.

It has been the prevailing fashion to attach an imaginary value to any branch of science, by tracing its origin as far as references will admit of; and the names of Grecian philosophers have been arrayed in its favour, not considering the dubious characters of the writings often attributed to them, and the difficulty of proving the identity between the object before us and that referred to, or treated on, by some of those very early aspirers to science. If we were to reflect a little concerning this mode of proceeding, we should find that Botany (although derived from the Greek word Βοτανὴ, "an herb" or "grass") had not its origin with Æsculapius, Hippocrates, Dioscorides, or indeed with any of the ancients. For when it is considered how very much the nomenclature has been altered, and in many cases entirely changed, and how widely Botany, as it is now defined, differs from what their notions of it were, the absurdity of attributing to them what in this instance they really

never possessed, will be very obvious. What the Greeks considered to be the science of Botany was, in fact, that of Materia Medica; as the application of herbs to the purposes of medicine is the leading feature of the works ascribed to Hippocrates and others, as we now have them collected together: from which it should be inferred, that what is termed "Opera Hippocratis" for example, is not only the work of various persons, but even of different periods. Besides, we well know that they never described the characters of plants, such as the figure of their corollas, calyx, or pericarp, but only ascertained and handed down to their posterity the sensible medicinal properties of vegetables. And however much more useful this sort of knowledge might be, yet it certainly was only a branch of medicine, and can by no means be comprehended within the term "Botany", which, strictly speaking, is that science which treats of the structure, organization, and characters of plants. Willdenow justly observes, in his Introduction to his "Principles of Botany", that "that science which teaches us to distinguish one plant from another, and leads us to a knowledge of its peculiarities, is termed Botany";

but observe, this author does not say, that science which teaches us the virtues or properties of plants.

I trust the reason given will be sufficient, as well as satisfactory, for the deviation in regard to the history usually given of this science by teachers of it—which has not been done from the love of novelty, but from a conviction of the error of the practice alluded to. Without a systematic arrangement no branch of knowledge can be properly acquired, or retained in any degree of order by the memory, which in all cases is very materially assisted by such means; so that by beginning with the most simple illustrations, and gradually ascending in the scale, the student will not only steadily accomplish the object he has in view, but be able to digest the different facts which will come within his observation, and make such comparisons as will enable him to understand the leading points of the science, and then can fill up the outline at his leisure.

Some account of those individuals who have contributed to advance the study of Botany, as well as of those who have severally framed systems of classification of plants, together with a

succinct description of their respective modes of arrangement, may not be uninteresting. I shall commence with a short memoir of Cæsalpinus, who was the first inventor of a system of plants; and as this botanist, for he deserves the appellation, flourished towards the close of the sixteenth century, and as systematic Botany formed such an important epoch, I propose to date its origin from this great philosopher.

We will divide the history of this science into five eras.—

I. From Cæsalpinus to Morrison, or from 1583 to 1669.

II. From Morrison to Tournefort, or from 1669 to 1694.

III. From Tournefort to Vaillant, or from 1694 to 1717.

IV. From Vaillant to Linnæus, or from 1717 to 1735.

V. From Linnæus to Smith, or from 1735 to 1791.

Andreas Cæsalpinus was born at Arezzo, in Tuscany. He published his great work, entitled, "Cæsalpini de Plantis Libri Sexdecim." He formed his system on the fruit and corculum, which displays much ingenuity; and at

that period the sixteen classes into which he divided it, comprehended all such plants as were then known. This plan answered very well, as far as the knowledge of plants extended at that time; but as the science advanced, it was found that many plants could not be referred to any of his divisions; and that induced the next eminent person (whose performance I have now to consider), Robert Morrison, to publish his system, which he framed on the formation of the flower, and the general external habit of plants. His definitions are very often exceedingly erroneous, and have been the cause of much dispute. He distributed his system into eighteen classes.

Joseph Pitton de Tournefort was born in 1656. In the early part of his life, he shewed great traits of genius. He would steal from school to study Nature, which, in after years, he followed up, by travelling through the continents of Europe and Asia, and was subsequently chosen Professor of Botany at Paris. This celebrated naturalist founded his system chiefly on the form, regularity, and number of petals of the corolla; and although he has evinced great assiduity in distributing his classes, yet all sys-

tems founded on the corolla alone, must fail, because that part of a plant is subject to great variation that is dependent, for the most part, on adventitious circumstances. His arrangement was followed by all the professors of Europe of his time, and is to this day quoted by some.

We will now examine the systems of Linnæus and De Jussieu.

Linnæus, who spent the early part of his life in great difficulty, and whose brilliant genius at last overcame all obstacles, first formed a system on the figure, duration, &c. of the calyx, or flower-cup; but he afterwards found many plants that could not be referred to it; and it was not till then, that he formed the idea of the sexual system, which now surpasses all others. I will venture to assert, without fear of proof to the contrary, that no plant has been found in any country, that could not be referred to one of the twenty-four classes he enumerated. Several Botanists have altered it; but after all, the original is the best, with the alterations so judiciously made by Sir James Edward Smith, who very patriotically purchased the whole of the Herbarium of Linnæus; and he has published many new facts from it, which will ever lay sci-

ence under great obligations to him. Besides inventing this system, he also described plants, according to their natural affinities, and has left us fifty-five families. This brings under our immediate notice, the present famous natural system of De Jussieu, which is now so generally followed, almost to the entire exclusion of the Linnæan. No person can deny the brilliancy of the talents of Jussieu, so conspicuous in all his luminous writings and throughout his system: yet, to be impartial, it must be conceded that there are many plants which cannot be referred to any of his natural orders, the number of which exceeds a hundred; and they are approached by so many points, that it requires no ordinary memory to be able to classify plants according to its rules: and had the Linnæan no other recommendation than its simplicity and easy application, that alone would be sufficient to give it pre-eminence. In adverting to these systems, my object has been rather to lay them briefly before the reader than to discuss their comparative merits; trusting that the Linnæan will be preferred, both from the facility of illustrating it, and the ease with which the principles of it may be imparted.

Having said so much on the arrangement of plants, I shall next consider the utility and advantages of a knowledge of Botany, which has frequently been designated as a catalogue of technical terms, without any useful application. It is scarcely worth while to endeavour to refute so futile an observation, were it not that it affords an opportunity of stating its claims to public patronage. If we consider it simply as a branch of education, what a delightful acquisition does it form with other accomplishments, leading the mind "through Nature up to Nature's God"; for who can examine the beautiful symmetry and organization of any plant, without being struck with the power and wisdom displayed throughout it? Does not an acquaintance with such a delightful branch of knowledge, always presenting fresh living objects to the eye bedecked in the most fascinating colours, and exhaling the most delicious odours, call forth the better feelings of the imagination; and may we not say with the poet,

"Emollit mores, nec sinit esse feros"?

Let us only see how many of the arts are tributary to it; and especially remark the relation

that exists between it and agriculture. Martyn's "Flora Rustica" as well as many other works, will bear out this position. But to trace its immediate advantages to individuals, I would observe, how indispensable a knowledge of it is to those who visit foreign climes. Not only may a shipwrecked crew be fed by fruits which require the aid of the botanist to discriminate as to their noxious or esculent properties, but it may even open a new channel of commerce: e. g. the bark of a great portion of the trees which grow in Australasia, afford tannin in considerable abundance, so much so that it has been found worth while to separate it for importation. New fruits are by its means introduced, for it is the botanist alone that can vouch for their character. But the principal use of Botany, is in the supplying of medicines for the alleviation of disease; and it will prove a national good, when it shall be made a part of the imperative duty of the medical practitioner to be acquainted with it. There can be no doubt but that every country has plants indigenous to it for the cure of the maladies which may befal its inhabitants; and no person can suppose for a moment, that the All-

wise Creator has formed any thing without its use. The more the subject is investigated, the greater its advantages will appear.

Having endeavoured to shew the claims of this interesting science on the attention of the reader, I shall now proceed to offer some observations respecting the vegetable economy. Can a mere knowledge of the external appearances of plants suffice? Certainly not: for it is by tracing the minutiæ of Nature, that we discover the mechanism of organized beings, so ably contrived, and so beautifully displayed, and are enabled to form just ideas of the sublime works of the great Artificer of the universe.

Whenever we investigate any subject relative to natural science, we find the greatest regularity and order pervading every class of bodies, whether organized or unorganized: by the former, we mean such as have the actions dependent on vitality, such as circulation, respiration, and transpiration, and the power of reproduction; by the latter, we understand those that are composed of particles chemically or mechanically combined, and destitute of any vital power.

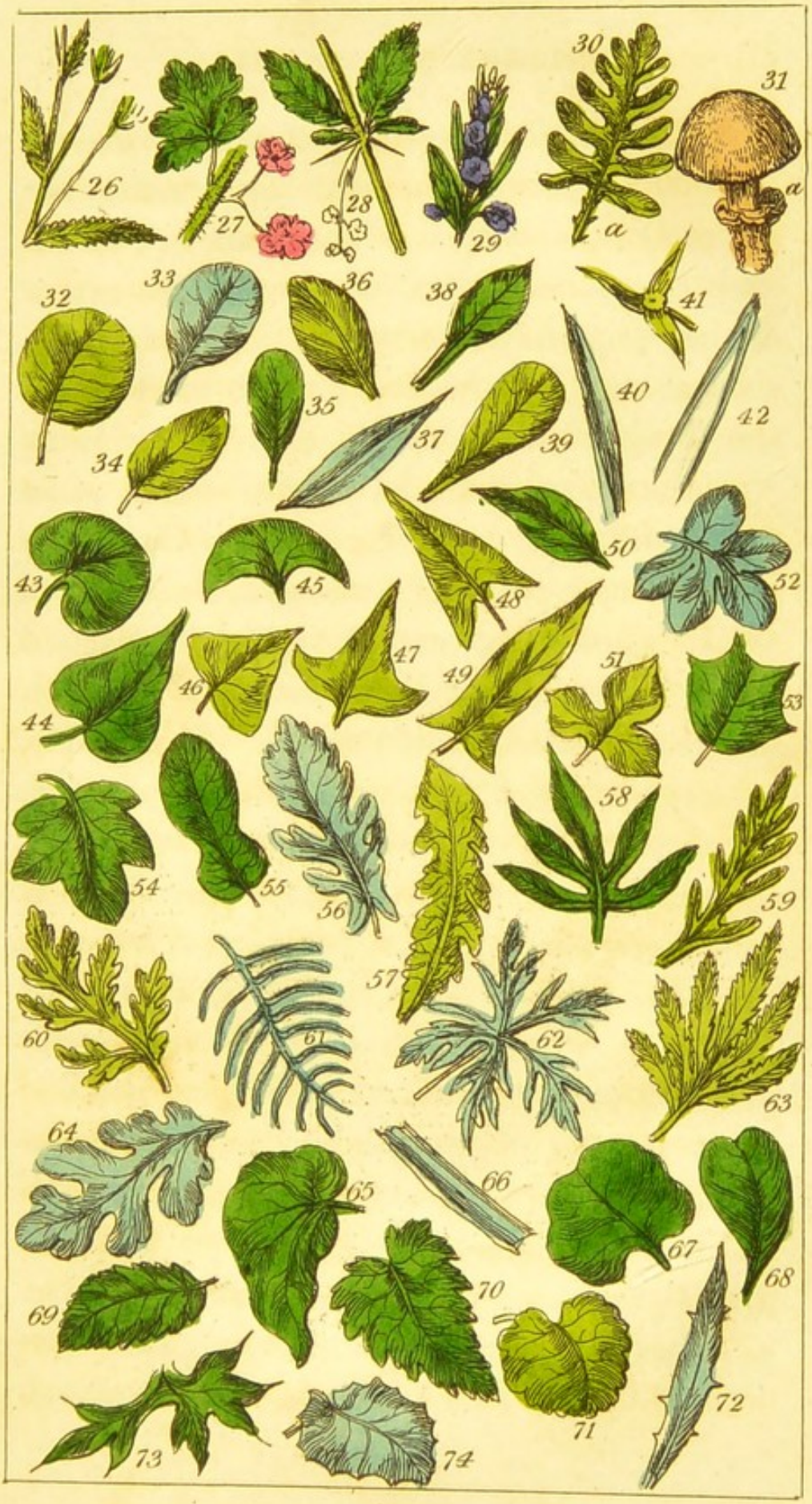
A question will arise, concerning the circumstances on which this vital energy depends,

whether it is the result of organization, or an independent principle: the best answer to such an interrogation is a candid avowal of our ignorance: but some elucidation may be gathered from the following remarks of Sir James Smith, in his "Introduction to Physiological and Systematic Botany." "The effects of this vital energy are still more stupendous in the operations constantly going on in every organized body, from our own elaborate frame to the humblest moss or fungus. Those different fluids, so fine and transparent, separated from each other by membranes as fine as those which compose the eye, all retain their proper situation, though each fluid individually is perpetually removed and renewed for sixty, eighty, or an hundred years, or more, while life remains. So do the infinitely small vessels of an almost invisible insect, the fine and pellucid tubes of a plant, all hold their destined fluids; conveying or changing them, according to fixed laws, but never permitting them to run into confusion; but no sooner does death happen, than, without any alteration of structure, or any apparent change in their material configurations, all is reversed;—the eye loses its form and brightness,

its membranes let go their contents, which mix in confusion, and thenceforth yield to the laws of chemistry alone. Just so it happens, sooner or later, to the other parts of the animal as well as the vegetable frame. Chemical changes, putrefaction, and destruction, immediately follow the total privation of life; the importance of which becomes instantly evident when it is no more. I humbly conceive, therefore, that if the human understanding can in any case flatter itself with obtaining, in the natural world, a glimpse of the immediate agency of the Deity, it is in the contemplation of this vital principle, which seems independent of natural organization, and an impulse of His own divine energy."

Now as plants are endowed with life, they are, as a natural consequence, subject to death, though the term of their existence varies greatly, some only living for one year, which are termed Annuals; others two years, named Biennials; and some many years, which are called Perennials.

The various juices circulating in the tubes of plants undergo chemical changes, according to the purposes for which they are destined. The effect of light is very remarkable: celery (cepium graveolens), sea-kale (crambe maritima),



Stems and Leaves.

are instances of it; for were they exposed to it, the former would be so bitter, and the latter so acrid, that they could not be eaten. Common tansy, well known for its bitterness and pungency, has been eaten with impunity, when excluded from the action of light. Linnæus compared the leaves of plants to the lungs of animals, as the organs by which exhalation and transpiration are carried on in vegetables; and in the animal kingdom, the air is taken in by the lungs, and suffers a chemical change. Does not also a similar effect take place in atmospheric air? Do not plants liberate a quantity of free oxygen, and retain carbonic acid gas?

Strip off all the leaves of any plant, and it will die; or even, if the process of transpiration be impeded by dirt, or carbonaceous matter on their surfaces, remark how soon the vegetable denotes the obstruction of its necessary office.

There are vessels which convey the juices to various parts of the plant, and others that return them, adducent and reducent vessels corresponding, as it were, to arteries and veins in animals. Deprive a plant entirely of its sap, and you kill it. Take away the blood of an animal, and you destroy it.

The various juices of plants are formed from the sap; and are not the different secretions of animals formed from the blood? Vegetables cannot exist without air, any more than animals can. Place a plant under the exhausted receiver of an air-pump, and it dies—put an animal under similar circumstances, and it expires.

Excess of stimulus affects vegetables in the same manner as it does animals—destroys them. Willdenow, in his "Principles of Botany", when alluding to boletus, says, "These plants require a very small quantity of oxygen to promote their growth, and therefore as soon as they are brought into the open air, they decay. This is soon proved by the well-known observation, that rooms or repositories which are fusty or mouldy, are freed from this inconvenience by the admission of air."

We have now endeavoured to trace the analogy between the two kingdoms, so far as they can with propriety be compared. Linnæus suffered the brilliancy of his imagination to get the better of his judgment, when he stated, that heat was the heart, and the earth the stomach of plants. In his "Philosophia Botanica", he says, "Stones grow, vegetables grow, and live; ani-

mals grow, live, and feel." This act of locomotion in plants is a very distinguishing characteristic.

The quality of the juices secreted by vegetables varies very much : in the euphorbia it is extremely acrid—so much so, as to produce a caustic effect when applied to the skin. In others it is very bland, as the juice of the acacia vera, or gum arabic of the shops. The acer saccharina or sugar-maple, furnishes to the North Americans an article well known under the name of sugar, but which is generally obtained from the sugar-cane, or saccharum officinarum of Linnæus. Manna is procured from a species of ash termed fraxinus ornus. And many other vegetable products might be enumerated, were it not that they would form too extensive a list for present consideration.

To conclude: I would recommend the Student to collect examples of the various parts of plants, and arrange them according to the order adopted in this work. He may afterwards read Sir James Smith's admirable Introduction with pleasure and profit, and then proceed to collect and describe plants according to the plan adopted by Linnæus.

A

PRACTICAL INTRODUCTION

TO

BOTANY.

PART I.

DESCRIPTION OF PLANTS.

THE figures immediately following the description, and inclosed by crotchets, refer to the Plates, and those at the *end* of the line to the Index.

PLANTS are of three sorts:

I. TREES, which have perennial stems, or such as continue for many years, and are branched at the top, as the *oak* [Fig. 1] . No. 1

II. SHRUBS, which are a diminutive kind of trees, having perennial stems, and being branched from the bottom, as the *lilac* [2] 2

III. HERBS, which die down to the root every year, as the *primrose* [3] . . 3

1. Some herbs are *annual* *, or perish within the year 4
2. Others are *biennial*, or flower the second year and then perish . . . 5
3. Others are *perennial*, or survive many years 6

These all possess,

I. A Root.

II. The Herb, or Plant itself.

III. The Fructification.

I. The Root is that organ by which a plant is fixed in the ground, or to some object that supports it, and by means of which it receives nourishment 7

There are several kinds of Roots :—

1. Spindle-shaped, or fusiform roots, which are long, thick, and tapering, as of the *carrot* and *radish* [4] 8

* Herbs are designated in some botanical works by the following zodiacal signs, viz. annuals by ☉; biennials by ♂; and perennials by ♃ :—trees or shrubs by ♄.

2. Branching or ramose roots, are divided into branches from the sides, as in the different kinds of *trees* [5] 9

3. Bulbous roots are fleshy, and have fibres at the bottom.

a. Some bulbs are solid, as of the *turnip* [6] 10

b. Others are scaly, as of the *lily* [7] 11

c. Others are coated, as of the *onion* [8] 12

4. Tuberous roots are roundish and fleshy, and have fibres on the sides and top, as of the *potato* [9] and *peony* [10] 13

5. Fibrous roots are such as consist only of slender threads or filaments, as in most of the *grasses* [11] 14

6. Granulous, or granulated roots have numerous small fleshy particles or beads intermixed with the fibres, as in the *white saxifrage* (saxifraga granulata) [12] . . . 15

7. Repent, or creeping roots, are such as branch off horizontally, and throw out fibres at intervals, as in *mint* [13] . . . 16

8. Premorse, or bitten roots, have an abrupt extremity, appearing as though they had been

bitten off, as in the *devil's bit scabious* (scabiosa succisa) [14] 17

II. THE HERB, or PLANT, is that part of every vegetable production which arises from the root, and is terminated by the fructification 18

It comprehends.

I. A TRUNK.

II. LEAVES.

III. SUPPORTS.

I. THE TRUNK is that part which produces and supports the leaves or fructification, or both 19

It is of several kinds, of which the following are the principal:

[1.] A STEM (caulis) which bears or elevates from the root both the leaves and flowers, as in *trees*, *shrubs*, and most kinds of *herbs* 20

In its growth a Stem is,

1. Upright (erectus), arising in an almost perpendicular direction, as in *yellow centaury*, (chlora perfoliata) [15] 21

2. Straight (strictus), quite perpendicular without any bending, as in the *garden lilies* 22

3. Procumbent, weak and resting on the ground, as in *procumbent speedwell* (veronica agrestis), and *common cucumber* [16] . 23

4. Repent, or creeping, resting on the ground, and throwing out roots at intervals, as in *ivy crowfoot* (ranunculus hederaceus) [17] . 24

5. Sarmentose or trailing, when creeping, barren of flowers, and thrown out from the roots for the purpose of increase, as in the *strawberry* [18] 25

6. Radicant, clinging to any other object for support, by means of fibres which do not imbibe nourishment, as *ivy* [19] . . 26

7. Scandent, or climbing, growing upward, but supported in its growth, either by spiral tendrils, as in the *vine*, or by adhesive fibres, as in *ivy* 27

8. Turning (volubilis) spirally ascending round other plants: to the right in *convolvulus*, and to the left in the *hop* [20] . . 28

9. Diffuse (diffusus and laxus), loosely spreading, as in *biting stone-crop* (sedum acre) 29

10. Flexuous or zigzag (flexuosus), forming

angles alternately from left to right, and from right to left, as in *matted lavender* (statice reticula) [21] 30

11. Forked or dichotomos, always dividing into two, as in *misseltoe* (viscum album) [22] 31

12. Proliferous (prolifer) shooting new branches from the summits of the former ones, as in *lycopodium annotinum* 32

13. Articulate or jointed, as in *marsh samphire* (salicornia annua) [23] . . . 33

In shape a Stem is,

1. Round (teres) or destitute of angles, as in the *upright meadow crowfoot* (ranunculus acris) 34

2. Two edged (anceps) as in *perforated St. John's Wort* (hypericum perforatum) [24] 35

3. Triangular (trigonus) having three edges 36

4. Square or quadrangular (tetragonus or quadrangularis) having four sides, as in the *white dead nettle* (lamium album) . . . 37

5. Angular (angulosus) when the number of angles is either variable, or more than five 38

6. Winged (alatus) when the angles are

extended into flat-leafy borders, as in *everlasting pea* [25] 39

The surface of the Stem is,

1. Smooth (glaber) destitute of all kinds of hair or down 40
2. Smooth and even (lævis) destitute of all kinds of roughness or inequality . . 41
3. Polished, smooth, and shining (nitidus) 42
4. Viscid, covered with a clammy juice as in several species of *catch-fly* . . . 43
5. Scabrous (scaber) rough to the touch from any little rigid inequalities; opposed to smooth and even, as in *black knapweed* (centaurea nigra) 44
6. Hispid, or bristly, as in *borage* . 45
7. Hairy (hirtus or pilosus) as in *meadow clary* 46
8. Downy and soft to the touch, (tomentosus) as in the leaves of *dove's-foot*, *crane's-bill* (geranium rotundifolium) . . . 47
9. Shaggy or villous (villosus) covered with soft hairs, as in *mountain fleawort* (cineraria integrifolia) 48
10. Hoary (incanus) as in *wormwood*. 49
11. Glaucous, clothed with fine sea-green

mealiness, which easily rubs off, as in *yellow centaury* (chlora perfoliata) 50

12. Striated, marked with fine hollow parallel lines, as in *cuckoo pint* (arum maculatum) 51

13. Furrowed (sulcatus), marked with deeper lines than the last, as in *alexanders* (smyrnium olusatrum) 52

14. Spotted (maculatus), as *hemlock* (conium maculatum) 53

NOTE.—The spines and prickles of the stem will be explained in another place.

[2.] A CULM or STRAW is the peculiar stem of *grasses*, *rushes*, and other similar plants 54

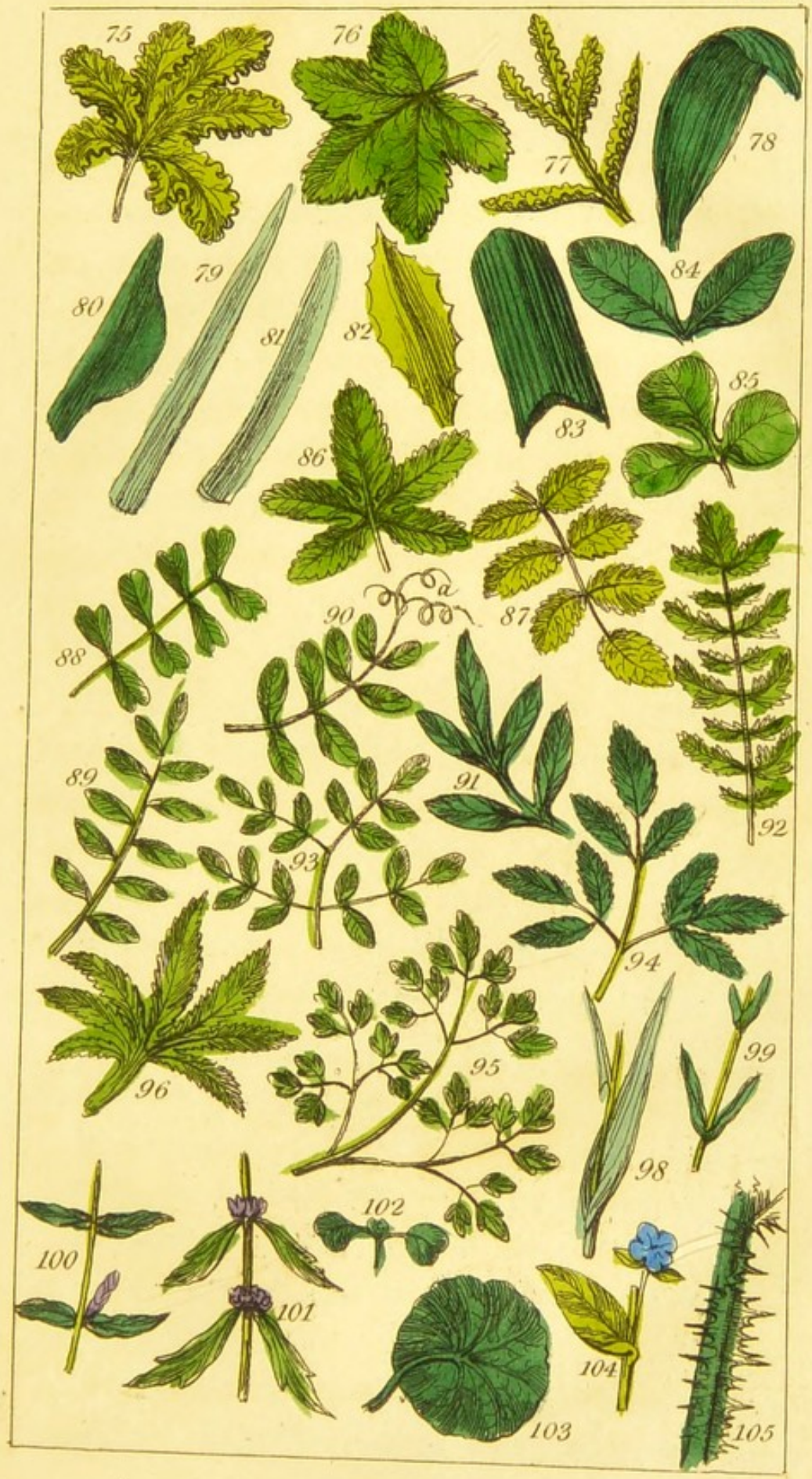
It is sometimes,

1. Without joints (enodis), as in the *bulrush* (scirpus lacustris) 55

2. Jointed (articulatus), as in most of the *grasses* 56

3. Knee-bent (geniculosus), or bent like the knee, as in *floating fox-tail grass* (alopecurus geniculatus) 57

[3.] A SCAPE or STALK rises from the root,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Leaves.

and supports the flowers and not the leaves, as in *narcissus*, *primrose*, and *hyacinth* [3] 58

[4.] A PEDUNCLE, or FLOWER-STALK, is a partial trunk, springing from the stem and supporting the flowers, but not the leaves [15 *a*] 59

The Flower-stalk is,

1. Axillary, when it grows from the bosom of a leaf, that is, betwixt the leaf and the stem, as in the *great hairy willow herb* (epilobium hirsutum) *Canterbury bells*, and many others [26] 60

2. Opposite to a leaf (oppositifolius) as in *dove's-foot crane's-bill* (geranium molle) [27] 61

3. Gemmaceous, or growing out of a leaf-bud, as in *barberry* [28] 62

4. Terminal, when it terminates a stem or branch, as in *wild tulip* (tulipa sylvestris) 63

5. Lateral, when situated on the side of a stem or branch, as in *Cornish heath* (erica vagans) [29] 64

6. Solitary, either single on a plant, as in the *mountain bramble* (rubus chamæmorus), or

only one in the same place, as in many common plants 65

7. Clustered (aggregati pedunculi), when several flower-stalks grow together, as in *dark mullein* (verbascum nigrum) . . . 66

8. Scattered (sparsi), dispersed irregularly over the plant or branches, as in *perennial flax* (linum perenne) 67

9. Uniflorous, biflorous, triflorous, &c. and multiflorous, bearing one, two, three, &c. and many flowers 68

10. Sessile, when there is no flower-stalk, as in the *star thistle* (centaurea calcitrapa) . 69

[5.] A PETIOLE, or LEAF-STALK, is a partial trunk, supporting the leaf, but not the flowers 70

[6.] A FROND is composed of a branch and leaves blended together, and is frequently united with the fructification, as in the *ferns* [30] 71

[7.] A STIPE is the stem of a Frond [30*a*]. This term is also applied to the stalk of a fungus, as of the *common mushroom* [31*a*] 72

II. THE LEAVES are organs which answer the office of lungs, by expiring and inspiring air and water. For this purpose their surface is full of minute pores or holes . . 73

They are,

1. Simple,
2. Compound,
3. Determinate.

Simple leaves are such as have only a single leaf on the petiole or leaf-stalk . . 74

They are extremely various in shape and appearance.

Orbiculate, or round [32]. . . 75

Subrotund, or roundish, when the shape is nearly circular, as in *salix reticulata* [33] 76

Ovate, or egg-shaped, when the length is somewhat greater than the breadth, and the base rounded and wider than the other end, as in *water pimpernel* (samolus valerandi) [34] 77

Obovate, of the same figure with the broader end uppermost, as in *primrose* and *daisy* [35] 78

Oval, or elliptic, of similar form to ovate and subovate, with the exception of its being of equal breadth at each end [36] . . 79

Oblong, or considerably longer than broad, and narrowed though rounded at the ends 80

Lanceolate, or spear-shaped, when the shape is oblong, and narrows gradually towards each end, as in many of the *willows* [37] . 81

Spatulate, of roundish figure, tapering into an oblong base [38] 82

Cuneiform, or wedge-shaped, broad and abrupt at the extremity, and tapering towards the base [39] 83

Linear, or strap-shaped, long and narrow like a strap or fillet, as in *daffodil* and most of the *grasses* [40] 84

Subulate, or awl-shaped, slender at the base, and gradually tapering towards the end like an awl, as in *prickly salt wort* (salsola kali) [41] 85

Needle-shaped (acerosum), linear and evergreen, generally acute and rigid, as in the *fir* [42] 86

Reniform, or kidney-shaped, when roundish, and hollowed at the base, without any angles, as in *asarabacca* (asarum Europæum) [43] 87

Cordate, or heart-shaped, when oval or egg-shaped, hollowed at the base, and the lower part is without angles or corners, as in *black briony* (tamus communis) [44] . . 88

Lunulate, or crescent-shaped, when round, and hollowed at the base, and the hinder or lower part has angles [45] 89

Triangular, when there are three sides nearly equal, and three angles or corners, as in *Danish scurvy grass* (cochlearia Danica) [46] 90

Deltoid, or trowel-shaped, having three angles, of which the terminal one is much further from the base than the lateral ones, as in *perennial goose-foot* (chenopodium bonus henricus) [47] 91

Sagittate, or arrow-shaped, when triangular, somewhat hollowed at the base, and furnished with angles at the lower part, like the head of an arrow, as in *common arrow head* (sagittaria sagittifolia) [48] 92

Hastate, or halbert-shaped, when triangular, hollowed at the base and sides, and the angles are extended, as in *sheep's sorrel* (rumex acetosella) [49] 93

Rhomboid, or diamond-shaped, approaching to a square, as in *stinking goose-foot* (chenopodium olidum) [50] 94

Lobed, when divided to the middle into parts that stand wide from each other, and are

rounded or convex at the margin. According to the number of the lobes the leaves are termed 95

Bilobate, or two lobed 96

Trilobate, or three lobed, as in *hepatica* [51] 97

Quadrilobate, or four lobed . . . 98

Quinquelobate, or five lobed, as in *common maple* [52] 99

Quadrangular, having four angles, as in the *tulip tree* [53] 100

Quinquangular, having five angles, as some *ivy* leaves [54] 101

Panduriform, or fiddle-shaped, oblong, broad at the two extremities, and contracted in the middle, as in *fiddle dock* (rumex pulcher) [55] 102

Lyrate, or lyre-shaped, when divided into segments, of which the upper ones are larger, and the lower ones farther asunder, as in *yellow rocket* (erysimum barbarea) [56] . . 103

Runcinate, when cut into several transverse acute segments, pointing backward, as in the *dandelion* [57] 104

Palmate, or hand-shaped, somewhat resembling the human hand with the fingers extended [58] 105

Pinnatifid, or wingcleft, when divided deeply on each side into several nearly equal segments, as in *sea rocket* (bunias cakile) [59] . 106

Bipinnatifid, or doubly pinnatifid, as in *papaver argemone* [60] 107

Pectinate is a pinnatifid leaf, the segments of which are parallel and remarkably narrow, like the teeth of a comb, as in *common water milfoil* (myriophyllum spicatum) [61] . . 108

Laciniate, or jagged, when variously divided into lobes, and when these lobes are again divided in an irregular manner, as in *long-stalked crane's bill* (geranium columbinum) [62] 109

Partite, or divided, when separated nearly to the base, as in *green hellebore* (helleborus viridis) [63] 110

From the number of divisions the leaves are termed,

Bipartite, or in two parts . . 111

Tripartite, or in three parts . . 112

Quadripartite, or in four parts . . 113

Quinquepartite, or in five parts . 114

Multipartite, or in many parts . . 115

Sinuate, when the edges are hollowed, or deeply scalloped, as if part of the leaf had been cut out, as of the *oak* [64] . . . 116

Oblique, or unequal, when the two halves of a leaf are unequal in dimension, and their bases are not parallel [65] 117

Truncate, or abrupt, when the extremity appears as if it had been cut off, as in the leaf of the *tulip tree* 118

Præmorse, or jagged, pointed, very blunt, with various irregular notches [66] . 119

Retuse, ending in a broad shallow notch, as in *mountain sorrel* (rumex digynus) [67] 120

Emarginate, having a notch at the extremity, as in *bladder senna* [68] . . . 121

Obtuse, or blunt, terminating in a rounded extremity, as in the *primrose* and *daisy* 122

Acute, or sharp, ending in an acute angle, as in many of the common plants . . . 123

Acuminate, or pointed, having a taper or awl-shaped extremity, as in the *common reed* 124

Mucronate, sharp at the point, and tipped with a rigid spine, as in *thistles* . . 125

Cirrose, or tipped with a tendril . . 126

Entire (integerrimum), destitute of all kinds of teeth, notches, or incisions, as in the *orchis* and *lily* tribes 127

Serrated, or like the teeth of a saw, and

pointing towards the extremity of the leaf, as in the *nettle* and *rose* [69] . . . 128

Some leaves are doubly serrated, or have the teeth again cut into other little teeth, as in *Canterbury bells* [70] 129

Crenate, or scalloped, when the teeth are rounded and not directed towards either end of the leaf, as in *ground ivy* [71] . . 130

Dentate, or toothed, beset with projecting horizontal and somewhat distant teeth, of the same substance as the leaf, as in the *corn blue bottle* (centaurea cyanus) [72] . . 131

Spinous, beset with prickles, as in the *thistles* [73] 132

Unarmed, as opposed to spinous . 133

Wavy (repandum), having the border with numerous minute angles, and small segments of circles alternately, as in *fringed buckbean* (menyanthes nymphoides) [74] . . 134

Glandular (glandulosum), beset with numerous little glands, as in *mountain St. John's wort* (hypericum montanum) . . . 135

Revolute, when the margin is turned or rolled backward, as in *marsh Andromeda* (andromeda polifolia) 136

Involute is the reverse of revolute, as in *common butterwort* (pinguicula vulgaris) . 137

Ciliate, or fringed, bordered with soft parallel hairs as in *cross wort* (galium cruciatum) 138

Veiny (venosum), when the fibres on the surface of the leaf are branched, as in the *hawthorn* 139

Curled (crispum), when the border of the leaf is more expanded than the middle part, so as to appear curled and twisted [75] . . 140

Rugose, rugged or wrinkled, when the veins of a leaf are tighter than the surface between them, causing the latter to swell into inequalities, as in several species of *sage* . . 141

Plaited (plicatum), when the middle part of the leaf, especially as it approaches the margin, is acutely folded up and down, as in the *mallows* [76] 142

Undulate, when the middle part of the leaf, as it approaches the margin, is obtusely waved up and down, as in *wild mignionette* (reseda lutea) [77] 143

Costate, or ribbed (nervosum), when the veins of a leaf extend in simple lines from the base to the point, as in *Solomon's seal* (convallaria multiflora) [78] 144

Naked, implies that a leaf is destitute of any kind of clothing or hairiness . . 145

Ensiform, or sword-shaped; two-edged, ta-

pering to a point, and somewhat convex on both surfaces, as in different species of *Iris* [79] 146

Acinaciform, or scimitar-shaped, when the leaf is long, fleshy, thick, and straight at one edge, thin and arched at the other . 147

Dolabriform, or hatchet-shaped, shaped like a hatchet or axe, of unequal thickness [80] 148

Semi-cylindrical (semi-cylindraceum), flat on one side and rounded on the other, as in *sea goosefoot* (chenopodium maritimum) . 149

Tubular (tubulosum), hollow within, as the leaf of the *common onion* 150

Fleshy (carnosum), of thick, pulpy substance, as in *houseleek*, and the different species of *sedum* or *stonecrop*, and *aloe* . . 151

Gibbous, swelling on one or both sides 152

Canaliculate, or channelled, having a deep furrow or channel extending from the base to the end, as in *poetic narcissus* (narcissus poeticus) [81] 153

Three-edged (trigonum), having three longitudinal sides and as many angles [82] 154

Carinate, or keeled, when the back is longitudinally prominent, as in *two-flowered narcissus* (narcissus biflorus) [83] . . . 155

Sulcate, or furrowed, marked with deep lines running lengthwise 156

Cylindrical, or round one way and long the other 157

Lingulate, or tongue-shaped, is a term applied to express a thick fleshy leaf, somewhat in the form of a tongue 158

2. Compound Leaves are such as have more than one leaf upon a petiole or leaf-stalk 159

Binate, or growing in pairs [84] . 160

Ternate, or growing by threes, as in the *trefoils* [85] 161

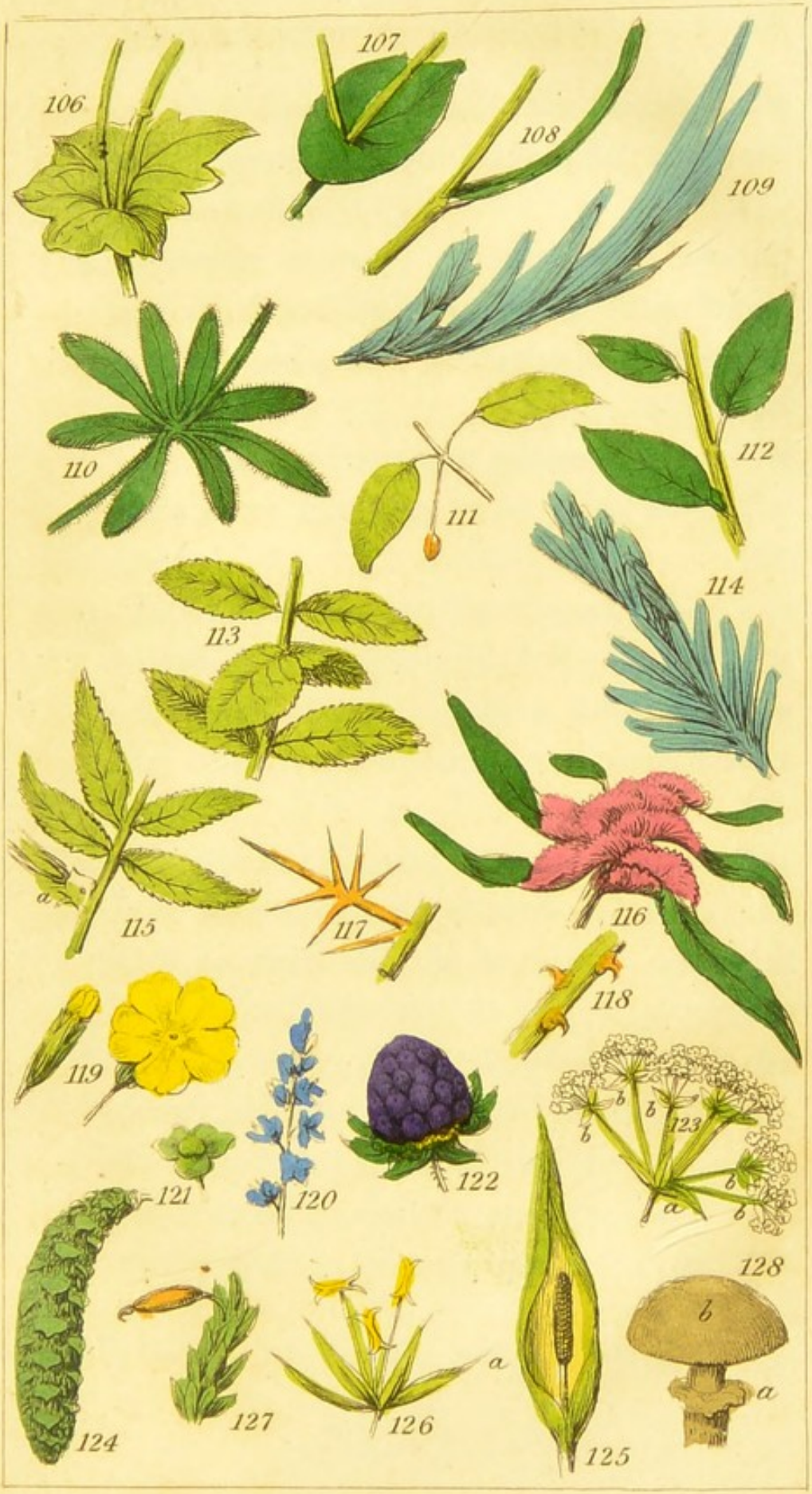
Quinate, or growing in fours, as *common cinquefoil* (potentilla reptans) [86] . 162

Digitate, or fingered, when several leaflets, or little leaves, proceed from the summit of a common footstalk, as in *potentilla verna* and *reptans* 163

Pinnate, or winged, when several leaflets proceed from the opposite sides of one footstalk, as in the *ash tree* and *rose* . . . 164

Pinnate leaves are of several kinds:—

1. Pinnate terminated by an odd one; when



Leaves. Supports. Calyx.

an undivided leaf-stalk has many little leaves growing from each side, as in the *rose* and *elder* [87] 165

2. Abruptly pinnate, or winged; when an undivided leaf-stalk has many little leaves on each side, and not an odd leaf at the end [88] 166

3. Oppositely pinnate, or winged: when the leaflets are opposite or in pairs, as in the *rose* 167

4. Alternately pinnate, or winged; when the leaflets grow alternately [89] . 168

5. Pinnate, terminated by a tendril, as in *bush vetch* (vicia sepium), and many others [90] 169

6. Decursively pinnate, or winged; when the little leaves expand downward along the stalk on each side, as in *shrubby cinquefoil* (potentilla fruticosa) [91] . . 170

7. Interruptedly pinnate, or winged; when the principal leaflets are ranged alternately with an interrupted series of smaller ones, as in *silver weed* (potentilla anserina) and *common dropwort* (spiræa filipendula) [92] 171

Bipinnate, or doubly winged, when a leaf-

stalk has lateral ribs, and each of these ribs forms a winged leaf [93] 172

Biternate, twice ternate, or doubly three-leaved, as in *gout-weed* (ægopodium podagraria) [94] 173

Triternate, thrice ternate, or triply three-leaved, as in *yellow fumitory* (fumaria lutea) [95] 174

Pedate is a ternate leaf with its lateral leaflets compounded in their fore part, as in *bear's foot* (helleborus fœtidus) [96] . . . 175

Articulate, or jointed, where one leaf grows out at the top of another, as in *annual samphire* (salicornia annua) [97] . . . 176

3. DETERMINATE LEAVES. By the determination of leaves is to be understood their character expressed from some circumstance foreign to their own particular structure or shape; as from their situation, insertion, or direction 177

Leaves are,

Inflected, curved inward, when bent upward towards the skin . . . 178

Erect, or upright, when the angle which

the leaf forms with the stem is very small, as in *smooth tower mustard* (turritis glabra) [98] 179

Expanding, spreading, or patent; when they are in a direction between upright and horizontal, as in *maiden pink* (dianthus deltoides) [99] 180

Horizontal, when they stand at right angles with the stem, as in *field gentian* (gentiana campestris) [100] 181

Reclined or reflex, when they are bent downward, so that the tip is lower than the base, as in *motherwort* (leonurus cardiaca) [101] 182

Radical leaves are such as spring immediately from the root, as those of the *cowslip* 183

Depressed, where the radical leaves are pressed close into the ground, as in *hoary plantain* (plantago media) 184

Natant (natantia), floating on the surface of the water, as those of the *water lilies* . 185

Demersed (immersa, or submersa), plunged under the water 186

Emersed, or growing partly above the water, as in *common arrow head* (sagittaria sagittifolia) 187

Seminal, or seed leaves, those which rise immediately from a seed, or rather which before

were the cotyledons: they are observable on *radishes* when very young [102] . . 188

Cauline, or stem leaves, such as grow on the stem 189

Ramose, or branch leaves, those which grow on the branches 190

Peltate, or shield-formed, when the foot-stalk is inserted into, or near the centre of the lower surface of the leaf, as in the nasturtium [103] 191

Petiolate, or growing on a foot-stalk, as those of the *common gooseberry* and *currant* . 192

Sessile, or sitting, when the leaf grows immediately to the stem, branch, or root, without any foot stalk, as in *evergreen alkanet* (anchusa sempervirens) [104] 193

Decurrent, or running downward, when the base of a sessile leaf extends downward along the stem, as in several kinds of *thistles* [105] 194

Amplexicaul, or embracing the stem, when the base of the leaf embraces the stem sidewise, as in *yellow horned poppy* (chelidonium glaucium) [106] 195

It is called *semi amplexicaul*, when it only half embraces it 196

Perfoliate, when the foot stalk perforates, or passes through the substance of the leaf, as in *thorough wax* (bupleurum rotundifolium) [107] 197

Connate, or growing together, when two opposite leaves join, and are united into one, as in *yellow centaury* (chlora perfoliata) . 198

Vaginant, or sheathing, when the base of a leaf enfolds the stem, and there forms a cylindrical tube, as in most of the *grasses* [108] 199

Equitant, disposed in two opposite rows, and clasping each other by their common base, as in *Lancashire asphodel* (narthecium ossifragum) [109] 200

Stellate or starry, } when the stalk is sur-
Verticillate or whorled, } rounded by leaves like the spokes of a wheel, as in *goose grass* (galium aparine) [110] 201

These, according to the number of leaves of which the stem or whorl is composed, are called,

Bine, when there are only two upon a stem or plant, as in the *snowdrop* . . 202

Tern, when there are three leaves . 203

Quatern, when four leaves . . 204

Quine, when five leaves . . . 205

Sene, when six leaves, &c. &c. . 206

Opposite, when the leaves grow in pairs opposite to each other, as in *common chickweed* (stellaria media) [111] . . . 207

Alternate, when the leaves grow out regularly one above another on the opposite sides of the stem, as those of *water pimpernel* (samolus valerandi) [112] 208

Acerose or chaffy, when they are needle-shaped, linear, and evergreen, as in the *fir* and *yew* 209

Imbricated, or tiled, when they lie over each other, like the tiles of a house, as in the *common heath* and *sea spurge* (euphorbia paralias) 210

Fasciculated, bundled, or tufted; when many leaves arise nearly from the same point, as in the *larch* 211

Decussate, in pairs alternately crossing each other, as in several kinds of *mint* [113] 212

Two-ranked (disticha), spreading in two directions, and yet not regularly opposite at their insertion, as in the *yew* [114] . . 213

THE SUPPORTS, PROPS, or FULCRA, are those small parts of plants, the chief use of which is to strengthen and support them 214

These are of several kinds:—

1. A Stipule is a scale or small leaf situated sometimes on each side, and sometimes on one side only, of the base of the leaf-stalks, for the purpose of supporting them at their first appearance, as in the different kinds of *vetches.* [*Fig.* 115 *a.*] Sometimes it is united laterally to the foot-stalk, as in the *rose* . . . 215

2. A Bractea, or floral leaf, differs in shape and colour from the other parts of a plant; it is generally situated on the fruit stalk, and sometimes so near the flower as to be, at first sight, easily mistaken for the calyx. In some species of *cow wheat* (melampyrum) the floral leaf assumes a very beautiful appearance [116] 216

3. A Spine, or thorn, is a sharp-pointed projection growing from the woody substance of a plant, as in *furze*, or *gorze*, and *hawthorn* [117] 217

4. An Aculeus, or prickle, is a sharp-pointed projection formed from the bark, and not from the woody part of a plant, as in the *rose* and *bramble* [118] 218

5. A Tendril, or clasper (cirrus), is a spiral shoot or string, by means of which some plants

support themselves against adjacent bodies, as in the *vine*, the *pea*, and various kinds of *vetches* [90 *a*.] 219

6. A Gland is a little tumour for the discharge of some kind of fluid. Glands are abundant on the stalk and other parts of the *moss rose*, and constitute the most prominent character of that flower 220

7. Hair or down 221

III. THE FRUCTIFICATION comprises both the flower and fruit, and all the parts which are immediately necessary for the production and preservation of these 222

It comprises seven principal parts:—

I. The CALYX, or Flower-cup.
II. The COROLLA, or Blossom.
III. The STAMENS, or Chives.
IV. The PISTIL, or Pointal.
V. The SEED-VESSEL, or Pericarp.
VI. The SEEDS.
VII. The RECEPTACLE.

Of these the Calyx, Corolla, Stamens, and Pistil, are properly parts of the flower; and the

Seed-vessel, Seeds, and Receptacle are parts of the fruit; and it is from the number, proportion, positions, and other circumstances attending these parts and fructification, that the classes, orders, and genera of vegetables are known.

I. The Calyx or Flower-cup is formed of one or more green or yellow leaves, situated at a small distance from, or close to, the blossom; and its chief use is to inclose and protect the other parts 223

It has received different names according to the circumstances with which it is attended. These are,

1. Perianthium, or Flower-cup, which has its station close to the other parts of the Flower, as in the *primrose* [119] 224

1. If it include the stamens and not the germen, it is the perianthium of the flower, as in the male flowers of *perennial mercury* (mercurialis perennis) [120] 225

2. If the germen but not the stamens is included, it is the perianthium of the

fruit, as in the female flowers of *perennial mercury* [121] . . . 226

3. But if it include both the germen and the stamens, it is the perianthium of the fructification, as in the *common bramble*, and numerous others [122] 227

2. Involucrum or Fence, which is the calyx of an umbel, when stationed at some distance from the flower, as in the *hemlock* and *carrot* [123] 228

1. It is called an universal involucrum if it be under the universal umbel [*Fig.* 123 *a.*] 229

2. It is called a partial involucrum if under a partial umbel [*Fig.* 123 *b.*] . 230

3. Catkin, or Amentum, which is a composition of flowers and chaff, on a long, slender, thread-shaped receptacle; the whole somewhat resembling a cat's tail in shape, as in the *hazel* and *willow* [124] 231

4. Spatha, or Sheath, which is a kind of calyx that opens lengthwise, and puts forth a flower-stalk, or spadix, as in the *snowdrop*, *arum*, and *narcissus* [125] 232

5. Glume, or Husk, which is the calyx and

blossoms of grasses; and consists of one or more thin, dry, semi-transparent leaves, called valves [126] 233

The sharp points, or beards issuing from the glume, are called *awns* or *aristæ* [126 *a*.]

6. Perichætium, which is a scaly sheath which invests the fertile flower, and consequently the base of the fruit-stalk in some *mosses* [127] 234

NOTE.—The calyptra or veil, being now considered as the calyx of mosses, the perichætium takes its place among the seven kinds of calyx.....235

7. The Volva, Curtain, or Wrapper, is the calyx of mushrooms, and some other kinds of fungi. It surrounds the stem; and, whilst the plant is in a young state, is attached to the upper part or cap. When torn by the growth of the cap, the part surrounding the stem often remains, and, in this state, is called the ring 236

[*a* the curtain, *b* the cap. *Fig.* 128.]

DIFFERENT STRUCTURES OF THE CALYX.

I. With respect to number, it is

1. Single, as in the *primrose*, and most other flowers [119] 237

2. Double, as in the *mallow* [129] . 238
3. Wanting, as in the *tulip* and *lily* 239

II. With respect to composition, it is

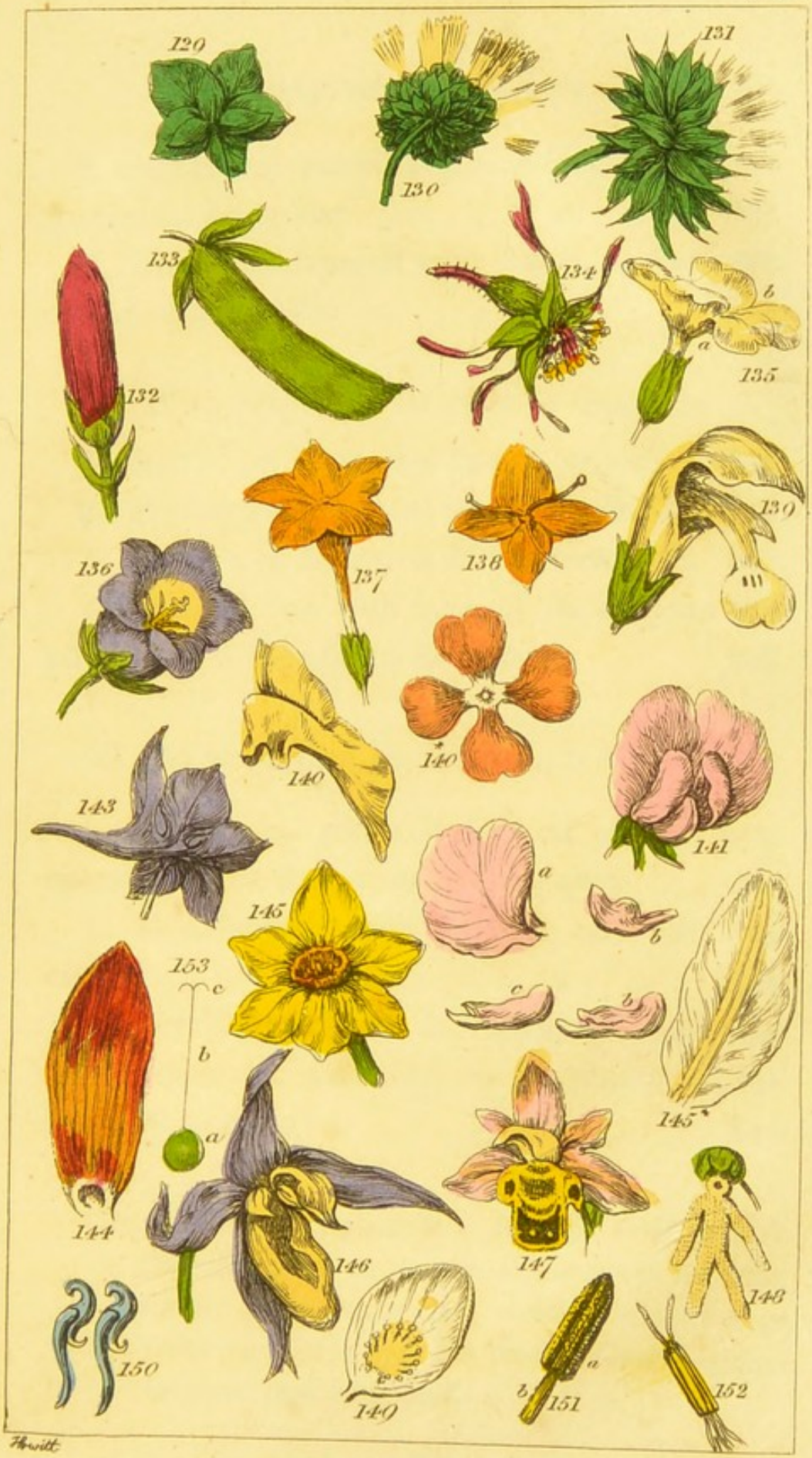
1. Imbricate, or composed of various scales lying over each other, as in the *hawkweeds* and *sowthistle* [130] 240
2. Squamose, composed of scales divaricated on all sides, and spreading widely open, as in the *thistles* [131] 241
3. Augmented, or has a series of distinct leaves shorter than its own, which surround the outer part of the base, as in the *pink* and *carnation* [132] 242
4. Many-flowered, or common to many florets, as in the *scabious*, and the plants of the class *syngenesia* 243

III. With respect to situation, it is

1. Beneath the seed-vessel, as in the *pea* [133] 244
2. Above the seed-vessel, as in the *rose* [134] 245

IV. With respect to its margin, it is

1. Entire, as in most plants . . . 246



Calyx. Corolla and Nectary.

2. Serrate, or sawed at the edge, as in some species of *hypericum* 247

3. Ciliate, or fringed with hairs, as in some species of *centaurea* 248

V. With respect to its apex or top, it is

1. Acute, or sharp, as in the *primrose* 249

2. Prickly (aculeatum) as in the *thistle* 250

3. Obtuse, or blunt, as in the *water-lily* 251

4. Lopped, or with one of its indents appearing as if cut off, as in *verbena* . 252

VI. With respect to duration, it is

1. Caducous, when it falls off at the first opening of the flower, as in the *poppy* 253

2. Deciduous, when it falls off with the corolla 254

3. Persistent, when it continues until the fruit arrives at maturity, as in plants of the class *didynamia* 255

NOTE.—In some plants it is difficult to distinguish the calyx from the bractea or floral-leaf, until the former begins to wither, which it always does when the fruit is ripe; but the floral-leaf continues for some time afterwards.

II. The COROLLA, or BLOSSOM, is the termination of the inner bark of a plant, continued to, and accompanying the fructification, generally in the form of coloured leaves. Its use is to serve as an inner work or defence for the parts which it incloses; as the calyx, which is usually of stronger texture, does for an outer defence 256

The leaves of which the corolla consists, are called petals.

DIFFERENT STRUCTURES OF THE COROLLA.

1. MONOPETALOUS. A monopetalous corolla usually consists of two parts; a tube or lower part, and limb or upper part, which usually spreads wider 257

[*a* the tube, *b* the limb. *Fig.* 135.]

According to its figure it is either,

1. Bell-shaped, or campanulate, that is bulging out, and without a tube, as in *campanula* and *deadly nightshade* [136] 258
2. Funnel-shaped (infundibuliform), or tubular in the lower, and conical in the upper part, as in the *tobacco-plant* [137] 259
3. Salver-shaped (hypocrateriform), that is,

plain or flat, and standing on a tube, like a salver, as in the *primrose* [135] . 260

4. Wheel-shaped, or rotate and flat, without a tube, or with a very short one, as in *borage* and *speedwell* [138] . . 261

5. Gaping, or ringent, so called from its supposed resemblance to the mouth of a gaping animal, as in the various kinds of *dead-nettle* [139] . . . 262

6. Personate: a corolla is denominated personate, or masked, when it has two lips which are closed by a kind of palate, as in the different kinds of *snapdragon* (antirrhinum) [140] 263

2. DIPETALOUS. A dipetalous corolla consists of two petals, as in *enchanter's nightshade* 264

3. POLYPETALOUS. A polypetalous corolla consists of many petals, each of which has usually a claw, or narrow part, by which it is fixed, and a lamina, or thin plate, which is the upper part, as in the *rose* . . . 265

It is

1. Cross-shaped, or cruciform, when it con-

sists of four equal petals, so situated as to resemble an equal-sided cross, as in the *common stock* and *wall-flower* [140] 266

2. Butterfly-shaped, or papilionaceous, when it is irregular, and consists of four petals, somewhat resembling a butterfly in shape. The back or upper one is large and spreading, and has the name of standard, the two side ones are called wings, and the lower one has the name of keel, from an imaginary resemblance in form to the keel of a ship, as in the *pea* [141] . 267

[*a* the standard—*b* the wings—*c* the keel.]

3. Rosaceous, or spreading like a *rose* 268

4. In all other cases a polypetalous corolla is named according to the number of petals of which it consists . . . 269

It is called

Tripetalous, when it has three petals 270

Pentapetalous, when it has five petals 271

Hexapetalous, when it has six petals, &c. &c. 272

1. With respect to shape, the corolla is

1. Undulate, or waved, as in the *horse-chestnut* 273

2. Plicate, or folded, as in *convolvulus* 274
3. Revolute, or rolled back . . 275
4. Twisted, as in *periwinkle* . . 276

II. With respect to its margin, it is

1. Crenate, or notched, as in *flax* . 277
2. Serrate, or sawed, as in the flower of the *lime-tree* 278
3. Ciliate, or fringed, as in *menyanthes* 279
4. Denticulate, or toothed, that is, having a little jag at the bottom of the divisions, as in *samolus valerandi* 280

III. With respect to duration, it is

1. Caducous, when it falls off as soon as the flower is blown 281
2. Deciduous, when it falls off before the fruit is ripe 282
3. Persistent, when it lasts until the fruit is ripe 283
4. Marcescent, when it withers, but does not fall, as in the *orchis* 284

NECTARY or Honey-cup. There belongs to the corolla of some plants a part called the nectary or honey cup (nectarium), the use of which is for the secretion of honey . 285

It is very various in its form and appearance.

1. In plants that have only one petal, the tube of the blossom contains the honey, as in the *primrose* [119*a*] . . . 286
2. It is a sort of spur or horn, in the *larkspur*, *snapdragon*, and *columbine* [143] . 287
3. It is a hollow cavity in the substance of the petals, of the *crown imperial*, and *ranunculus* [144] 288
4. It crowns the corolla like a funnel, in the *narcissus* [145] 289
5. In the petals of the *lily* it is a naked channel [145] 290
6. It is shaped like a slipper in *cypripedium* [146] 291
7. It has the appearance of a bee in the *bee orchis* (ophrys apifera), [147] and is somewhat shaped like a man hanging by the head, in *green man orchis* (ophrys anthropophora) [148] . . . 292
8. In the *gilliflower*, *turnip*, and several others, it is on the germen, in the form of a gland 293
9. In *grass of parnassus* this organ is singularly beautiful. It springs from the base of each petal, and is a heart-shaped sub-

stance, terminating in thirteen slender threads, each tipped with a little globe [149] 294

10. In *aconite* or *monk's hood* the nectary has been compared in shape to a dolphin elevated on a pillar or filament [150] 295

NOTE.—Although nature has fixed no absolute limits betwixt the calyx and corolla, yet these may generally be distinguished by their position with respect to the stamens. The petals and stamens are ranged alternately, whereas the segments of the calyx and the stamens answer to each other. In plants the flowers have no corolla.

III. The STAMENS, or CHIVES (stamina), are slender thread-like substances, which are generally placed within the blossom, and surround the pistils. These are denominated the male parts of a flower [151] . . 296

Each stamen usually consists of three parts;

1. The filament, or thread, which serves to support the anther [151 *a*] . . 297

NOTE.—Some stamens, however, have no filament.

2. The anther, or summit, which is the part fixed upon the filament, and contains the pollen [151 *b*] 298

a. In most plants the anther is situated on the top of the filament . . 299

b. In some it is on one side, as in the *herb paris* 300

c. In others it is on the pistil, as in *birth-wort* 301

d. In others it is on the receptacle, as in *cuckoo pin* 302

The number of anthers differs in different plants.

a. One anther is common to three filaments in *cucurbita* 303

b. One anther is common to five filaments in the class (syngenesia) [152] . 304

c. There are two anthers to each filament in *mercurialis* 305

d. There are three anthers to each filament in *jasmine* 306

3. The pollen, or farina, is a fine dust or powder contained in the anthers of flowers. When the anther arrives at maturity it bursts and discharges this powder.

The pollen is too minute to admit of examination by the naked eye; but by the assistance of a microscope it appears, in many plants, very beautiful 307

a. In the *sun-flower* it is a prickly ball 308
b. In the *sycamore* it is like a cross 309
c. In the *bloody cranesbill* it is a perforated globe 310
d. In the *marsh mallow* it is like the wheel of a watch 311
e. In the *pansy* it is triangular . 312

IV. The PISTIL, or POINTAL (pistillum), is an organ in the centre of the flower, which adheres to the fruit, and is destined for the reception of the pollen. This is denominated the female part of the flower [153] . . 313

It consists of three parts,

1. The germen, or seed-bud, which is the lower part, and is the rudiment of a seed-vessel, or fruit not yet arrived at maturity [153 *a*] 314

2. The style, or shaft, is the part that stands upon the germen, and supports the summit [153 *b*] 315

The style is not a part absolutely essential, many flowers having the stigma immediately upon the germen.

3. The stigma, or summit, is the upper part of the pistil [153 *c*].

In most flowers the stigma is single . 316

In some, as the *syringa*, there are two stigmata 317

In others there are three stigmata, in others, four, &c. 318

The stigma varies considerably in shape. It is

a. Globular in the *primrose* . . 319

b. Blunt in *Andromeda* . . 320

c. Lopped in *maranta* . . . 321

d. Notched in *melica* . . . 322

e. Peltate, or shaped like a shield, in *water lily* 323

f. Crown-shaped in *pyrola* . . 324

g. Striate, or streaked in the *poppy* 325

NOTE.—Some flowers have only one pistil; others have two pistils; others three, four, &c. and some have more than can easily be counted.

V. The SEED-VESSEL, or PERICARP, is the germen grown to maturity; and is that organ of a plant which contains the seeds [154] 326

There are several kinds of seed-vessels, viz.

[1.] A capsule which is a dry, hollow, seed-vessel, which opens in some determinate manner, as at the side by a small hole, as in *cam-*

panula; horizontally as in the *pimpernel;* lengthwise in the *convolvulus;* or at the top, in the *poppy*, and most other plants . . 327

It has several parts:

1. A valve, or inclosure, which is the general external covering [154 *a*] 328
2. Sutures or seams, the edges by which the valves are connected [154 *b*] . . 329
3. Cells or loculaments, hollow places in which the seeds are situated. Some capsules have only one, and others two, three, four, &c. [154 *c*] 330
4. Partitions or dissepiments, which separate the cells from each other [154 *d*] . 331
5. The column (columella), which is an upright substance that passes through the centre of some capsules, and connects the several partitions and seeds [154 *e*] . . . 332

2. Nut (nux) is a seed covered by a hard woody shell, as the *hazel-nut* [155] . 333
3. Drupe (drupa) is a pulpy seed-vessel, consisting of a hard nut or stone, encompassed by a soft or pulpy substance, as the *plum* and *cherry* [156] 334

4. Berry (bacca) is a pulpy seed-vessel, in which the seeds are naked and dispersed, as the *gooseberry* [157], *strawberry*, and *blackberry* [158] 335

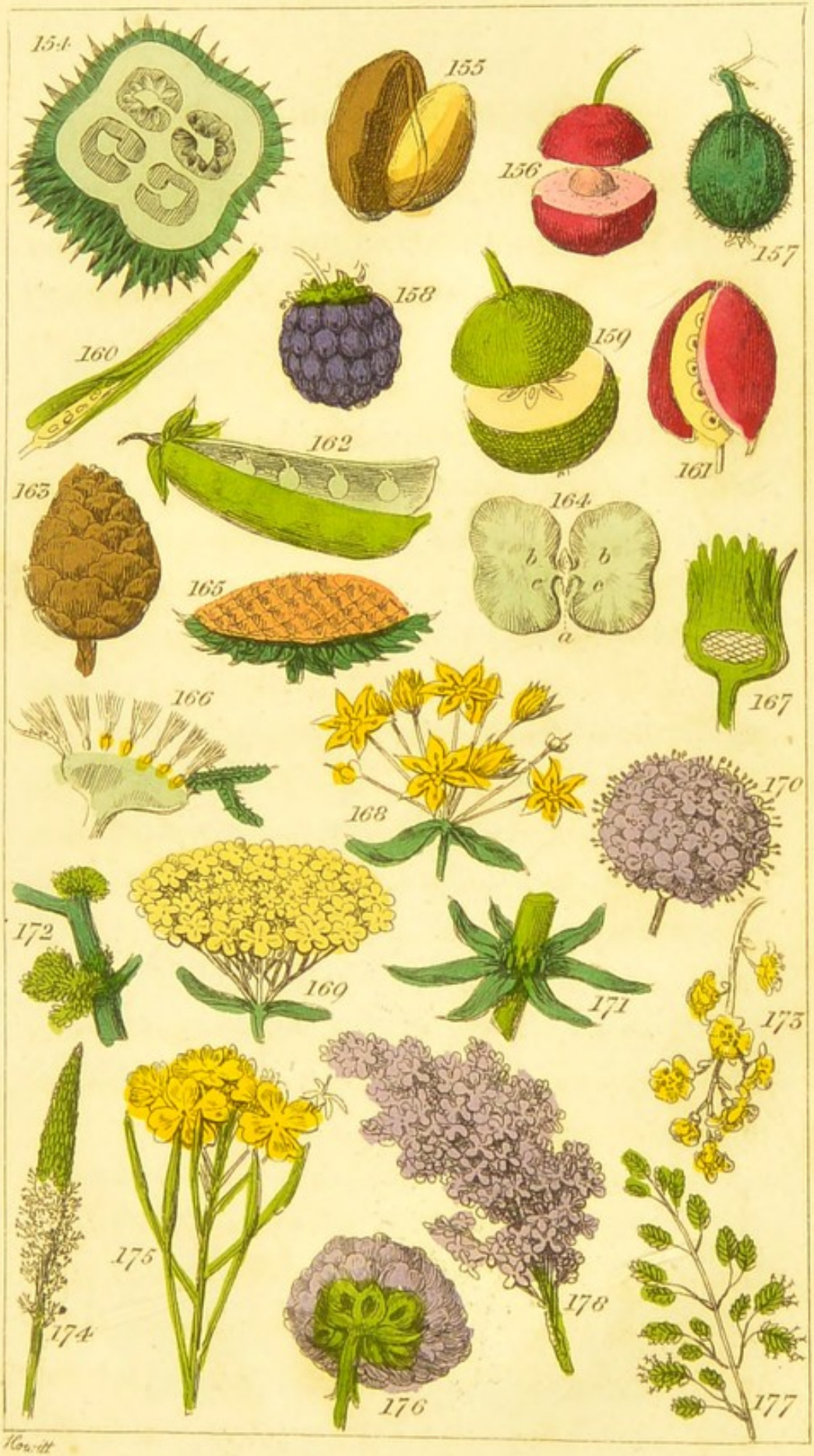
5. Pome (pomum) is a fleshy or pulpy seed-vessel, covering a capsule which contains the seeds, as the *apple* and *pear* [159] . 336

6. Silique (siliqua) is a pod or seed-vessel usually longer than it is broad, with two valves or covers, and separated by a linear receptacle, the seeds alternately fixed to both sutures or seams, as in the *common stock* [160] . 337

7. Silicle (siliculosa) is a pod, or seed-vessel, in general broader than it is long, with two valves, and the seeds alternately fixed to both sutures, as in *honesty* and *shepherd's purse* (thlaspi bursa pastoris) [161] 338

8. Legume (legumen) is a pod or seed-vessel of two valves, in which the seeds are fastened to one suture or seam only, as in the *pea* [162] 339

9. Cone (strobilus) is a kind of seed-vessel formed by a catkin with hardened scales, and containing a seed within the base of each scale, as in the *fir* [163] 340



Seed Vessels, Seed, &c.

VI. The SEED is the deciduous part of a vegetable, and contains the rudiments of a new plant [164] 341

It consists of,

1. The heart (corculum), or that part which is the future plant in miniature [164 *a*] 342

2. The side lobes (cotyledons), which are the perishable parts, designed to afford nourishment to the young plant when it first begins to expand [164 *b*] 343

In many plants the lobes ascend in the form of leaves.

3. The eye or scar (hilum) is an external mark or scar upon the seed, by which it is fastened to the seed-vessel. This is very remarkable in the bean [164 *c*] 344

4. The seed-coat (arillus) is the outer covering of the seed 345

NOTE.—Some seeds are crowned with the cup of the flower; others have a hairy or feathery crown; others have a thread at their extremity; others are covered with hooks; and others have a kind of membrane attached to them, for the purpose of enabling the wind to waft or disperse them abroad 346

The seeds themselves vary much in figure: some are kidney-shaped, as those of the *poppy;* others are globular, as of the *pea;* others triangular, as those of the *tansy;* and others cylindrical, as those of *St. John's wort* . 347

VII. The RECEPTACLE is the base which connects the other six parts of fructification together, and on which they are seated [165] . 348

It is called,

1. A proper receptacle when it belongs only to the parts of a single fructification; and this has the name of 349

1. A receptacle of the fructification when it is common to both the flower and fruit 350
2. A receptacle of the flower, when it is the base to which the parts of the flower only are fastened, and not the germen 351
3. A receptacle of the fruit, when it is a base for the fruit only, remote from the receptacle of the flower . . 352
4. A receptacle of the seeds, when it is a base that fastens the seeds within the seed-vessel 353

2. A common receptacle is that which connects many florets in such manner that the taking away of any of them would cause an irregularity 354

This kind of receptacle is said to be,

1. Chaffy or bristly, when its surface is set with a thin substance like chaff, or with hairs or bristles, by which the florets are separated, as in the *thistles* [166] 355
2. Naked, when it is entirely smooth, and free from these chaffy or bristly particles, as in *sow-thistle* and several others [167] 356

3. An umbel is a receptacle which, from a common centre, runs out into thread-shaped foot-stalks 357

It is called,

1. A simple umbel when it has no subdivisions, as in several species of *garlic* [168] 358
2. A compound umbel, when each footstalk is terminated by a little umbel [123] 359

4. A cyme, or tuft, is a receptacle that runs out into a number of foot-stalks; and these

again into others, so proportioned that the flowers they support form nearly an even surface, as in the *elder* and *guelder-rose* [169] 360

5. A spadix is the receptacle of the arum, and some other plants, and is so called from being produced within a spatha, or sheath 361

OF THE DIFFERENT KINDS OF FLOWERS.

Complete flowers are,

I. SIMPLE.

II. AGGREGATE.

I. SIMPLE FLOWERS differ from aggregate flowers in not having any part of the fructification common to many florets . . 362

II. AGGREGATE FLOWERS are those in which many florets are so connected by some part of the fructification that no one of them can be taken out without destroying the form of the whole 363

NOTE.—The connecting part, in aggregate flowers, is either the receptacle or the calyx; and the partial flowers of which they are composed are called *florets* 364

Aggregate flowers are of seven kinds,

1. AGGREGATE FLOWERS, properly so called,

have a common undivided receptacle, the anthers all separate, and the florets usually on stalks, as in the *scabious* and *teasel* [170] 365

2. Compound flowers consist of numerous florets, all sessile or seated on a common undivided receptacle, and inclosed in one contiguous calyx. It is essential to this kind of flower that the anthers be united into the form of a cylinder 366

Compound flowers are of three kinds:

1. Ligulate, or strap-shaped, when the corollas of the florets are flat, shaped like a fillet, and expanded towards the outer side, as in the *dandelion* . . 367
2. Tubulose, when all the florets are tubular, and nearly equal, as in *thistles* . 368
3. Radiate, when the florets of the middle part are tubulose, and those of the circumference of another form, viz. either ligulate, as in the *yarrow;* tubulose, but unlike the tubulose florets of the centre, as in the *blue bottle;* or naked, as in *artimisia* 369

3. Umbellate flowers are those which consist

of many florets placed on a receptacle, or on fastigiate peduncles which are all produced from the same point, as in the *hemlock* [123] 370

4. Cymose flowers have many florets, placed on a receptacle upon fastigiate peduncles, the primary ones of which issue from the same centre as in an umbel, but the secondary, or partial ones lie dispersed without order, as in the *guelder rose* [169] . . . 371

5. Amentaceous flowers have a thread-shaped receptacle, along which are disposed chaffy scales that form an amentum or cat-kin, as in the *hazel* [124] and *willow* . . 372

6. Glumose flowers have a common receptacle, the base of which is furnished with a glume or husk, as in the *grasses* . 373

7. Spadiceous or sheathed flowers are such as have a common receptacle, which issues from a spatha, or sheath, as in the *arum* or *cuckoo pint* [125] 374

NOTE.—The receptacle has the name of spadix [125 *a*] 375

OF INFLORESCENCE.

Inflorescence is a term used to express the particular manner in which flowers are situated upon a plant.

The several kinds of inflorescence are thus distinguished,

1. A whorl (verticillus), in which the flowers surround the stem in a sort of ring, though they may not perhaps be inserted on all sides of it, as in *marestail* (hippuris vulgaris) [171] but merely on two opposite sides, as in the *dead nettle*, and even on one side only, as in the *sea-dock* (rumex maritimus) [172] . 377

2. A raceme, or cluster (racemus), consists of numerous rather distant flowers, each on its own proper stalk, and all connected by one common stalk, as a bunch of *currants* [173] 378

3. Spike (spica) bears numerous flowers ranged along one common stalk, without any, or at least with very short partial stalks, as in *common lavender* and the different species of *plantain* [174] 379

4. Corymb (corymbus) is a kind of spike in which the partial flower-stalks are gradually longer as they stand lower on the common stalk, so that all the flowers are nearly on a level, as in the *cuckoo-flower* (cardamine pratensis) [175] 380

5. Fascicle (fasciculus) is a term applied to flowers on little foot-stalks, variously inserted

and subdivided, collected into a close bundle, level at the top, as in the *sweet-William* 381

6. A head, or tuft (capitulum), bears the flowers sessile or setting, as in *common thrift* (statice armeria) [176] . . . 382

7. An umbel (umbella) has several flower-stalks or rays, nearly equal in length, spreading from one common centre, their summit forming a level, convex or even globular surface, or sometimes a concave surface [123] . 383

8. A cyme (cyma) has the general appearance of an umbel: as in the umbelliferous plants, its common stalks all spring from one centre, but it differs from those plants in having the stalks variously and alternately subdivided, as in the *elder* and *guelder rose*, (see No. 360) [169] 384

9. A panicle (panicula) bears the flowers in a sort of loose, subdivided bunch or cluster, without any order, as in *London-pride* (saxifraga umbrosa), *oats*, and different kinds of *grass* [177] 385

10. A bunch (thyrsus) is a dense or close panicle, more or less of an ovate figure, as in the *lilac* [178] 386

PART THE SECOND.

Of the Classification of Plants.

The Linnean system of the classification of plants is formed upon a supposition that the stamens represent the male, and the pistils the female part of the fructification. The whole vegetable kingdom is distributed into 24 *classes*. These classes are divided into *orders*, which are subdivided into *genera* or *tribes*; and these genera are further divided into *species* or individuals 387

Note.—Every vegetable production, when in a perfect state, is furnished with flowers and fruit or seed; there being no species in which these are wanting.

I. Classes.—The characters of the classes are taken either from the *number*, the *length*, the *connection*, or the *situation* of the stamens 388

II. ORDERS.—The characters of the orders are most frequently taken from the *number* of the PISTILS; but sometimes from circumstances relative to the stamens, the pistils, or seed 389

III. GENERA.—The essential characters or marks of the genera, are taken from some other particulars in the flower. Generic descriptions are designed to contain an account of *all the most obvious appearances* in every part of the flower 390

IV. SPECIES.—The species are mostly characterized from some peculiarities in the *stem* or *leaves;* sometimes from parts of the flower; and sometimes, though rarely, from the roots 391

In some plants, owing to soil, situation, or other causes, both the leaves and flowers are subject to variation. When this happens they are denominated VARIETIES.

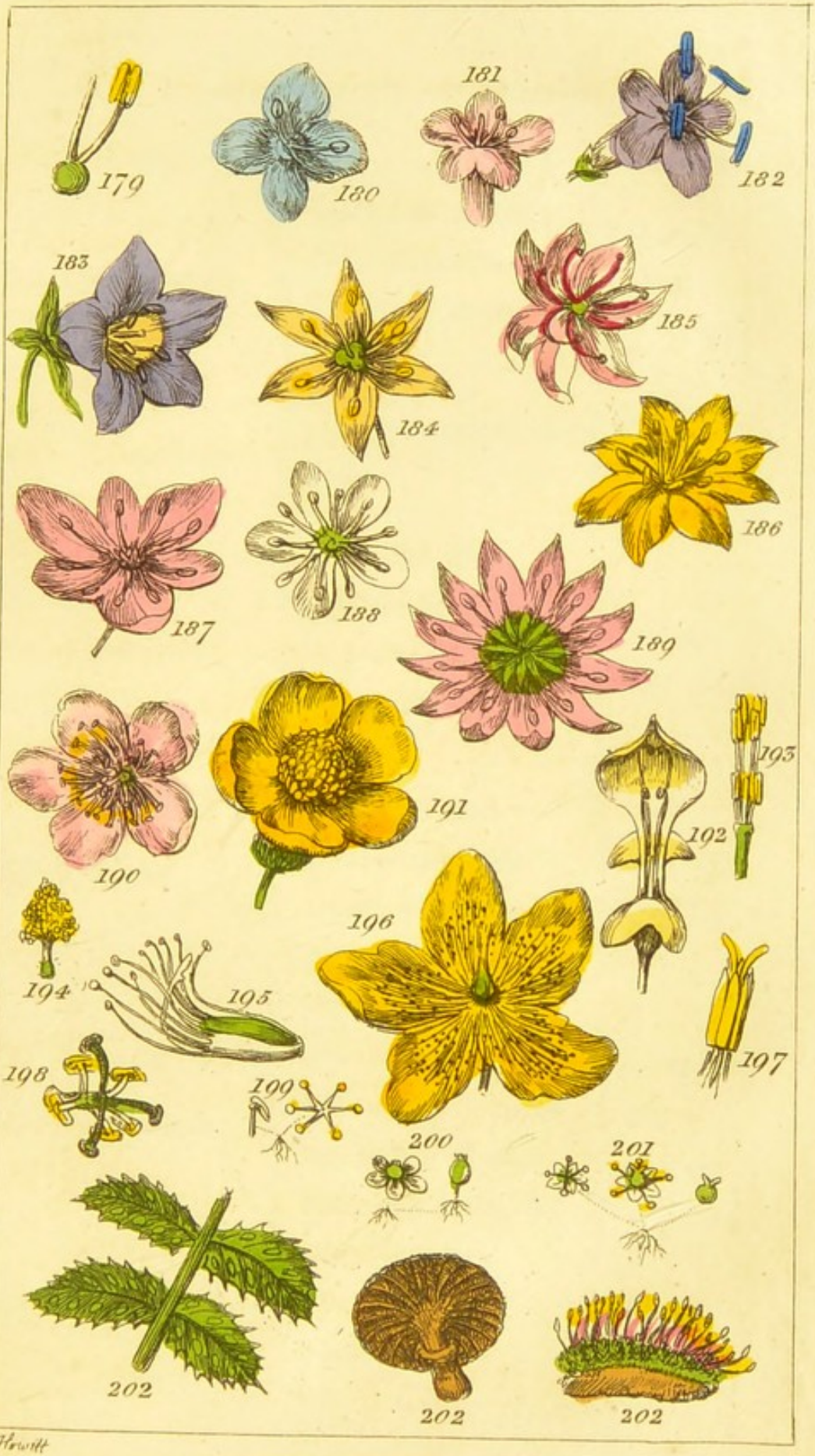
CLASSES. 393

EXAMPLES.

1. Monandria . . one stamen . . *marestail* [179]
2. Diandria . . two stamens . . *speedwell* [180]
3. Triandria. . three stamens { *valerian* and *crocus* . [181]

CLASSES.		EXAMPLES.
4. Tetrandria	four stamens (of equal length) .	*scabious* and *plaintain* [182]
5. Pentandria	five stamens (the anthers not united) . . .	*campanula* and *honeysuckle* [183]
6. Hexandria	six stamens (of equal length) .	*tulip* and *garlic* [184]
7. Heptandria . seven stamens		*horse chestnut* and *wintergreen* [185]
8. Octandria . eight stamens .		*mezereon* & *yellow centaury* [186]
9. Enneandria . nine stamens		*flowering rush* [187]
10. Decandria . ten stamens .		*saxifrage* [188]
11. Dodecandria	twelve to nineteen stamens (fixed to the receptacle) .	*houseleek* [189]
12. Icosandria	twenty stamens and upwards, fixed on the calyx .	*rose* and *fruit trees* [190]

CLASSES.		EXAMPLES.
13. Polyandria	twenty stamens and upwards (fixed to the receptacle) .	*poppy* and *ranunculus* [191]
14. Didynamia	four stamens, two long and two short, (flowers ringent and personate) .	*sage, foxglove* [192]
15. Tetradynamia	six stamens, four long and two short (flowers cruciform) .	*wallflower* and *stock* [193]
16. Monadelphia	filaments of the stamens united at the bottom, but separate at top	*mallow* [194]
17. Diadelphia	filaments of the stamens united into two sets, (flowers butterfly-shaped) .	*pea* [195]
18. Polyadelphia	filaments of the stamens united into three or more sets .	*St. John's wort* [196]



Hewitt

Classes.

CLASSES.		EXAMPLES.
19. Syngenesia	anthers united, five stamens (flowers compound) .	*dandelion* [197]
20. Gynandria	stamens upon the pistil . .	*passion flower* [198]
21. Monœcia .	stamens and pistils distinct in separate flowers upon the same plant . .	*cucumber* [199]
22. Dicœcia .	stamens and pistils distinct upon different plants .	*briony* [200]
23. Polygamia	stamens and pistils variously situated : both in the same flower, stamens only, or pistils only .	*atriplex* or *orache* [201]
24. Cryptogamia	fructification concealed.	*ferns, &c.* [202]

ORDERS.

I. The orders of the first thirteen classes, viz. 1. Monandria, 2. Diandria, 3. Triandria, 4. Tetrandria, 5. Pentandria, 6. Hexandria, 7. Heptandria, 8. Octandria, 9. Enneandria, 10. Decandria, 11. Dodecandria, 12. Icosandria, and 13. Polyandria, are taken from the number of the PISTILS, or female parts of the flower: the titles terminate in *gynia*, as those of the classes do in *andria* 394

Orders.	*Explanation.*	
1. Monogynia, . .	1 pistil .	[203]
2. Digynia, . .	2 pistils .	[204]
3. Trigynia . .	3 pistils .	[205]
4. Tetragynia . .	4 pistils .	[206]
5. Pentagynia . .	5 pistils .	[207]
6. Hexagynia . .	6 pistils .	[208]
7. Heptagynia . .	7 pistils .	[209]
8. Octogynia . .	8 pistils .	[210]
9. Enneagynia . .	9 pistils .	[211]
10. Decagynia . .	10 pistils .	[212]
11. Dodecagynia .	about 12 pistils	[213]
12. Polygynia . .	many pistils	[214]

II. The orders of the fourteenth class, *Didynamia*, are taken from the situation of the seeds 395

1. Gymnospermia . naked seeds [215]
2. Angiospermia . seeds in a capsule [216]

III. The orders of the fifteenth class, *Tetradynamia*, are formed from a difference in shape of the seed vessels 396

1. Siliculosa . pod in a silicle (a broad pod) [217]
2. Siliquosa . pod in a silique (a long pod) [218]

IV. In the classes *Monadelphia*, *Diadelphia*, *Polyadelphia*, and *Gynandria*, the orders are taken from the number of the stamens . 397

1. Pentandria . . 5 stamens.
2. Hexandria, &c. . 6 stamens, &c.

V. In the nineteenth class, *Syngenesia*, the orders are taken from the structure of the flower 398

1. Polygamia æqualis . all the florets alike [219]
2. Polygamia superflua, the florets of the disk,

or centre, perfect, or united; those of the margin furnished with pistils only, but all producing perfect seed [220]

3. Polygamia frustranea, the florets of the disk, or centre, perfect or united; those of the margin neuter; only some few of the genera having the rudiments of pistils in their outer florets [221] 399

4. Polygamia necessaria, the florets of the disk furnished with stamens only; those of the margin with pistils only [222] . . 400

5. Polygamia segregata, several flowers either simple or compound, but with united tubular anthers, and with a partial calyx, all included in one general calyx [223] . . . 401

VI. The classes *Monœcia* and *Diœcia* take their orders from the number and other peculiarities of the stamens . . . 402

1. Monandria . . has 1 stamen.
2. Diandria . . — 2 stamens.
3. Triandria . . — 3 stamens.
4. Tetrandria . . — 4 stamens.
5. Pentandria . . — 5 stamens.
6. Hexandria . . — 6 stamens.
7. Polyandria . . — 7 stamens.

8. Monadelphia .	filaments of stamens united into one set.
9. Polyadelphia .	stamens united into several sets.
10. Gynandria . .	stamens rising from the pistil.

VII. In the twenty-third class, called *Polygamia*, there are three orders:— . 403

1. Monœcia . .	one habitation.
2. Dicœcia . .	two habitations.
3. Tricœcia . .	three habitations.

VIII. The twenty-fourth class, *Cryptogamia*, has five orders:— 404

1. Filices . .	Ferns .	[224]
2. Musci . .	Mosses .	[225]
3. Hepatica . .	Liverworts	[226]
4. Algæ . .	Sedges .	[227]
5. Fungi . .	Mushrooms	[228]

BRIEF EXPLANATIONS OF THE LINNEAN CLASSES AND ORDERS AS CONNECTED WITH EACH OTHER.

CLASS I.—MONANDRIA. This class consists of such plants as are furnished with only one stamen. It comprehends two orders . 405

1. Monogynia, containing plants which have but one pistil. *Ginger*, *turmeric*, and *Indian shot* belong to this order; and the English plant *hippuris*, or *marestail*.
2. Digynia, two pistils, comprehends, amongst other plants, *callitriche*, or *star wort*.

CLASS II.—DIANDRIA, two stamens. It has three orders 406

1. Monogynia, one pistil. This order contains,
   a. Plants which have regular corollas, as the *jasmine*, *lilac*, and *privet*.
   b. Plants which have irregular corollas and seeds in a capsule, as *veronica* or *speedwell*.
   c. Plants with irregular corollas and naked seeds, as *rosemary* and *sage*.

2. Digynia, two pistils. This order contains but one genus, *anthoxanthum*, a kind of grass.

3. Trigynia, three pistils. *Pepper* is the only genus of this order.

CLASS III.—TRIANDRIA, three stamens. This class has three orders . . . 407

1. Monogynia, one pistil; contains

a. Flowers superior, or situated upon the seed vessel, as *valerian*, *crocus*, and *iris*.

b. Flowers inferior, or below the seed-vessel. These are grass-like, and have only a single seed, as *bog-rush* and *club-rush*.

2. Digynia, two pistils; contains the greater number of grasses.

a. Flowers scattered, one in each calyx, as *canary-grass*.

b. Flowers scattered, two in each calyx, as *melic-grass*.

c. Flowers scattered, many in each calyx, as *oats*.

d. Flowers in spike, on a subulate receptacle, as *ray-grass*, *barley*, and *wheat*.

3. Trigynia, three pistils; contains only three British plants, *pipe wort*, *blinks*, and *four-leaved all-seed.*

CLASS IV.—TETRANDRIA, four stamens. The flowers of this class are distinguished from those of the class Didynamia by the stamens being of equal length. It has three orders . 408

1. Monogynia, one pistil; contains
   a. Monopetalous flowers, or flowers with one petal, as *teasel*, *scabious*, and *plantain.*
   b. Flowers with four petals.
   c. Flowers without petals, as *pellitory* and *ladies mantle.*
2. Digynia, two pistils.
3. Tetragynia, four pistils, contains *holly* and the *pond weeds.*

CLASS V.—PENTANDRIA, five stamens. This class contains six orders . . . 409

1. Monogynia, one pistil; comprehends
   a. Monopetalous flowers, or flowers with one petal, as *lungwort*, *borage*, *primrose*, *convolvulus*, *periwinkle*, *potato*, *campanula*, and *woodbine.*

b. Flowers with five petals, as *gooseberry*, *currant*, *ivy*, *buckthorn* and *violet*; the latter has been transferred into this class from the abolished Linnean order Syngenesia Monogamia.

c. Flowers incomplete, as *sea-milk-wort*.

2. Digynia, two pistils; contains

a. Monopetalous flowers, or flowers with one petal, as *gentian* and *dodder*.

b. Flowers destitute of corolla, as *beet*, *goosefoot* and *elm*.

c. Umbellate plants.

One division of these has both an universal and partial involucrum, as *carrot* and *hemlock*.

Another division has a partial involucrum only, as *coriander* and *chervil*.

And a third division has neither, as *parsnips* and *fennel*.

3. Trigynia, three pistils; contains the *elder* and *guelder rose*.

4. Tetragynia, four pistils; has only two genera, one of which is *grass of Parnassus*.

5. Pentagynia, five pistils; contains *thrift* and *ilex*.

6. Polygynia, many pistils; contains only one British plant, the *little mouse-tail.*

CLASS VI.—HEXANDRIA, six stamens. The flowers of this class are distinguished from those of the class Tetradynamia by the stamens being all of equal length. It has five orders . 410

1. Monogynia, one pistil; contains
   a. Flowers that are furnished with calyx and corolla, as the *barberry.*
   b. Flowers with a spathe or glume, as *snowdrop*, *narcissus*, and *onion.*
   c. Flowers destitute of calyx, as *tulip*, *lily*, *hyacinth*, and *asparagus.*
   d. Flowers destitute of corolla, as the different kinds of *rush.*

2. Digynia, two pistils; contains *rice* and some other foreign plants.
3. Trigynia, three pistils; contains *meadow-saffron*, and the different kinds of *dock.*
4. Tetragynia, four pistils.
5. Polygynia, many pistils; contains only one genus, *alisma.*

CLASS VII.—HEPTANDRIA, seven stamens, has four orders 411

1. Monogynia, one pistil, contains the *horse-chestnut.*
2. Digynia, two pistils.
3. Tetragynia, four pistils.
4. Heptagynia, seven pistils.

CLASS VIII.—OCTANDRIA, eight stamens, has four orders 412

1. Monogynia, one pistil. This is a very various and numerous order, and contains the *nasturtium*, the different kinds of *heath*, and *cranberry.*
2. Digynia, two pistils.
3. Trigynia, three pistils; contains *buck-wheat* and *knot-grass.*
4. Tetragynia, four pistils; contains *moschatel* and *herb paris.*

CLASS IX.—ENNEANDRIA, nine stamens, has three orders 413

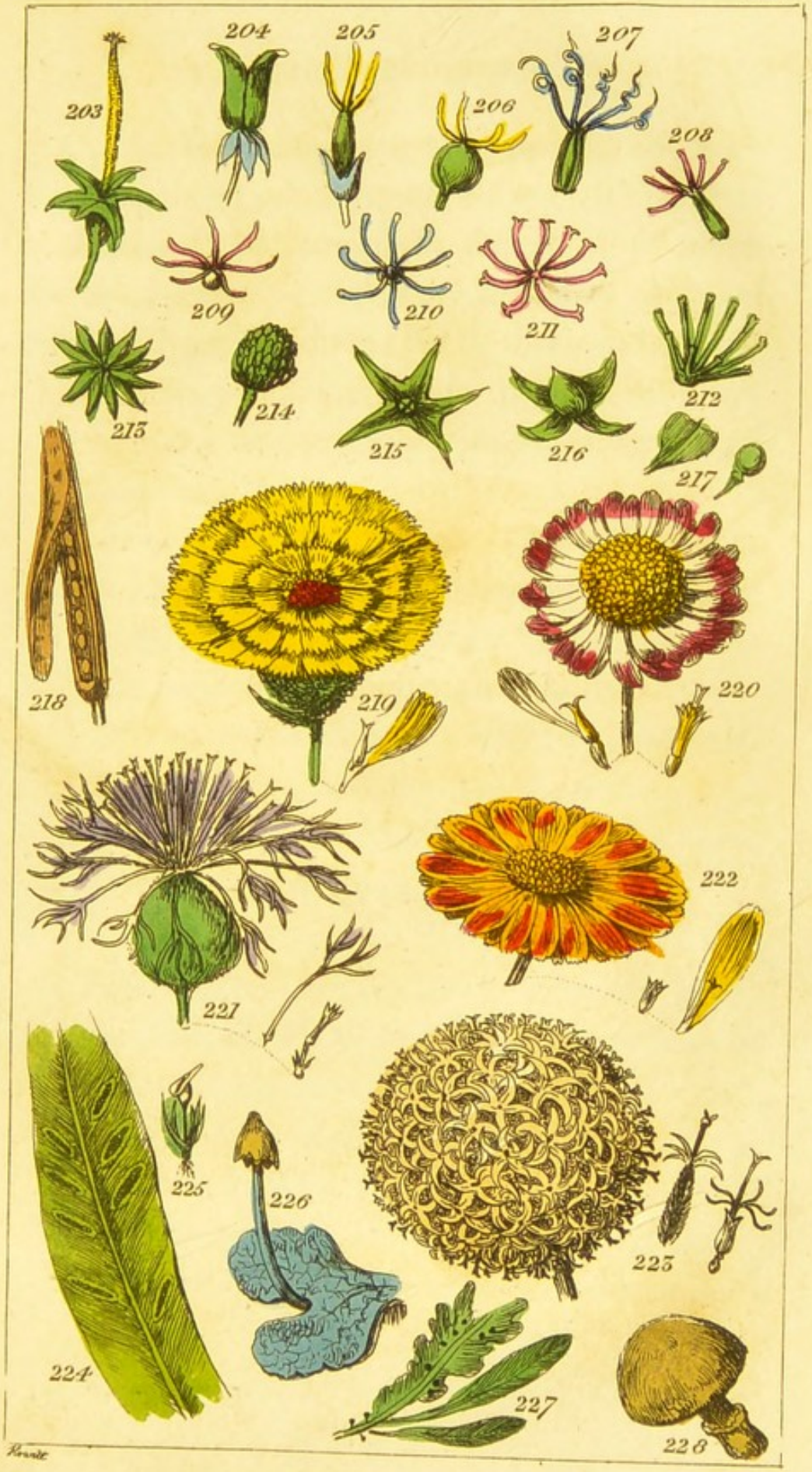
1. Monogynia, one pistil.
2. Trigynia, three pistils.
3. Hexagynia, six pistils; contains the *flowering rush.*

CLASS X.—DECANDRIA, ten stamens, has five orders 414

1. Monogynia, one pistil; contains,
   a. Flowers with many petals.
   b. Flowers with one petal, as the *strawberry tree.*
2. Digynia, two pistils; contains the different kinds of *saxifrage*, and *pink* or *carnation.*
3. Trigynia, three pistils; contains the *sandwort*, *stitchwort*, *campion*, and *catchfly.*
4. Pentagynia, five pistils; contains the *stonecrops*, *lichens*, and different species of *mouse-ear.*
5. Decagynia, ten pistils.

CLASS XI.—DODECANDRIA, from twelve to nineteen stamens. It has six orders . 415

1. Monogynia, one pistil; contains the *spiked-willow herbs.*
2. Digynia, two pistils; contains *common agrimony.*
3. Trigynia, three pistils; contains *mignionette*, *woad*, and different kinds of *spurge.*
4. Tetragynia, four pistils.
5. Pentagynia, five pistils.
6. Dodecagynia, about twelve pistils; contains the *houseleek.*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Orders.

CLASS XII.—ICOSANDRIA, twenty or more stamens, inserted into the calyx. This class comprehends various kinds of fruit, all of which are wholesome, and the greater part of them extremely grateful food; it has three orders 416

1. Monogynia, one pistil, contains all kinds of *plums* and *cherries; peach*, *almond*, and *myrtles*.
2. Pentagynia, five pistils. Under this order it has been found convenient to arrange such plants as have from two to five pistils, and occasionally one or two more. It is exemplified by the *hawthorn*, the *medlar*, *pear*, *apple*, and *meadow-sweet*.
3. Polygynia, many pistils, contains the *roses*, *strawberry*, *raspberry*, and *bramble*.

CLASS XIII.—POLYANDRIA, stamens numerous, and inserted into the receptacle, or base of the flower; it has seven orders . . 417

1. Monogynia, one pistil, contains,
   a. Flowers with four petals, as the *poppy*.
   b. Flowers with five petals, as the *cistus*.
   c. Flowers with many petals, as the *water-lilies*.

2. Digynia, two pistils, as the *peony*.
3. Trigynia, three pistils, as *larkspur* and *monkshood*.
4. Tetragynia, four pistils.
5. Pentagynia, five pistils, as *columbine* and *fennel-flower*, or *devil in a bush*.
6. Hexagynia, six pistils, as *water-aloe*.
7. Polygynia, many pistils, as the *anemones*, *hellebores*, *marsh-marygold*, and *ranunculus*.

CLASS XIV.—DIDYNAMIA, four stamens, two long and two short, by which it is distinguished from the class Tetrandria, in which the four stamens are of equal length. The flowers of this class are labiate, ringent, or personate; it has only two orders 418

1. Gymnospermia, seeds naked, at the bottom of the calyx, and in all the British plants four in number; this order contains,
   a. Flowers with a calyx for the most part cleft, as *ground-ivy*, *mint*, *betony*, *dead-nettle*, and *horehound*.
   b. Flowers which have the calyx bilabiate, or divided into two lips, as *thyme*, *marjoram*, and *basil*.
2. Angiospermia, seeds in a capsule, and

generally very numerous; this order contains,

a. Flowers with the calyx in two divisions, as *broom-rape.*

b. Flowers with the calyx in four divisions, as *yellow-rattle*, *cow-wheat*, and *eye-bright.*

c. Flowers with the calyx in five divisions, as *fox-glove* and *snap-dragon.*

CLASS XV.—TETRADYNAMIA, six stamens, four long and two short, by which it is distinguished from the class Hexandria, in which the six stamens are of equal length. The flowers of this class are cruciform, or cross-shaped; it has two orders, ... 419

1. Siliculosa, comprehending such plants as have a roundish pod or pouch, as in *scurvy-grass* and *honesty:* in some of them the pod is notched at the extremity, as in *shepherd's purse* and *candy-tuft.*

2. Siliquosa, comprehending such plants as have a very long pod, and the seeds fastened alternately to the surfaces or seams; this order contains,

a. Flowers which have the calyx closed

and the leaflets converging longitudinally, as in the *wall-flower*, *stock*, *turnip*, and *radish*.

b. Flowers which have the calyx gaping, and the leaflets distant above, as in the *cuckoo-flower*, *charlock*, and *mustard*.

CLASS XVI.—MONADELPHIA, stamens united by their filaments into the form of a tube. It has seven orders, which are distinguished by their number of stamens . . . 420

1. Triandria, three stamens.
2. Pentandria, five stamens; contains the genus *erodium*, or *stork's bill*, which of late has been separated from that of *geranium*.
3. Octandria, eight stamens.
4. Decandria, ten stamens, contains the *geraniums*, properly so called.
5. Endecandria, eleven stamens.
6. Dodecandria, twelve stamens.
7. Polyandria, many stamens; contains the *mallows*, *marsh-mallow*, *hibiscus*, and *holly-hock*.

CLASS XVII.—DIADELPHIA, stamens united by their filaments into two sets. Nearly all

the flowers of this class are papilionaceous or butterfly-shaped. It has four orders, which are distinguished by the number of their stamens 421

1. Pentandria, five stamens.
2. Hexandria, six stamens; contains the different kinds of *fumitory* and *milk-wort*.
3. Octandria, eight stamens; contains the genus *polygala* or *milk-wort*.
4. Decandria, ten stamens; contains the plants which are usually termed Leguminous; such as *peas*, *beans*, *vetches*, *broom*, *furze*, and *trefoil*.

Class XVIII.—Polyadelphia. Stamens united by their filaments into more than two parcels. The plants of this class have been arranged by Sir J. E. Smith under three orders, distinguished by the number or insertion of the stamens 422

1. Dodecandria, having stamens, or rather anthers, from twelve to twenty, or twenty-five in number, their filaments unconnected with the calyx, as in the *orange* and *lemon*.
2. Icosandria, having numerous stamens,

their filaments inserted (in several parcels) into the calyx.

3. Polyandria, having many stamens unconnected with the calyx, as in *tutsan* and the several kinds of *St. John's wort.*

CLASS XIX. — SYNGENESIA, the anthers united into a tube: the flowers of this class are compound; it has five orders . . 423

1. Polygamia æqualis, in which each floret is perfect, or furnished with stamens and a pistil. This order contains:

   a. Flowers, in which all the florets are ligulate or strap-shaped, as *dandelion* and *sowthistle.*

   b. Flowers globose, generally uniform and regular, their florets all tubular, five-cleft, and spreading, as in the *thistles* and *burdock.*

   c. Flowers discoid, having the florets all tubular, regular, crowded and parallel, as in *hemp agrimony.*

2. Polygamia superflua. In this order the florets of the disk, or centre, are perfect, and those of the margin furnished with pistils

only; but all produce perfect seed. It contains:

a. Discoid flowers, of which the florets of the margin are obsolete or inconspicuous, as in *wormwood* and *tansy*.

b. Radiant flowers, of which the marginal florets are strap-shaped and spreading, as in the *daisy* and *chrysanthemum*.

3. Polygamia frustranea. In this order the florets of the disk, or centre, are perfect, and have both stamens and pistil, and those of the margin neuter, or destitute both of pistils and stamens; with the exception of a few genera, which have the rudiments of pistils in their outer florets, as in the *star thistle* and *blue bottle*.

4. Polygamia necessaria. In this order the florets of the centre only have stamens, and those of the margin have only pistils, as in the *garden marygold*.

5. Polygamia segregata. This order comprehends such flowers as have united tubular anthers, the florets with a partial calyx, all included in one general calyx, as the *globe thistle*.

CLASS XX.—GYNANDRIA, stamens inserted either upon the style or germen. It has seven orders 424

1. Monandria, one stamen, contains the *orchis* tribe, which till lately has been arranged under the order Diandria.
2. Diandria, two stamens, contains the genus *cypripedium or ladies' slipper.*
3. Triandria, three stamens.
4. Tetrandria, four stamens.
5. Pentandria, five stamens.
6. Hexandria, six stamens, contains the very extraordinary genus *aristolochia* or *birthwort.*
7. Octandria, eight stamens.

CLASS XXI.—MONŒCIA. Stamens and pistils in separate flowers, but both growing on the same plant. It has nine orders . . 425

1. Monandria, one stamen.
2. Diandria, two stamens.
3. Triandria, three stamens, contains the genus *carex* or *sedge*, *cat's tail*, and *bur-reed.*

4. Tetrandria, four stamens, contains the *alder*, *birch*, and *box trees*, *nettle*, and *mulberry*.
5. Pentandria, five stamens, contains the *lesser burdock*.
6. Hexandria, six stamens.
7. Polyandria, more than seven stamens, contains the *oak*, *beech*, *hazel*, *hornbeam*, *walnut*, and *plane trees*, *arrow-head*, and *arum* or *cuckoo-pint*.
8. Monadelphia, the stamens united by their filaments into one set, contains the *pine* or *fir trees*, *cucumbers* and *gourds*.
9. Polyadelphia, the stamens united into more than two sets.

Class XXII.—Diœcia. Stamens and pistils in separate flowers, situated on two separate plants. It has eight orders . . 426

1. Monandria, one stamen.
2. Diandria, two stamens, contains the *willows*.
3. Triandria, three stamens.
4. Tetrandria, four stamens, contains the *misletoe* and *gale*, or *Dutch myrtle*.
5. Pentandria, five stamens, contains the *hop*.

6. Hexandria, six stamens, contains *black briony.*
7. Polyandria, many stamens.
8. Monadelphia, the stamens united into one set, contains the *yew* and *juniper.*

CLASS XXIII.—POLYGAMIA, stamens and pistils separate in some flowers, and united in others, either on the same plant, or on two or three distinct plants. It has three orders: 427

1. Monœcia, having united flowers, accompanied with barren or fertile flowers, or both on the same plant, as in the genus *atriplex*, or *orache.*
2. Dicœcia, having the different flowers on two different plants.
3. Tricœcia.

CLASS XXIV. — CRYPTOGAMIA. Stamens and pistils either not well ascertained, or not to be numbered with any certainty. It has five orders 428

1. Filices, or Ferns, bear seed either on the back, or on the summit, or near the base of the frond.
2. Musci, or Mosses, are leafy plants, and

have a conical membranous corolla, called a calyptra or veil, which adheres to the top of the capsule and covers it; the capsule is elevated on a fruit-stalk, and is of one cell and one valve, and opens by a vertical lid.

3. Hepaticæ, or Liverworts, are for the most part frondose plants, that is, their fructification originates from what is at the same time both leaf and stem. Their capsules have no lid or covering.

4. Algæ, or Flags, have sometimes a frondose herbage, sometimes they are a mere crust, and sometimes leathery or gelatinous. Their seeds are embedded either in the frond itself, or in some peculiar receptacle adapted to them:

this order comprehends:

a. Lichens, the fructification of which consists, for the most part, of a smooth, round disk, flat, convex, or concave, and in the substance of which the seeds are embedded.

b. Marine Plants, or Sea Weeds, as they are frequently called.

5. Fungi, or Mushrooms, are destitute of

herbage, properly so called, and have their fructification in a fleshy substance.

It comprehends,

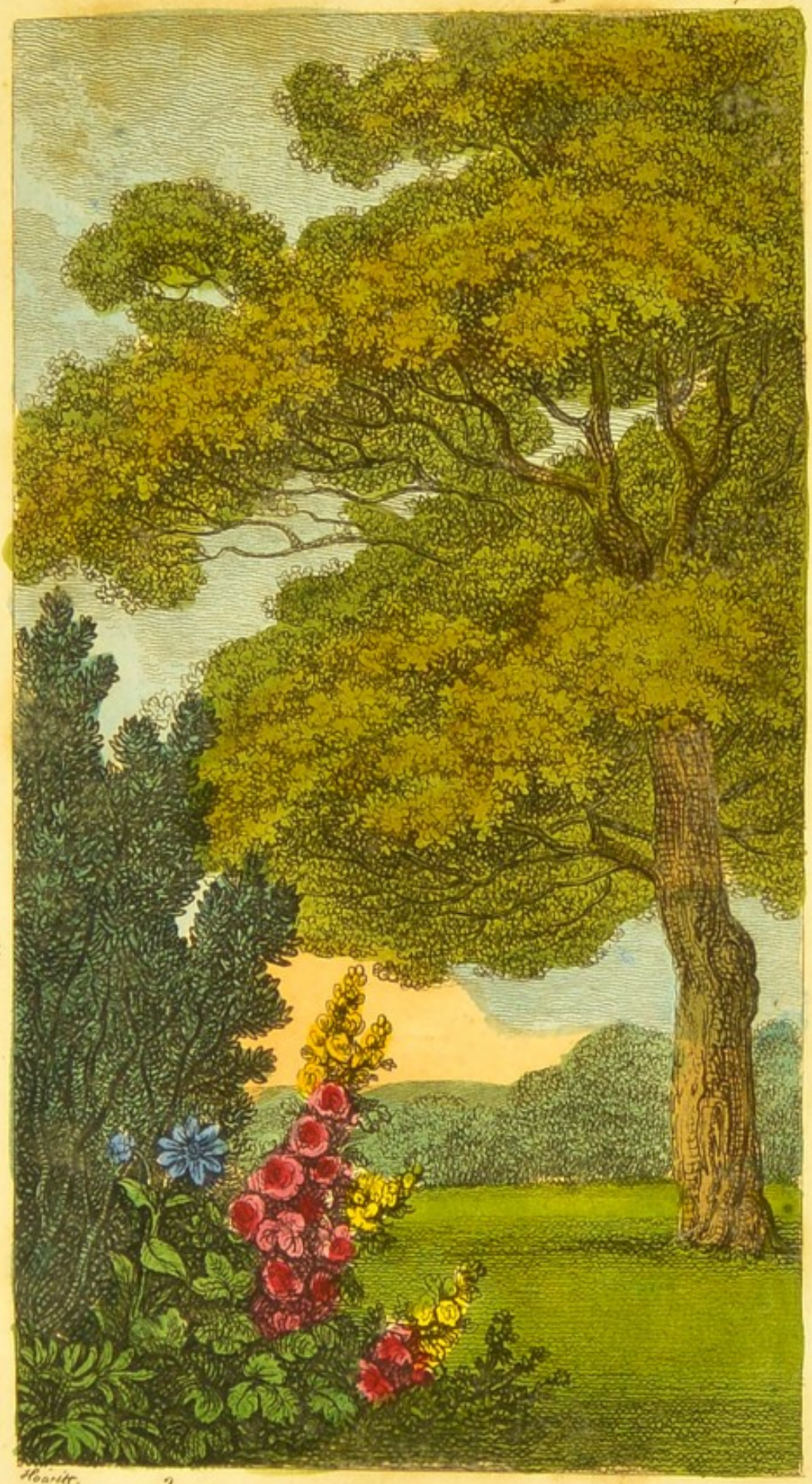
a. Plants which have seeds on their under surface, as the *mushrooms* and *boleti*.

b. Plants which have seeds on their upper surface, as the different species of *peziza* and *phallus*.

c. Plants which have seeds on every part of their surface, as the *clavariæ*.

d. Plants which have seeds in their substance, as the *truffle*, *puff-balls*, and *mould* or *mucor*.

1 Frontispiece.



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Hogarth. 3

Trees, Shrubs, and Herbs.

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*** The Numbers correspond to similar Numbers in the Margin of the Definitions.

THE END.

G. Woodfall, Printer, Angel Court, Skinner Street, London.