

**A short introduction to the knowledge of the science of botany : explaining the terms of art made use of in the Linnaean system. Illustrated with five copper plates exhibiting the characters of the genera / By Philip Miller.**

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A SHORT  
INTRODUCTION  
TO THE  
KNOWLEDGE  
OF THE  
SCIENCE of BOTANY:

Explaining the  
TERMS of ART  
Made use of in the  
LINNÆAN SYSTEM.

Illustrated with  
FIVE COPPER PLATES  
Exhibiting the  
CHARACTERS of the GENERA.

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A  
SHORT INTRODUCTION  
TO THE  
KNOWLEDGE  
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**A**LL the sciences have each their proper language: but Botany alone has almost as many different languages as there are different authors, each using names and particular phrases, to represent the same plants; and sometimes the same denomination is applied by different authors to different plants; but although the Nomenclature of Botany has in all times been varied, yet it never was so much altered as of late years. New Views have

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occasioned new observations, which have enabled the modern Botanists to rectify the denominations of the antients.

A denomination is so much more perfect, as it contains fewer arbitrary things, and has less relation to foreign. This is a kind of definition, which must be rendered as exact as possible, using the visible attributes and qualities of the plant itself, making an abstraction of the affinity it has to other plants of the same genus, or of different genera.

The modern Botanists have an advantage over the antients in following this rule; they name the plants from the parts which they contain; whereas the others have generally given them by their outward appearance; the moderns in each of their phrases, have regard to the essential parts of the plant they express: that in a word is the most particular character, which can be known by the first inspection, avoiding the long denominations and terms which are superfluous, and only burden the memory to no purpose, they have banished the names of the countries where the plants grow, their virtues, and properties, &c. from the titles.

When there is but one known specie of a genus, it is not necessary to add a specific denomination—

nomination to its generical name, because there is no other specie to distinguish it from. And it were to be wished, that each plant had but one essential character to distinguish it from all the other species of the genus: in which case each denomination would be comprised in two or three words. But as it often happens that one specie has many different characters common to one or other species of the same genus, they are then obliged to add a longer denomination to it. However all other things being equal, the shortest phrases are always best. In consequence of this, doctor *Linnæus*, the celebrated professor of Botany at *Upsal* in *Sweden*, has proposed simple and proper terms, not only to express all the different parts of plants, but also the principal qualities, forms, figures, situations, directions, and manners of existing of each of these parts. He is not satisfied to join the definitions and explications to each of these terms, to fix and determine their true meaning: but he has also added figures to such as were necessary to give a more just and complete idea of them. These principals have been almost universally adopted, by those who have wrote after him. This rule he will not permit to be

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departed from; and his manner of expression is become the living language of Botany.

The sexual method of classing plants, established by doctor *Linnaeus*, is much preferable to all the systems of Botany which have yet appeared. 1. Because of all those which have been proposed, there is not one of them which approaches so near to a natural method as this, most of the classes being very natural. 2. It is founded upon the parts of the plants, which are the most constant, and least subject to variation, the stamina and pointals, which are the true organs of generation.

These are simple and easy to retain in memory. The classes are established upon the stamina or male organs; the orders or subdivisions of the classes upon the pointals or female organs; and the genera upon all the parts of the fructification. All these parts being considered according to their number, their figure, their proportion, and their situation, the specifick differences are taken from the habit or external appearances of the plants. Those who will take the trouble of examining this method, and comparing it with any of the former, will be much better acquainted with its excellence than words can explain it. The author does not pretend to say it is perfect;







fect; the only natural method, if there is one, should have an advantage of this, but in default of the last, he endeavours to follow that which approaches nearest to it.

Doctor *Linnaeus* has taken the most essential parts of the plants, which are those of the fructification, to establish the characters of the genera, in a more substantial manner, than all the authors who have preceded him. The exact descriptions which he has given of all these parts, and the short natural terms which he has used, together with the observations which he has added to those of his genera, which carry any essential character, or which are liable to exception in any of the species, are owing to the labour of this worthy botanist. It is certain that these descriptions will have this advantage, that they can be applied to any method which may be hereafter invented, for the establishing of new genera, when the old ones are insufficient, by the junction of those whose identity have escaped the first methodists, by the dismembering of some of them, which were over charged with species, (which fatigue and embarrass the learner,) in short by clearing of some other whose characters are equivocal or obscure. Doctor *Linnaeus* has found a way of ranging the species under their  
true

true genera, and of separating those which do not properly belong to them.

The distinguishing varieties from real species, is a part of the science of botany not well understood; for as variety of soils, situations, and culture greatly alter the appearance of plants, so there are too many who from a fondness of shewing their great nicety in distinguishing, are apt to make species of several plants, which are only accidental variations; while others, on the contrary, are as ready to suppose many plants which agree in some particular characters, are only accidental variations; and it must be confessed that the learned author whose system we here adopt, is of this number; for in all his books where he has enumerated the species of plants, he has joined by way of synonym many plants as varieties of the species, which are always constant in their essential characters, when propagated by seeds, be the soil or situation ever so different: but this may be readily excused, for as he has not had experience enough in the culture of plants, to know how far, culture, difference of soils and situations will alter the appearances of plants, so it cannot be expected he should be perfect in an article, which requires many years trial and observation to determine.

The

The following circumstances are excluded by doctor *Linnaeus*, from having any share in distinguishing the species from varieties, *viz.* *sex, magnitude, time of flowering, colour, scent, taste, virtues and uses, duration, multitude, pubescens, leaves and monstrous flowers.* Most of which it must be confessed should not be allowed as distinguishing characters to species, but there are some which must be admitted, where other marks are wanting to distinguish two species which have great affinity, provided the characters so used are permanent: and these we find have been frequently used by doctor *Linnaeus* himself in his later works with great propriety, and it may be presumed as he becomes more knowing in the culture of plants, he will adopt many more.

According to modern botanists, plants are supposed to consist of the six following parts, the Root, *Radix*, the Trunk, *Truncus*, the Support, *Fulcra*, the Leaves, *Folia*, the Flowers, *Flores*, and the Fruit, *Fructus*.

The Root, *Radix*,  
Is that part of a plant which is fastened to the ground, or to some other body, from whence it draws its nourishment.

Roots are divided into three sorts, *viz.* fibrous, bulbous, and tuberous.

A fibrous

A fibrous root is composed of many other small roots, which divide at the stalk or trunk, see fig. 1. plate 1. These are sometimes perpendicular, and are called tap roots as at a. f. or horizontal which are called spreading roots as at b. Fleshy, or *Carnose*, see fig. 2. Hairy, *Filamentosa*, which appear like slender threads or hairs, as at c. fig. 1. single at fig. 2. and branching at fig. 1.

Bulbous roots are of the five following sorts,  
 1. Solid, *Solida*, as fig. 3. these are of a thick fleshy solid substance, as is represented at fig. 4. which is cut horizontally through the middle.  
 2. Coated, *Tunicata*, see fig. 5. which are composed of many lamina, or coats, closely surrounding each other as is represented fig. 6. where it is cut through the middle.  
 3. Scaled, *Squamosa*, see fig. 7. these are composed of many fleshy scales lying over each other.  
 4. Double, *Duplicata*, see fig. 8. where there are two solid bulbs joined; these are also called Testiculated roots.  
 5. Clustered, *Aggregata*, see fig. 9. these are also called Granulous roots, having some appearance of grain.

A tuberous root is one that is composed of many fleshy tubers, which swell more than the stalk, see fig. 10. when these adhere closely to the stalk, they are termed *sessilis*, i. e. sitting

sitting close ; or if they are suspended by threads, they are called pendulous, see fig. 11. these are of different figures.

The Trunk, *Tuncus*,

Is that part of a plant which rises immediately from the root, and sustains the branches; this denomination is therefore only given to trees ; and that of stalk to plants.

Stalks are divided into simple or compound.

A Simple Stalk *Caulis Simplex*, is one which arises single from the root, and continues so without interruption to the top. This is also called an intire stalk, *caulis integer*. When the stalk has no leaves or branches, it is called a naked stalk, *caulis nudis*. When it is garnished with leaves, *caulis foliatus*, a leafy stalk. When it is upright, *caule rectus*. Or if it is oblique to the root, *caule obliquus*. When it twines round a support, *caule volubilis*. If it is pliant, *caule flexuosus*. When it reclines to the ground, *caule reclinatus*. If it lies upon the ground, *caule procumbens*. When it puts roots out of the joints which fasten to the ground, *caule repens*, a creeping stalk. When it puts out roots the whole length of the stalks, *sarmentosus*. If the stalks live several years, they are

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are termed, *perennis*, abiding stalks, if but one year, *annuus*, annual. When they are lignous or woody, *fruticosus*, shrubby, or *suffruticosus*, under shrubs. If they are cylindrical, *teres*, or taper. When they have two angles, *anceps*, if three angles, *trigonus*, if many angles, *polygonus*. When a stalk is streaked, *striatus*. If furrowed, *canaculatus*, channelled. When it is smooth, *glaber*. If it is hairy, *villosus*. If rough, *scaber*. And if the hairs are prickly, *hispidus*.

A branching Stalk, *Caulis ramosus*,  
Is one that puts out lateral branches as it ascends. If the branches are irregular and thinly placed, it is called a diffused stalk, *diffusus*. If they are large, *brachiatus*, or limbed. When there are a great number of branches *ramosissimus* very branching. If they have supports *fulcratus*. When they are prolific, *proliferous*.

A compound Stalk, *Caulis compositus*, is one that soon divides into branches; when it is forked, it is called *Dichotomus*, if it has two ranges of branches *districbus*, or when these are again divided *subdivisus*. A straw, *culmus*, is a fistulous stalk garnished with leaves, and is generally terminated by a spike or panicle, as in grasses or corn. If this is intire *integer*; or branched *ramosus*; if uniform *æqualis*, if jointed *articulatus*;

*articulatus*; or scaley *squamosus*, if without leaves *nudus*, or when garnished with leaves, *foliatus*.

The supports *fulcra*, are certain parts of a plant, which serve to sustain or defend the others. These are of the ten following sorts. The *stipula*. The leaf which supports the flowers *bractea*. The tendril or clasper *cirrus* or *capreolus*. The spine *spina*. The thorn *aculeus*. The footstalk of the leaf *petiolus*. The footstalk of the flower or fruit *pedunculus*. The stalk *scapus*. The gland *glandula*. The scale *squama*.

The footstalk which sustains the flower or fruit is called *pedunculus*. If this sustains but one flower or fruit *unicam*. If two *geminam*, if several *plurimam*, and when it supports a great number *numerofam*. When these arise from the root *radicalem*, from the stalk *caulinam*; from the wings of the stalk *alarem*, or from the extremity *terminatricem* or *terminalem*. If they are single *solitariam*, or thinly placed *sparsam*; if in groups *conglobatam*, in clusters *conglomeratam*, if in panicles *paniculatam*, or in roundish bunches *corymbosam*; if in close bunches or bundles *fasciculatam*. When they are in whorles round the stalks *verticillatam*, or in spikes *spicatam*. If in long bunches like grapes *racemosam*, or in form of  
an



an umbrella *umbellatam*, if in form of a head *capitatam*.

The stalk *scapus* is so called when it rises single from the root without branches, and immediately supports the flowers and fructification.

The footstalk of the leaf *petiolus*, is that which sustains the leaf as the *pedunculus* sustains the flower and fruit, and is sometimes called the tail of the leaf.

The tendril *cirrhus* or *capreolus* is a clasper, by which a plant fastens itself to any other body for support.

The *bractea* or floral leaf, is of a different form and colour from the other leaves, and is always situated near the flower, and never appears but with it; so may be termed a floral leaf.

The *stipula* is a scale which forms the future bud, and is situated at the insertions of the leaf.

The thorn *aculeus* is a sharp brittle point, which is so slightly fastened to the plant, as to be taken off without tearing the other parts.

The spine *spina*, is so firmly fastened to the plant, that it cannot be taken off without tearing it.

The

The gland, *glandula*, is a kind of teat which serves for the secretion of the humours.

The scale, *squama*, is generally found in katkins, where they serve as a cover to the stamina and apices of the male flowers; and in some flowers at the bottom of the flower-cup, or under the flowers themselves, in some plants.

Of LEAVES, *Folia*.

I shall not here mention all the varieties of leaves, which are taken notice of by some of the late writers in Botany, but shall only here include their principal or most essential differences; and shall not take the terms from a single difference, but from such as are common to many; for the inserting too great number of terms will burden the memory too much, which will embarrass the learner in the application of them; and if those here mentioned are not sufficient to distinguish every variety, we should endeavour to keep a just medium between the old and new terms, avoiding the two extremes.

When two genera of leaves are combined to form one species, or the species is composed of two genera, which become the parts of the species, these genera being once established, it

will not be difficult to form the species, so as to require no other definition, provided the genera are well defined, and do not burden the memory; as for example,

<i>Cordato-ovatum.</i>	<i>Ovato-cordatum.</i>
<i>Cordato-ovale.</i>	<i>Ovali-cordatum.</i>
<i>Cordato-oblongum.</i>	<i>Oblongo-cordatum.</i>
<i>Cordato-lanceolatum.</i>	<i>Lanceolato-cordatum.</i>
<i>Cordato-sagittatum.</i>	<i>Sagittato-cordatum.</i>
<i>Cordato-hastatum.</i>	<i>Hastato-cordatum.</i>

There must be great care taken in placing the genera either first or last, in the formation of the species, for this is not indifferent; the last denotes the form in which the leaf results, and the first in some measure corrects it, by adding a sort of exception to it; so that by changing their place, it will alter the definition of the leaf. As for example, *Cordato-ovatum*, by this is to be understood a leaf more approaching to an oval. But when it is *Ovato-cordatum*, the leaf is supposed to be more of a heart-shape. But this will be better conceived by their figures hereafter referred to.

Leaves are divided into the three following classes.

1. Single

1. Single leaves.
2. Compound leaves.
3. Determinate leaves.

The 1st class of single leaves. Plate II.

Those leaves are called single, *simplicia*, whose footstalks support but one.

There are seven sorts of single leaves, where we consider a leaf according to its circumferences, *sinus*, its borders, its surface, its summit, and its substance.

The circumference (*circumscriptio*) of a leaf depends upon its border having no *sinus* or angle; therefore we should comprehend in this title all those leaves whose figures are in form of a ring differently compressed, if they have no *sinus* or angles.

1. We call a leaf orbicular or round (*orbiculatum*) whose length and breadth are equal, and whose borders are equally distant from the center, see fig. 1. plate II.

2. A roundish leaf (*subrotundum*) is one whose breadth is greater than the length, see fig. 2. but this term is often used in a more extensive sense.

3. An oval leaf (*ovatum*) is in form of an egg, and is longer than it is broad; and when the base or lower part forms a segment

of a circle, but the upper part draws nearer to a point, see fig. 3.

An obverse oval leaf (*obverse-ovatum*) is one in form of an egg reversed, the same as fig. 3. when the part which is fastened to the footstalk is narrower than the top.

4. An oval or elliptick leaf, is one which is longer than it is broad, and whose upper and lower parts have the same segment of a circle, see fig. 4.

An oblong leaf (*oblongum*) is one whose length is more than twice the breadth, and the two points are narrower than the segment of a circle, see fig. 5.

A wedge-shaped leaf (*cuneiforme*) is one that is shaped like a wedge; the length is much greater than the breadth, and is narrowed from the top to the base, see fig. 45.

The angles of a leaf (*anguli*) are the prominent parts which project from the border of an entire leaf.

An angle is different from a sinus, as it is the projecting part of a leaf, see fig. 20. *e, a, e*, whereas the sinus is the part which is diminished, see fig. 20. *a, e, b*, so the angle exists in the leaf, and the sinus is without the leaf. We must not confound the sides with the angle, as is frequently done. The angle

in a leaf is considered horizontally, fig. 20. *a, b, c*, and the side of a leaf in a perpendicular view, see fig. 58. *a, b, c*.

A Spear-shaped leaf, (*lanceolatum*) is shaped like the point of a spear; it is oblong, and gradually narrowed from the middle to both ends, where it ends in points, see fig. 6.

A linear or narrow leaf (*lineare*) is that which commonly is narrowed toward the two ends, but the sides are parallel its whole length, see fig. 7.

An awl-shaped leaf (*subulatum*) is somewhat like the former on its upper surface, but the under part is thicker in the middle, growing narrower to a point at the top, like the point of an awl, see fig. 8.

A triangular leaf (*triangulare*) is one with three rectangular sides, and three angles, the two lower being even with the base, see fig. 12.

A deltoide leaf (*deltoides*) is one with four angles, the two at the top being at a greater distance from the center than those of the sides, see fig. 58.

A quinqueangular or five cornered leaf (*quinqueangulare*) is one whose sides are strait to the middle and are not broken, see fig. 20. *a, b*, this sometimes happens.

After these differences are once established, it will be easy to figure any other varieties which may arise from the number of angles, which do rarely happen.

A round leaf (*rotundum*) is one that has no angles or indentures, so is different from the preceding, especially the seventh and twelfth.

A sinus divides the disk of the leaf into many parts, at the base, as in fig. 14. and 18. at the top as in fig. 21, 22. at the sides as in 23, 25. the whole length as in fig. 26.

A kidney-shaped leaf (*reniforme*) is that which is shaped like a kidney, it is almost orbicular, but indented at the base without angles, see fig. 9.

A heart-shaped leaf (*cordatum*) is shaped somewhat like an egg, but is indented at the base without angles, see fig. 10.

A moon-shaped leaf (*lunatum*) is somewhat like a half orbicular leaf, but is deeply indented into two curve angles at the base, like a half moon, see fig. 11.

An arrow pointed leaf (*sagittatum*) is a triangular leaf indented at the base like the point of an arrow, see fig. 13.

A heart arrow-pointed leaf (*Cordato-bastatum*) is like the former, but the borders are convex, see fig. 14.

A pike or javelin-shaped leaf (*hastatum*) is a triangular leaf whose sides and base are indented, and the angles are expanded like the point of a halberd, see fig. 15.

A bifid leaf (*bifidum*) is a leaf divided at the top in two parts, whose inferior borders within the division are strait, see fig. 16.

There are some leaves which are divided into three parts (*trifidum*) others into four (*quadrifidum*) some into five (*quinquesfidum*) and others into many (*multifidum*) from the number of these divisions, they are easily known.

A trilobate or three-lobed leaf (*trilobum*) is one that is divided into three lobes to the middle, which are separated from each other, and their borders rounded, see fig. 17.

When the leaves are divided into two lobes (*bilobum*) or four (*quadrilobum*) or five (*quinquelobum*) so from the number of their lobes, they may be easily defined.

A palmated-leaf (*palmatum*) is in form of a hand opened, it is divided into several parts from the top to the middle, or almost to the base, see fig. 22.

A wing-pointed leaf, (*pinmatifidum*) is one which is cut into several lateral sinuses, separat-



ed their whole length like the feathers of a wing, see fig. 23.

A jagged leaf (*laciniatum*) is one that is cut into many sinuses, to the midrib, and the lobes are also cut undeterminately on their borders, see fig. 24.

A sinuated leaf (*sinuatum*) is one that is cut on the borders into sinuses the whole length, which are separated by lobes which are but slightly intended, see fig. 25.

An indented sinuated leaf (*sinuato-dentatum*) is the same with the former, but the lateral lobes are narrower, see fig. 26.

A quinquepartite leaf (*quinquepartitum*) is one that is divided into five parts to the base, see fig. 28.

In changing the number of parts into which the leaf is divided, we may denote their signification, as in two (*bipartitum*) in three (*tripartitum*) in four (*quadripartitum*) and if into many (*multipartitum*).

An entire leaf (*integrum*) is one which has no sinus on its border, and an undivided leaf (*indivisum*) is the same, but *integrum* must be distinguished from *integerrimum*; the first denotes a leaf which has no sinus in its disk, and the second has none on its border.

The margin or border of a leaf (*margo*) denotes

denotes the variety there is seen on the edges of leaves, but these have no relation to their disk, nor are the extremities at the top included in this distinction.

An indented leaf (*dentatum*) is one that has its borders end with horizontal points of the same consistence with the leaves, but are separate and distinct from each other.

A sawed leaf (*ferratum*) is one whose borders are sharply indented like the teeth of a saw, lying one over the other like tiles, and generally point toward the top, see fig. 31. When these indentures point toward the base, it is termed *retrosum ferratum*, *i, e*, sawed backward.

A double sawed leaf (*duplicato ferratum*) is one whose borders are garnished with two sorts of teeth, one small and the other large, see fig. 32. the less upon the greater.

A crenated or notched leaf (*crenatum*) is one whose borders are cut into angles or indentures, which are contiguous and turn inward, without any bend either to the top or the base, see fig. 38. When the notches are pointed, it is termed (*acute crenatum*) see fig. 35. and when they are rounded (*obtusè crenatum*) see fig. 36. and a double crenated leaf,

is one that has small crenatures upon the larger, see fig. 33.

A repanded leaf (*repandedum*) is one whose border is indented the whole length, and the lobes are each a segment of a circle, with obtuse sinuses between them, see fig. 46.

A cartilaginous or gristly leaf (*cartilagineum*) is one whose border is distinguished from the other part of the leaf by a cartilage or membranous fleshy substance, see fig. 34.

A ciliated leaf (*ciliatum*) is one whose border is set round with small parallel hairs, like those of the eye lid, see fig. 50.

A lacerated or torn leaf (*lacerum*) is one whose border is composed of torn segments of different sizes and figures, see fig. 24.

A curled leaf (*crispum*) is one whose border is plaited and fringed like a furbelow, see fig. 39.

A gnawed leaf (*erosum*) is one whose sinus and disk appear as if they were eaten on their borders, see fig. 21.

An entire leaf (*integerrimum*) is one whose border is quite entire without any kind of indenture, see fig. 42.

The superficies of a leaf denotes its surface above and below.

A downy leaf (*tomentosum*) is one whose surface is covered with hairs so small, as not to be distinguished by the naked eye, like cotton cloth, see fig. 48.

A velvet leaf (*pilosum*) is one whose surface is garnished with hairs which are discernable, see fig. 47.

A hairy leaf (*hirsutum*) is very near a-kin to the former, but the hairs are longer.

A stinging leaf (*bispidum*) is one whose surface is covered with rough brittle hairs, which sting the flesh when handled, and are easily broken, see fig. 49.

A rough leaf (*scabrum*) is one whose disk is covered with small inequalities or tubercles.

A bristly leaf (*aculeatum*) is one whose surface has many cartilaginous bristles which easily separate from the leaf.

A prickly leaf (*spinosum*) has its disk or border armed with cartilaginous thorns which adhere closely to the leaf, and cannot be separated without injury to the leaf.

A warted leaf (*papillosum*) is one whose surface is garnished with small protuberances or vesicles, see fig. 54.

A polished leaf (*nitidum*) is one whose surface is smooth, and shining as if polished.

A plaited

A plaited leaf (*plicatum*) is one that is plaited from the base by a sort of vessel or nerve which extends to the border, one being raised, and another depressed alternately, so as that the disk appears in angles, see fig. 37.

A waved leaf (*undulatum*) is that whose outer part of the disk becomes extended beyond a circle of the same diameter, in such a manner that the borders rise and fall like waves, see fig. 46.

A wrinkled leaf (*rugosum*) is one that has deep veins, leaving between them spaces, where the substance of the disk rises like flesh interposing, see fig. 51.

A veined leaf (*venosum*) is one that has branching veins or vessels running thro' it, or appears to have a great number of orifices of veins joined, see fig. 52.

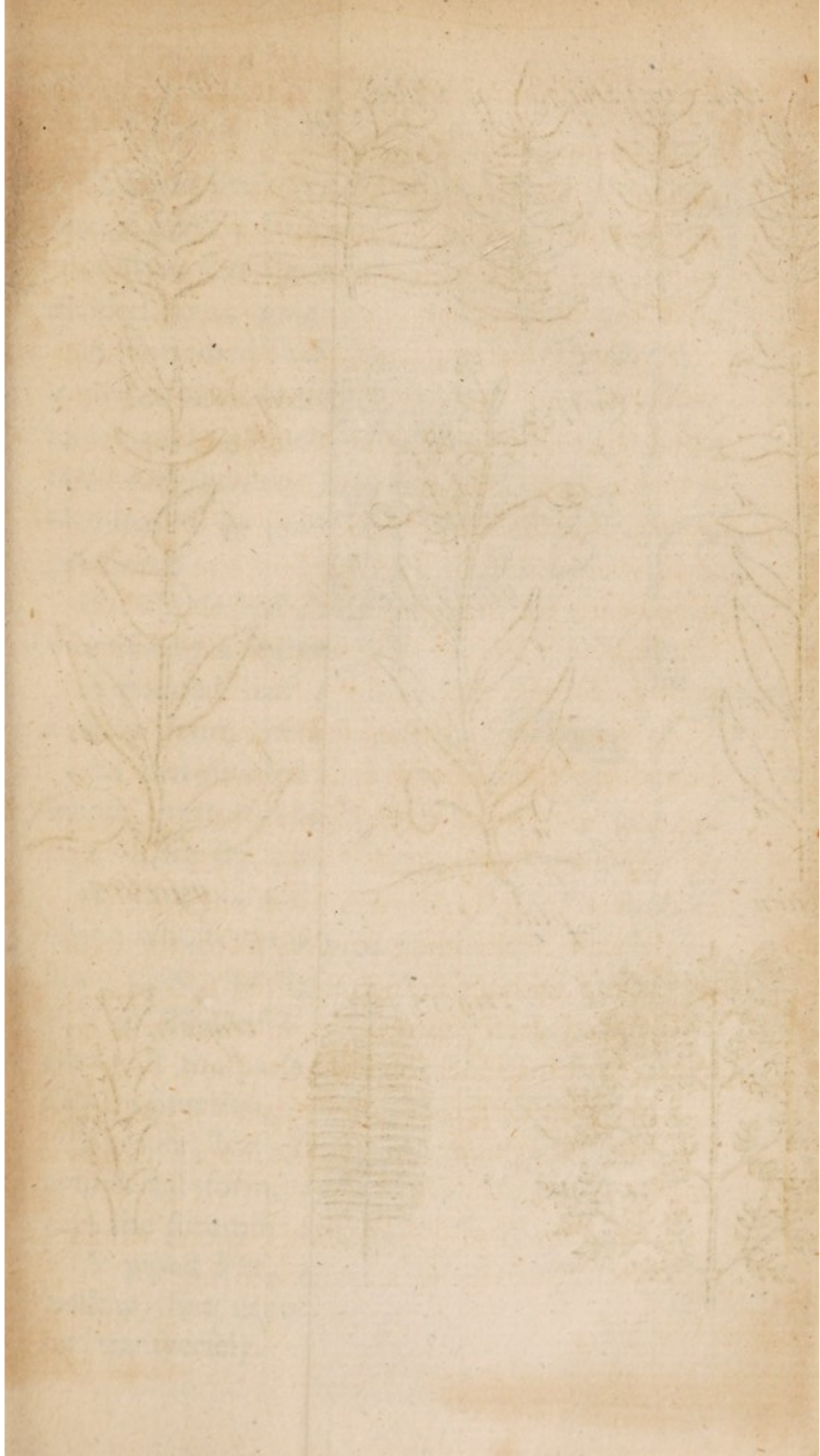
A nerve leaf (*nervosum*) is one that has single veins, extending parallel from the base to the top without branching, see fig. 53.

A naked leaf (*nudum*) is one that has no marks or veins, so is opposite to the former.

The point or top of a leaf (*apex*) represents the diversities there are in the upper extremity.

A truncated leaf (*truncatum*) is one whose top is terminated by a transverse line.

A blunt





A blunt leaf (*retusum*) is one whose top is terminated by a transverse line.

A blunt leaf (*præmorsum*) is one whose top is divided by an open pointed sinus, see fig. 18.

A hollowed leaf (*emarginatum*) is one that is fopewise indented at the top; when it is terminated by blunt summits, it is termed (*obtuse-emarginatum*) see fig. 45. and when it is terminated by pointed summits (*acute-emarginatum*.)

An obtuse leaf (*obtusum*) is one that is terminated by a segment of a circle, see fig. 40.

A pointed leaf (*acutum*) is terminated by a sharp point, see fig. 41.

An awl-pointed leaf (*acuminatum*) is one whose summit is terminated like the point of an awl, see fig. 42.

A blunt-pointed leaf (*obtusum cum acumine*) is one whose top is blunt and terminated by a sharp point, see fig. 43.

The sides of a leaf (*latera*) is perceived when all the parts are considered in a perpendicular situation.

A taper leaf (*teres*) is one that is of a cylindrical form, or shaped like a pillar except the summit, see fig. 62.

A piped leaf, (*tubulosum*) is one that is hollow, but cannot be perceived unless it is cut transversely.

A fleshy



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A fleshy leaf (*carnosum*) is one that is full of pulp, or fleshy substance between the membranes, which form the upper end and lower surface.

A membranaceous leaf (*membranaceum*) is one that the membranes do not inclose any pulp.

A depressed leaf (*depressum*) is one that appears as if it was pressed on the side which regards the stalk.

A compressed leaf (*compressum*) is one that is impressed on the two opposite sides which do not regard the stalk.

A flat or plain leaf (*planum*) is when both the surfaces are level and parallel every where.

A convex leaf (*convexum*) is a depressed leaf raised in the middle above the sides.

A concave leaf (*concauum*) is one that is hollowed in the middle.

A channeled leaf (*canaliculatum*) is one that is channeled or guttered the whole length, see fig. 61.

A sword-shaped leaf (*ensiforme*) is one that is compressed, and edged like a sword on both sides, with a convex middle the whole length.

A sabre-shaped leaf (*acinaciforme*) is a compressed fleshy leaf like the point of a spear, with

one edge convex and narrow, the other broader and raised, and the inner blunt and straiter, see fig. 56.

A hatchet-shaped leaf (*dolabrisforme*) is a compressed suborbicular leaf like a plainer; it is blunt, projecting or swelling outwardly with a sharp edge, and almost cylindrical toward the lower part, see fig. 57.

A tongue-shaped leaf (*linguiforme*) is a depressed linear fleshy leaf, a little convex on the upper side, and has generally cartilaginous borders, see fig. 55.

A three sided leaf (*triquetrum*) is one that has three flat longitudinal sides, but is generally awl-pointed.

A three cornered leaf (*trigonum*) is like the former, but the faces are channeled and the projections are membranous.

### OF COMPOUND LEAVES, Plate III.

Compound leaves are divided into simple and decomposed.

A compound leaf is composed of several small leaves united together upon the same common footstalk, which is but one compound leaf.

A leaf

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A leaf is called (*folium*) but when it is composed of many small leaves, it is called (*foliolum*) these form a compound leaf.

A compound leaf when properly understood, is one which is produced from a single composition.

A fingered or handed leaf (*digitatum*) is one composed of several small leaves sitting on the top of a common footstalk, but in a strict sense it should be composed of more than four small leaves, see fig. 1.

A trifoliate leaf (*ternatum*) is one composed of three small leaves standing upon one common footstalk, see fig. 2. when these have no proper footstalk, it is termed (*foliolis sessilibus*) but when each has a proper footstalk (*foliolis petiolatis.*)

When a leaf is composed of two lobes (*binatum*) these sit upon a common footstalk, see fig. 3.

When it has many small leaves branching upon a common footstalk, it is called a branching leaf (*ramulosum*) see fig. 4.

A winged leaf (*pinnatum*) is composed of many small leaves, ranged along on each side the common footstalk like wings; but as these are ranged in different manners, so they have different appellations, *viz.*

When

When it is terminated by a single lobe or little leaf, it is an unequal winged leaf, (*imparipinnatum*) see fig. 5. when it is not terminated by a small leaf or tendril, it is called an abrupt winged leaf (*abruptum*), see fig. 6.

When the small leaves are placed opposite on the footstalk, as in fig. 6. it is called an opposite winged leaf; but when they are placed alternately, it is called an alternate winged leaf.

When the small leaves are alternately unequal, as in fig. 7. it is called an interrupt winged leaf.

If it has clasps or tendrils by which it fastens to any other body or support, it is called a (*cirrhus*) winged leaf, see fig. 8.

When the small leaves have borders running along the footstalk from one to the other, as in fig. 9. it is called a running winged leaf (*decurrentibus*).

When the footstalks have a jointed membrane between the small leaves, as in fig. 10. they are termed membranaceous footstalks.

When the leaf is composed of one pair of little leaves placed opposite, as in fig. 11. it is called a conjugated leaf.

A lyre shaped leaf (*lyratum*) is one leaf whose lower part is cut in such manner, as if

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the segments at the base were separated from the body of the leaf, and detached from those on the top, see fig. 12.

A double winged leaf (*duplicato-pinnatum*) or (*pinnato-pinnatum*) is a leaf composed of leaves, which were composed before of wings, see fig. 13.

A decomposite leaf (*decomposita*) is that whose common footstalk divides twice before it is garnished with leaves, as in fig. 23, and 24. this is also called a doubly winged leaf, (*duplicato-pinnatum*).

A supradecomposite leaf is one whose common footstalk divides several times before it is garnished with small leaves, see fig. 19 and 22.

A double trifoliate leaf, (*duplicato-ternatum*) is one which is composed of two orders of trefoil leaves, and when the common footstalk is divided into three, each sustaining three leaves, it is called a triplicate trefoil leaf (*triplicato-ternatum*) see fig. 15.

Of the determination of leaves.

The determination of leaves consists in this difference, *viz.* that a leaf is distinguished without any regard to it's structure or form; this is divided into four orders, which consist in the

the direction, the place, the insertion, and the situation.

I. The direction, see fig. 16. is the expansion which the leaf acquires from the bottom to the top. If it is arched (*inflexum*), that is, when it returns toward the footstalk as at *a, a*; when it is upright (*erectum*), that is if it makes an acute angle with the footstalk, see *b, b*. If it spreads open, or stands almost in a right angle with the perpendicular *c, c*, it is called (*patens*); when it is horizontal, that is, when its makes a right angle with the perpendicular, as at *d, d*, (*horizontale*); when the leaf is reclinated, or the summit is turned so that it is lower than the base (*reclinatum*), as at *e, e*; when it is turned back or rolled as at *f, f*, (*revolutum*), or a revolved leaf.

When a leaf puts out a radicle from its top, as some of the ferns do, it is called *radicans*; if it puts out roots from its under surface, *radicatum*, and if they float on the waters, *natans*.

II. The place, see fig. 17. this is determined by the place where it is fastened to the plant, the seed leaf (*seminale*) *a, a*, is that which is first put out from the seed, and is often called *Cotyledon*.

A radicle leaf (*radicale*) is one which rises from the root, and is not fastened to the stalk, *b*, those leaves which are fastened to the stalk (*caulinum*) *c, c, c*, those which sit on the branches (*ramosum*) *d, d*, those which are under the ramifications or wings of the stalk, (*subulare*) *e, e*, and the floral leaf (*florale*) is always situated near the flower.

III. The insertion is the manner in which a leaf is fastened to the plant, see fig. 18.

A Buckler or shield shaped leaf (*peltatum*) is one whose footstalk is fastened to its disk, and not to the base or border *a*.

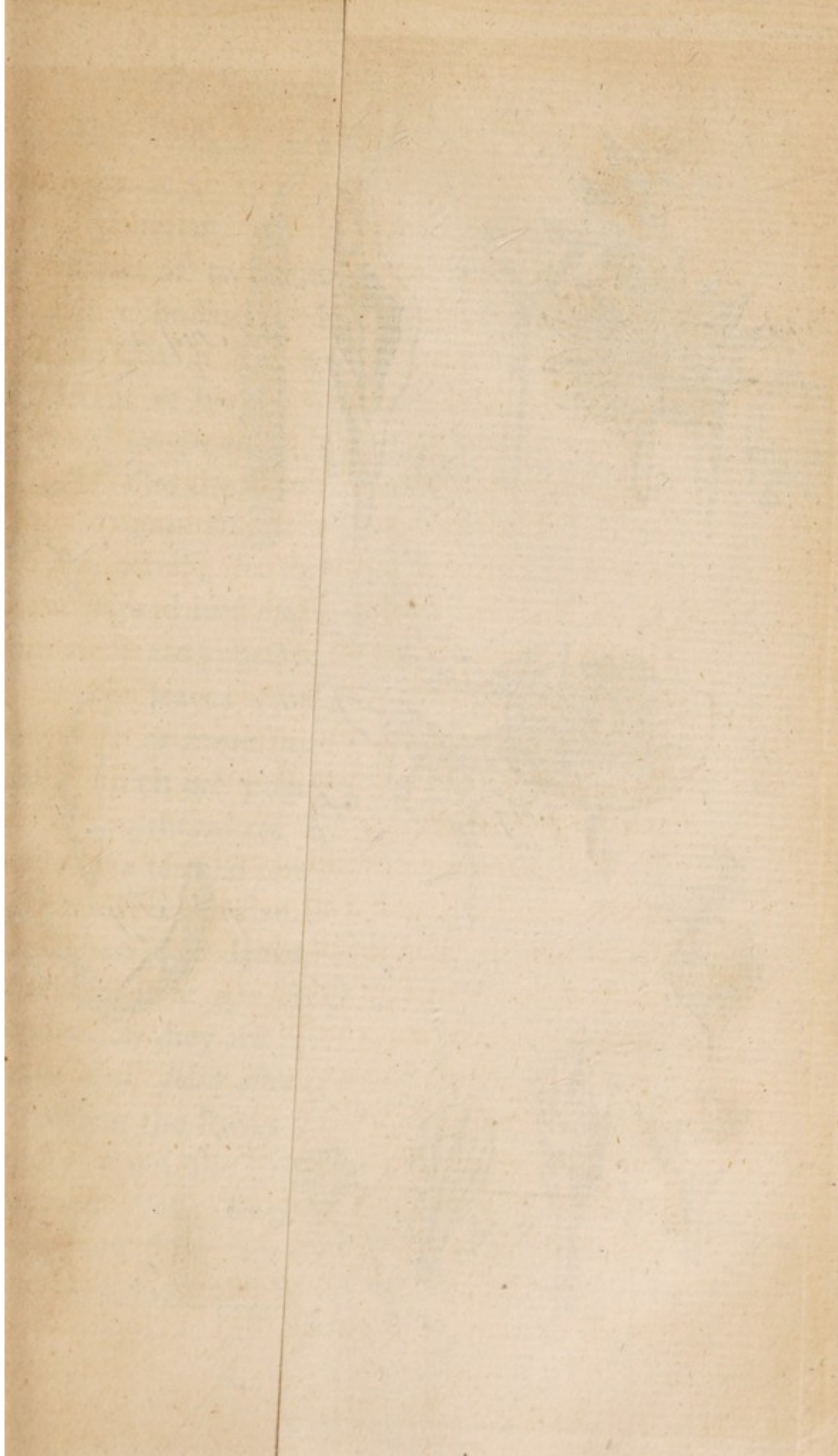
When the leaf has a footstalk at its base by which it is fastened to the plant as at *b*, it is called *petiolatum*.

If it is fastened to the branch without a footstalk as at *c*, (*sessile*) fitting close.

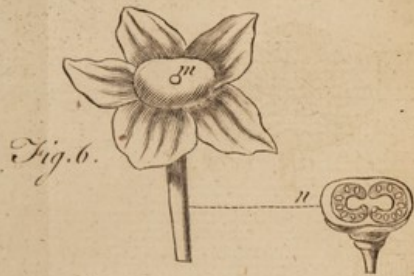
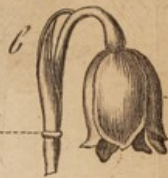
When the base of the leaf is fastened by a membrane running along the stalk as at *d*, *decurrens*. When the base of the leaf extends so as to embrace the stalk quite round as at *e*, *amplexicaule*.

But when the lobes of the base are too short for to wholly embrace the stalk, it is termed *semiamplexicaule*, half embracing.

A perfoliate leaf (*perfoliatum*) is one whose disk surrounds the stalk, the branch, or the footstalk







footstalk without any of the borders adhering to it, as at *f*.

A coherent leaf (*folia connata*) is where the base of two opposite leaves unite, and appear to be but one leaf, see *a*, when the base of the leaf is like a cylinder, and surrounds the stalk or branch like a sheath as at *b*, it is termed (*vaginans*).

IV. The situation of the leaves (*situs*) depends upon the position of each with regard to the others, see fig. 21.

A jointed leaf (*folia articulata*) is one whose summits are joined to the other, see fig. 20.

Starry leaves (*folia stellata*) are such as have six or more small leaves surrounding the stalk which are pointed like stars as at *a*.

When there are but three of these leaves, they are termed *ternata*; when four as at *b*, *quaterna*; when five, *quina*, &c.

When two leaves are placed opposite on the stalk as at *c*, *c*, it is termed (*folia opposita*) and when they are ranged one above the other as at *d*, *d*, *folia alternata*, alternate leaves.

When the leaves are situated loosely without order upon the branches as at *e*, they are termed (*folia sparsa*), scattered leaves.

When there are many leaves set upon a common footstalk, which are so closely placed

as that their situation cannot be easily discovered, they are termed (*conferta*) clustered, as at letter *f*.

When they are ranged like the tiles of a house, or scales of fish, *imbricata*, as at *g*.

But when the leaves are placed in clusters, proceeding from the same point as at *b*, *fasciculata*, clustered or bundled leaves.

#### Of the parts of the fructification.

These parts are either general or particular, the general are two, *viz.* the flower and the fruit. The particular are subdivided into the eight following parts, *viz.* the empalement or cup (*calyce*), the flower-leaves, or petals, (*corolla*), the stamina, (*filamenta*), the summits (*anthera*), the pointal or style (*stylus*), the pericarpium or fleshy substance which surrounds the seeds, the seed (*semina*), and the receptacle or placenta. The five first belong to the flower, and the three last to the fruit.

#### The parts of the flower, plate IV.

I. The cup of the flower (*calyx*) is that which incloses or sustains the other parts; these are divided into the seven following sorts, the *perianthium*, the *involucrum*, the *spatha*, *gluma*, *amentum* or *julus*, *calyptra*, and *volva*.

The

The *perianthium* is the most common sort of flower cup; it is often composed of many parts, or when it is of one part or piece, it is divided or cut half way into more or less parts, this always surrounds the flower.

The *involucrum* or outer cover embraces many flowers, which are collected together and have each their proper *perianthium*. They are disposed in form of rays, and are sometimes coloured, see fig. 1. *a, a, a*. This is often met with in the second order of *Linnaeus's* fifth class.

The *spatha* or sheath is a particular sort of cover to one or several flowers, which seldom are provided with any particular *perianthium*, it consists of a membrane fastened to the stalk, and is of different figures and consistence, see fig. 2. *b, b, b*.

It is sometimes composed of two pieces, as at fig. 2. *c, c*, this often occurs in *Linnaeus's* I. III. VI. and XX. class.

*Gluma* or chaff, is a sort of cover only belonging to the corns and grasses, these are composed of two or three membranaceous valves, as at fig. 3. *d, d*, which are often transparent on their borders.

A *julus* or katkin (*amentum*) is a mass of male or female flowers fastened to an axis in

form of a rope, being covered with small scales which serve for calyces, see fig. 4. these occur frequently in *Linnaeus's* twenty first class.

The coif (*calyptra*) is a thin membranaceous cover of a conick form, which covers the parts of fructification, and is often met with in many kinds of moss on the top of the flowers.

The purse (*volva*) is a thick sort of covering which incloses several of the mushroom tribe, and opens lengthways to let them out.

II. The petal or flower leaf (*corolla*) is that which immediately surrounds the parts of generation; there are two sorts of these, the petal and the nectarium. When it is of one piece, it is called (*monopetalous*) and when it is of many pieces, *polypetalous*.

The flower leaf, or petal, is generally distinguished by the beauty of its colour, see *e, e, e*, fig. 5. When this is of one piece, it is distinguished by the tube (*tubus*) *b*, and the limb or border (*limbus*) *g*, when the flower is of many petals, each are distinguished by their tail (*unguis*) *l*, and the blade (*lamina*) *i*.

The nectarium is that part of the corolla, which is destined to contain the honey or sweet juice of the flower, and is of different figures,

figures, as a tube, a scale, a pimple, or tubercle, see *f, f, f*, fig. 5.

A floret (*corollula tabulata*) consists of one piece formed in a kind of tube or bell shape, cut at the top into four or five parts which open and turn backward, see fig. 9.

A half floret (*corollula ligulata*) consists of a flat narrow limb or tail turning outward, whose summit is either entire or indented in three or five points, see fig. 10.

III. The stamen is the male part of generation in flowers, and is composed of two parts, the filament and the summit.

The filament (*filamentum*) serves to sustain the summit or apex, this is sometimes in form of a thread, and at others it is awl-shaped.

The summit (*anthera*), or apex, is the essential part of the stamina, or the male organ of generation; it consists of a little bag of one or more cavities, which is commonly fastened to the point of the filament, and contains the male farina.

IV. The pistillum (*pistillum*) includes the female parts of generation in flowers, which is composed of the germ (*germen*), the style (*stylus*), and the stigma.

The germ incloses and defends the embryos of the seeds, and is properly the matrix of the plants. The

The style fits upon the germ and sustains the stigma, but there are some flowers which have no style.

The stigma is the female organ of generation, and is of different figures, it is generally situated upon the extremity of the style, and when there is no style it fits upon the germ.

### The Parts of Fruit.

The (*pericarpium*) is formed of the germ which enlarges and incloses the seeds, see *m, n*, fig. 6. it is divided into eight species, the capsule, the shell, the pod, the husk, the nut, the apple, the berry, and the cone.

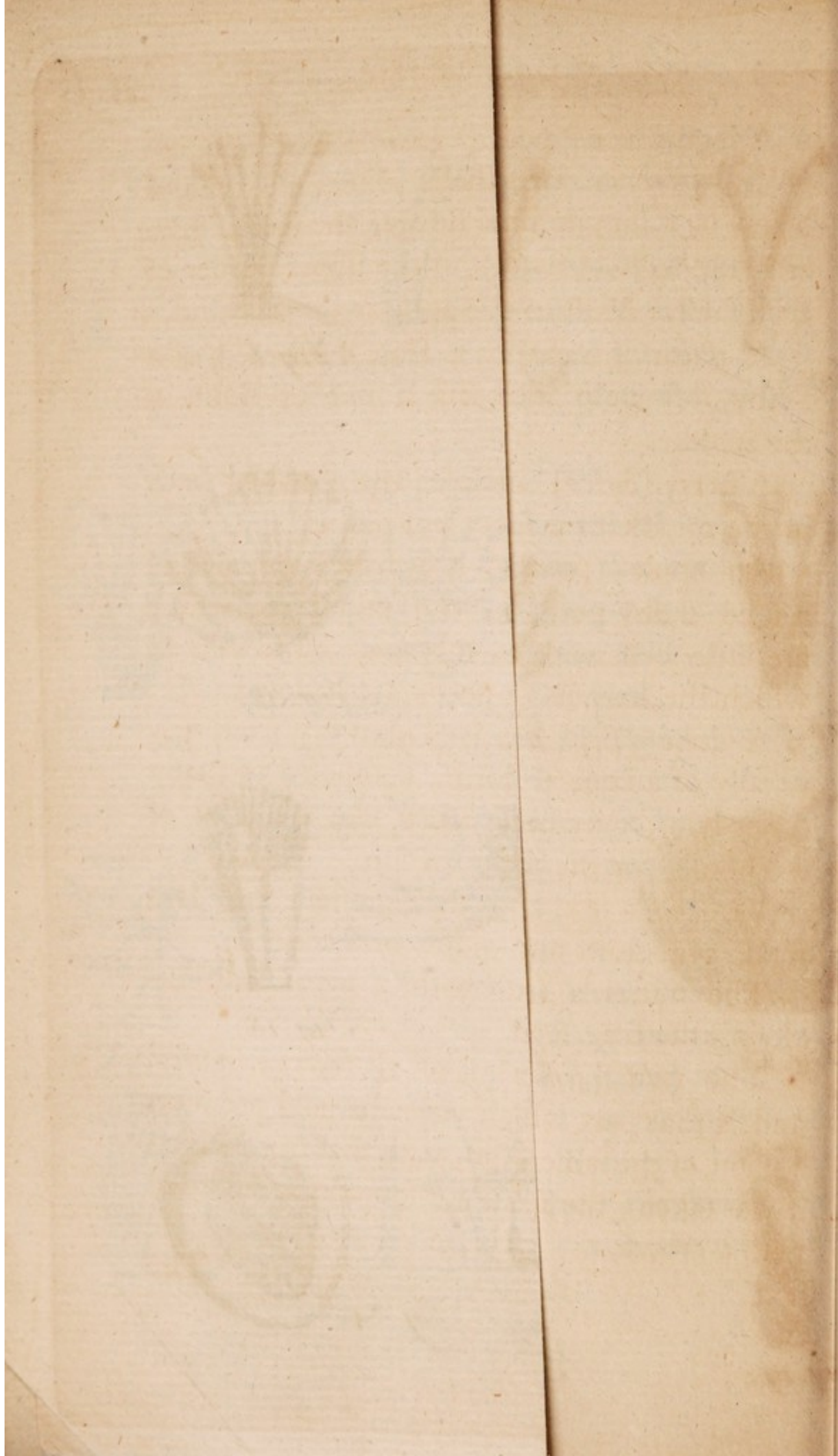
The capsule is composed of many dry elastic cells, which when the seeds are ripe generally open at the top; when it has but one cell, it is called *unilocularis*, if two *bilocularis*, or if several *multilocularis*.

The shell (*conceptaculum*) is different from a capsule of one cell, in the cover being softer and not so rough, opening lengthways on one side, and the seeds are not fastened to it.

The pod (*siliqua*) fig. 7. is composed of two lids, *o, o*, which open from the base toward the point, separated by a diaphragm or membranous partition, to which the seeds are fastened by an umbilical cord.







A leguminous pod (*legumen*) fig. 8. is an oblong cover of two shells joined above and below by a longitudinal future, the seeds, *q, q,* are fastened alternately to the upper border of each shell. Most of the pulse are of this kind.

A plum (*drupa*) is a fruit composed of a fleshy soft pulp inclosing a nut or stone in the middle.

A berry (*bacca*) incloses many naked seeds in the middle of a succulent pulp.

An apple (*pomum*) is a fruit composed of a solid fleshy pulp, in the middle of which are little cells with membranaceous covers in which the kernels or seeds are inclosed.

A cone (*strobilus*) is a hard dry fruit, generally of a conical form, composed of many scales lying over each other like the tiles of an house, or the scales of fish.

VI. Seeds are also distinguished into two sorts, *viz.* nuts and grains or seeds.

The nut is a fruit with a hard shell, inclosing the true seed.

The seed (*semen*) is of all sorts of figures, and is that part which vegetates and produces a plant of the same kind, with that from which it was taken; the seeds are sometimes adorned with a crown.

The

The crown (*corona*) is either simple as at fig. 11. *t*, or tufted, as at fig. 10 and 11. *x*, *z*, *u*. When the down or tuft fits close upon the seed, without any footstalk, or support as at *u*, it is termed (*sessilis*); but if it has supports, as at *r*, *x*, *s*, *z*, (*stipite insidens*), each of these tufts are again divided into simple and branching, the simple, *u*, *x*, is composed of single rays; and the branching, *u*, *x*, fig. 10 and 11, of bearded or feathered plumes.

The receptacle (*receptaculum*) is the placenta upon which is placed the flower, or fruit, or both together, and is of different figures.

#### AN EXPLANATION OF THE CLASSES.

##### Plate V.

Plants have flowers visible or almost invisible, the visible flowers are either hermaphrodite, that is to say, they are each furnished with stamina and pointals; or of one sex, either all male, when they have only stamina and no pointals, or all female, when they have pointals without stamina.

The stamina are either detached from each other, or united together by one of their parts, as also sometimes with the pointal.

The

The stamina are not of equal length, or there are constantly a certain number which are shorter than the rest.

The classes of plants which are established upon the principles of the sexes, are distinguished according to the number, proportion, and the situation of the stamina in their flowers.

The plants which have hermaphrodite flowers.

- Fig. 1. (*Monandria*) with one stamen.
- Fig. 2. (*Diandria*) two stamina.
- Fig. 3. (*Triandria*) three stamina.
- Fig. 4. (*Tetrandria*) four stamina.
- Fig. 5. (*Pentandria*) five stamina.
- Fig. 6. (*Hexandria*) six stamina.
- Fig. 7. (*Heptandria*) seven stamina.
- Fig. 8. (*Octandria*) eight stamina.
- Fig. 9. (*Enneandria*) nine stamina.
- Fig. 10. (*Decandria*) ten stamina.
- Fig. 11. (*Dodecandria*) twelve stamina.
- Fig. 12. (*Icosandria*) when there are more than twelve, and these are fastened to the interior part of the flower cup, and not to the receptaculum.
- Fig. 13. (*Polyandria*) when there are more than twelve, which are fastened to the receptaculum.

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The plants whose flowers have two stamina shorter than the other, are distinguished in the following manner.

Fig. 14. (*Didynamia*) these flowers have two long and two shorter stamina.

Fig. 15. (*Tetradynamia*) these flowers have four long and two shorter stamina.

Those plants whose flowers have their stamina united together, or with the pointal, are distinguished in the following manner.

Fig. 16. (*Monadelphica*) these have all their stamina united by their tails into one body.

Fig. 17. (*Diadelphica*) These have all their stamina united by their tails into two bodies.

Fig. 18. (*Polyadelphica*) these have all their stamina united by their tails into three or more bodies.

Fig. 19. (*Syngenesia*) these have all their stamina united by their summits in form of a cylinder.

Fig. 20. (*Gynandria*) the stamina of these fit upon the pointal, and not upon the receptaculum.

Those plants whose flowers are of different sexes are thus distinguished.

Fig. 21. (*Monœcia*) the plants of this class have male and female flowers upon the same individual.

Fig. 22. (*Diœcia*) these have male and female flowers upon different plants.

Fig. 23. (*Polygamia*) these have hermaphrodite flowers, with flowers of one sex, either male or female upon the same individual.

Those plants whose flowers are inclosed in the fruit, or are so small as not to be seen by the naked eye, are included in the 24th class, intituled *Cryptogamia*, see Fig. 24.

#### AN EXPLANATION OF THE ORDERS.

The orders or subdivisions of the classes are established upon the pointals, as the classes are upon the stamina, the number of pointals taken to the base of the style, and when there is no style, the stigmas are counted.

The orders of the 13 first classes are,

1. (*Monogynia*) flowers with one pointal.
2. (*Digynia*) those with two pointals.
3. (*Trigynia*) with three pointals.
4. (*Tetragynia*) with four, &c.

When the flower has a great number of pointals, *Polygynia*.

The 14th Class (*Didynamia*) is divided into the two following orders.

1. (*Gymnospermia*) these have four naked seeds succeeding each flower sitting in the cup.
2. (*Angiospermia*) the seeds of these are inclosed in a cover.

The 15th class, (*Tetradynamia*) is also divided into two orders.

1. (*Siliculosa*) short poded, the *pericarpium* or cover is suborbicular, and garnished with a style of the same length.
2. (*Siliquosa*) long poded, the *pericarpium* of this is long, with a style scarcely seen.

The 19th class (*Syngenesia*) is divided into the five following orders.

(*Polygamia*) is a flower composed of many florets.

1. (*Polygamia æqualis*) is a flower composed of hermaphrodite florets, in the disk and the circumference.
2. (*Polygamia superflua*) the flowers of this order are composed of hermaphrodite florets in the disk, and of female in their circumference.
3. (*Polygamia frustranea*) have flowers composed of hermaphrodite florets in the disk, and of neutral in their circumference.

4. (*Polygamia necessaria*) the flowers of this order are composed of male florets in their disk, and of female in their circumference.

5. (*Monogamia*) is a flower which is composed of simple florets.

The sixteenth class (*Monodelphia*), the seventeenth (*Diadelphia*), the eighteenth (*Polyadelphia*), the twentieth (*Gynandria*), the twenty-first (*Monoœcia*), the twenty-second (*Dioœcia*), and the twenty-third (*Polygamia*), establish their orders upon the classical characters of those of the preceding classes.

The last class (*Cryptogamia*), in short is divided into as many orders, as the families which compose it.





