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AUTHOR OF THE
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LECTURES ON BOTANY,

AS DELIVERED TO HIS PUPILS,

BY

WILLIAM CURTIS, F.L.S.

AUTHOR OF THE

FLORA LONDINENSIS, BOTANICAL MAGAZINE, &c. &c.

Part of which were published several Years since,

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INTRODUCTORY

L E C T U R E.

SECTION I.

GENTLEMEN,

THE season of the year seems now to invite you to the pursuit of Botany; a science which, if not essentially necessary to you in the line of any particular profession, is at least deserving some share of your attention as men, as rational beings.

Of all the studies which engage mankind, few are attended with circumstances equally pleasing in their pursuit, few can boast that infinite variety of objects which are perpe-

tually engaging the attention, few that are so conducive to the health of the student.

The Botanist neither breathes the putrid air of the dissecting room, nor inhales the noxious effluvia of the laboratory ; but, as he freely ranges the fields, all that is sweet to the smell, all that can charm the eye or ear, bursts forth on every side and crowds upon his senses.

It is a science which has been cultivated by the wisest of mankind, and particularly by the most distinguished professors of the medical art. Here, as philosophers we may admire and contemplate the beautiful works of an Almighty Being :—what an infinite display of wisdom is observable in the manner in which plants grow and are propagated !—what care is taken in perpetuating the succession of each species !—how admirably are they adapted to every soil and situation, so as to leave no part of the globe, not even rocks

and stones uncovered!—with what regular order, and in what constant succession, do they flower and produce their seeds!—in short, a mind that is of an inquisitive or contemplative turn, will find in plants an endless source of innocent and instructive amusement. Another world as it were opens to his view; he sees the face of nature with different optics; and has the superior pleasure of being able to read in that book which to the generality of mankind is a mere blank.

It has been the opinion of many, that the benevolent Author of nature has given to each country plants proper for the cure of diseases peculiar to its inhabitants, and many good reasons may be brought in support of that opinion. We are not to expect however that every plant possesses medical qualities. Many no doubt were intended solely as food for the various animals, for clothing, and other wise purposes in the economy of nature; but this should not prevent us from

attempting to discover the qualities of plants which may happily prove antidotes to diseases, as yet the *opprobria medicorum*. What heart-felt satisfaction must attend the person who should discover a specific for cancers, or any other dreadful disease. It were to be wished that the faculty were as eager after discoveries of this kind, as chemists were formerly in the search after the philosopher's stone: the prospect of success is perhaps more promising, the attempt at least is much more laudable.

The importance of this science as a branch of medical knowledge, is happily expressed by the late ingenious Dr. GREGORY, the ornament of his profession, and I may add, of human nature, in his advice to the young physician: he thus expressed himself on this subject; “ The science of Botany is subservient to the practice of physic, as far as it facilitates the knowledge of plants, by reducing them into the most commodious and perfect

system; and though it is not necessary to be particularly acquainted with the name and history of every plant, yet every one ought to be so well founded in the principles of Botany, as to be able to find its place in the system, and to describe it scientifically; and we ought to be particularly acquainted with every material circumstance relative to those plants which are used in diet or medicine."

Yet, notwithstanding the acknowledged utility of this science, notwithstanding professors of medicine are warm in its recommendation, it is much to be regretted that gentlemen of the faculty are so little acquainted with it practically: even in the country, where plants obtrude themselves on the notice of the most common observer, how few are there who know with certainty the plants they use.

I have been most credibly informed, that when Dr. WITHERING, a gentleman distin-

guished not less for his medical than his botanical skill, went to reside at Birmingham, he found some of the medical people there making an extract from the cow-parisley instead of hemlock; and it is much to be feared, that mistakes of this sort frequently frustrate the well-meant endeavours of the physician.

Although newly-discovered chemical remedies and foreign drugs may have justly superseded many of our English plants, yet a great number are still retained in our Pharmacopœia: to be acquainted with these at least is the duty of every one that takes upon himself the important character of guardian of the health of mankind.

I cannot better illustrate how necessary a knowledge of plants is, particularly to medical gentlemen resident in the country, than by reciting an extract from a letter which I received some few years since from Mr. LOWE, surgeon at Preston in Lancashire, a gentleman who had formerly been my pupil.

“ On Thursday the 5th of June, Mr. FRECKLETON, a healthy strong man about thirty-five years of age, a publican in the town, eat a handful of fool’s-parsley with nearly the same quantity of young lettuce, about one o’clock at noon ; in about ten minutes he was affected with a pain and hardness in his stomach and bowels, attended with a rumbling ; he walked out into the fields, but was seized with such languor, weariness and weakness, that it was with difficulty he supported himself till he got home ; he was much troubled with giddiness in his head, his vision was confused, and sometimes objects appeared double : at seven o’clock he took an emetic, which brought up, as he supposes, all the fool’s-parsley he had eaten, but not any of the lettuce ; this considerably relieved him from the uneasy sensations in his bowels, but the other symptoms continued, and he passed a restless night. Next day he had much pain in his head and eyes, which last were inflamed and blood-

shot: he had different circumscribed swellings in his face, which were painful and inflamed, but they were transient, and flew from place to place; this night he took a powder which made him sweat profusely. On Saturday his eyes were highly inflamed, painful, and entirely closed by the surrounding inflammation; this day he was bled, which gave him much ease in his head and eyes. From this time until Monday he continued to get better; but had, even then, pain, heat, and inflammation in his eyes, with œdematous swellings of his cheeks; his remaining symptoms went off gradually, and he is now well. He had been told that the plant which he had eaten was hemlock; to be satisfied, I accompanied him into the garden where he had gathered the plant, and found it to be the *æthusa cynapium*, or fool's-parley. To be convinced of this beyond a doubt, I compared a specimen of it with the figure and description of the plant given in the *Flora Londinensis*, with which I found it exactly to correspond."

Independent of the singular satisfaction which Mr. LOWE must feel from knowing the plant in question, an advantage has arisen to the public; the poisonous quality of the fool's-parley is ascertained, which before was only suspected. Time, and a taste for science which of late years has made such rapid advances and such material improvements in every branch of medicine; which has introduced a rational practice, founded on an intimate knowledge of the animal economy, and an accurate history of diseases; which has rescued surgery from the hand of pretenders, and taught mankind to repose a confidence in those only who have laudably exerted themselves in acquiring anatomical knowledge; which has redeemed chemistry from empirics, and made it subservient to the practice of physic, will, it is presumed in a few years, place Botany in a more favourable point of view, and cause its utility in medicine to be more generally acknowledged.

But it is not to medicine alone that Botany is subservient; perhaps it may be applied with as much advantage to Agriculture; a science which, in this enlightened age, when arts and sciences are carried to a pitch unthought of in former times, we might expect that a nation celebrated not less for its arts than its arms, should be among the first to promote, as improvements in it are the only solid check to the baneful and enervating effects of luxury and dissipation: accordingly we find many of our nobility, gentlemen of landed property, and public societies, fully aware of its importance; and endeavouring, by premiums, and a variety of other means, to improve it. Much however still remains to be done, nor is it probable that their endeavours will be crowned with success until Botany is more cultivated; nor until plants, particularly the grasses, are better understood.

I am inclined to suppose, that this inattention of the faculty and others to Botany, has

proceeded in a great measure from a want of opportunity to acquire it; and that, if the same means were afforded as for other sciences, there would no longer be cause of complaint or censure.

I shall esteem myself most happy if, by the institution of these lectures, I should prove in the least degree instrumental to its advancement: but conscious how inadequate my abilities are, fully to answer your expectations, I enter on the office with diffidence, trusting that you will receive my well-meant attempt with candour and good nature.

To contribute to this desirable end, my labour and my small abilities shall most readily be devoted; much however will depend on your own diligence. To set you in the right path, and to accompany you a little way on your journey, will be to me a very pleasing task; and all, I presume, which you can expect from any preceptor. To arrive at

perfection in this most agreeable science, must be the effect of your own industry and application.

Botany, or the science which teaches us to distinguish one plant from another, is of very great, nay almost infinite, extent. To know every plant which grows on the surface of the earth, is altogether impossible : to know perfectly the native plants of our own country, with all those which have at different periods been introduced into our gardens from foreign parts, would, I am confident, occupy the whole of a man's life, let his taste for the science, or his application to it, be ever so great. Seeing then that a complete knowledge of plants is not to be attained, let us endeavour to direct our attention to that part of it which it is in our power to acquire; and which, when acquired, will be of the greatest advantage to us.

Botanists may be divided into two kinds ;

the theoretic and the practical. By the practical Botanist is to be understood, one who is capable of naming a plant at sight, but is unacquainted with the names of the several parts which compose it, and incapable of finding it out in any systematic arrangement. Such are the generality of simplers who acquire their knowledge traditionally, or from figures, and may be compared to persons who cannot read.

The theoretic Botanist is one who may be well acquainted with the several parts which compose a plant; may know the names by which each part is distinguished, and can assign to them their several uses; is well versed in the history of the science, and the various systems that have been published; perhaps a perfect judge of their several merits and defects, yet at the same time possesses very little practical knowledge of the plants themselves. Botanists of this sort however are few in number, and chiefly to be found

amongst men of sedentary lives; who are more fond of study than of active employment, of books than herbarizing.

It must be obvious that these two must unite to form the scientific and useful Botanist; and as the practical part should be ingrafted on the theoretic, so one grand object with you should be to acquire a knowledge of some system, as the key which will unlock to you the whole treasures of the vegetable kingdom. But, before you can with propriety enter on this part of the subject, it will be necessary for you to be acquainted with the several parts of which a plant is composed, beginning with the root, and tracing them up to the seed. While you are acquiring this knowledge, which we shall endeavour to impart to you in our ensuing lectures, the practical part must not be neglected: and here, in the first place, the plants of our own country seem to demand your particular attention. For these, you

should not let slip opportunities of herbarizing excursions; of the plants collected in which, by the assistance of the outlines of Botany in general, you will soon be able to place each specimen in its proper place, and raise a systematic memorandum to your future assistance.

Now in order to attain a knowledge of the structure of the several parts of the flower and fruit, you cannot dissect and examine too many different kinds; and to obtain a knowledge of those plants whose names you may acquire, it is necessary you should either dry or preserve them, as an anatomist would his anatomical preparations, or that you make drawings or take impressions of them. For it is scarcely possible for the best memory to retain the name of a plant by once hearing it; but by having a dried specimen of the plant, a drawing, or impression of it, with the name affixed, by turning these over now and then, a knowledge of them is kept fresh in the memory.

As the drawing of plants requires not only a particular genius, but will take up a great deal more time than falls to the lot of most students, so it is not to be generally recommended. Yet, where a Botanist has time and abilities, he will find the drawing of plants not only an agreeable amusement, but that the attention necessarily paid to the plants in drawing of them, will strongly fix a knowledge of them in the memory.

The taking of impressions from the plants themselves is perhaps worthy of more attention than has been paid to it, as by this means a likeness of almost any plant may be obtained in a few minutes; and such a likeness as will ever after serve to give an idea of the original still more completely if it be coloured from nature, though in a rude manner. To succeed in this, procure from a letter-press printer two balls, similar to those which they make use of in printing, with this difference, that they should be

covered with a white sheep-skin, such as is used for making gloves of, or spreading plasters on ; or in lieu of these, two pieces of soft leather, with tow or wool tied up in them, may be substituted ; a small quantity of printer's ink may be had at the letter-press or copper-plate printer's ; or a mixture of ivory black well ground with boiled linseed oil, about the size of a hazel nut, is to be put on one of them ; the two balls are then to be dabbed together until the ink is very thinly and evenly distributed over both surfaces.

The specimen, which ought to be expressive of the habit of the plant, and to have been the preceding day expanded and lightly pressed between the leaves of a book, is then to be placed evenly on one of the balls, and repeatedly dabbed with the other. If the plant be very large, it will be necessary to cut it into two or more pieces ; the uppermost ball is then to be dabbed several times on the plant till the fibres of the leaves and

the stalk become visibly black. The plant is then to be taken off the lowermost ball, and laid on one side of a sheet of thick writing paper, the other side of the paper being laid over it, the leaves and the stalks are to be pressed and rubbed over with the palm of the hand, or ball of the thumb pretty hard, but not so hard as to squeeze out the juices of the plant; taking particular care that the plant is not moved during the operation, which is very likely to happen. Thus an impression of each side of the plant may be obtained; of which the underside, as being the most fibrous, is generally the most beautiful. Particular care should also be taken that too much ink be not applied, as it will have a very disagreeable effect both in the plain impression and in the coloured one. Those who would wish that the flowers should appear distinct and perfect, should take them off the plant, expand them, and colour them on the ends of the stalk afterwards.

It must occur to every person that there are many parts of plants that cannot well be represented in this way, as berries of all kinds for example, fruits, &c. If the artist has any taste for drawing, when he has coloured the plant and flowers, he can readily represent with a proper colour either the berry, fruit, or seed vessel of the tree or plant, when it happens to be striking; and if the colour be natural, the delicacy of the finishing is not to be regarded, as it is not to be considered as a fine painting, but a sufficient likeness, executed by a common hand, in a speedy manner.

Another mode of taking off impressions has lately been introduced, in which smoked paper is substituted for blacking balls, and in the opinion of some this method is most preferable. To prepare the paper, rub it over first with linseed oil, then smoke it over the flame of a large tallow candle, moving it to and fro, that the paper does not take fire till

the whole surface is regularly blacked over. The leaf or plant is then to be laid on the smoked paper, pressed, and rubbed till the fibres become black; the impression is then to be taken off on a piece of white paper, as in the other way.

There are no plants look more beautiful taken off in this manner than the ferns.

The most common and perhaps the most satisfactory mode is to dry and preserve the plant itself. If a person will bestow the necessary time and pains, plants may be dried and preserved so as to retain their form, many of them their colours, and make a beautiful appearance; even with the greatest care there are many that will lose their colours, and some will even change black, as the cow-wheat, whilst others look almost as lively when dried as when alive; it is in vain therefore for you to expect that your dried specimens will assume an uniform appearance.

There are various ways of drying and preserving plants; the whole art of which consists in drying them under such a degree of pressure that the leaves and flowers shall neither shrink nor be shrivelled, while the plant at the same time has as much air as is necessary to its drying of a good colour, and preventing it from turning black or mouldy.

The method of obtaining dried specimens in the greatest perfection is as follows. You are in the first place to be particularly careful to select a good specimen of the plant, as that requires no more trouble to preserve than a bad one. By a good specimen is to be understood such an one as represents the true habit and general appearance of the plant, of its common size, in full bloom, and perfectly dry.

Such a specimen being procured, we are to lay it out between the leaves of a single sheet of paper, it is of little consequence what kind

of paper, provided it is not too coarse, carefully expanding every leaf and flower, but not in such a manner as to give them a stiff unnatural appearance; we are then to place this single sheet of paper containing the plant, betwixt the leaves of a large book, laying a weight on the book just sufficient to make the plant flat, but not to bruise it.

After remaining a day or two in this situation, the single sheets of paper containing the plants, are to be taken out of the book, placed on the floor in a dry room, or exposed to the sun, and covered with dry sand about an inch thick. The weight of the sand will be sufficient to keep the plant from shrivelling, while the moisture of the plant evaporates through its interstices; and thus, if the situation be dry, and more particularly if artificial heat be made use of, the plants, if not very succulent, will dry quickly, and of a good colour.

Should this method of drying them by means of sand be thought too troublesome, or be impracticable for want of suitable accommodations, the plants may be continued betwixt the single sheets of paper in the large book till dry, taking them out frequently to give them air, and replacing them in the same book made perfectly dry, or putting them into another; or a number of quires of paper may be substituted instead of a book; by thus alternately exposing them to the air and keeping them under pressure, you will obtain very good specimens.

Too much care cannot be taken of a collection of plants thus carefully made; they are most liable to suffer from being kept in a damp situation, or from the depredations of insects. They require therefore to be kept in a place perfectly dry, impregnated with the effluvia of camphor, and to be often looked over. Now whichsoever of these methods you should adopt, whether you draw

your plants, take impressions of them, or preserve them, it will be necessary in your herbarizing excursions, to take with you a tin box, or a book to put them in.

The advantage of a tin box, or vasculum is, that not admitting any air, the plants are preserved fresh till you get home, when you may dispose of them as you please; the larger the box, the larger it will admit your specimens to be. A small size folio book, provided with strings instead of clasps, that the plants may not be bruised, is on many accounts to be preferred; if this be used, each plant, for the more readily turning to it, is to be placed in the order of its being gathered.

As it will be necessary for you to dissect a variety of flowers, and other parts of plants, a penknife, a common lancet, with a large pin or needle, should be your constant companions; and as many flowers, or the parts

of which they are composed, will frequently require to be magnified, a small pocket lens should be added, for the examination of them.

As a proper selection of books in the learning a science must be of material consequence, the mind retaining the first principles it imbibes in an eager pursuit, we shall venture to give you a few instructions on what books will be most proper for you to read; and we may premise that many will not be necessary for you at present. We are not so vain as to imagine that the information you may acquire from our lectures will be such as to preclude the use of botanical books; nothing is farther from our intention: all that we mean to infer is, that you will study with much greater advantage when you come to be somewhat acquainted with the subject.

The knowledge you may derive from our

lectures will perhaps save you the trouble of searching several more voluminous works, but the practical knowledge of plants will be better acquired, and more perfectly impressed on the memory, by frequent excursions, and preserving the specimens till you are thoroughly acquainted with them. This I know, books cannot afford adequate assistance, but to such as cannot, for want of suitable parts of the day to attend to it, or to those who cannot spare time from other pursuits, we may in particular recommend the perusal of the following books, which may be divided into three classes: viz.

1st. Such as treat of the rudiments of the science, or explain its terms, and which may be considered as of the introductory kind.

2d. Such as treat particularly of the British plants.

3d. Such as treat of the genera and species of plants generally. We may enumerate,

Berkenhout's *Lexicon Botanicum*.

Milne's *Botanical Dictionary*.

[Martyn's *Language of Botany*, 2d Edit.
which has been published since these,
may be substituted for them.]

Lee's *Introduction to Botany*.

Roussseau's *Letters on the Elements of Botany*, translated by Professor Martyn,
with many additional Letters. 2d Edit.

Linnæi *Philosophia Botanica*.

Rose's *Translation of the same book*.

The *Termini Botanici* of Linnæus, published by Dr. Rotherham, a small 12mo.

In the 2d class, as such as treat of the plants of this country, we may select

Raii *Synopsis*, 1 vol. 8vo. 3d edit.

Hudson's *Flora Anglica*, 2 vols. 8vo.

Lightfoot's *Flora Scotica*, 2 vols. 8vo.

Withering's *Botanical Arrangement of the British Plants*, 2 vols. 8vo. 2d edit.

(a 3d and 4th edition have since been published, but for those who understand

Latin, Dr. Smith's *Flora Britannica* may supersede these).

Ditto by Dr. Stokes.

Berkenhout's *Outlines of the Natural History of Great Britain*, 2 vols.

Broughton's *Enchiridion Botanicum*.

(Dr. Smith's *Compendium Floræ Britannicæ* may be substituted for this with advantage).

Curtis's *Flora Londinensis*, 2 vols. folio.

Smith's *English Botany with Plates*, by Sowerby.

Transactions of the Linnean Society.

Of the 3d class, or such as treat of the genera and species of plants generally, we would recommend

Linnæi *Genera Plantarum*.

The Litchfield Translation of the same, in 2 vols.

Jussieu *Genera Plantarum*.

Linnæi *Species Plantarum*.

(an edition of this is now publishing

by Willdenow, containing the modern discoveries).

Linnæi Systema Vegetabilium, or
The Litchfield Translation of the same, in
2 vols.

This however is but a very short catalogue of botanical books, yet an acquaintance with these will give you a pretty general idea of the science of Botany. Such as wish to be more minutely acquainted with the subject, and to obtain a general knowledge of the several treatises that have been written on Botany, should consult the Bibliotheca Botanica of the learned Haller, who has not only given a compleat catalogue of them, but a short account and critique on each.

SECTION II.

On Plants compared with Animals.

BOTANY, as we before observed to you, is a science which teaches us to distinguish one plant from another.

A plant is defined by botanists to be a body endowed with life, destitute both of sensation and *locomotive* power, capable of imbibing nourishment, increasing and finally propagating its species. Different authors have differed somewhat in their definitions, but a want of sensation or perception, and an inability of moving from the spot to which it is fixed, have been considered by most of them as the criterion by which a plant may with certainty be distinguished from an animal.

The learned and scientific bishop of Landaff, who has written on this particular subject with that perspicuity and ingenuity so peculiarly his own, informs us that he knows of no character to be relied on that will discriminate animals, vegetables and minerals, as opposed to one another; he observes, “every one thinks he knows what an animal is, and how it is contradistinguished from a vegetable; a dog or a horse he is truly persuaded are beings as clearly distinguished from an herb or tree, as light is from darkness; yet as in these, so in the other productions of nature, the transition from one to the other is effected by imperceptible gradations.

“The locomotive powers which appertain to most animals are so manifest in quadrupeds, birds, fishes and insects, that in our first and superficial enquiries into nature, we are apt to consider the possession or want of these powers as making a decisive and essential

difference betwixt animal and vegetable bodies, yet on a cloſer examination we find there are a great number of animals which, like the limpet, are fixed to one ſpot, and are deſtitute of every power of progreſſive motion.”

From a variety of circumſtances, observable in the economy of vegetables, the learned prelate is of opinion, that plants are not wholly deſtitute of perception. The perception of a man, he obſerves, “ ſeems to be indefinitely greater when compared with that of corallines, ſea-pins, and oysters, than the perception of theſe, which are allowed to be animals, doth, when compared with the ſigns of perception manifeſted by a variety of what are called vegetables. Sponges open and ſhut their mammillæ; corals and ſea-pins protrude or draw back their fuckers; ſhell-fiſh open or keep cloſe their ſhells in ſearch of food or to avoid injury; it is from theſe and ſimilar muſcular motions, that we judge

the beings to which they belong to have perception; that is, to be animals. Now in the vegetable kingdom, we may observe the muscular motions of many plants to be to the full as definite and distinguishable as in the class of animals just mentioned. The plants called *Heliotropiæ* turn daily round with the sun: by constantly presenting their surfaces to that luminary, they seem as desirous of absorbing a nutriment from its rays, as a bed of muscles doth from the water, by opening their shells upon the afflux of the tide.

The *Flores Solares* are as uniform in their opening and shutting, as animals are in their times of feeding and digesting; some in these motions do not observe the season of the year, but expand and shut up their flowers at the same hour in all seasons; others open later in the day, or do not open at all when they are removed from a Southern to a more Northern aspect. Trefoil, Wood Sorrel,

PLATE I.

THE DIONÆA MUSCIPULA,

OR,

VENUS's FLY TRAP.

To illustrate the signs of perception in plants, this plant, though not very common in this country, is selected, being well known by Botanists in general to possess the sensitive property in an eminent degree.

Our figure represents the general habit of a healthy plant, with the expansion of that part which possesses such extreme irritability, and which is so beset with sharp prickles at the edge, as to resemble a rat-jin or trap; if a fly or other insect comes within its margin, it closes on them and holds them till they perish; a figure of one in that state being here represented.—Vid. Dr. Smith's Observations on the Irritability of Plants.

Mountain Ebony, Wild Senna, African Marigold, &c. are so regular in folding up their leaves before rainy weather, that they seem to have a kind of instinct or foresight similar to that of ants : young trees in a thick forest, are found to incline themselves towards that part through which the light penetrates, as plants are observed to do in a darkened chamber towards a stream of light let in through an orifice ; and as the ears of corn do towards the South. Whatever can produce any effect upon an animal organ, as the impact of external bodies, heat and cold, the vapour of burning sulphur, of volatile alkali, want of air, &c. are found to act also upon the plants called sensitive : but not to insist upon any more instances, the muscular motions of the *Dionæa Muscipula*, lately brought into Europe from America, seem far superior in quickness to those of a variety of animals. Vide *plate 1.*

Now to refer the muscular motions of

shell-fish and zoophytes to an internal principle of volition, to make them indicative of the perception of the being, and to attribute the more notable ones of vegetables to certain mechanical dilations and contractions of parts occasioned by external impulse, is to err against that rule of philosophizing which assigns the same causes for effects of the same kind. The motions in both are equally accommodated to the preservation of the being to which they belong, are equally distinct and uniform, and should be equally derived from mechanism, or equally admitted as criterions of perception.

Our author next produces instances from the generation, -nutrition, organization, life, health, sickness, and death of plants, still further to prove the close affinity betwixt animals and vegetables, and to the perusal of which we must refer our readers who wish for more information on this curious subject; leaving which, we proceed to the more im-

mediate object of our Lecture, which is to point out to you the structure of the seed, and the manner in which it unfolds itself and becomes a plant.

SECTION III.

On Seeds.

THE seeds of vegetables may be considered as analogous to, and with respect to generation, answering the same purposes as, the eggs of animals; for by means of these plants are chiefly propagated. Every seed if perfect and properly impregnated, is capable, when placed in a proper situation, of becoming a new plant similar to its parent.

We shall now point out to you its particular structure while a seed, and the manner in which it unfolds itself and becomes a plant.

Most seeds are composed of the same essential parts, and the process of vegetation is somewhat similar in all; there are some seeds however in which those parts are more obvious than in others, such as the large

garden bean, and French bean, &c. In these you will see all the parts very distinctly; and when they are once pointed out, you will readily acquire a clear idea of their structure.

On dissecting the garden bean, we find it to consist of the

HILUM, or the eye.

CUTIS, or the husk.

CORCULUM, or Embryo of the future plant,

COTYLEDONS, or the lobes. *Vide pl. 2.*

Besides the *cutis* or husk, some seeds are furnished with an additional covering, which Linnæus calls an *arillus*; this is observable in the Hounds-tongue, *Ranunculus*, and other seeds: and most seeds have, in one particular part of them, a small *foramen* or hole.

1st. The HILUM, or eye, is a mark in the end or middle of the outer husk of the seed, and is a kind of cicatrix, formed by the

P L A T E I I.

ON SEEDS.

Fig. 1.—A Garden Bean in a green state. 1. The hilum, or eye. 2. The footstalk, or umbilical cord, by which it was connected to the pod. 3. The footstalk dilated, so as to cover the hilum before their separation. 4. The foramen or aperture at the extremity of the hilum.

Fig. 2.—The same stripped of its husk. 1. Part of the radicle projecting beyond the cotyledons.

Fig. 3.—A Bean divided longitudinally down the middle. 1. The cutis or husk. 2. One of the cotyledons within the husk. 3 and 4. The corculum in its natural situation.

Fig. 4.—The two cotyledons divided, with their vessels arising from the exterior edge, and which, ramifying, enter the corculum. 1 and 2. The plumule. 3. The radicle.

Fig. 5.—A transverse section of a dry Bean, which shews how the radicle in Fig. 3.—3. is surrounded by the duplicature of the husk. 1. The radicle. 2. The duplicature. 3. The cotyledons.

Fig. 6.—The Husk of Fig. 3, with the cotyledon and corculum taken out of it. 1. Shews its greater thickness at the hilum. 2. The duplicature in its anterior part.

Fig. 7.—One of the cotyledons of a Kidney Bean, with the corculum. 1. In its natural situation.

Fig. 8.—The corculum of the Kidney Bean magnified; the plumule 1. shewing the veins of the future leaves. 2. The radicle.

Fig. 9.—The Kidney Bean, in which the hilum 1. is situated in the middle of the seed.

Fig. 10.—The Kernel of a Filbert.

Fig. 11.—Half of the same, or one of the cotyledons in which the corculum is situated at the point 1.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

breaking off of the vessels to which the seed was connected, and which supplied it with nourishment. In the large garden, or Wind-for bean, it is placed at the end; in the kidney or French bean, it is situated in the middle.

2d. The CUTIS, or husk, which incloses and preserves the Cotyledons and Corculum; this is evidently composed of two coats, and is thicker round the hilum than in any other part of it; on one side it has a duplicature which incloses the end of the radicle; this duplicature is very conspicuous when the bean is cut transversely through the middle; *vide plate 2.*

Just below where the point of the radicle terminates, a small *foramen* or hole is observable in all those seeds at least which are of a tolerable size; it is so small however in general as to require the assistance of a magnifying glass: in the French bean it may be clearly

discovered betwixt the hilum and point of the radicle, even by the naked eye. This foramen is constant and uniform in its appearance, and does not arise from the breaking off of the stalk, which connected the seed to the seed-vessel. If at any time we are at a loss to find this foramen, soak the seed for a few hours in water, and then on pressing it we shall see small bubbles of air or water issue from it.

3d. The CORCULUM, or Embryo. This may be considered as the essence of the seed or embryo of the future plant; that part which all the others serve only to defend and nourish. It is divided into two parts, the *plume* and *radicle*.

The *plume* is the upper part of the corculum; from its resemblance to a feather, it has been called by Grew the plume, by Linnæus, *plumula*; it rises upwards when the seed begins to vegetate, and forms all

that part of the plant which appears above ground.

The *radicle* is the lower part of the corculum, which descends and forms the root of the plant. It has been called by Grew and other writers, the *radicle*; by Linnæus, it is called the *rostellum*; but we prefer Grew's name, as being more expressive, and more easily retained in the memory; both the plume and radicle are remarkably conspicuous in the French or kidney bean, the plume exhibiting the future leaves and even their fibres.

4th. The COTYLEDONS, or Lobes of the seed, make up the fourth part; they form the principal substance of the seed, inclose, and for some time afford nourishment, to the corculum. In most plants they are two in number, as in the large garden bean, pea, &c. Some have one cotyledon only, as the grasses, and some few are said to have several coty-

ledons, though in fact these appear to have but two cotyledons, each of which is divided into several parts, as in the cress. *Vide pl. 3 & 4.*

Plants whose seeds have one cotyledon only, are called monocotyledons; when they have two, dicotyledons; and when several, polycotyledons.

Their substance is generally composed of farinaceous matter, mixed with expressed or essential oil, and that often in a very considerable proportion, as in almonds and aniseeds; the former by pressure, the latter by distillation.

From the extremity of these cotyledons arise a number of very minute vessels, which unite as they proceed towards the corculum, into which they enter in two distinct bodies. Being of the same colour as the other parts, their ramifications are not visible on the flat surface of the cotyledons; we have a proof of their existence however by a transverse

P L A T E III.

ON SEED-LEAVES, &c.

This Plate is illustrative of the difference of the feminal leaves in different plants ; that is, the form which the cotyledons of different seeds assume in the progress of vegetation. Thus 1, which appears to have several cotyledons, in fact has but two, each of which is cleft into three parts, and placed on a footstalk. 2. Shews the same kind of division, but not so deeply cleft. 3. Is pinnated into many leaflets. 4. Is more simple, the future leaves becoming dentated. 5. Simple and future leaved trifidum. 6. Remarkably long. 7. The most simple, and generally thick, as the kernels of many fruits. 8. Remarkably long and slender. 9. Appears to have four cotyledons, but in fact there are but two, each of which is slightly cleft and grooved from the base to the apex. 10, 11, and 12, Are very simple and minute ; the radicle in these make a more rapid advancement than the plume, till they begin to throw out their future leaves.

P L A T E I V.

O N S E E D - L E A V E S , &c.

Fig. 1.—Shewing an instance of polycotyledons in the fir.
2. The radicle not yet beginning to put forth fibres.

Fig. 2.—3. The husk of the seed leaving the cotyledons. 4.
The cotyledons now become feminal leaves. 5. The
radicle.

Fig. 3.—A Pea in the state of vegetation, the plumule rising
upward. 6. The seed which perishes under ground. Vid.
Plate 5.

Fig. 4.—A Pea, which having vegetated, the plumule in
the state of Fig. 3, was cut off 5. When it produced
another, 6.

Fig. 5.—Another Pea, whose plumule had been cut off,
produced two others, 7. The Pea, 8. From nine Peas
having their plumules cut off, five of them produced two
new ones each, and the other four, one each. Query
whether the two in general would be more productive
than the original one.

section; this is the only proof we have of their existence, which indeed seems a sufficient one. If the section be made at the extremity of the lobe, you may discern some very minute specks; these, the nearer the section be made to the corculum, appear larger and fewer in number, till at last they seem to unite in one large branch, and enter the corculum; their delicate structure prevents us altogether from unravelling them by maceration, or filling them by injection. If we examine a thin slice of a cotyledon with a large magnifier, it appears to be made up of a number of small bladders.

Such then appears to be the structure of the cotyledons, the farinaceous matter of which they are composed is the substance which is in such general use in all countries for food; when ripe and dry, they are pretty easily reduced to powder; the husk being of a different texture and more tough, is separated in the bolting and sifting, and forms the bran.

Having now examined the structure of the seed, and shewn you all its component parts, we come to take notice of the alterations which it undergoes when placed in a situation adapted to make it vegetate.

SECTION IV.

On Vegetation.

IN order that a seed should vegetate and produce a new plant, it is necessary in the first place that it be impregnated ; secondly, that it be placed in a certain degree of heat, and supplied with a proper quantity of moisture and air ; these appear to be all that are necessary to set the *punctum vitæ*, or principle of life, in motion.

For the illustration of this subject we have chosen the Pea and Radish, as the process of vegetation in most plants will be illustrated by these. *Vide pl. 5 & 6.*

After a pea has been placed in moist earth, in the summer time, for the space of twelve hours, the whole bulk of it is considerably increased, so as to make it take up twice the space it did before ; and from its increased weight as well as size, it is evident it has absorbed a quantity of water : this water must have insinuated itself either by the small foramen we before shewed you, or through the coats of the seed. The radicle now becomes more prominent and apparent ; in twenty-four hours more, the radicle has penetrated through the husk, and passes downward into the earth ; the plume soon afterwards makes its way from betwixt the cotyledons, where it lay inclosed, and rises upwards. Hitherto the corculum has received all its nourishment from the cotyledons, it soon however leaves these for a more durable parent, the earth. The radicle as it descends, begins to throw out small fibres, which increase, and draw nourishment from the earth ; the plume rises upwards and expands into

P L A T E V.

ON THE PROGRESS OF VEGETATION

IN THE PEA, &c.

- 1.—A Pea, which, having been placed in moist earth, is just ready to vegetate.
- 2.—One of the cotyledons, with the corculum in its natural situation.
- 3.—The cotyledons opened, shewing the corculum betwixt them, and the manner in which it is connected to them.
- 4.—The radicle shooting downwards, being the first obvious appearance of vegetation.
- 5.—The vegetation further advanced, the radicle having shot down deeper, and beginning to put forth fibres, the plumule rising upwards, and just appearing above ground.
- 6.—The plumule further advanced.
- 7.—The radicle now beginning to push forth numerous fibres.
- 8.—The plumule expanded into leaves.
- 9.—The Pea continuing under-ground, where the cotyledons perish.
- 10.—A Garden Bean in a state of vegetation.
- 11.—The radicle putting forth fibres.
- 12.—The plumule expanding into leaves.

P L A T E VI.

ON THE PROGRESS OF VEGETATION

IN THE RADISH.

- Fig. 1.—The radicle just breaking through the cutis or husk.
- Fig. 2.—The radicle pushing downwards; the husk burst so as to shew a little of the cotyledons.
- Fig. 3.—The radicle further advanced, the husk more opened, and the cotyledons more visible.
- Fig. 4.—The husk ready to drop off, the cotyledons still yellow, but beginning to assume the appearance of leaves.
- Fig. 5.—The husk dropped off, the cotyledons now more like leaves, just rising above ground.
- Fig. 6.—The cotyledons in the form of green leaves, as they first appear above ground, as yet without the appearance of the plumule.
- Fig. 7.—The cotyledons or seed leaves grown larger, with the plumule 7, now considerably advanced, rising up betwixt them.
- Fig. 8.—Wheat in a state of vegetation, the radicle and plumule springing from the same end.
- Fig. 9.—Barley in a state of vegetation, the radicle and plumule apparently springing at opposite ends, though in fact, the plumule only passes along under the husk.

P L A T E VII.

CONTINUATION OF THE PROGRESS OF VEGETATION

IN THE RADISH.

Fig. 1.—The cotyledons of the seed which are converted into green leaves still retained on the Radish at its full growth; illustrating the difference between this and the Pea, &c. in which the cotyledons perish under ground.

leaves, the cotyledons having afforded nourishment to the corculum, till it is capable of shifting for itself, continues under ground and rots. *Vid. pl. 5.*

Such is the progress of vegetation in the pea and the seeds of the grasses; but in the radish, and a great number of other seeds, a very different process takes place. The cotyledons, which in the pea perished underground, and never appeared, in these are converted into real leaves, a circumstance which passes unnoticed by most people; and did not daily observation prove it, we should scarcely be persuaded to think, that the thick, white, and solid substance of the cotyledons, is converted into green leaves: *Vid. pl. 6.* these kind of leaves are called feminal leaves, and are of a different shape in different plants; their form however is little attended to, though capable of affording very good marks for distinguishing the species when other cha-

rafters are wanting. *Vid. pl. 3. & 4.* They are always smooth, and of a different shape from those into which the plumule expands; in some plants they quickly go off, in others they continue a long time, as in the radish. It is while the plant is in this state that it is so liable to be destroyed by insects. *Vid. pl. 7.*

The cotyledon leaves being smooth, tender, and sweet, are eaten with great avidity by many insects, and whole fields of turnips in this state are frequently destroyed by a small beetle, not much larger than a pin's head; if the plant is able to expand its plume, and come into rough leaf, as the farmers call it, they consider the crop as safe.

Some have recommended soaking of the seeds in bitter and saline infusions previous to their being sown, in order to prevent the insects from destroying them, but from the alteration which the lobes undergo, supposing them to be saturated with this infusion before

they are converted into cotyledon leaves, the effect of such infusions must be entirely destroyed; it is to be feared that a remedy for so destructive an evil can scarcely be found from any management of the seed previous to its being sown, except where the egg of the insect is already contained in the seed, which may sometimes be the case.

It appears very evident, that during the progress of vegetation in many seeds, a degree of fermentation takes place, which converts the cotyledons into sugar: in the seeds of the grasses this is very apparent.

If we take a large heap of barley, soak it in water, and afterwards spread it on the floor, keeping it regularly turned over, that no part of it may be more heated than the rest, in a day or two the radicle will shoot out at one end, and shortly after the plumule will appear at the other; if we take the barley in this state and dry it on a kiln, we shall con-

vert it into malt. And as a proof of its containing a greater quantity of sugar than it did before, we have only to taste it. Such is the theory of making malt; which is nothing more than converting the cotyledons of the barley into sugar, by means of the fermentation which takes place during the vegetation of the feed.

This fermentation however cannot take place in so great a degree in all feeds; such a change in its elementary parts would be quite incompatible with its appearing afterwards in the form of leaves, which the cotyledons in many feeds do, and which cannot therefore have suffered so great an alteration in their structure.

Some feeds retain their vegetative powers much longer than others; parsnip and many other feeds will not vegetate if they have been kept more than a year, while others, parti-

cularly those of the tetradynamia class, keep a very great length of time without injury; and there have been instances where seeds of this kind have been dug up after having been buried for a vast number of years, still retaining their vegetative property.

After seeds have been placed in a proper situation, there is a great deal of difference with respect to the time of their beginning to vegetate; some spring in a day or two, as the grasses, &c. others remain a year or two, as the nuts in general.

Moisture and insects are very destructive to seeds; whoever wishes either to keep or send seeds to any distance, should be careful to secure them against these. Insects will eat into and destroy the corculum, and even the cotyledons; and moisture will occasion a fermentation to take place, which will destroy

its vegetative property, or make it vegetate before its proper time.

If the seeds then be quite ripe, perfectly dry, and wrapped up in paper, taking care that no insects be inclosed with them, such a process it is presumed will keep them in a state of vegetation as long as enclosing them in wax, or any other tedious or formal processes whatever.

We shall finish this lecture by relating a fact relative to the expansive power of the cotyledons mentioned by Dr. Hasselquist, in his '*Iter Palestinum*.'

He informs us, that the inhabitants who live near the banks of the river Nile, are frequently visited in the night by the hippopotamus, or river horse, a very large animal, which destroys and ravages their gardens and

fields ; in order to destroy this nightly visitor, they place a large quantity of peas near his haunts, these he greedily devours, which swelling in his stomach, so distends it as to kill him.

SECTION V.

On Seed-vessels.

WE have already shewn you the structure of the seed, and the manner in which it vegetates ; we come now to shew you the structure of the vessels, or cases which contain the seeds, and the several methods which nature, in her wonderful economy, makes use of in her distribution of them.

In some plants the seeds are not contained within any kind of seed-vessel, but fixed to the end of the flower stalks, or receptacle, as in *Leontodon* or *Dandelion*, where they remain till ripe, and then drop off, or are

blown off by the wind, as in the umbelliferous plants, and those of the class syngenesia.

In some plants the seeds have no other seed-vessels than what the calyx affords; in the bottom of which they are contained, as in the plants of the class and order didynamia gymnospermia: here the calyx continues without suffering any alteration, but in some other plants the calyx expands when the plant is in flower, and afterwards closes on the seed, and secures it till ripe, as in the *Rumex* or Dock.

But the seeds in the generality of plants are inclosed within a pericarpium or seed-vessel, which in different plants is variously constructed, and according to its diversity of structure, acquires different appellations. Linnæus enumerates eight different kinds, viz.

CAPSULA, SILIQUA, LEGUMEN, FOLLI-

PLATE VIII.

PERICARPIUM.

CAPSULA.

- Fig. 1.—Unilocularis, having but one cell.
Fig. 2.—Bilocularis, having two cells.
Fig. 3.—Trilocularis, having three cells.
Fig. 4.—Quatrilocularis, having four cells.
Fig. 5.—Sexlocularis, having six cells.
Fig. 6.—Multilocularis, having many cells.

Fig. 6.

Fig. 5.

CULUS, DRUPA, POMUM, BACCA, and STROBILUS.

1st. CAPSULA.—The Capsule is the most common kind of seed-vessel, and is defined to be a dry hollow seed-vessel, which splits or opens in some determinate manner.

A Capsule consists of several different parts, each of the pieces into which a seed-vessel splits or divides, is called a valve; if it split into two, it is called bivalvis; into three, tri-valvis, and so on.

The cavity of the capsule is called *loculamentum*. If a capsule consist of one cavity or cell, it is called *unilocularis*, one-celled; of two, *bilocularis*, two-celled; of three, *trilocularis*, three-celled; and so on. Vid. *Plate 8*.

A Capsule consisting of three cells, each of which has in it a single seed, is called Capsula Tricocca.

Capsules differ much with respect to the manner in which they open ; they generally split into as many pieces or valves, as they have cavities ; if they have only one cavity, it opens for the most part at top, as in the *Lychnis*, *Poppy*, and *Cerastium* ; sometimes at the sides, as in the *Caltha* ; sometimes at the bottom, as in the *Campanula* ; in some few the Capsule divides horizontally near the middle, as in the *Pimpernel* ; this kind of Capsule is called *Circumscissa*. In some kinds of Capsules the valves are endowed with an elastic quality, by which means the seeds are thrown to a considerable distance, as in the *Impatiens Noli me tangere*.

Capsules differ exceedingly with respect to their form, as well as their surface, thus we find them round, oval, long, three cornered, jointed, &c. ; some smooth, others prickly ; remarkable instances of this occur in the poppy, the species of which are chiefly distin-

PLATE IX.

P E R I C A R P I U M.

Fig. 1.—Pericarpium Folliculus, a seed-vessel of one valve, opening from top to bottom on one side, the seeds being attached to a receptacle within it, not to any future.

Fig. 2.—A seed magnified.

Example.

Afclepias Synaca.

Fig. 3.—Pericarpium Pomum; a fleshy seed-vessel without any external opening or valve, containing within its substance a capsule.

Fig. 4.—A seed from the same.

Example.

Apple.

Fig. 2.

Fig. 4.

Fig. 1.

Fig. 3

PLATE X.

PERICARPIUM.

Fig. 1.—Pericarpium Drupa; a seed-vessel which is succulent or pulpy, having no external opening or valve, containing within its substance a stone or nut, as in Fig. 2. A transverse section of the same, Fig. 3.

Example.

Cherry.

Fig. 4.—Pericarpium Legumen; a seed-vessel in which the seeds are fixed to one future only.

Example.

Pea.

Fig. 1.

Fig. 4.

Fig. 2.

Fig. 3.

PLATE XI.

P E R I C A R P I U M.

Fig. 1.—Pericarpium Bacca; a pulpy feed-vessel, containing within its substance a number of naked seeds.

Fig. 2.—A whole feed-vessel of the same.

Example.

Gooseberry.

Fig. 3.—Pericarpium Strobilus, a cone; a species of feed-vessel composed of woody scales, between which lie the seeds.

Example.

Fir Cone.

Fig. 4 —Pericarpium Siliqua; a feed-vessel having two valves, in which the seeds are fixed to both futures.

Fig. 5.—The same opened to shew the seeds.

Example.

Wall Flower.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

guished by the smoothness or roughness of the capsules.

2d. *SILIQUA* is a seed-vessel having two valves, in which the seeds are fixed to both futures.

3d. *LEGUMEN*, a seed-vessel of two valves, in which the seeds are fixed to one future only.

4th. *FOLLICULUS*, a seed-vessel of one valve, opening from top to bottom on one side, the seeds being attached to a receptacle within it, not to any future.

5th. *DRUPA*, a seed-vessel which is succulent or pulpy, having no external opening or valve, containing within its substance a stone or nut.

6th. *POMUM*, a fleshy seed-vessel, without

any external opening or valve, containing within its substance a capsule.

7th. *BACCA*, a pulpy seed-vessel, containing within its substance a number of naked seeds.

8th. *STROBILUS*, or Cone, a species of seed-vessel composed of woody scales, within which lie the seeds.

Such then are the different kinds of seed-vessels; we shall now make a few remarks on the seeds.

With respect to number, plants are either furnished with one seed to each flower, as in Bistort, Dock, &c. With two, as in the umbelliferous plants; three, as in *Euphorbia*; four, as in the Didynamous plants; numerous, as in the Poppy. The fertility of some plants with respect to their number of seeds,

is truly astonishing. Instances of this kind are afforded in the Poppy, Tobacco, Orchis, Ferns, and Mosses.

Mr. Ray, from experiments made by himself, estimates the annual produce of the seeds of a single leaf of the spleen-wort to be upwards of a million.

The form of the seeds, as well as of the seed-vessels, is extremely various, the appearance of some exceedingly curious and beautiful; the seeds of most of the compound flowers are furnished with a pappus or down, when this is placed immediately on the crown of the seed, it is called *sessilis*; when placed on a footstalk, *stipitatus*; when the pappus consists of simple rays, it is called *simplex*, as in Sowthistle; when branched or feathered as in Goat's-beard, *plumosus*; this is evidently intended for their dissemination; others are furnished with little hooks, as in the genus

Caucalus; some have their surfaces reticulated like a honey-comb; some are perfectly smooth and polished; some glossy, as if varnished, as the Bistort; others deeply grooved; some perfectly round; others kidney-shaped; others flat; others three-cornered; some furnished with wings, as the Maple, and some of the umbelliferous plants; in short the seeds afford a large field of contemplation for the philosophic botanist.

The great variety of ways which nature has provided for their dissemination, is no less worthy of our notice; some are carried along by rivers and torrents, and frequently conveyed many hundred miles from their native soil, and though into very different climates to those which gave them birth, yet to which by degrees they become familiarized. Those that are carried by the wind are either winged, as in Birch, and some of the umbelliferous plants, or furnished with a

pappus or down, which we have shewn you, as in dandelion, goats-beard, and valerian. Some seeds are placed within a winged calyx, as in scabious, or contained within an inflated seed-vessel, as in bladder-fenna. Some birds swallow the seeds and afterwards void them entire, frequently on trees, where they grow, as in mistletoe; some attach themselves to animals by means of little hooks, which are either fixed to the seeds themselves, as in clivers, or make a part of the calyx, as in burdock. Some are thrown out of the seed-vessels, by means of the elasticity of the valves, as impatiens; others by an elastic substance immediately surrounding the seed, as wood-forrel, or by an elastic ring surrounding the capsula, as in the ferns. In short, the various means which nature makes use of in their dissemination, shew how solicitous she has been for preserving the species.

SECTION VI.

On Roots.

HAVING given you an idea of the seeds, the vessels which inclose them, and the process by which vegetation forms the future plant, in the next place we shall begin at the Root, and trace the plant to its full growth.

The root is generally understood to be that part of the plant which is under-ground, and which draws forth nourishment from the earth necessary for the existence of the plant.

Linnæus, in treating on roots, considers all that lies below the branches, roots, and terms the stem the *ascending caudex*; how far

it may be proper to adopt the same plan we shall leave, but to illustrate the intention of these lectures we shall be much better understood, and the science more simplified, in adhering to the most general acceptation of the word. The body of the root, or that which lies below the surface of the earth, he terms the *descending caudex*, the fibrous part of the root is termed the *Radicula*, which imbibes the nourishment from the earth for the support of the whole plant.

The root, like the stalk, consists of *Cortex*, the outer covering of all ; *Liber*, the inner bark ; *Lignum*, the wood ; and *Medulla*, the Pith.—*Vid. Sect. 7. on Stalks.*

The root in duration is *Annua*, annual, living but one year ; *Biennis*, biennial, a root which continues to vegetate two years ; or *Perennis*, perennial, continuing several years.

Roots in figure are various, and from their

different shape acquire different appellations, as *fibrosa*, *premorfa*, *granulata*, *tunicata*, *fusiformis*, *subrotunda*, *tuberosa*, *solida*, *squamosa*, &c. for an illustration of which, vide plates annexed.

A knowledge of roots is very necessary, not only to the gardiner, but also to the agriculturist, and from the extensive use they are of in medicine, the medical student will always do well in examining plants, to examine their roots likewise, as he may have opportunities of detecting wrong ones amongst those he may have occasion to use; nevertheless it is not from the root in general that we are to decide on its utility, either in medicine or for culinary uses, the parts of fructification being in general the most certain criterions.

Thus we find that most of the night-shades are more or less poisonous, and even potatoes are not perfectly free from this quality,

although they contain it in so slight a degree as not to be prejudicial to the constitution; quere, whether such as grow on the top of the ground, or rather swell to the surface, and by exposure to the light and air become green, which green colour is not superficial, but goes considerably into the potatoe, are not more so than the others? They have an acrid or rather a copperas taste, acquired by exposure to the air: some of the other night-shades are exceedingly poisonous, and if taken in any considerable quantities produce delirium, and even death.

Plants of the class Hexandria, have many of them roots of a very pungent and acrimonious taste, which are nevertheless wholesome and agreeable when roasted or boiled, as onion, &c. The roots of the martagon and tulip are also eaten in some parts as common food.

PLATE XII.

ON ROOTS.

Fig. 1.—Radix Fibrous, a root which has no solid body, but is made up entirely of thread-like fibres.

Example.

Common Groundsel.

Fig. 2.—Radix Præmorsa; a root which does not run tapering to its extremity, but appears bitten off.

Example.

Plantain.

PLATE XIII.

ON ROOTS.

Fig. 1.—*Radix Tunicatus*; a transverse section of a root consisting of many coats, each forming a concentric layer, opposed to *squamosa*, which see.

Fig. 2.—The whole bulb.

Example.

Onion.

Fig. 3.—*Radix Granulata*; a granulated root, consisting of small knobs attached to the root by small fibres, same as *aggregata*.

Example.

Saxifraga Granulata.

Fig 1.

Fig 2.

Fig 3.

PLATE XIV.

ON ROOTS.

Fig. 1.—Radix Subrotunda ; a root which is nearly round.

Example.

Turnip.

Fig. 2.—Radix Fusiformis ; a root which tapers downwards to a point, spindle-shaped.

Example.

Carrot.

PLATE XV. ✕

ON ROOTS.

This, though apparently fibrous, is fusiform when older, furnished with but few fibres; the stalks running on the surface of the ground, take root at the joints, by which method the plants increase, but widely differ from the *Radix Repens*, which see.

Example.

Potentilla Reptans.

PLATE XVI.

ON ROOTS.

Fig. 1.—Radix Dentata; a root having many tooth-like knobs, differing from granulata in the shape of the knobs, and not being attached to the body of the root by means of a fibre as it is.

Example.

Primulæ.

Fig. 2.—Rad. Repens, a creeping root, extending horizontally under ground, and sending forth shoots from the joints; some roots have such progressive power, as to pierce any substance softer than wood, and will go through a potatoe, or Jerufalem artichoke; the outline of one in that state being here represented.

Example.

Couch Grass.

PLATE XVI. ✠

ON ROOTS.

Radix Tuberosa; a root consisting of subrotund bodies, collected into a bundle, from Tuber, a knob or knobbed root; of these there are three kinds, viz. palmata, fasciculata and pendula.

Palmata, when it spreads in such a manner as to resemble a hand.

Fasciculata, when a quantity of tubera or knobs are collected into a bundle.

Pendula, a species of tuberosa, where the knobs hang down.

Example.

Peony.

PLATE XVII. ✠

ON ROOTS.

Fig 1.—Radix Solidus; a root which is solid, and not disposed in scales as in squamosa, or in lamina as in tunicata.

Fig. 2.—The whole bulb of the same.

Fig. 3.—Radix Squamosa; a scaly root, a species of bulbosa, which is composed of scales lying over each other.

Example.

Lilium.

Fig. 1.

Fig. 2.

Fig. 3.

Roots of plants of the class *Didynamia Gymnospermia*, are seldom or never used either in medicine or economical purposes; plants of *tetradynamia* class are some of them very acrid, as horse-radish, but no plant in the whole class is poisonous, nor is there in the roots of plants of the class and order *monadelphia polyandria*, but on the contrary they are emollient and lubricating, instances of which are afforded in both the common and marsh mallows; the same quality of obtunding acrimony is observable not only in the root, but in every other part of the plant.

In fact, till the class and order of a plant or root can be ascertained by its fructification, the smell or taste should not quite be depended upon, although they are the most natural criterions, thus a horse will graze with safety amidst noxious and salutary plants, and should he meet with the *phellandrium aquaticum*, or common water hemlock, he

will, by his smell or taste, avoid it as poisonous, while a cow, to whose sense of smell and taste it is agreeable, will eat it, and to her it proves wholesome. This shews that what is salutary to one set of our organs, either those of smelling or tasting, may be so to the rest; still new things that have not been ascertained, are not to be trusted to too great an extent at first, but tried with caution, for want of which practitioners in medicine have sometimes erred, to the danger of the lives of their patients; this may happen from a too great eagerness to bring in plants to the aid of medicine from amongst the most powerful and poisonous ones, which certainly requires the greatest caution and skill of the most able of the faculty. The determining of plants by the smell or taste, whether they are noxious or salutary, opens at once an extensive field of contemplation and wonder for man to see the goodness of a superior Being to every part of his creation, and shews why one herb was made more noxious than

another to the same animal, for if all were salutary alike, one animal would deprive another of subsistence; whereas at present they must not eat of those which do not accord with their sense of smelling or tasting, on pain of sickness, or perhaps death.

SECTION VII.

On Stalks.

THE feveral parts into which the plumule expands itself, are much more numerous than thofe into which the root divides, or in other words, there is a much more confiderable apparatus for encreafing a plant by its feeds than its roots.

In annual roots, ftrictly fo called, the apparatus is extremely fimple, confifting of nothing more than the fibres neceffary to draw forth nourifhment from the earth ; but in many perennial roots, a provifion is not only made for the prefent growth of the plant, but alfo for its future increafe, and this

is effected by the production of bulbs, or tubera, which contain in them one or more embryos, or future plants; thus we compare a potatoe to a large feed, having many corcula or embryos, which like real feed, require only to be placed in a proper situation to make them vegetate.—*Vid. plate 18.* ✠

Annual plants are generally much quicker in producing their feeds than perennials, indeed perennial plants, in certain situations, produce no feeds at all; thus many of the grasses, when growing on the tops of very high mountains, where cold and moisture predominate, become viviparous, that is, the panicle instead of producing feeds, throws out shoots of grass, which from their weight falling to the ground, strike root, and so the plant is increased.—*Vid. plate 19.* ✠

Such grasses on being introduced into the garden, are apt in a few years to lose their viviparous quality, or a plant may be intro-

PLATE XVIII. ✠

ON ROOTS.

Shewing a species of the Radix Tuberosa, which is pendulous, and to illustrate a way by which roots are encreased, viz. by the roots, as these are well known to possess that quality in an eminent degree.

Example.

Potatoe.

PLATE XIX. ✠

ON ROOTS.

Fig. 1.—Part of a stalk of Creeping Crow-foot, shewing a mode of increasing plants, viz. by roots springing from the stalk. 1.

Fig. 2.—Another mode of increasing plants, viz. by bulbs forming in the axæ of the leaves, as in pilewort. 1.

Fig. 3.—Shews bulbs formed in the head of a plant of the onion tribe, whereby the plant is increased. 1.

Fig. 4.—A leaf of the Cuckow flower, in which the mid-rib has thrown out roots.

Fig. 5.—Part of a flowering branch of the Sheep's Fescue Grass, become viviparous, viz. throwing out shoots of grass where the seed should be formed, which falling on the ground take root.

Fig 1

Fig 2.

Fig 3

Fig 4

Fig 5.

5

duced into a climate where the winter may set in so soon as to prevent it from feeding, which is exactly the case with the Jerusaleme artichoke, and many of the asters, and which consequently never produce seeds with us, yet there are few plants in a garden which increase by their roots to the same degree. It often happens indeed, where nature has given great powers of increase to the root of a plant, she has not been so solicitous about its perfecting its seeds, as in the butterbur, &c. There are some instances, but those indeed are very rare, in which plants appear to be all root, if roots they may be called, as in the lycoperdon, tuber or truffle, which never produce any thing like either stalk or leaf, and which therefore affording no certain marks of discovery, are hunted up by dogs bred up to the business.

But for the most part the roots throw up a stalk which finally produces both flower and fruit. We find by experience that the root

and the herb reciprocally assist each other. If we cut down the stalk of a perennial plant, it will generally throw out new ones, but by continuing the operation the root is ultimately destroyed, for the root can no more exist without the herb, than the herb can without the root, yet there are some plants which are not so soon destroyed by this operation as others.

In speaking of the vegetation of the seed, we observed that the corculum as it unfolded, produced the radicle and plumule, that the radicle shooting downward, became the root, while the plumule rising upward, became the stalk. It is in this way that the stalk is primarily produced, and continues to be produced in annual plants. In herbaceous perennial plants, where the stalk yearly decays, the root annually throws up a new one, the stalk therefore may originate either from a seed or from a root.

The stalk in its structure, is very similar to the root, so much so indeed, that Linnæus has considered the stalk as a root above ground; without entering very minutely into its structure, we find it to consist of the

CORTEX, or outer bark, covered by its cuticle, a continuation of which forms the future calyx.

LIBER, or inner bark, a continuation of which forms the corolla.

ALBURNUM or sap, a soft white substance found between the liber or inner bark, and the wood, and which in process of time, requiring solidity, becomes the wood itself; to the generation of this substance, the tree is supposed to owe its annual increase.

LIGNUM, the wood in the centre of which is the Medulla, or pith.

The Medulla is largest in the young shoots of trees ; as the trees grow old it disappears entirely. Elder is well known to have a large quantity of medulla ; elm, oak, pear, and apple, have scarcely any ; guaiacum, ebony, and iron wood, none at all.

Though the structure of plants is difficult to unravel, yet experiments made by divers persons prove that they are chiefly composed of tubes and cells, which are infinitely various, some of these tubes convey air, and these have often been found to assume a spiral form, others the sap, and others the proper juices of the plant, which is often coloured ; in the spurge we find it white, as well as in many of those plants which have compound flowers, as lettuce, dandelion, &c. and which from this circumstance, have been called lactescent : in the celandine it is yellow. The vessels of plants do not appear to have the same kind of structure as the blood-vessels of animals,

but go on in a more straight direction, and usually terminate in a cell or cavity; but though they have not the same communication as veins and arteries, yet it is evident they have some kind of communication, for if we cut a notch in a stem more than half way through, and a little way up on the opposite side cut another notch equally deep, the circulation will nevertheless be carried on through that stem.

Stalks vary much in their manner of growth, and frequently form exceeding good specific characters.

Linnæus enumerates four kinds of stalks, viz. CAULIS, CULMUS, SCAPUS, and STIPES.

CAULIS, is that kind of stalk which supports both the fructification and leaves, and is common to plants in general.

CULMUS, or Straw, a kind of stalk peculiar to the grasses.

SCAPUS, a kind of stalk which supports the fructification, but not the leaves.

STIPES, a kind of stalk peculiar to the fungi. It is also used by Linnæus to signify the stalk of the ferns. Stalks, according to their durability, acquire different names; thus when it dies down to the root yearly, it is called *herbaceous*; whether it be from an annual or perennial root. If it continues through the winter, and produces buds, it is called *fruticosus*, or *arboreus*, shrubby, or woody, for they appear to differ in size only.

Stalks vary also in a variety of other particulars, all of which are enumerated and described by Linnæus; we shall point out to you some of the most remarkable, or such as most frequently occur.

ACULEATUS; beset with sharp prickles, as in Sweet Briar.

ANCEPS ; two-edged, forming two angles opposite each other, as in *Sisyrinchium*.

ANGULATUS ; angulated, as in *Convallaria Polygonum*.

COMPRESSUS ; compressed on opposite sides, the transverse section forming an ellipsis, as in the *Poa Compressa*.

ERECTUS ; erect, upright, perpendicular.

FISTULOSUS ; tubular, a hollow stem, as in Hemlock.

FOLIOSUS ; covered with leaves, as in *Lily*, *Gladiolus*.

HISPIDUS ; covered with bristles or prickles, which are only superficially rooted, so as to strip off with the rind, as in *Bryony*.

INANIS ; spongy or pithy, neither solid nor tubular, as in *Bella Donna*.

NUDUS ; naked, without leaves or branches, as in *Cowslip*.

PROCUMBENS ; lying horizontally along the ground, but not shooting out *radiculae*.

from the joints, as in Repens; Convolvulus; Soldanella.

PUBESCENS; downy, hairy, as in Deadly Nightshade.

RAMOSISSIMUS; abounding with branches irregularly disposed.

RAMOSUS; having many branches, but not in so great an abundance as the former. The branches of the stalk are called *rami*, these usually have the same structure as the stalk itself, and vary very much in point of number, direction, and other circumstances unnecessary to dwell on.

REPENS; creeping horizontally along the ground, and sending forth radiculae at the joints, as in Potentilla Reptans.

SARMENTOSUS; a creeping stalk almost naked, producing leaves at the joints, as in the Vine.

SCANDENS; climbing as in Bryony.

SIMPLEX; a simple stem, not dividing, but continuing a single stem up to its apex.

SOLIDUS; a solid stem, opposed to Inanis, and Fistulous, as in Asparagus.

SPINOSUS; having strong woody prickles proceeding from the lignous part of the stem, as in Hawthorn.

STRIATUS; grooved, or superficially channelled, as in Scandix Corofolia.

SULCATUS; deeply grooved or channelled, as in Oenanthe Crocaliti.

TERES; cylindrical.

TETRAGONUS; four-cornered, as in Monarda.

TRIGONUS; three-cornered, as in Scirpus Mant.

URENS; stinging, as in nettle.

VOLUBILIS; turning up a pole or stem of another plant in a spiral form, as in Hop.

SECTION VIII.

On Leaves.

WE come in the next place to give you a general idea of the structure of leaves, and to point out to you the principle different kinds as they are botanically considered.

Leaves are defined to be fibrous and cellular processes of plants, which are of various figures, but generally extended, with a flat, membranous, or skinny substance.

In their structure they considerably resemble the stalk, and hence they may in some degree be considered as a stalk flattened.

The generality of leaves are obviously composed of, 1st, The lignous, or woody substance, distributed in innumerable ramifications through the middle of the leaf, and which gives it firmness and durability. 2d. The parenchyma, fleshy or pulpy substance, placed on each side of, and in the interstices of the woody net-work, forming the principle substance, and giving to the leaf its green colour; this substance, which is very tender, from its cellular structure, is quickly destroyed by maceration, leaving the woody substance or skeleton of the leaf behind.

These two parts are covered on each side by a membrane or skin, which is considerably tougher than the parenchyma, and not so soon destroyed by maceration.

Insects frequently destroy one of the skins of the leaf, generally the under one, as being the most tender, together with the paren-

chyma, leaving the woody ramifications and upper skin entire; and sometimes in herbaceous plants, where the woody ramifications are tender, a small caterpillar or grub, hatched from an egg deposited by a fly, between the two coats, will destroy both the woody and parenchymateous substances, leaving the two skins colourless.

The skeletons of leaves, made by maceration, are usually exhibited by Lecturers on Anatomy; the best we have seen were in the museum of the late Sir Ashton Lever; they appear to have been made with extraordinary care.

To succeed in making preparations of this kind, we should select such leaves as are of a firm woody texture, as Holly, Pear, Tulip Tree, Poplar, Ivy, Eryngo, &c. and such leaves for this purpose are best gathered in autumn, when they have acquired their

greatest firmness. They are to be macerated in water till you find the parenchymateous substance in a dissolved state; the skin on each side of the leaf is then to be very cautiously separated. Skeletons of the leaves of Poplar, and Eryngo, are frequently found in gardens in the autumn, ready made; as are remarkably perfect skeletons of the seed-vessel of the winter Cherry, made in the same manner by exposure to the winds and rain.

Leaves appear to be the organs of perspiration and inspiration in plants.

The woody net-work we have been speaking of, is covered, as we have shewn you, with a cuticle, which appears to be a continuation of the skin of the stalk; on the underside of the leaf it appears to be furnished with a great number of absorbent vessels, destined to imbibe the humidity of the air. The upper surface turned towards the sky,

serves as a defence to the lower; and this disposition is so essential to the vegetable economy, that if a branch be overturned in such a manner as to destroy the natural direction of the leaves, they will of themselves in a very short time, reassume their former position, and that as often as the branch is thus overturned.

Leaves, then, are useful and necessary organs; trees perish when totally divested of them. In general, plants stripped of any of their leaves, cannot shoot vigorously; witness those which have undergone the depredation of insects: witness likewise the very common practice of stripping off some of the leaves from plants, when we would diminish their growth, or lessen the number of their shoots.

When vegetation ceases, the organs of perspiration and inspiration become superfluous; plants therefore, at least in this country, are

not always adorned with leaves ; they produce new ones every year, and every year the greater part are totally divested of them, and remain naked during the winter.

As the different kinds of stalks afford many excellent characters to distinguish plants, so the leaves being more variously diversified, afford a still greater number, and hence are distinguished by a great diversity of names. Leaves are primarily distinguished into simple and compound.

A simple leaf is such whose footstalk is terminated by a single expansion, and these according to a variety of circumstances, assume different names, viz.

ACINACIFORME ; scymeter shaped, implying substance, one edge of the leaf being convex and sharp, the other straight and thicker, as in the *Mesemb Acinaciforme*.

ACEROSUM ; leaves furrounded at the base by chaffy squamæ, linear and abiding till the fruit, &c. is ripe, as in *Juniperus*.

ACULEATUM ; beset with prickly hairs or bristles, as in *Aster Tenellus*.

ACUMINATUM ; Terminating in a long tapering point, as in *Camilla Japonica*.

ACUTUM ; differing from *Acuminatum* in not extending itself into a subulated point, but terminating in an acute angle, as in *Lamium Album*.

ADNATUM ; growing close to the stem, as in *Melianthus*.

ADVERSUM ; turning towards the South, as in *Amomum*.

AGGREGATA ; so regularly composed that a leaf cannot be taken away without destroying the uniformity of the whole, as in *Sempervivum*.

ALTERNA ; leaves growing alternately on the stalk, as in *Convalaria Polygonum*.

AMPLEXICAULE ; the base of the leaf

furrounding the stem horizontally without sheathing it, i. e. open behind, as in *Brasica Napus*.

ANGULOSUM ; angular.

APPROXIMATA ; growing near each other, opposed to remote.

AURICULATUM ; ear shaped, as in *Jungermannia ciliaris*.

AVENIA ; having no veins visible.

AXILLARE ; inserted under the base of a branch.

BARBATUM ; hairs issuing from the tip of the leaf, as in the *Mesembri Barbatum*.

BIFARIA ; a leaf pointing two ways.

BIFIDUM ; cloven into two parts.

BULLATUM ; when the Parenchymateous substance of the leaf rises higher on the surface than the veins, so as to appear blistered.

CADUCUM ; signifying the shortest time of duration, the leaf falling off at the first opening of the flower.

CANALICULATUM; having a deep groove or channel running from the base to the apex.

CAPILLACEUM; capillary, as in *Jungermannia rupestris*.

CARINATUM; when the inferior disk, or lower side of the leaf, resembles the keel of a ship, as in *Hemerocallis Fulva*.

CARNOSUM; a leaf of a fleshy substance, softer than the *Compactum*, and more firm than the *Pulposum*, as in *Sedum Desyphylum*.

CARTILAGINEUM; the margin of the leaf being strengthened with a different substance from that of the disk.

CAULINUM; growing immediately on the stem, without the intervention of branches, as in *Agrimonia Eupatoria*.

CILIATUM; whose margin is finally edged with hairs, as in *Sempervivum*.

CIRCINALIA; a term of foliation, expressive of the leaves being rolled spirally downward within the gemma, as in *Felices*.

CIRRHOSUM; a leaf terminating in a tendril, as in *Nissolia*.

COLORATUM ; when leaves are of a different colour than green, though usually so.

COMPACTUM ; when the parenchyma of the leaf is of a firm and hard substance.

CONCAVUM ; the upper surface of the leaf hollowed or concave.

CONDUPLICATUM ; a term signifying that the sides of the leaf are parallel and approach each other, as in *Amygdalus*.

CONFERTA ; crowded together, as in *Antirrhinum Monspessulanum*.

CONNATA ; when two leaves opposite are joined at their base, so as to have the appearance of one leaf, as *Dipsacus*.

CONTINUATUM ; continued, when the leaf appears to be a continuation of the substance of the caulis, as in *Ficus*.

CONVEXUM ; rising from the margin to the centre of the upper surface of the leaf, reverse of *Concavum*.

CONVOLUTUM ; a term in foliation, when the leaf is rolled up in form of a scroll of paper, as in *Arum*.

CORDATUM; heart-shaped and blunt at the apex, as in *Cyclamen Persicum*.

CRENATUM; bluntly notched, with teeth, or angles, inclining towards neither extremity, as in *Saxifraga Geum*; when a number of segments of small circles, instead of angles, it is termed *obtusely crenatum*; when the larger notches are themselves surrounded with small ones, *duplicate crenatum*.

CRISPUM; undulated from the margin of the leaf being too long for the disk.

CUCULLATUM; rolled up longitudinally in a conical form, hooded or cowled, as in *Sarracenia*.

CUNEIFORME; gradually narrowed towards the base, wedge-shaped, as in *Saxif. Cuneifolia*.

CUSPIDATUM; regards the apex only, and applied to those whose leaves resemble the point of a lance or spear.

DÆDALEUM; a leaf whose form or texture is remarkably beautiful.

DECIDUUM ; expressing the second degree of duration, falling off with the flower. See Caducum.

DECURRENS ; when the base of a sessile leaf extends itself downwards along the stem, beyond its usual termination : i. e. when the basis of the leaf is long in proportion and adheres entirely to the leaf, as in the *Centaurea Glaustifolia*.

DECUSSATA ; growing opposite in pairs, and each pair being alternately on opposite sides of the stem.

DELTOIDEUM ; a rhomboid leaf, consisting of four angles, in which the distance from the side angles to the base is shortest, as in Poplar. Vide. Berkenhouts's Lex. Botanic.

DEMERSUM ; applies to aquatic plants sunk below the surface of the water.

DENTATUM ; toothed, diverging remote points on the margin, as in *Arabis Alpina*.

DEPENDENS ; hanging down, pointing to the ground.

DEPRESSUM; depressed or sunk in the center.

DISTICHA; growing in two rows, on two sides of the branch only.

DOLABRIFORM; in shape resembling an hatchet, as in *Mesembri Dolabriformis*.

ELLIPTICUM; elliptical, oval.

ENERVA; having no visible nerves. Vide Nervosum.

ENSIFORME; shaped like a two-edged sword, gradually tapering to the point, as in *Iris Versicolor*.

EROSUM; when the margin appears gnawed or bitten.

EXSUCCUM; dry, when the substance of the leaf is nearly void of juice, opposed to Succulentum.

FARCTUM; stuffed, opposed to Tubulosum.

FASICULATA; growing in bundles or bunches, as in *Larch*.

FISSUM; a leaf split or cloven half way

down, according to the number of divisions it is distinguished, as bifidum, trifidum, multifidum, &c.

FLABELLATUM; fan-shaped, a leaf in shape of a fan.

FLORALE; those which immediately attend the flower.

GEMINA; two growing together in a kind of bundle, as in *Pinus Silvestris*.

GIBBUM; when the intermediate pulp renders both sides of the leaf convex.

GLABRUM; smooth but not glossy.

HASTATUM; spear-shaped, the posterior angles projecting side-ways, as in *Solanum Dulcamarum*.

HISPIDUM; covered with hairs or bristles, as in *Borage*.

IMBRICATA; having flat surfaces parallel with each other, and lying over like the tiles of a house, as in *Craffulâ Quadrangularis*.

INCANUM; covered with a whitish down, as in the *Cistus Incanus*.

INCISUM ; cut into irregular segments, as in *Ranunculus*.

INFLEXA ; bending upwards toward the stem.

INTEGERRIMUM ; perfectly entire, as in *Ligustrum Vulgaris*.

INVOLUTA ; when the outer margins of the leaf are rolled on both sides spirally inwards, as in *Viola*.

LACERUM ; variously cut into irregular segments as if rent or torn.

LANATUM ; covered with coarse crooked hairs like wool, as in *Stachys Lanata*.

LANCEOLATUM ; oblong, gradually tapering towards each point, as in the *Geranium Linceolatum*.

LACUNOSUM ; deeply furrowed, when the veins of the leaf are sunk much below the surface.

LINEARE ; straight, as in *Rosmarinus*.

LINGULATUM ; tongue-shaped.

LOBATUM ; divided almost to the center

into lobes, according to the number of lobes, bilobum, trilobum, and so on to as many as there may be in the leaf example. *Hepatica*.

LUCIDUM ; clear, transparent.

LYRATUM ; Harp-shaped, or in form of a lyre.

MEMBRANACEUM ; membranous, having no distinguishable pulp between the two surfaces.

MUCRONATUM ; sharp pointed, as in *Sempervivum Mucronum*.

NATANS ; a term for aquatic plants, signifying to swim on the surface, as in *Nymphæ*.

NERVOSUM ; having nerves or vessels extending themselves from the base to the apex without branching out.

NITIDUM ; bright, shining, glossy, as in *Geranium Peltatum*.

NUDUM ; perfectly smooth, without hairs.

OBLIQUUM ; transverse, when the apex of the leaf points to the horizon, and the base upwards, as in the *Protea*.

OBLONGUM ; being long in proportion from the base to the apex, both extremities being rounded, but narrower than the segments of a circle, as in *Rumex Acetosa*.

OBOVATUM ; egg-shaped, the smaller end being fixed to the stalk, as in the *Primula Villosa*.

OBTUSUM ; having a blunt or rounded apex, opposed to *Acutum*.

OBVOLUTUM ; a term in foliation, signifying that the margins of the leaves alternately embrace the straight margin of the opposite leaf, as in *Dianthus*, &c.

OCTONA ; eight leaves growing together.

OPPOSITA ; growing in pairs opposite to each other, as in *Veronica Teucrium*.

ORBICULATUM ; the longitudinal equal to the transverse diameter, a round leaf, as in *Hydrocotyle*.

OVALE ; oval, elliptical.

OVATUM ; resembling the longitudinal section of an egg, as in *Viburnum Tinus*.

PALMATUM ; resembling a hand, or palm of a hand, divided in several parts beyond the middle, as in *Rheum Palmatum*.

PAPILLOSUM ; when the surface of the leaf is covered with dots or points like little bladders.

PAPULOSUM ; when the surface is covered with pimples.

PARABOLICUM ; in form of a parabola.

PARTITUM ; divided nearly to the base, as in *Anemone*.

PELTATUM ; the petiolus being inserted into the disk of the leaf, and not unto its base, as in *Geranium Peltatum*.

PERFOLIATUM ; when the base of the leaf surrounds the stalk, it appearing to go through it, as in *Bupleurum Rotundifolia*.

PERSISTENS ; expresses the third degree of duration. See *Caducum Deciduum*, remaining till the fruit is ripe.

PETIOLATUM ; a leaf growing on a foot-stalk, opposed to *Seffile*, as in *Veronica Montana*.

PILOSUM; covered with long distinct hairs, as in Hieraceum.

PINNATIFIDUM; transversely divided into long horizontal segments, as in Chelidonium Hybridum.

PIXIDATUM; when one leaf is, in resemblance, let into another, as in Equisetum.

PLANUM; neither concave nor convex, as in Cyclamen-coum.

PLICATUM; plaited like a fan, as in Eryngium Maritimum.

PULPOSUM; the pulp regarding the substance of leaves.

PULVERATUM; covered with a kind of meal or dust, as on the inferior disk of the Frankenia Pulverulenta.

QUATERNA; four leaves growing circularly round the stalk, as in Asperula Taurina.

QUINA; five leaves, growing in same manner as in Veronica Virginica.

RADICALE; proceeding immediately from the root.

RADICATUM; a leaf whose substance shoots out roots.

RAMEUM; inserted on the branches.

RECLINATUM; bending downward, the apex of the leaf being lower than the base.

RECURVATUM; bending in a greater degree than *Reclinatum*, but not so much as *Revolutum*.

RENIFORME; resembling a kidney in shape, as in *Saxifra granulata*.

REPANDUM; having a serpentine margin with angles.

RETUSUM; terminating in an obtuse sinus, same as *Obtusum*.

REVOLUTUM; rolled backwards.

RHOMBEUM; diamond-shaped.

ROTUNDATUM; rounded.

RUGOSUM; wrinkled, when the substance of the leaf rises above the veins, as in *Horehound*.

RUNCINATUM; a kind of pinnatifid leaf, in which the lobes are anteriorly convex, and posteriorly transverse, as in *Leontodon*.

SAGITTATUM; shaped like the head of an arrow, as in *Saliva Gluten*.

SCABRUM; rough, opposed to *Glaber*, as in *Pulmonaria Officinalis*.

SCARIOSUM; sonorous.

SEMINALE; the seed leaf, the leaves into which the cotyledons of the seed expand, as in *Turnip*, *Radish*, &c.

SEMPERVIRENS; the longest degree of duration, evergreen. See *Caducum*, *Deciduum*, *Peristens*.

SENA; growing in fixes, as in *Veronica Siberica*.

SEPTENA; having seven on a footstalk, as in *Coronilla Glauca*.

SERICEUM; when the surface is covered with silky down, of extreme fine texture, as in *Lotus Creticus*.

SERRATUM; sharply toothed, or saw-shaped at the margin, as in *Serratula*.

SESSILE; growing immediately on the caulis, as in *Veron Cham*.

SETACEUM ; fine and tapering like a bristle, as in *Asparagus*.

SINUATUM ; having wide hollows on the margin.

SPARSA ; irregularly shaped, as in the lilies.

SPATULATUM ; roundish at the apex, but lengthened by a narrower base in form of a *Spathula*.

SPINOSUM ; prickly, having sharp prickles on the margin.

SPLENDENTIA ; shining. See *Nitidum*.

STELLATA ; furrounding the stem like the radius of a circle. See *Verticullata*.

SUBULATUM ; awl-shaped, as in *Sedum Reflexum*.

TERES ; such as by their internal pulp are rendered in part cylindrical, as in *Allium*.

TERNA ; three leaves growing round the stalk circularly, as in the *Veron Spuria*.

TOMENTOSUM ; covered with numerous white hairs so closely matted as scarcely to

be distinguished, as in *Cerastatium Tomentosum*.

TRIFIDUM ; being thrice divided by linear sinuses, having straight margins, as in *Rosa Lutea*.

TRINA ; three leaves growing in a small bundle, as in *Pinus*.

TRINERVIUM ; having three apparent veins running from the base to the apex, without branching. See *Triplinervium*.

TRIPARTITUM ; consisting of three divisions down to the base, as in the *Eryngium Campestris*.

TRIPLINERVIUM ; whose apparent veins run in three's, or three-fold, from the base to the apex, without branching. See *Triner-vium*.

TRIQUETRUM ; when applied to leaves, means their substance as triangular, their figure considered in one plane, as in *Anthericum Officinarum*.

TRUNCATUM ; having its apex truncated, or cut off.

TUBULOSUM; when cut tranſverſely it appears hollow within, as in *Allium*.

VAGINANS; the lower part of the leaf forming a ſheath to the ſtem, as in *Ciſtus Incanus*.

VENOSUM; whoſe veins branch and ſpread over the whole ſurface of the leaf.

VERTICILLATA; ſurrounding the ſtem like the radii of a wheel.

VILLOSUM; wooley, covered with diſtinct ſoft hairs, as in *Primula Villoſa*.

VISCIDUM; when the ſurface is clammy, *Senecio Viſcoſus*.

UNDULATUM; when the ſurface riſes in waves from the diſk to the margin, as in *Oenothera Molliffima*.

URENS; burning, ſtinging, as in *Nettle*.

SECTION IX.

Of Compound Leaves.

COMPOUND leaves are such whose footstalks are terminated by more than one expansion, or whose footstalk supports more than one leaf. The principal distinctions are,

ARTICULATUM; when one leaf grows from the extremity of another.

DIGITATUM; when a number of leaflets, or small leaves are connected to the extremity of a footstalk, from whence they proceed like Radii, totally unconnected as in Lupin or Hemp.

PEDATUM; when the footstalk divides

into two, and connects the leaflets on its interior sides only, as in *Helleborus Fœtidæ*.

PINNATUM; when many leaflets are connected, or grow on each side of a common footstalk, as in *Polemonium*.

ABRUPTÆ; when the same terminates abrupt, or without a leaflet.

INTERRUPTÆ; when the leaflets are alternately less.

BIPINNATUM DECOMPOSITUM; or doubly pinnated; twice pinnated.

TRIPINNATUM SUPRADECOMPOSITUM; trebly pinnated, as in some of the *Polypodiums*.

SECTION X.

On the Fulcra of Plants.

THE other parts usually attendant on the stalk, are called by Linnæus, Fulcra (from Fulcrum, a prop) and are calculated either to assist the plant in its growth, or to defend it from injuries.

Of these Linnæus enumerates seven different kinds, viz.

BRACTEA; leaves growing with the flowers, and usually differing greatly in shape and colour. Pl. 20.

PUBES; all kinds of hairiness, whether fine or coarse; whether terminating in a fine point or a viscid globule. Pl. 24.

PETIOLUS; the footstalk of a leaf.

PEDUNCULUS; the footstalk of a flower.

STIPULÆ; a small leaf usually placed in pairs at the joints of the plant: attendant on most of the Leguminous plants, varying much in number and form. Pl. 21.

CIRRHUS; a clasper or tendril, by which the plant fastens itself to any other body; as the Hop round the pole, &c. Pl. 22.

ARMA; arms or weapons, intended by Nature to secure them from external injuries: they consist of four different species, viz. 1st, ACULEUS; prickles, which are fixed only to the rind, so as to be easily separated from the plant, without tearing the Ligneous part, as in Rosa.—2d, FURCÆ, or Forks; when several of these grow together they are distinguished thus: bifidæ, trifidæ, according to the number of prongs in each Furca, as in Barberries.—3d, SPINA; rigid prickles which cannot be removed without the Ligneous part too, as in Prunus.—4th, STIMULI; stinging, as in the Urtica. Pl. 23.

PLATE XX.

ON THE FULCRA OF PLANTS.

Fig. 1.—Bractea; shewing an instance wherein the floral leaves differ much in colour from those of the rest of the plant, called Bractææ coloratæ.

Example.

Purple Top'd Clary.

Fig. 2.—Bractea; shewing an instance of the floral leaves differing in shape from those of the rest of the plant.

Example.

Lime.

PLATE XXI.

ON THE FULCRA OF PLANTS.

Fig. 1.—Stipulæ; when small leaflets are growing at the joints of plants, either at the footstalk of a leaf or flower, they are generally in pairs, sometimes more.

Fig. 2.—Aculeus; prickles which are easily separated without tearing the wood.

Example.

Rose.

PLATE XXII.

ON THE FULCRA OF PLANTS.

Fig. 1.—Cirrus; a clasper or tendril, that spiral string by which some plants attach themselves to other bodies, attendant on most of the climbing plants.

Example.

Passion Flower.

PLATE XXIII.

ON THE FULCRA OF PLANTS.

Fig. 1.—Arma; arms or weapons to defend them from external injuries; a species of arma called aculei, prickles which are only fixed in the rind, and may be separated without tearing the ligneous parts, as in rose.

Fig. 2.—Furcæ; forks; when several of them grow together they are distinguished by bifida, for two; trifida, for three, and so on.

Example.

Barberry.

Fig. 3.—Spina; rigid prickles which cannot be separated without tearing the ligneous parts.

Example.

Plumb.

Fig. 4.—Stimuli; stinging, as in nettle.

Fig 2

Fig 1.

Fig 3.

Fig 4.

PLATE XXIV.

ON THE FULCRA OF PLANTS.

Fig. 1.—Petiolus, the Footstalk of a Leaf which does not support the Flower.—Pedunculus, the Footstalk of a Flower which does not support the Leaves.—Pubes, all kinds of hairiness, whether coarse or fine, whether terminating in a sharp point, or viscid globule.

Example.

Violet.

SECTION XI.

On Inflorescence.

IT now remains for us to shew you the different kinds of Inflorescence or modes, in which plants flower; of these Linnæus enumerates several different kinds, the principal of which are:

1st. VERTICILLUS, or Whirl; a mode of flowering in which the flowers are disposed circularly at each joint of the stem, having very short footstalks, exemplified in Mint, Horehound, and other plants, hence called Verticillatæ. Pl. 25.

2d. SPICA; a mode of flowering, in which the flowers are ranged alternately upon both sides or all round a simple common flower-

stalk ; in general the flowers are seated immediately on the stalk, without any partial footstalk, or if there are any footstalks, they are usually very short. When these flowers grow all to one side, it is called *Spica Secunda* ; when from each side, *Disticha*. Pl. 26.

3d. *RACEMUS* ; a mode of flowering in which the flowers, placed along a common footstalk, are furnished with short proper footstalks, proceeding as lateral branches from the common flower stalk. Pl. 27.

4. *PANICULA* ; a mode of flowering in which, according to Linnæus, the fructifications are disposed on footstalks variously subdivided. Pl. 28.

5. *THYRSUS* ; a mode of flowering resembling the cone of a Pine, is a panicle contracted into an oval or egg-shaped form. Pl. 29.

6. *UMBELLA* ; a mode of flowering, in which a number of slender footstalks proceed from the same center, and rise to an equal

PLATE XXV.

ON INFLORESCENCE.

Verticillus, a species of Inflorescence in which the Flowers grow in whirls round the stem.

Example.

Hyfop.

PLATE XXVI.

ON INFLORESCENCE.

Spica, a species of Inflorescence resembling an Ear of Corn; it includes a great variety of Plants, under which denomination comes most flowers whose blossom runs tapering up the stem.

Example.

Veronica Tucrum.

PLATE XXVII.

ON INFLORESCENCE.

Racemus, consisting of a Pedunculus with short lateral branches. A Racemus may be of many different kinds, as simple, compound, erect, hanging down, &c. Its strict explanation is a bunch of Berries, such as Grapes, Currants, &c.

Example.

Red Currant.

PLATE XXVIII.

ON INFLORESCENCE.

Panícula, a species of Inflorescence wherein the outline of the entire figure is nearly elliptical.

Example.

Ladies Bed Straw.

PLATE XXIX.

ON INFLORESCENCE.

Thyrſus. Linnæus defines it to be a Panicle contracted into an oval or egg-shaped form; its origin ſeems to have been from the cuſtom of the ancients, of carrying, at the feaſts of Bacchus, a ſpear wrapped about with Ivy.

Example.

Buckbean.

PLATE XXX.

ON INFLORESCENCE.

Umbella, a species of Inflorescence producing Umbels, i. e. many Pedunculi from one common center, proceeding to an equal length, which, spreading, forms itself similar to an Umbrella. All plants which come strictly under this denomination, are of the class and order Pentandria Digynia.

Example.

Hemlock.

PLATE XXXI.

ON INFLORESCENCE.

Cyma, a mode of Inflorescence which, like the Umbell, the Footstalks proceed from one center, but differ from the Umbell in the partial Footstalks, which proceed from the primary ones, being disposed without any regular order.

Example.

Deadly Nightshade.

PLATE XXXII.

ON INFLORESCENCE.

Corymbus, a species of Inflorescence, in which the partial flower-stalks, which are produced on both sides of the common stalk, arise to an equal height, the flowers growing in clusters, each on a seperate pedunculus.

Example.

♂ *Sperula Odorata*,
Woodruff.

PLATE XXXIII.

ON INFLORESCENCE.

Capitulum, a species of Inflorescence, in which the flowers are collected into a head at the summits of the Pedunculus.

Example.

Auricula.

height, so as to form an even and generally a round surface at top. Plants producing umbels, are called Umbelliferous Plants. Pl. 30.

7. CYMA ; a mode of flowering, in which like the Umbell, a number of slender footstalks proceed from a common center, and rise to the same height, but, unlike the Umbell, the secondary or partial footstalks, are disposed without any regular order. Pl. 31.

8. CORYMBUS ; a mode of flowering, in which the partial flower-stalks are produced along the common stalk on both sides, and though of unequal lengths, rise to the same height, so as to form a flat and even surface at top. Pl. 32.

9. CAPITULUM ; a mode of Inflorescence, in which many flowers are collected into a head at the extremity or summit of the footstalk. Pl. 33.

SECTION XII.

On the Parts of Fructification.

BY the parts of Fructification in vegetables, we understand those of the flower and fruit, and these according to Linnæus, are seven in number.

1. The CALYX.
2. The COROLLA.
3. The STAMEN.
4. The PISTILLUM.
5. The PERICARPIUM.
6. The SEMEN.
7. The RECEPTACULUM.

To these may be added another, viz. the NECTARIUM, for though it is not found in all flowers, it is to be met with in a great number of them.

PLATE XXXVI.

ON THE PARTS OF FRUCTIFICATION.

Various Pistilla

Fig. 1.—Pistillum in the Iris.

- 2. ——— in the Crocus.
- 3. ——— in the Primrose.
- 4. ——— in the Comfrey.
- 5. ——— in the Tulip.
- 6. ——— in the Violet.
- 7. ——— in the Heartsease.
- 8. ——— in the Poppy.

PLATE XXXVII.

ON THE PARTS OF FRUCTIFICATION.

On the Calyx.

Fig. 1.—Shewing an instance wherein the Calyx is entirely wanting.

Example.

Tulip.

Fig. 2.—The Calyx of the Carnation, which for the support of the Petal, Fig. 3. is not only very deep but of one entire piece, and strengthened by several scaly supports at the bottom, otherwise the length of the Petals would break out of their regular order.

Fig 1

Fig 2.

Fig 3

The first of these, the CALYX, or Flower-cup, is the exterior green part of the flower, which encloses and supports the bottom of the Corolla, and frequently covers it before its expansion.

The second part, the COROLLA, is that delicate coloured part of the fructification which is enclosed by the Calyx, and known by the name of the Flower.

The third part, the STAMEN, or STAMINA, if there be more than one, which most commonly happens, are those small thread-like substances found in the inside of the flower, and placed next to the Corolla.

The fourth part, the PISTILLUM, is the small upright body or column, placed in the very center of the flower, shewn in *Primula*.

By the term Flower, we understand the four parts now mentioned, viz. the Calyx, the Corolla, the Stamen, and the Pistillum; you are not to expect however to find all these

parts in every flower: many have no Calyx, as the Tulip, Pl. 37. and Crown Imperial; some have no Corolla, as in Hemp, Willow, and Ladies Mantle; and there are a few instances of some flowers having neither a Calyx nor Corolla, as in the Hippuris, or Mare's-tail, in which there is only one Stamen and one Pistillum, and which therefore is the simplest flower possible.

The fifth part, the PERICARPIUM, is the seed-vessel which remains after the several parts of the flower are decayed, and contains

The sixth part, the SEMEN, or seed of the plant, these two usually constitute the fruit.

The end of the stalk, which supports all the other parts of the fructification, is called the RECEPTACULUM, and constitutes the seventh part.

We cannot compliment Linnæus on the happiness of the term Receptaculum, as it seems to convey an idea different from what he intends. Botanists before him, used the

PLATE XXXVIII.

ON THE PARTS OF FRUCTIFICATION.

- Fig. 1.—Shewing an instance wherein the Flower is unaccompanied by a Corolla, as in the Male Willow.
- Fig. 2.—A single Flower of the Male Willow.
- Fig. 3.—A Branch of the Female Willow.
- Fig. 4.—A single Flower of the Female Willow, selected, wherein the Corolla is also wanting.

PLATE XXXIX.

ON THE PARTS OF FRUCTIFICATION.

Representing the Hippuris, or Mareftail, which has neither a Calyx nor Corolla, fo that it is as fimple a Flower as is poffible, having but one Stamen and one Piftillum.

PLATE XVII.

ON THE PARTS OF FRUCTIFICATION.

On the Nectarium.

Fig. 1.—Nectarium in the Passion Flower, in form of threads. 1.

Fig. 2.—Nectarium in the Narcissus, appearing like a continuation of the Corolla. 1.

Fig. 3.—Nectarium in the Nigella. 2.

Fig. 4.—A perfect Flower of the same. 3.

Fig 1

Fig 2

Fig 3.

Fig 4.

PLATE XVIII.

ON THE PARTS OF FRUCTIFICATION.

On the Nectarium.

Fig. 1.—Nectarium in the Aconite, appearing like two horns, Fig. 3. under the coul or hood. 1.

Fig. 2.—Nectarium in the Columbine.

Fig. 4.—One of the parts detached.

Fig. 5.—Nectarium in the Snow-drop. 1.

Fig. 6.—Nectarium in the Hellebore. 1.

Fig. 7.—Nectarium in the Willow. 2.

Fig 1.

Fig 2

Fig. 3.

Fig 4

Fig 5.

Fig 6

Fig 7

PLATE XIX.

ON THE PARTS OF FRUCTIFICATION.

On the Nectarium.

- Fig. 1.—Nectarium in the Crown Imperial, in form of a gland, secreting Honey.
- Fig. 2.—Nectarium in the Grass of Parnassus.
- Fig. 3.—Nectarium in the Iris, in form of a beard, extending itself up the base of the Petal.
- Fig. 4.—Nectarium in the Nasturtium, wherein it is extended to a long point.

Fig 1

Fig 2

Fig 4

Fig 3

word THALAMUS, which it is rather a matter of surprize that Linnæus should not adopt, since it would have accorded so well with the other families he has been so fond of applying to his doctrine of the sexes.

This part belongs equally to the flower and fruit. Besides these, as we observed to you, there is an additional part found in many flowers, called the NECTARIUM, which is extremely various both in its forms and uses. It sometimes appears as a gland secreting the honey, as in the Willow, and Crown Imperial, and Geranium Lamium. At other times it serves as a kind of vessel to receive it, as in Hellebore. It assumes besides a variety of anomalous appearances, which we shall shew you when we come more particularly to treat of this part. We may make this general observation on the Nectarium, that if any part occurs in the flower, whatever may be its form, if it does not appear to answer the purpose of any of the other parts

of the fructification, it may be considered as the Nectarium.

Having endeavoured to give you a general idea of the several parts of the fructification, we shall now treat more particularly of the form and different kinds of each.

The CALYX, or Flower-cup, as we observed to you, is the exterior green part of the flower, which encloses and supports the bottom of the Corolla, and frequently covers it entirely before its expansion; it is not present in all flowers, being wanting in the Lily, Tulip, Crown Imperial, and many others. In some cases the Calyx appears to be wanting, when in reality it is not. The reason is, that the Calyx drops off immediately on the expansion of the flower, as in Poppy; its colour is most commonly green, but in some few instances it is met with of some other brilliant hue. By culture, the Calyx in several plants, particularly the Cowslip, Primrose, and Polyanthus, is apt to be

PLATE XLI.

ON THE PARTS OF FRUCTIFICATION.

Shewing the difference that subsists betwixt two Plants of the same Genus, with respect to the texture of their Corollas; the Helleborus Hyemalis, which is of a delicate texture; and soon falls off; whereas in the Helleborus Fœtidus it is very thick and clumsy, and remains till the seeds are ripe.

changed into the nature of the Corolla; and the Corolla of the Tulip sometimes assumes the appearance of a Calyx. In some instances therefore it is difficult to decide from appearances which is the Calyx and which the Corolla. In the Hellebore for instance, how great is the difference betwixt the Helleborus, Hyemalis, and Fætidus, for these are undoubtedly of the same genus. The Corolla in the Hyemalis is tender and delicate, of a fine yellow colour, and soon falls off; whereas in the Fætidus, it is of a green colour, of a thick clumsy texture, and remains till the seeds are ripe; this seems to shew that Nature has placed no absolute limits betwixt Calyx and Corolla.

The Calyx is defined by Linnæus to be the termination of the Cortical Epidermis, or outer bark of the plant, which, after accompanying the trunk or stem through all its branches, breaks out with the flower, and is present in the fructification in this new form.

Whether this be really the case or no, is of little importance; it is an opinion which is controverted by Grew and Hedwig.

The use of the Calyx, as Dr. Grew observes, is evidently to enclose, secure, and support, the other parts of the flower; to be their security before its opening, by intercepting all extremities of weather, and afterwards to be their support by containing all their parts in their due and graceful position. Hence, continues the same author, we have the reason why the Calyx is frequently various, and sometimes wanting; some flowers have none, as Tulips, because having a flat or firm leaf or petal, and each leaf likewise standing on a broad and strong basis, they are thus sufficient of themselves. Carnations on the contrary, have not only an empalement or Calyx, but for the greater support of the petals, it is composed of one piece, for otherwise the foot of each leaf or petal being very

PLATE XXXIV.

ON THE PARTS OF FRUCTIFICATION.

The Calyx.

Fig. 1.—Calyx Perianthium, as in Primrose.

- 2. — Spatha, as in Snow-drop.
- 3. — Amentum, as in Hazel.
- 4. — Involucrum, as in Hemlock.
- 5. — Gluma, as in the Grasses.
- 6. — Volva, as in Mushrooms.
- 7. — Calyptra, as in Mosses.

Fig. 3.

Fig. 2.

Fig. 1.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

long and slender, most of them would be apt to break out of compass.

Thus far then as to what the Calyx is, and its uses. In such an infinity of vegetable productions as Linnæus had to arrange, divide, and subdivide, it became necessary to give different names even to the same parts of the plant, according to the different appearances it assumed; hence Linnæus enumerates seven different kinds of Calyx, viz. 1. Perianthium; 2. Involucrum; 3. Gluma; 4. Amentum; 5. Spatha; 6. Calyptra; 7. Volva. Pl. 34.

The first of these, the CALYX PERIANTHIUM, Linnæus defines to be that kind of Calyx which is contiguous to the fructification, as in Primrose, Convolvulus, and by far the greater number of plants.

2d. INVOLUCRUM, is when the Calyx, usually consisting of several leaves, is situated at the foot of an Umbel, as in the Umbelliferous Plants, such as Hemlock, Cow-parisley,

Chervil, and in a few others, which are not termed Umbelliferous Plants, though growing in an Umbel, as the Flowering Rush, and Cowslip ; it occurs also in some single flowers, as the Anemone and Passion Flower.

3d. The Calyx GLUMA, is confined to the Grasses.

4th. The AMENTUM is confined to trees bearing catkins, as the Willow, Hazel.

5th. The SPATHA, is a kind of Calyx of a sheath-like form, common to flowers having bulbous or tuberous roots, as in Narcissus and Iris.

6th. The CALYPTRA is peculiar to Mosses.

7th. The VOLVA, which is peculiar to Mushrooms.

We observed to you before that the CALYX PERIANTHIUM was by far the most common kind of Calyx, and of this there are many variations ; thus it is called a PERIANTHIUM of the FRUCTIFICATION, when it includes both the Stamina and Rudiment of the fruit,

as in Primrose ; a PERIANTHIUM of the FLOWER, when it *contains* the Stamina without the Rudiments of the fruit, as in the Evening Primrose, and Willow Herb : and a PERIANTHIUM of the FRUIT, when it contains the Rudiment of the Fruit, without the Stamina. This latter is exemplified in the Morina Persica of Tournifort, but instances of this kind of Calyx are very rare. It assumes different names according to the number of parts into which it is divided ; thus it is called Monophyllus when composed of one leaf ; Diphyllus, when composed of two ; Triphyllus, when composed of three, and so on. It takes the name of Commune, when it supports and connects together a great number of florets, as in Centaurea, and most of the compound flowers ; and as in these flowers the Perianthium is usually composed of a number of leaves or scales, lying one over the other, like tiles on the top of a

house, it most commonly takes the name of Imbricatum.

Having now shewn you the Calyx, and many of the various forms it assumes, we come next to treat of the COROLLA, a part of the Fructification, equally, if not more various in its appearance.

The COROLLA, as we before observed to you, is that delicate coloured part of the Fructification which is enclosed by, and situated next to the Calyx.

When we speak of this part in general terms, we call it the Corolla, it takes likewise the subordinate or partial name of Petal. Thus when the Corolla is composed of one petal, as in the Primrose; sometimes it is composed of several pieces, as in the Tulip; each of those divisions is called a petal, according to the number of pieces, it takes the name of Monopetala, Dipetala, Tripetala, and so on to Polypetal; instances of the latter occur in Trollius and Nymphæ.

PLATE XL.

ON THE PARTS OF FRUCTIFICATION.

On the Corolla.

Fig. 1.—Illustrating the terms which Corollas receive from their number of Petals, this being Monopetalous, i. e. the Corolla being of one entire piece.

Example.

Convolvulus.

Fig. 2.—Hexapetala, a Corolla, consisting of six Leaves or Petals.

Example.

Lily.

Fig. 3.—Polypetala, consisting of many Leaves or Petals; when they amount to a considerable number they are thus distinguished.

Example.

Water Lily.

Fig 1.

Fig 2

Fig 3

PLATE XXXV.

ON THE PARTS OF FRUCTIFICATION.

On the Corolla.

Fig. 1.—Campanulata or Bell shaped.

Example.

Deadly Nightshade.

Fig. 2.—Infundibuliformis or Funnel shaped.

Example.

Thorn Apple.

Fig. 3.—Hypocrateriformis or Salver shaped, having a flat limb. 1. Placed on a tube. 2.

Example.

Perriwinkle.

Fig. 4.—Cruciata or Cross shaped, when composed of four equally spreading Petals, somewhat resembling a cross; the upper part of the Petal is called the Lamina, the bottom the Unguis or Claw. Fig. 5.

Example.

Wallflower.

Fig 1

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

PLATE XV.

ON THE PARTS OF FRUCTIFICATION.

On the Corolla.

Fig. 1.—Rotata or Wheel shaped, having a flat limb without any tube.

Example.

Borage.

Fig. 2.—Papilionacea, as in the Pea.

Fig. 3.—Ringens, gaping or grinning, an irregular Corolla, which divides into two lips, the opening betwixt which is called the Faux or Mouth.

Fig. 5.—A similar Corolla called Personata, differing in having the Mouth shut. 7.

Example.

Snapdragon.

Fig. 4.—The Papilionaceous Corolla dissected. 2. The Vexillum or Standard. 3. The Ala or Wings. 4. The Carina or Keel.

Example.

Sweet Pea.

Fig 1

5

Fig 2

1

Fig 3

Fig 4

2

3

1

4

Fig 5

7

The lower narrow part of a Monopetalous Corolla, is called the *Tubus*, or *Tube* ; the upper spreading part, the *Limbus*, or *Limb*.

The lower narrow part of a Polypetalous Corolla, affixed to the receptacle, is called the *Unguis*, or *Claw* ; the upper spreading part, *Lamina*.

The Corolla also assumes different names, according to the diversity of its form ; thus it is called *CAMPANULATA*, or bell-shaped, when growing somewhat in the form of a bell, as in Bell flower, and Deadly Nightshade.

INFUNDIBULIFORMIS, or funnel-shaped.

HYPOCRATERIFORMIS, or salver-shaped, having a flat limb placed on a tube, as in *Vinca*.

ROTATA, or wheel-shaped, a flat limb without any tube, as in Borage.

RINGENS, gaping or grinning ; an irregular Corolla, which gapes and divides into two lips ; the opening between the two lips is called the *Faux*, or *Mouth*. When the *Faux*,

or Mouth, in a similar kind of flower, is filled with an intervening substance, or Palate, it is then called *COROLLA PERSONATA*, as in *Anterrhinum*.

The Corolla is called *CRUCIATA*, or cross-shaped, when it is composed of four equal spreading petals, which somewhat resemble a cross, as in *Wallflower*.

PAPILIONACEA, when we have an irregular Corolla, consisting of four petals, the uppermost of which spreading wide, is called the *Vexillum* or *Standard*; the two side ones, the *Ala*, or *Wings*; and the lowermost, which is somewhat boat-shaped, the *Carina*, or *Keel*. A Corolla is called *Composita*, or compound, when it consists of a number of florets or small flowers, placed on one common receptacle, and contained within a common *Calyx*; and of compound flowers there are three kinds, viz. *Ligulata*, *Tubulosa*, and *Radiata*.

PLATE XLVII.

ON THE PARTS OF FRUCTIFICATION.

On Compound Flowers.

Fig. 1.—Radiata, when the Florets in the center are tubular, and those in the circumference flat and spreading.

Fig. 2.—Tubulosa, when all the Florets are tubular, and nearly equal, as in the Thistle.

Fig. 3.—Ligulata, when all the Florets are flat, as in the Dandelion.

Fig. 1

Fig 2

Fig 3

LIGULATA ; is when all the florets are flat, as in Dandelion.

TUBULOSA ; when all the florets are tubular, and nearly equal, as in the Thistles and Knapweed.

RADIATA ; when the florets in the center are tubular, those in the circumference flat and spreading, as in Daisy and Ragwort.

Having, we fear, almost tired you with technical terms, which, however necessary, are far from captivating, we shall defer treating of the remaining part of the Fructification to another Lecture.

F I N I S.

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