BRITISH TROPHY IN HONOUR
ROBERT JOHN THORNTON, M.D.
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NEW ILLUSTRATION

OF THE

SEXUAL SYSTEM

OF

Carolus Von Linnaeus:

COMPREHENDING

AN ELUCIDATION OF THE SEVERAL PARTS OF THE FRUCTIFICATION;

A PRIZE DISSERTATION ON THE SEXES OF PLANTS;

A FULL EXPLANATION OF THE CLASSES, AND ORDERS, OF THE SEXUAL SYSTEM;

AND THE

Temple of Flora, or Garden of Nature,

USING PICTURESQUE, BOTANICAL, COLOURED PLATES, OF SELECT PLANTS, ILLUSTRATIVE OF THE SAME, WITH DESCRIPTIONS.

SHALL BRITONS, IN THE FIELD
UNCONQUER'D STILL, THE BETTER LAUREL LOSE?
IN FINER ARTS AND PUBLIC WORKS SHALL THEY
TO GALLIA YIELD? .........................

THOMSON.

BY

ROBERT JOHN THORNTON, M.D.


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DEDICATION.

MADAM!

In Eastern Language high and mighty Potentates are compared to lofty Trees which afford Food and Shade to the sun-burnt Traveller. In the more temperate Regions of the Earth, Kings and Princes are contemplated as the Sun, which sheds his benign Radiance every where, inspiring each Object with new Life and Refreshment: by the Concurrence, therefore, of all Nations, the great Attribute of Sovereignty is Protection; from conferring of which by Your Most Gracious Majesty, the Science of Botany in Great Britain chiefly owes its present Advancement; and this NEW ILLUSTRATION of the SEXUAL SYSTEM of the great LINNÆUS, its Foundation; which in Point of Magnificence is intended to exceed all other Works of a similar Nature on the Continent, and to be not only a National Honour, but an Eternal Memorial of that Patronage which is granted to Botany by Your Most Gracious Majesty. From the unbounded Protection, so liberally bestowed by an august King, and the best of Queens, all the useful and ornamental Sciences, with the pleasing Arts of Painting, and Engraving, have reached their pre-eminence; nor have the English Nation less reason now to be proud also of their superiority in Type and Paper.

Whilst the honourable Exertions of a great Nation have been lately concentrated to embellish and illustrate the Fancy of Poets, or Sacred and Historic Truth; the Science of Botany, advanced as it is by Linnaeus, and subsequent authors, and by the glowing imaginations
of modern Poets, who have improved on Ovidian Metamorphosis, seemed, likewise, to have a claim to enlist the fine Arts into her service.

In the humble hope, that this Work, which in its progress has received the smile of the munificent Alexander, Emperor of Russia, will not be found altogether unworthy of your Majesty’s countenance, and deeply impressed with the highest consideration of that Honour graciously conferred upon me by your Majesty’s most generous Patronage,

I have the Honour to subscribe myself,

MADAM!

With the highest Gratitude, and profoundest Veneration,

Your Majesty’s most obliged, devoted,

And dutiful Subject,

ROBERT JOHN THORNTON.
Preliminary Observations
PRELIMINARY OBSERVATIONS.

FLOWERS, although apparently so diversified, consist but of five Parts:

I. The Pistillum, in the centre,
II. The Stamen, exterior to this.\(^1\)

The Pistillum is discriminated by a swollen base, which is the seed-vessel, or Germin, which being opened discloses the seeds. The Stamen is discriminated by having a part which forms the pollen, or coloured farina, called an Anther by botanists.

A perfect Pistillum is composed of three Parts.\(^2\)

1. The Stigma, at top, rarely absent, though sometimes obscure.\(^3\)
2. The Style, elevating the Stigma, not absolutely essential.\(^4\)
3. The Germin, or seed-vessel, always present.\(^5\)

A perfect Stamen is composed of two Parts:

1. The Anther, at top, containing the fertilizing pollen, always present.
2. The Filament, elevating the anther, not so essential, being absent in some flowers.\(^6\)

For the protection and nourishment of the Sexual Organs of vegetables, (viz. the Pistilla and Stamina) Nature has furnished two other Parts.

III. The Corolla, interior; \(^*\)both expanded bodies, being expansions, according to Linneus,
IV. The Calyx, exterior.\(^4\)\(\) the first of the bark, and the latter of the rind.

These are discriminated not only by their respective situations, but by the greater delicacy of the Corolla compared with the Calyx, which last is usually green. These parts are not absolutely essential, some flowers being destitute of one,\(^7\) or both of them.

As an appendage to the Corolla,\(^1\) there is found in some plants,

V. The Nectarium, for the secreting, and containing of honey.

Vegetable Infregnation is thus performed. The farina secreted by the anthers of flowers, passes on the stigma of the pistillum, and is there absorbed, and carried to the seeds, which it renders fertile, as is confirmed by numerous observations and experiments.

\(^{*}\) The Pistillum is very conspicuous in the White Lily, and in the Night-blooming Cereus, as also in the American Aloe.
\(^{5}\) The six Stamina are seen extremely well in the White Lily and Aloe, as are also the five stamens in the Blue Passion-flower.
\(^{6}\) The White Lily furnishes an example of a perfect Pistillum, as also the Night-blooming Cereus.
\(^{4}\) As in the Medalia. It is extremely distinct in the Tulipa, Lily, and Passion-flower.
\(^{1}\) Vide the plate of Tulipa, where you will find a Pistillum in the centre without the Style, also the Poppy, whose Stigma is like a Paraphyle. The Style is very conspicuous in the Lily, Cereus, and Passion-flower.
\(^{1}\) For this Part vide the Aloe, Cereus, Lily, and Passion-flower.
\(^{2}\) Vide the plate of the Cereus. The Filament is very observable in the Lily, Aloe, Cereus, &c. as well as the Anther, with its pollen.
\(^{3}\) These Two Parts are finely displayed in the Blue Passion-flower, the Calyx of that climbing plant having a hook at the extremity of the back of the five leaves, constituting the Calyx.—Vide also the Medalia, Cereus, &c.
\(^{1}\) The lenticular tribe have no Calyx: see the Superb Lily; vide also the Begonia.
\(^{1}\) The rishinae, or glory, of the Blue Passion-flower is a fine example of the Nectarium; vide also the cup of the Renealmia and Linum.
ANALYSIS
or
Division of Calyces into their Several Kinds.
THE DIFFERENT KINDS OF CALYX.

The term Calyx, like our words, horse, bird, dog, habitation, is a generic word, including several distinct kinds, thus:

I. **Perianth** (Perianthium), is the outer expanded covering of a flower...the most common kind of Calyx...usually green...sometimes coloured...contiguous to the corolla...protecting the organs for reproduction in their infant-state...sometimes caducous...often abiding with the fruit...and sometimes even serving the office of pericarp...usually single, ...occasionally double...not unfrequently very obscure...or wholly deficient.

II. **Involucre** (Involucrum), is a calyx remote from the flower...most commonly stationed at the foot of a general, or partial, umbel.

III. **Spathe** (Spatha), a species of calyx, which first involves the infant-flowers like a sheath, and then opens longitudinally.

IV. **Glume** (Gluma), the outer valves, or husk of corn, or grass, enclosing one, or more, florets.

V. **Ament** (Amentum), small chaffy scales, protecting the florets placed on a thread-like common receptacle.

VI. **Calyptra** (Calyptra), the covering of a moss, placed over it, like a cap or bonnet.

VII. **Volva** (Volva), a membrane, which involves the fungus in its infant-state, and which afterwards appears in a lacerated form on the foot-stalk.

**Botanical Terms** applicable to the Calyx.

**Peculiar** (Proprius), belonging to a single flower...**Common** (Communis), common to several flowers...**Beneath** (Inferus), placed beneath the Germen...**Above** (Superus), above the Germen...**Monophyllum** (Monophyllus), consisting of one leaf...**Diaphyllum** (Diaphyllus), of two leaves...**Triphyllum** (Triphyllus), of three leaves...**Tetraphyllum** (Tetraphyllus), of four leaves, and so on to **Polyphyllum** (Polyphyllus), composed of many leaves. ...**Intire** (Integer), having the border, or edge of the leaf even...**Toothed** (Dentatus), cut into teeth...**Partite** (Partitus), divided into segments...**Reflexed** (Reflexus), bent back,... **Imbricated** (Imbricatus), having the leaves placed over one another like the tiles of a house.

* All or most of these terms are illustrated in our "Picturesque Botanical Plates," and are more fully explained in our "Philosophy of Botany."
ANALYSIS,
OF
Division of Petals into their Several Kinds.

COROLLA.

I. BELL-SHAPE,
   Compressed.

II. SICKLE-SHAPE
    (Venus)

III. TUNNEL-SHAPE
    (Talarium)

IV. SALVER-SHAPE
    (Volvulus)

V. RINGENT
    (Regenson)

VI. PERSIANATE
    (Pistiloid)

VII. TUBULAR
    (Tubularia)

VIII. LIGULATE
    (Ligulata)

IX. CRUCIFORM
    (Cruciform)

X. ROSACEOUS
    (Rosacea)

XI. LILACIOUS
    (Lilacina)

XII. DIPLOIONIACTOUS
    (Diploioniactous)

COROLAS.

I. Simple.

II. Compound.

III. Repeat.

IV. Irregular.
DIFFERENT KINDS OF COROLLA.

The term Corolla is a compound idea, made up of several distinct notions, as

I. Bell-shaped (Campanulata), hollowed internally like a bell, often ventricose, or swollen at the sides, and without a tube.

II. Wheel-shaped (Rotata), slightly hollow, or the border flat, and with so little tube as to resemble a wheel on the ground.

III. Funnel-shaped (Infundibuliformis), having the border of the Corolla like a cone, and placed upon a tube, so as to resemble a funnel.

IV. Salver-shaped (Hypocrateriformis), having the corner of the Corolla flat, and placed upon a tube, resembling a salver.

V. Ringent (Ringeus), having the border of the Corolla like two lips, and these open, placed upon a tube, resembling a person gaping.

VI. Personate (Personata), having the border of the Corolla like the lips, the mouth closed, greatly resembling the snout of an animal, also placed upon a tube.

VII. Tubular (Tubularis), when the floret of a compound flower ends in a tube, the border being five-cleft.

VIII. Ligulate (Ligulata), when the Corolla of the floret is linear, i.e. resembles the strap of a shoe.

IX. Cruciform (Cruciata), having four petals, placed like a St. Andrew's cross.

X. Rosaceous (Rosacea), having five, or more petals, not fleshy, orbicularly placed.

XI. Liliaceous (Liliacea), having six, or more petals, fleshy, placed also in a circle.

XII. Papilionaceous (Papilionacea), having four petals, of different shapes and sizes, placed so as to resemble a butterfly on the wing.

Botanical Terms applicable to the Corolla.

Monopetalous (Monopetalous), composed of one petal only...Polypetalous (Polypetala), composed of two or more petals...Simple (Simplex), not a compound flower...Compound (Composita), made up of distinct florets on a common receptacle...Rayed (Radiata), having tubular florets in the disk or center, and ligulate in the ray or circumference...Tubular (Tubularis), having florets ending in a tube...Ligulate (Ligulata), having the petal linear like a strap...Regular (Regularis), with all the parts proportionate...Irregular (Irregularis), having all the parts disproportionate...Ventricose (Ventricosa), swollen at the sides...Conical (Infundibuliformis), like a cone...Linear (Linearis), having the sides parallel...Tube (Tubus), the inferior narrow hollow part of a monopetalous corolla...Claw (Unguis), the inferior narrow flat part of a polypetalous corolla...Limb (Limbus), the upper part of a monopetalous corolla...Lamina, or Border (Lamina), the upper flat part of a polypetalous corolla...Banner (Falcillum), the upper petal of a papilionaceous flower...Wings (Ala), the side petals of ditto...Keel (Carina), the under petal, shaped like a boat, of ditto...Toothed (Dentata), the edge cut into teeth...Cleft (Fissa), cut into small segments...Partite (Partita), cut into deep segments...A Segment (Lacinia), the cut portions of the corolla, larger than teeth.
DIFFERENT KINDS OF COROLLA
DIFFERENT KINDS OF NECTARIES.

The term NECTARY, like the COROLLA, is also a complex idea, like our words pigeon, dog, made up of many different individuals, here indeed too numerous and diversified, to be distributed under heads, for every singular appearance in different parts of the flower, even unconnected with the corolla, or whatever is not corolla, whether it secretes honey, or not, is called by botanists, the NECTARY.

The following are among the more prominent examples.

1. A spur, or horn, (Nect. corniculatum), as in Larkspur (Delphinium).
2. A small open cup (Cyathus apertus), small hollow cups, circularly ranged in the interior of the flower, as in Hellebore (Helleborus).
3. A cup closed by a lid (Cyathus clausus), a similar arrangement of nectaries, as in the preceding, but closed with a lid, as in Devil in the Bush (Nigella).
4. Like the cut finger of a glove (Nect. companulatum), hollowed like the finger of a glove cut off, but depending, as in Renalma, Limodorum.
5. Like a funnel (Nect. infundibuliforme), as in Narcissus.
6. Like a slipper (Nect. calceiforme), as in Lady's Slipper (Cypripedium).
7. A simple cavity (Fovea excavata), an excavation at the base of each petal, as in Crown Imperial (Fritillaria).
8. A naked channel (Linea longitudinalis excavata), an hollow longitudinal groove, in a petal, as in White Lily (Lilium Album).
9. Villous projections (Nect. barbatum), numerous villi placed upon the petal, as in some species of Iris.
10. Filaments without anthers imitating stamina (Filamenta sine antheris, veluti stamina), filiform projections like stamina, each terminated with a clasper, as in Arum.
11. Petal-like (Nect. petalum mentiens), as in Snow-drop (Galanthus), and Trollius.
12. Resembling a nest of doves (Columbus referens), five cornuted nectaries, the whole resembling much a nest of doves, as in Columbine (Aquilegia).
13. Resembling Dolphins (Figuram Delphini representans), like a Dolphin elevated on a pillar or filament, as in Monkshood (Aconitum).
14. Like a tongue (Veluti lingua), as in Indian Reed (Canna Indica).
15. Resembling rays of glory (Filamenta versicolorata in orbem posita), projections in the form of rays of glory, as in the several Passion-flowers.
16. Giving the appearance of various animals (Nect. formam animalium mentiens), as in the several Orchises.
17. A naked scale (Squama nuda), as in Ranunculus and Willow.
18. A fringed scale (Squama fimbriata), as in Parnassia.
19. Glands upon the stamens (Glandulae filamenti adspersae), as in Dittany (Dictamnus).
20. Glands at the insertion of stamens (Glandulae filamenti posita), as in the Stock.
DIFFERENT KINDS OF RATIONALS
DIFFERENT KINDS OF PERICARPS.

Ten different sorts of pericarps, or seed-vessels, are enumerated by botanists.

I. Drupe (Drupa), is a pulpy seed-vessel...encompassing a stone, or nut.

II. Pome (Pomum), is a pulpy seed-vessel...not enclosing a stone, or nut...in the middle of which are radiated cells for the reception of seeds.

III. Berry (Bacca), is a pulpy seed-vessel...without radiated cells in the center...having the seeds irregularly dispersed throughout the pulp.

IV. Follicle (Folliculus), is a membranous seed-vessel...of one valve...opening longitudinally, i.e. on the side...and having no apparent suture for fastening or attaching the seeds within it.

V. Silique (Siliqua), is a membranous seed-vessel...of two valves, with a dissepiment intervening...seeds attached alternately to the upper and under sutures...seed-vessel longer than broad...flowers cruciform.

VI. Silicle (Silicula), has the same definition as the last...except that the seed-vessel is rather broader than long.

VII. Legume (Legumen), is a membranous seed-vessel...of two valves...no dissepiment...seeds attached to the superior suture only...flowers papilionaceous.

VIII. Capsule (Capsula), is a membranous seed-vessel...varying in the number of valves...without the characters of Pericarps IV. V. VI. VII. as defined above...splits in a determinate manner into valves.

IX. Nut (Nux), a hard stone, or shell, enclosing a kernel...but without a pulpy covering, in which case it would be a Drupe.

X. Strobile (Strobilus), is a seed-vessel composed of ligneous scales, which embrace the seeds within their bosom.

Terms applicable to the different Pericarps.

Valves (Valkule), the external pieces forming the sides of the seed-vessel...Sutures (Suture), the edges, or margins, by which the valves are connected...Column (Columnella), a central point of union of the partitions in the seed-vessel...Partitions (Dissepimenta), the divisions of the seed-vessel into cells...Cells (Loculamenta), hollow places for the reception of the seeds...One-seeded (Monospermus)...Two-seeded (Dispermus); and so on.
DIFFERENT KINGS OF BRIGARPS

...
DIFFERENT KINDS OF SEEDS.

The seeds present so great a diversity of appearance, that they cannot, like the Calyx, Corolla, or Pericarp, be grouped into distinct assemblages, but must be presented to the reader individually, of which the following are some of the most striking examples.

1. A double seed, each resembling a boat (Semen duplex, navicula formam representans), as in the umbelliferous.

2. Kidney-shaped, with heptagon and pentagon cells (Reniforme, cellulis pentagonis et heptagonis), as in Poppy-seed (Semen Papaveris).

3. Ovalate (Ovatum), shaped like an egg, as in Eye-bright (Euphrasia).

4. Globular (Globosum), as in the Pea (Pisum), and Coriander (Coriandrum).

5. Square (Tetragonum), having four sides, as in Foxglove (Digitalis).

6. Triangular (Triangulare), having three sides, as in Tansy (Tanacetum).

7. Cylindric (Oblongum), oblong, as in St. John's-wort (Hypericum).

8. Resembling a particular shell (Figuram concha mentiens), as in Wood-sorrel (Oxalis).

9. Ditto, as in Purslane (Portulaca).

10. Ditto, as in Cinquefoil (Potentilla).

11. Resembling the head of a monkey (Figuram cynocephali representans), as in the Cocoa-nut.

12. A single crown (Corona simplex), as in Ragwort (Senecio).

13. A double crown (Corona duplex), as in Holy Thistle (Centaurea Benedicta).

14. A shuttle-cock (Corona pennacea), as in Dandelion (Leontodon).

Terms applicable to the Seed.

Aril (Arillus), the outer coat of the seed...Eye (Hilum), an oblong scar, marking the place where the seed was affixed by an umbilical cord to the seed-vessel...Heart (Corculum), the rudiment of the young plant within the seed...Plume (Plumula), the ascending part of the corcule, or infant stem...Radicle (Radicula), the descending part, or infant root...Cotyledons (Cotyledones), the side-lobes, furnishing nourishment to the corculum...Seminal leaves (Folia Seminalia), the first leaves of the plantule, serving the office of cotyledons, or lobes...Pappus (Pappus), a feathery crown...Stipe (Stipes), a thread connecting the pappus to the seed.
DIFFERENT KINDS OF SEEDS

The term 'seed' is used in two distinct contexts: referring to the reproductive organs of plants and as a term in the context of seeds of different kinds. In botany, a seed is a plant that contains the embryonic plant within a protective covering.

In the agricultural context, seeds are the starting point for the growth of new plants. The choice of seed can significantly influence the success and health of the crop. Factors to consider include the type of crop, the local climate, and the intended use of the crop (e.g., food, fuel, fiber).

Selecting the right seed is crucial. Seeds from reputable sources are more likely to produce healthy plants. Seeds from the same variety but different sources should be tested for genetic purity and disease resistance.

The process of selecting seeds involves considering factors such as germination rate, disease resistance, and the need for specific traits in the crop. It's also important to consider the environmental conditions in which the crop will be grown.

In conclusion, seeds are a vital component in the agricultural and botanical worlds, playing a critical role in the growth and survival of plants. Understanding the different kinds of seeds and how to select the right ones for specific needs is essential for successful planting.

[Further information could be added, such as tips on seed storage, seed germination, and the importance of genetic diversity in seeds.]
THE
Prize
Dissertation
on the
Sexes of Plants,
by
Carolus Von Linnaeus,
WRITTEN,
Anno Domini,
1759
ON

THE SEXES OF PLANTS.

It is certain that the Sexes of Plants could not altogether escape the observance of the most ancient investigators of Nature, and even must have struck some philosophers of modern times: for Nature has furnished this phenomenon to be contemplated in almost every plant; for it must be allowed, that scarce any one can be found devoid of it.

In the remotest period of time, the Arabians derived their principal support from the Date-bearing Palm, the Persians from the Pistachia Nut, the inhabitants of the Archipelago from the Fig, and those of Chios cultivated the Mastic Tree. In all these it was necessary to attend to the Sexual Distinction, in order to promote the efficacy of the male as respects the female flowers, and hence they could not altogether be ignorant of a circumstance so exceedingly evident, certainly, as far as regards these trees.

But if truly we contemplate the fate of Botanical Science, we shall easily discover the reason why this theory continued so long obscured in darkness.

The writings of the ancients testify, that Botany was at a low ebb, when Mathematics and Astronomy had made considerable advancement.

After the regeneration of letters, it was the first endeavour of botanists to separate and investigate amongst the ruins the broken fragments of botanical science; in which endeavour, when they perceived that not much riches were to be collected, at length they turned their researches into Nature herself, and began to describe plants from actual observation, until they were so overwhelmed with their number, that they even despaired to number up the species growing in their own gardens, especially when both Indies poured in daily so great a profusion, that properly to name them all, no memory was sufficient.

At last, Systematics endeavoured to describe all plants, with regard to their fructification, and to arrange them into their several companies; nor have they ceased this attention even to the present time.

But when these systematic writers were particularly busy about the Corolla, which especially courts the eye, and the Fruit, which has the greatest use, it happened that they paid little attention to the minuter parts of plants, until they perceived that the larger parts were of themselves insufficient to discriminate so many plants, which daily increased the army of Flora.

This induced the more modern Botanists to investigate all those parts most minutely, which are to be met with in the fructification, and they esteemed their labours not unrepaid, if from thence they could construct true and convenient characters.

Amongst these the Stamina and Pistilla, although generally small bodies, and on that account neglected by former persons with contemptuous pride, were found so important, that there is no flower to be met with devoid of these parts.
Afterwards, these corpses were esteemed of great moment, and on them particular names were imposed; and, moreover, all the several parts of fructification were carefully described.

Exactly to pronounce who first discovered the Sexes of Plants would be a task of the greatest difficulty, and of no real utility. For many inventions have increased by degrees, just as a river, which at first springs from a small rivulet, several of which run into a single channel, till at length it becomes augmented so as to bear the largest ships.

This knowledge of Sexual Distinction cannot be denied to the ancient cultivators of Palms,*

* Old Parkinson, who wrote his "Theatre of Plants" in 1640, speaking of the Palm, says, "the Date is the fruit of this tree, the best kinds are called reginae, as being diet fit for kings. The ancient writers have set down many things of the date-tree, that there are male and female, and that to make them bear, they must be near each other, or else they will not bear; but I pray you account this among the rest of their fables."

It is worthy of enquiry, whether the ancients really understood the meaning of the distinction of the date-tree into male and female, as it is at present understood. Quotations will, I think, settle fully this point.

"When the male Palm is in vigour, the spathia is cut, whereas the flowers proceed, as soon as it contains the down, flowers, and dust, and they shake this over the fruit of the female tree, and from that sprinkling, it turns out, that none drop their fruits, but all perfect them."—THEOPH. PLANT. lib. ii. c. 5.

How near had Pliny hit the mark!


"All trees, or rather in all things which the earth produces, even in herbs, the most diligent enquiries into Nature report, 'there be two sexes,' but in none more evident than in Palms. It is confirmed, that the wild female Palms do not produce fruit without the assistance of the male, and for this purpose the female bend their bought to him for mutual embrace. He also marries with the other female palms by gentle sighings, tender looks, and the dispersion of the powder. This male tree being cut down, the widowed females afterwards become sterile. This tree in plants has been observed by men who imitate it, and by the scattering of flowers and down of the male, or even only by the dispersion of the powder, upon the female."

"Feminae tod the male, and female, I of the phyllis, as Phylla Latia or the Parvum am suam flor, and the opusam parvam suam flor, non enim eum sine in medicinam et medicina in medicinam, sed eum in medicinam ut medicina in medicinam."

"For after what manner the male Palm flowers, he takes the female to his own tree, and sets the palmes in the tree, and the fruit of the tree makes the palmes to bear fruit, and the fruit of the palmes is the fruit of the tree, and the fruit of the tree is the fruit of the palmes."—PLATONIUM, lib. i.

"Palmus tremens pasit passionis actus, and indeed most aesthetically, as Florentius delivers in his Georgics, nor can this passion be extinguished until they meet. The female in love droops her head, nor is the basis firm, nor does she then produce fruit. This the farmers notice, they are conscious she is in love, endeavour to consiste to declare, and when she meets with the male plant she loves, she elevates herself, and they appear to embrace by mutual kisses. And the male plant also displays his affections, extends his arms, and as it were gazing at the object of his love, extends his roots to hers, and thus embraces her. The cure of this love, when the two are at a distance, is applied by countrymen, who bring the arms or hands of the lover to his mistress, and thus the male flowers are placed on the head of the female tree. This mitigates the wastages from the flame of love, and the rejoicing female then bears fruit."—GEORGIC. lib. x. c. 4.

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"As it respects plants, it is the opinion of philosophers, which otherwise would be esteemed a fable, to which also farmers subscribe, that plants are taken in love with one another, and feel the disappointment of love. They report that there are male and female. The female tree desires the male, and if she happens to be at a distance from the male, she pines away. On which account the farmer understanding the matter, as it were plants on a lover's spot, from which he looks down upon his beloved female, inclining to her his bouquet, or he places on the highest branch a bough of the male-tree in flower, the sight of which recreates her mind, recruits her dying body, and revives her even by a partial embrace. Such are the Nuptials of Plants."—AUGUSTINUS. TEXT. c. 17. p. 68.

Hence those much admired lines of Claudian, who most happily introduces a notice of this Love betwixt Plants in his description of the retreat of Venus into the Island of Cyprus.”

Vivunt in Venetius Frondes, omnium vicissim
Felix Arbor amant, mutand ad mutam Palmis
Feder: Pontius suspinit Populius iucu
Et Plavani. Plavantis, Alcnoe subslit Alias.

CLAUDIUS. EPIST. P. 177.

As a confirmation how little the ancients understood the true doctrine of the sexes of plants, Theophrastus mentions a male and female Plant and Fern, in which last certainly there could be no knowledge of the sexes in plants. He also expressly calls the fig, vine, and pomegranate, female plants in Book I, Chap IX. "Our Feminum magis Masculi asympnserci." "Why female plants grow more than the male plants." AESTOYLE AND PLINTH also say, "that the male plants differ only from the female plants in being taller, and more vigorous without! It would be, therefore, absurd to attribute a knowledge of the sexes of plants to the ancients. "Forst Pulmann qui meruit!"
these persons equally understood the Sexual Relationship of the Fig, and likewise in the

* Theophrastus, in his Second Book “De Causis Plantarum,” has Chapter XII. “De Caprifoliis et calicibus,” where this peculiar process, known by the name of Caprifoliation, is given.

Herodotus, whom Cicero calls the father of history, mentions distinctly the caprifoliation of the fig. 

Pliny also accurately describes the same process under the title “De Caprifoliis” and “On Caprifoliation.”

Plutarch, and other authors of antiquity, relate the same circumstances as are practised at this day in the Archipelago and in Italy. But the best account we have of this curious practice is from Tournefort, in a Memoir read before the Academy of Science at Paris in 1706, the substance of which is as follows.

Of the thirty species or varieties of the domestic fig-tree, which are cultivated in France, Spain, and Italy, there are but two cultivated in the Archipelago. The first species is called urtica, from the old Greek urchos, which answers to capriffus in Latin, and signifies a wild fig-tree. The second is the domestic or garden fig-tree. The former bears successively, in the same year, three sorts of fruit, called furmites, crotalitres, and orali; which, though not good to eat, are found absolutely necessary towards ripening those of the garden-fig. These fruits have a sleek even skin; are of a deep green colour; and contain in their dry and mealy inside several male and female flowers placed upon distinct flower-stalks, the female above the latter. The furmites appear in August, and continue to November without ripening; in these are bred small worms, which turn to a sort of gnats nowhere to be seen but about these trees. In October and November, these gnats of themselves make a puncture into the second fruit, and thus, by means of a vacuum, carry the sperm from the male into the female flower. In this case, the horticulturists are obliged to look for the furmites in another part, and fix them at the ends of the branches of those fig-trees whose orali are in a fit disposition to be picked by the gnats, if they miss the opportunity, the orali fall, and the gnats of the crotalitres fly away. None but those that are well acquainted with the culture know the critical moment of doing this; and in order to know it, their eye is perpetually fixed on the bud of the fig; for that part not only indicates the time that the pickers are to issue forth, but also when the fruit is to be successfully picked: if the bud is too hard and compact, the goat cannot lay its eggs, and the fig drops when the bud is too open.

The use of all these three sorts of fruit is to ripen the fruit of the garden fig-tree, in the following manner. During the months of June and July, the pickers take the orali, at the time their gnats are ready to break out, and carry them to the garden fig-trees: if they do not pick the moment, the orali fall; and the fruit of the domestic fig-tree, not ripening, will in a very little time drop in like manner. The pickers are so well acquainted with these precious moments, that, every morning, in making their inspection, they only transfer to their garden fig-trees such orali as are well conditioned, otherwise they lose their crop. In this case, however, they have one remedy, though an indifferent one; which, is, to sew over the garden fig-trees another plant in whose fruit there is also a species of gnats which answer the purpose in some manner.

Linnaeus thus explains the rationale of this practice. “The caprifolium, or wild fig, is the male plant, and the cultivated fig the female. The flowers are disposed within the cavity of the receptacle, which is so close shut, that often it will scarce admit the end of a common needle through a rent in its extremity. Now the fig-flee, which are of the ichn.Permission kind, being transformed, and furnished with wings, about the time the farina of the male fig is ripe, make their escape from those male figs, and being wholly covered with their dust, after copulation, they seek for a place to lay their eggs, and flying to every one of the female figs, they enter their cavities, which are filled with pistillus from all sides, by which means they must necessarily brush off that farina, or male dust, with which they were covered, and then the seeds are impregnated.” It is true, the female fig can ripen its fruit, though the seeds are not impregnated, because this fruit is not a pericarpium, or seed enceol, but only a receptacle: so also the hop, mulberry, strawberry, and kite, can produce fruit, even though their seeds do not ripen, because their fruit is nothing but a receptacle or calyx. Some botanists who were ignorant of this, seeing those trees produce fruit without previous impregnation, thought they had found an unanswerable argument against the generation of plants, but they did not consider, that the fruit of the fig is not a seed enceol, but a common receptacle. Yet it appears, that the fruits of the fig, if the seeds are impregnated, grow to a much larger size than those which are not; which Tournefort also observed: for he tells us, that a fig-tree, in Francaie Compost, where there is no caprifoliation, produced every year only 20 pounds weight of figs; but that another of the same size in one of the islands of the Archipelgo, produced yearly 280 pounds weight of figs, which is above ten times the quantity of the other. This age hath clearly refuted the opinion of Camerarius, who maintained that the seeds of figs never produced any plants. For Linnaeus tells us, that fig trees are raised every year in Holland from the seeds, provided the fruit is brought from Italy: But if the fruit grew in France, England, Germany, or Sweden, where there are no wild figs, the seeds produce nothing; on the other hand, if those seeds are sown, which grew in Italy or the Greek Islands, where the male fig abounds, the plants spring up with ease, putting forth leaves, which at first arc like those of the mulberry. The same experiment was tried with good success in the Upal garden in the year 1742.

Yet still it would be a difficulty for us to imagine, that such refined knowledge was in the breasts of the ancients. Tournefort, in explanation of this practice, says, “The pickers contribute to the maturity of the fruit of the garden fig-tree by causing them to extraneous the nutritious juices, the vessels inclosing which they fear, or perhaps too, when depositing their eggs, they leave some sort of ferment, which greatly agitates the milk of the fig.”

This is also seen by the explanation of Theophrastus, to whom a knowledge of the sexes of plants is attributed, in his chapter “De Caprifolium,” on Caprifoliation. “Cum autem morsus cebrorum orna fructum operine coeperit, humerum absumt supervacuum, et aditus liberrum auri praebet, et omni pomam spumatum efficitur.”

“By the numerous piercings of the flies, outlets are made in the figs, by which the superfluous moisture is drained, a free passage to the air afforded, and breathing pores produced.”

Tournefort, B. II. C. XII.

Like some of our modern gardeners, who are in the habit of applying the male flowers to the female in the cucumber plant raised under glasses, in order to ensure a produce so the ancients performed the like operation on their palms, pistachias, and figs, and in the same way, but without knowing, or even thinking, of the sexes in plants at the time.

Pistacia,
Pistacia,* certainly as far as respects these trees, who always had the custom of suspending the male flowers over the female in order to obtain fruit.

Nor can it be denied that the most ancient writers have expressly made mention of the Sceps in Plants. § But how little true knowledge they possessed upon this subject, and upon what slender foundations it was built, appears from this, that they often mention males and females, as separate in plants, where no such distinction existed.†

Nay, after the revival of letters, even in the last century, Botanists had so imbibed this ancient error, that even eminent teachers of the art so badly discriminated the Sceps, that they often called that a male which was the female plant,‡ which cannot better demonstrate their entire unacquaintance with the subject.

*The Turpentine Tree, the Terebinthus Indica of Theophrastus, p. 401, is thus mentioned by Pliny. "Syria Terebinthus habet. Mucrona est sine fructe. Femininam est fructu radiis teneris magnitudinis, alteri pallidis."

§ In Syria is produced the turpentine tree. The male bears no fruit. The female is of two kinds, the one has red grains of the size of peas, the other sort produces a pale fruit." Plin. Book XIII. Chap. IV.

This would be decisive, as proving Pliny’s knowledge of the sexes of plants, but unfortunately for him, there is found in the same book, the following passage: "Eitan Rhum Syrie muscula fert. Sterili feminina." "Also in Syria is produced the Rhum, or Sumach, the male of which bears fruit, but the female is barren." Bocconii, who wrote in 1657, notices the male and female Turpentine Tree. "E perche in secca et in Agrigento osservato due alberi di Pistacihi, diversi una dall’altra, et distinti da passare nel maschio et femina." "I observed in Agrigentum two trees of the Pistacia, or Turpentine Tree, differing from each other, which the peasants distinguish by the title of male and female."

I shall produce now a modern authority.

"In the garden of the Austin Friars I saw several large Pachycah nut-trees, called in Sicilian, Scornalvece, and the fruit, Festugo. These trees are of Linnaeus’s Class Dicici, Order Pentandria, and produce male and female flowers upon different distinct plants. The latter prove barren and useless, unless rendered fruitful by the infestation of the fornicare from a male plant, and, therefore, the purposes of fecundity can be only answered by trees of different sexes being set near each other. In these gardens are many of the female kind, and only one of the male, which has small, oblong, blunt leaves, of a dusky green, the flowers thick, and in bunches; the female blossoms are more scattered, the leaves larger, harder and rounder, and of a lighter colour. The male flowers first, and some gardeners pluck them when shot, dry them, and afterwards sprinkle the dust over the female tree. But the method usually followed in Sicily, when the trees are far asunder, is to wait till the female buds are open, and then to gather bunches of the male blossoms ready to blow; these are stuck into a pot of moist mould and hung upon the female tree, till they are quite dry and empty; this operation is called Tuchetire, and never fails to produce fructification." Swinburne’s Travels, Vol. iii. p. 366. 2d Ed. 1790.

Although I may seem to anticipate the train of reasoning of Linnaeus, I cannot forbear relating here a story respecting the Turpentine Tree (Pistachia Terebinthina) recorded by Duhemel.

"In the garden of Mons. de la Serre, in the Rue de St. Jacques at Paris, there grew a female Turpentine Tree, which flourished every year, but which furnished him no fruit capable of vegetation. This was a very sensible mortification to the owner, who being ignorant of the doctrine of the sexes of plants, had laboured very hard to obtain an increase of that tree. Mons. Duhemel and Jussieu properly took away all blame from the elements, and promised him they would soon procure him the pleasure he desired. They sent him a male Turpentine Tree, which was very much loaded with blossoms. It was according to their direction planted near to the female Turpentine Tree. That year it produced a great quantity of fruit well conditioned, and such as, when planted, rose with facility. Being removed, his female Turpentine Tree became barren as before."

Some gardeners in Sicily, according to Swinburne, have ingeniously contrived the art of budding the male tree upon the female, by which means the two sexes are placed together upon the same tree.

†As the male Peony, male Citrus, male Ficus, male Orchis, male Veronica, male Abrotanum, &c.

‡The Marcellus Peral Cinum, or common Dog’s Mercury, is thus described by J. Bauhin. "Ex foliorum alio, feminina quidem ligula reeem eminens, tennes, quas verticillatis sec in spino ambient florulis glomerati mucroni, qui in quatuor foliis orbis bello formae specimen, cirrospiceose pulpium ant herbolorum costant, nullo succedendo semine personatur. Morii autem ex eodem sin breves pedicellis orientur, quorum singula testicula forma, numilib conpresso, bistratique insulata, genua semina inchoant." Our countryman Ray could not let this pass unnoted, who, in vol. i. lib. iv. chap. r. "De Mercuriali," remarks. "In loco specificatione J. Bauhinii vulgare opinionem sequitur. Mercuriale sterilem et feminae, et sterilium pro morii accipistem, cum et contine ratione commune et alium serum naturalium analogia, ut sterilis dicatur moss, feminae feminae. Femina enim in omni genere quasi fertilissim et fructu edo. In hoc descriptione J. Bauhinii dicitur, quia Mercurialis fornicarum, et sterilis aspera sterilis, laetum et fructu edo. In hoc maris et female plantas were distinct species." His words are "Spinosum feminae, hoste sterilis, perpetum pro species diversa a Cap. Bauhino potitur, cum ex eodem cum fertili semine proveniant."
Sir Thomas切斯特顿, F.R.S.
Sorbonne Professor at Oxford,
President of the Royal College of Physicians.

Hic primus ante omnes florem coniuris visuit.
The English report, that their MILLINGTON* was the first true discoverer of this doctrine,

* LENZER would not have so slightly mentioned this immortal discovery of the Sexes of Plants made by our illustrious countryman MILLINGTON, Savilian Professor (probably Sedleian Lecturer on Natural History) at Oxford, and afterwards President of the Royal College of Physicians (a name not even mentioned in the Encyclopædia Britannica, or Biographia Britannica), but henceforth be esteemed, like that of the memorable HARVEY, or LENZER, he had been able to read the admirable account written in English of that important discovery, as it is given us by the learned GREW, in his "Account of the Anatomy of Flowers, prosecuted with the bare eye, and with the microscope," being a discourse read before the Royal Society Nov. 18, 1676, in which he thus clearly explains this matter.

"The Attire I find to be of two kinds. Seminiforme and Florid. That which I call Seminiforme, is made up of two general parts, chives and sexmes, one upon each chive. These sexmes (as I take leave to call them) have the appearance, especially in many flowers, of so many little seeds; but are quite another kind of body. For, upon enquiry, we find that these sexmes, though they seem to be solid, and for some time after their first formation, are entire; yet are they really hollow; and their side, or sides, which were at first entire, at length crack asunder: and that moreover the concave of each sexme is not a mere vacancy, but filled up with a number of minute particles, in form of a powder. Which, though common to all sexmes, yet in some, and particularly those of a tulip or a lily, being larger, is more distinctly observable.

"These sexmes are sometimes fastened so, as to stand erect above their chive, as those of larks-beed. Sometimes, and I think usually, so as to hang a little down by the middle, in the manner and figure of a kidney, as in mullions. Their chive or crack is sometimes single, but for the most part double; as these clefts it is that they discharge their powders: which as they start out, and stand betwixt the two lips of each cleft, have a resemblance of a pomegranate with its seeds looking out at the cleft of its rind. This must be observed when the clefts are recently made, which usually is before the expansion of the flower.

"The particles of these powders, though like those of meal or other dust, they appear not easily to have any regular shape; yet upon strict observation, especially with the assistance even of an indifferent glass, it doth appear, that they are a congeries, usually, of so many perfect globes, as so many grains of rice, or of other figures, but always regular. That which discloses their figure is that they being so small! in diage-murcury, borax, and very many more plants, they are extremely so. In mullions, and some others, more fairly visible.

"Some of these powders are yellow, as in diage-murcury, guttae-vire, &c. and some of other colours: but most of them I think are white; and those of yellow houndsm very elegant, the discharges powdered whereof, to the naked eye, are white as snow; but each globulet, through a glass, transparent as crystal; which is not a fallacy from the glass, but what we see in all transparent bodies whatsoever, lying in a powder or small particles together.

"The use of the attire, how contemplatively soever we may look upon it, is certainly great. And though for our own use we value the leaves of the flower, or the follicles, most; yet of all the three parts, this in some respects is the choicest, as for whose sake and service the other two are made. The use hereof, as to ornament and distinction, is unquestionable; but this is not all. As for distinction, though, by the help of glasses, we may make it to extend far; yet in a patent view, which is all we usually make, we cannot so well. As for ornament, and particularly in his reference to the sexmes, we may ask, If for that merely these were meant, then why should they be so made as to break open, or to contain any thing within them? Since their beauty would be as good if they were not hollow: and is better before they crack and burst open, than afterwards.

"Other uses hereof therefore we must acknowledge, and may observe. One is, for food; for ornament and distinction to us, and for food to other animals. I will not say, but that it may serve even in these for distinction too, that they may be able to know one plant from another, and in their flight or progress settle where they like best: and that therefore the varieties of these small parts are many, and well observed by them, which we take no notice of. Yet the finding out of food is but in order to enjoy it: which, that it is provided for a vast number of little animals in the attire of all flowers, observation persuades us to believe. For why else are they evenmore here found? Go from one flower to another, great and small, you shall meet with more upeesakes with these guests. In some, and particularly in the flower, where the parts of the attire, and the animals that provide, are more large, we may not think, that Almighty God hath left any of the whole family of his creatures unprovided for; but as the Great Master, somewhere or other elsevseas out to all, and that for a great number of these little folk, he hath stored up their peculiar provisions in the attire of flowers; each flower thus becoming their lodging and their dining-room, both in one.

"Wherein the particular parts of the attire may be more distinctly servicable, thin to one animal, and that to another, I cannot say: or to the same animal, as a bee, whether this for the honey, another for their bread, a third for the wax: or whether all only suck from brace some juice; or some may not also carry some of the parts, as of the globules, wholly away.

"But this is only the secondary use of the attire. But the primary and chief use of the attire" (author) is such, as hath respect to the plant itself; and so appears to be very great and necessary. Because, even those plants which have no flower or follicles, are yet some way or other attired; either with the seminiform, or the florid attire. So that it seems to perform its service to the seed, as the foliaceae, to the fruit. In discourse hereof with our learned Savilian Professor, Sir Thomas MILLINGTON, he told me, he conceived that the attire both serve as the male, for the generation of the seed.'

GREW goes on. "When the sexme (author) ripens, it lets fall the contained powder (forina), which particles of powdor (forina) themselves burst, and let loose a four powder (pollen), which performs the office of male, and being carried to the seed-case (germen) imparts to the seeds a prolific virtue." Vide Grew's Anatomy, p. 171. Nothing, therefore, can be clearer than that both MILLINGTON and GREW first perfectly knew the sexes of plants.

Doctor Fultersey also, in his Historical and Geographical Sketches of the Progress of Botany, is willing to grant the merit of this great discovery to GROW in preference to MILLINGTON. Probably this high merit should be equally shared by both.

"Whether," says he, "the true idea of the Sexual Process originated with Sir Thomas MILLINGTON, to whom it has been usually ascribed, may justly admit of a doubt; since Sir Thomas has left no written testimony on the subject; and Dr. Grew's mention of him does not imply that he actually published the idea from him. Add to this, that Mr. Ray, in the summary view of all Grew's discoveries, which he has prefixed to his "History of Plants" does not mention Sir Thomas MILLINGTON's name. Interested as we must suppose Mr. Ray to have been, in every discovery relating to vegetables, and candid as he was in his general conduct to the learned, it is not likely that he should have omitted, in this instance, to render praise where it was so justly due. When we further recollect, that Dr. Grew had been some years engaged in those microscopic experiments, on the anatomy of plants, which have rendered his name estimable with all posterity, that while he was thus employed in studying so intimately the organization of vegetables, and had observed, that in whatsoever parts the flower might be deficient, the attire is ever present, is it not strange that the true idea of its use should have been suggested to him?"
if it be allowed to call him an inventor, who understands the thing, but has not taught it in writing. They contend that about the year 1676, he saw the whole mystery; and, in truth, not long after, GREW and RAY,† both Englishmen, explained this matter farther.

* It perhaps may be objected to Linnaeus, that he did not clearly comprehend why this discovery is attributed to Millington, but it is a known fact, that LINNEUS was unacquainted with the English language, and, therefore, could only receive his knowledge from the report of others. The whole story has been fully explained in the last note.

† Our illustrious countryman Ray was made, by the writings of Grew, a complete convert to the doctrine of the Sexes of Plants. In his "Historia Plantarum," "History of Plants," published in 1696, Book I. Chap. X. "De floribus Plantarum, et primo de corum Partibus." The Flowers of Plants and of their Parts. Speaking of the stamens, he expressly says, "Grevius noner non hunc tantum usum staminum prestarre opiniatur, sed et pollinem illum seu globulos quibus apicis praegnantibus sunt, quodque per maturitatem effundit, spermatis masculini instar semilliosorum florundis inservire existit; ac praeclaram maximam plantarum parten utrunque sexus participem esse. Quod non abo incredibile videri debet, cum et in Animalium generi nonnulla undarum observantur, ut v.g. Cocclae terrae, quamvis quidem in seipso non generent, qui a plantis different. Nec oleae, quod purpureae habe (si modo spermata sint aut spermati analoge) in utero aut semen non penetrat, nam et in piscibus externis tumus avium ex sinis insipietur genitura, nec in ullo animalium generi, quod sciam, ovum intimat, at se uterum, quidem ipsum in plerisque, sed alius quis halitus et effluvia subtilius sufficient ad ovum penetrandum, et embryo ita insitus conclusum virifundam.

"Here it is said, non similitudine aliqua dignata, sed revera et strictè locupedi sexus different plantae ille, quam alio semine abeque florie, alio (ab ejendom plantae semine orie) floren abaque semine producunt. Tales sunt in Arborum generis Palus dactylifera, Salsilea pleisque ex nostris observationibus, et secundum Plinius eam Cedrus major: in Helvam, Lupinus salicarius, Conallus, Cupressum, Mercurialis, Phyllon, Urtica, Spinathus, Soteamoida Chinu, aliqua non piuca.

D. Grevii sententiam magispose conferent, quis de Palma dactylifera & Vetebus et Recipientibus tenduntur, nimium feminas non omnino fructificare, uti max fastis lipsiatis inqui: quid et pulv coma mabri feminis superum cum seminorum reddere. Nir enim Egyptian hoc fecerint (inqui Prosper Alpinus) sine dubio feminae vel mullos fructos ferent, vel quos ferrent non retinuerc, neque ha materessent. At inquiris in aereis et desertis, uti nemo meus pulve pers orum forum feminae fortius aspergit, feminae nihilominus feminae sunt. Ego vero venturum beneficio, qui pulverem marium feminilis effara.

Our countryman Grew supposes the stamens to perform the office of the male, and that the furvis with which the authors are filled, and which separates from them when mature, serves the purpose of fruitifying the pistillum, or female; and that the majority of plants are bisexuata; that is, contain both sexes in the same corydila. Not that plants, like the snail, and some other species of animals, are undervis, but are sufficient of themselves to produce their kind. Nor is there occasion, that the furvis should pass into the germs to the seeds, but only an halitus, or subtle effluxus, which is capable of itself to vivify the included embryo.

Besides bisexuata flowers, there are also others strictly unisexual, having the two sexes apart, for from the same sort of seed there shall spring up two plants, whereas one shall bear only staminea or males, and the other only pistilia or females. Of this kind are the date-bearing palms, according to Pliny the large cedar, and from our own observation many of the umbelliferae; and in herbs, the hop, hemp, mercury, nettle, spinach, and a great many others.

What is reported by the ancients and moderns greatly confirm this opinion of Grew, respecting the date-bearing palms, that the furvis of the male flowers, unless the male be placed near them, or the furvis of the male be dispersed over the female flowers (PLIN. HIST. NAT. LIB. 13. C 4) Unless the same was performed in Egypt, without doubt the females would produce no fruit, or what they had they would drop, or not ripen (PROSPER ALPINUS LIB. DE PL. EGYPT.). It may be objected that dates are found in uninhabited spots, but here the furvis is wasted to the females by means of the wind.

He, however, modestly ends with "Opinia autem haec de suis pollinis predicti uteriis adhibenda confirmationis indiget; nos aut vernimimus tantum admittimus." This opinion of Grew, of the use of the pollen before mentioned, wants yet more decided proofs; we can only admit the doctrine as extremely probable." But this was only his cautious manner of writing, as in the following passage, Lib. iv. Hist. p. 126, where he treats of Herb. "quum fructus a fructibus totius plantas distinct, se re Sess distinta". "On herbs, whose fruit is produced on plants separate from the male flowers, which are produced on other plants of the same kind," he writes "Plants have sections comprehesere, in sexu vero non different, praeit nos opinamur, umbel salem aut similitudinem quantum sexus obtinet, clem in eadem specie naturalis sterilis situs, et semina inofacere, aliena fertiles et semina praegnantes. Has naturali mares vacant, illas feminas ali motiles, ali mares factcunt, has feminae seminae et feminas propagant. Has naturali mares vacant, illas feminas alii metoles dabit, alii metoles ductu. C. Rambus quis nos sexu tantum diversas statuere, specimina distinctis facit; macta recit; clem ex ejisdem plante semine utereque orientem: eque enim jure Veterum et Formam species hominis distinctas facere poterint.

Plants comprehended in this section, if they do not differ in sexes, a doctrine which we maintain, nevertheless they possess at least the shade or similitude of sexes, since in the same species of plants some are found barren, produce no seed; whilst others are fertile, producing seed. The latter some have called males, the former females: others, of which number we are, more justly make the barren males, and the seed-bearing females. For the seeds of plants correspond to the eggs of animals; and what produces these are called females, not males. CUPRAS BURNEIX has made into distinct species, what we have given as only differing in sex, and badly, for from the same seed both sexes spring; for with equal propriety might the man and woman be made distinct species.

In his subsequent work, "Synopsis Methodica Stirpium Britannicorum," published in 1696, p. 53. when making the same class of British plants, where the sexes are distinct, in the poioe, he openly declares, "Hic colloginator staminum non esse paritem otonum et superfusus, sed potius valeat utilem et necessarium. Hoc enim confirmatur sententia opinionis pulverum in opicibus staminum contentium, spermatis masculini vires praestitit. Hence it may be collected, that the stamens are not an idle and superfluous part, but, on the contrary: very useful and necessary. This class of flowers confirms the opinion of those, who teach that the dust emitted in the stamens performs the office of the male.

I have been the more elaborate in this note to wipe away a very prevailing opinion, that our countryman Ray had doubts respecting the sexes of plants, because he hinted, as expressed above, that this doctrine should be established by experiments, as is here done by LINNAEUS, Ray's works throughout evince a true knowledge of the Sexes of Plants, and this doctrine owns much, as LINNAEUS allows, to both Grew and Ray.
NEHEMIAH GRENARD
SECRETARY TO THE ROYAL SOCIETY

Gresham College, where the first Meetings of the Royal Society were held.

London: Published for W. Innys. November 2nd.
A Plate from Grew's Anatomy of Plants, published in 1682.

1. Flower of Yellon Henbane, (Atropa belladonna.)

2. One of the Flowers magnified, of which there are 5.

3. Petals in a more advanced State.

4. Petillias, separated, covered with globules of Vomina.
A Plate from Gronow's Anatomy of Plants, published in 1682.

A block view of one of the flowers, as seen through the microscope.

A detail view of the flower, as seen through the microscope.

The stigma, or style part of the flower. The natural size.

The ovary, or female part of the flower. The natural size.

The ovary, as seen through the microscope.

The stamen, or male part of the flower. The natural size.

The stamen, as seen through the microscope.

The flower of Hyacinthus in its proper state. The natural size.

The flower of Hyacinthus, as seen through the microscope.

The flower of Hyacinthus, as seen through the microscope, by short filaments.

The flower in the flower, like a water-bottle, the swelling part being the ovary, the stem the stamen, or part containing the seeds.

CAMEARIUS, * and several others after him,† have well explained this doctrine:

* CAMEARIUS, Professor at Tubingen, in his book "De Sexu Plantarum," published in 1694, acknowledges, "that he first became convinced of the truth of this doctrine by pursuing what had been written on this subject by Gray, and afterwards by Ray, to whom he attributes the honour of establishing this important discovery." His experiments were only on the Meloc, the Mulberry, the Ricinus, and the Mercury; the three first of which he deprived of the stamen-bearing, or male flowers, and the last he separated from its correspondent female, and found that the seeds produced in each instance did not vegetate.

† In 1720, Mr. SAMUEL MOLLAWS, desirous, as it should seem, of extending the Lewesbokian system of generation into the vegetable kingdom, produced a paper before the Royal Society, in which he advances—that the farinum is a caryopsis of plants, one of which must be conveyed through the style into every ovary, or seed, before it can become prolific. He founded his opinion "from observing an opening in the axils, or, bush, of the burs, situated near where the plantale is found lodged, which he conceived was formed on purpose for the admission of a globule of the farinum, which so disposed became the plantale." The refutation of this opinion will presently appear.

In 1711, was read, "A Dissertation on the Structure and Use of the Parts of Flowers," by Mons. GEOFFROY, before the Royal Academy of Science at Paris, where several curious remarks on the Farina, and some experiments on the Sexes of Plants, are given.

Speaking of the farina, Mons. Geoffroy says, "It would be difficult to describe all the different figures of the farina; for however small, each corpuscle has a regular, determinate, and constant figure. In the general run this figure is oval, with a groove the whole length, resembling a grain of corn, or a seed of coffee, as in the Bryony, &c. But,

1. In that of the St. John's Wort, Hypericum Vulgare, of Caspar Basuline's Fokus. (Hypericum Perforatum, Lin.) appear like oval bodies, pointed at their extremities, and swelled in the middle.

2. In that of the Trefoil, Melilotus officinalis Germanus, C. B. P. (Trifolium officinale, Lin.) like a cylinder, having a band running its length.

3. Of the Violet, Viola Montana triforis odoratissima, C. B. P. (Viola grandiflora, Lin.) presents a prism with four irregular sides, transparent, and reflecting different forms.

4. That of the Borago, Borago stellata carunculis, J. B. (Borago officinalis, Lin.) are likewise cylinders, but compressed in the middle, and shining in three different distinct spots.

5. That of the Comfrey, Symphytum Consolida major, C. B. P. (Symphytum officinale, Lin.) represents two crystal balls attached together.


7. That of the Lily, Lilium albus vulgare, J. B. (Lilium candidum, Lin.) an oblong oval, pointed at both ends, and with a groove its whole length.

8. That of the Jonquil, Narcissus jonquilla, minor, C. B. P. (Narcissus Jonquilla, Lin.) have the form of a kidney.


11. That of the Ananthus, Ananthus variolus and herbaribus aculeis minor, J. R. H. (Ananthus mollis, Lin.)

12. That of the Spanish Broom, Genista Sanfura, J. R. H. (Spartium junceum, Lin.) are oblong, rounded at their extremities, and has two bands, being two luminous eminences.

13. That of the Tuberose, Hyacinthus Indicus, (Tuberosa, flore Hyacinthi orientalis, C. B. P. Polyanthus Tuberosa, Lin.) swelled in the middle, so as to make a prism with three sides.

14. That of the Campanula Campanula pyramidalis, altissima, J. R. H. are round transparent, with light eminences, and a luminous point in the center.

15. That of the Passion-flower, Granadilla Polyphylly fructo ovato, J. R. H. (Passiflora cresules, Lin.) are nearly round, with small risings over the surface.

16. That of the Pink, Caryophyllus sylvestris calidarium regionem, J. R. H. are round, the surface a regular mosaic.

17. That of the Geranium, Geranium angustifolium maximo flore, C. B. P. round, with a kind of navel, as in the apple.

18. That of the Pumpkin, Melopepoe compresso, C. B. P. (Cucurbita Melopee, Lin.) are round, with short pointed eminences.

19. That of the Sun-flower, and Marsh Caltha, Caltha palustris, have the surface covered with hairs.

20. That of the Aithea rietes seen (Lavatrus Oblia, Lin.) and the Convovulux purpureus, C. B. P. (Convovulux baderucius, Lin.) have the surface covered with very short eminences.

After many observations on the Sexes of Plants, he relates the following experiment:

I raised several plants of Maize, or Turkey corn, which on the summit of its branch produces male, or staminate flowers, and the fruit is enclosed in a leafy sheath.

I removed the stamina with all the care imaginable, as soon as they showed themselves, and before the pistilliferous flowers appeared.

Upon most of these plants, as served, the spike, after growing to a certain size, dried up, and the grains were withered, or only a few grains' attained its proper size, and these, but thinly scattered along the rachis, which might probably arise from imperfect conduction.

The same event occurred to him with the Dog's Mercury.

As to the manner of the embryos being conveyed into the seed, he accords entirely with MOLLAWS. He says, "that the best microscopes can never discover the plantale, or embryo, in the early stage of the pistillum, nor even when more advanced, unless the farina has reached the stigma of the pistillum." His words are, "En effet, si l'on examine dans les plantes legumineuses, le pistil, ou cette partie qui devient la gousse, avant que la fleur soit encore éclose, et qu'après l'avoir débarrassée des feuilles et des étamines, on la regarde au Soleil avec un microscope, on y remarque très aisément les petites veines vertes et transparentes qui doivent devenir les graines placées dans leur ordre naturel, et dans lesquelles on ne distingue rien autre chose que l'enveloppe ou l'écorce de la graine. En continuant d'observer pendant plusieurs jours de suite dans d'autres fleurs à mesure qu'elles avancent, on remarque que ces veines grossissent et se remplissent d'une liquide claire dans laquelle, lorsque les possesseurs se sont répandus et lorsque les feuilles de la fleur sont tombées, on commence à appercevoir un petit point ou

* It was a pity he had not tried the experiment of sowing these grains.

d globule
glabrous verdaire qui y distille libérement. On n'appartient encore rien d'organisé dans ce petit corps, mais avec le temps et à mesure qu'il grossit, on y distingue peu à peu deux petites feuilles comme deux cornes. La liqueur se consomme insensiblement à mesure que ce petit corps grossit; et la graine étant devenue tout à fait opaque, en l'ouvrant on trouve sa cavité remplit de la petite plante en racineole, composée du germe ou de la plume, de la radicole et des lobes de la Fève ou du Pois.

Si au contraire dans les pivoines à fleurs doubles, qui sont tout à fait dénuées d'étamines et de sommets, on examine les graines qu'elles produisent, soit qu'elles soient avortées ou qu'elles ne le soient pas; on les trouve vides contenant seulement quelques membranes dissecées et sans aucune apparence de graine, semblables en cela à l'œuf d'une poule qui n'a point été formé. En effet, s'il y a été un germe dans ces membranes, n'aurait-il pas dû grossir à proportion de ces enveloppes, et devenir très sensible.

En suivant cette conjecture, il n'est pas difficile de déterminer de quelle manière le germe entre dans cette veau-selle; car outre que la cavité du pistil s'étend depuis son extrémité jusqu'aux embryons des graines, ces veau-selles ont encore une petite ouverture près de leur attache qui se trouve à l'extrémité du conduct du pistil; en sorte que le petit grain de poussière peut tomber naturellement par cette ouverture dans la cavité ou espace de cireinelle reste encore assis sensible dans la pluralité des graines; on l'apparait très distinct sans le secours du microscope dans les Pois, dans les Fèves et dans les Phasèoles.

"La racine du petit germe est tout proche de cette ouverture, et c'est par cette même ouverture qu'elle sort, lorsque la graine vient à germer."

Next in order follows the useful Bradle, who published his "New Improvement in Planting and Gardening, both Philosophical and Practical," in 1721. He writes, "Mr. Morland has, in Phil. Trans. No. 287, anno 1703, given us to understand how the dust of the apices in flowers (i. e. the male spor) is conveyed into the germs or embryo seminale of a plant, by which means the seeds therein contained are impregnated. I then made it my business to search after this truth, and have had good fortune enough to bring it to demonstration by several experiments; since which, a gentleman of Paris has printed something of the same nature, in the Hist. de l'Acad. de Sciences, for the years 1711 and 1712, which were published about ten years ago.

"But to come to the point; the lily being a flower more generally known than any other, and its generative organs being large and exposed, I shall from hence endeavour to explain the method by which nature makes use of to impregnate the seeds of that and every other plant, and by which means the several species of vegetables have been continued to the world.

"The flower of the lily has six leaves or petals, which are set on upon the summit of the footstalk; they serve to guard the parts of generation from the injuries of the weather; and as they are of so other use that I know of, so it is not necessary that I should place them in the figure.

"B is the mouth of the pistillum, or passage which leads into the germs C, in which are three ovaries filled with little eggs or rudiments of seeds, such as we find in the ovaries of animals; but these eggs will decay and come to nothing, unless they are impregnated by the farina facundans or male seed of the same plant, or one of the same sort.

"From D to E is a stamen of the lily, through which the male seed of the plant is conveyed to be perfected in the apex F, where, by the sun's heat, it ripens and bursts forth in very minute particles like dust; some particles of which powder falling upon the office B, is either conveyed thence into the germs C, or by its magnetic virtue, draws the nourishment, with great force, from the other parts of the plant into the embryos of the fruit, and makes them swell.

"Now, that the farina facundans or male dust has a magnetic virtue, is evident; for it is only which bees gather and lodge in the cavities of their hind legs to make their wax with; and it is well known, that wax, when it is warm, will attract to it any light body. But again, if the particles of this powder should be required by Nature to pass into the ovaries of the plant, and even into the several eggs or seeds there contained, we may easily perceive, if we split the pistillum of a flower, that Nature has provided a sufficient passage for it into the uterus, or germs.

"In the first figure I have only given a design of one stamen with its apex, to prevent mistakes in my explanation; but the flower of every lily has six of the same figure and use, which are placed round about the pistillum, or female organ; so that it is almost impossible it should escape from receiving some of the male dust (or farina facundans) falling upon it.

"In this and other flowers of the like nature, the pistillum is always so placed, that the stigmas (anthers) which surround it, are either equal in height with it, or above it; so that their dust falls naturally upon it. And when we observe it to be longer than the anther, we may then conjecture that the fruit has begun to form itself, and has no longer occasion for the male dust. And it is likewise observable, that as soon as this work of production is performed, the male organs, together with the leaves or covering, fall off, and the pipe leading to the germs begins to shrink.

"We may farther remark, that the top of the pistillum in every flower, is either covered with a sort of velvet tuftick, or emits a gummy liquid, the better to catch the dust of the anthers.

"And now, as we may find in the description I have given of the lily, that the germs is within the flower; so, on the other hand, the germs of a rose is without the flower, at the bottom of the petals or flower-leaves. And likewise in fruit trees, the cherries, plums, and some others, have their stigmas within their flowers; and the gooseberry, currant, apples and pears, on the outside or bottom of their flowers. But farther; although Nature has designed the dust of the anthers to fertilize the pistillum contained in the flowers of plants, yet we observe that in some plants, the male and female organs are remote from each other. As, for example, the Guard, Pumkin, Melon, Cucumber, and all of that race, have blossoms distinctly, male and female, upon the same plant. The male blossoms may be distinguished from the female, in that they have not any pistil rudiment of fruit about them, but have only a large thorn covered with dust in their middle; the female blossoms of these has a pistillum within the petals or flower-leaves, and the rudiment of their fruit always apparent at the bottom of the flower before it opens; and so in like manner all nut-bearing, and, I think, mast-bearing trees, have their catkins or male blossoms remote from the female flowers.

"The oak, for example, which blossoms in May, has its male flowers distinct from the storns; we find strings of little farinaeoue flowers in the second figure marked G, remote from the rudiments of the storns or fruit, marked H. And so likewise in the Walnut, Chestnut, Hazel, Pine, Cypress, and even the Mulberry, Apple, and others. I have observed that some sorts of Willows change their Sex every year, by producing only male blossoms or catkins one year, and the other following, strings of female blossoms, which, if they be leaves, to be near enough some flowering male, will produce seeds.

"When we view, with a good microscope, the male dust of any single plant, we find every particle of it to be of the same size and figure; but in some cases it is of three colours, as in the tulip, where it is yellow, green, and black; but as plants differ from one another in their figure and quality, so are the figures of their several dusts greatly different from each other; a grain of the dust of Geranium Sanguinatum, maximum flave, of C, B, P. is like a bead of a necklace with a hole through it."
1. The outer skin in the outside of the bulb, because the bulb of the last year in the center of which is now to be drawn away.

Horizontal sections of the bulbs A, and B, showing the young Tulip in their centre.

Anatomical section of an Elizabeth bulb, showing also the young flower.

Anatomy of the Tulip Root.
A Plate to illustrate the Form Variety: Petals of Tulips.

1. La Manufacture:
   - Petals of a light purple shade with dark lines.

2. General Washington:
   - The petals are white with red spots.

3. Earl Spencer:
   - Petals are deep purple with dark purple stripes.

4. Triomphe Royal:
   - Petals of a deep purple.

5. Louis XIV:
   - Petals are deep purple with dark purple stripes.

6. Georgia Mutus:
   - Petals of a golden yellow.

7. Common Tulip:
   - Petals are deep purple with dark purple stripes.

8. Dutchess of Devonshire:
   - Petals are white with a mixture of pink and deep purple stripes.

Illustrations by P. Tulip.

London: Published by J. Nichol, 1798.
The image contains a text extracted from a page of a document. The text is written in English, and it discusses botanical topics such as the growth and development of plants, particularly focusing on tulips and their role in producing fruits. The text includes several paragraphs discussing the conditions and methods under which tulips grow, as well as their cultivation and the consequences of their development. The text also touches on the historical context of tulip cultivation and the significance of tulips in botany and horticulture. The content is detailed and informative, providing insights into the natural process of plant growth and the importance of tulips in various aspects of botanic studies.
But: none better than VAILLANT, the great French botanist, who, in his academic 

"From a repeated number of experiments, in separating the male from the female plants, I have always observed, that where it has been done in time, and with proper care, as so that there could have been none of the variai speciminae of the male plant scattered on the female; that though the female plants have produced sometimes fair seeds to appearance, yet, when they have been carefully sown, there has not been one plant produced from them.

† The honour of the discovery of the Specus in Plants is always torn from our countrymen, and given by the French to VAILLANT. In that famous Poem, published in Vailant's Botanicus Parisiense, De Conibibbs Florum, the poet gives this honour to VAILLANT.

Callibus insistit veteorum pede turba sequaci,
Vulgasque animae, servam genus; at abe stratv
Instinctum Valiantus iter. Quod callibus arte
Divigit in florae etiam sua te et Cerae
Visit, et per horam detectis primum amores.

Maceneus, M. D."
oration published by Boerhaave, showed that he knew this thing accurately, although he has not demonstrated it by actual experiments.

From that period, that is from the year 1718, many have attempted to raise up this rock, especially the author of the Sexual System, who had supposed that the thing itself was clear, and already established from his various labours, although Pontedera* has indeed attempted to refute it.

Stick I gently touched the inside of one of the filaments, which instantly sprung from the petal with considerable force, striking its anther against the stigma. I repeated the experiment a great number of times; in each flower touching one filament after another, till the anthers of all six were brought together in the center over the stigma.

In order to discover in what particular part of the filaments this irritability resided, I cut off one of the petals with a very fine pair of scissors, so carefully not to touch the stamen which stood next it; then, with an extremely slender piece of quill I touched the outside of the filament which had been next the petal, stroking it from top to bottom; but it remained perfectly immovable. With the same instrument I then touched the back of the anther, then its top, its edges, and at last its inside; still without any effect. But the quill being carried from the anther down the inside of the filament, it no sooner touched that part than the stamens sprang forwards with great vigour to the stigma. This was often repeated with a blunt needle, a fine bistre, a feather, and several other things, which could not possibly injure the structure of the part, and always with the same effect.

To some of the anthers I applied a pair of scissors, so as to bend their respective filaments with sufficient force to make them touch the stigma; but this did not produce the proper contraction of the filament. The incorporation remained only so long as the instrument was applied; so its being removed, the stamens returned to the petal by its natural elasticity. But on the scissors being applied to the irritable part, the anther immediately flew to the stigma, and remained there. A very sudden and smart shock given to any part of a stamen would, however, sometimes have the same effect as touching the irritable part.

Hence it is evident, that the motion above described was owing to an high degree of irritability in the side of each filament, next the germ, by which, when touched, it contracts, that side becomes shorter than the other, and consequently the filament is bent towards the germ. I could not discover any thing particular in the structure of that or any other part of the filament.

This irritability is perceptible in stamens of all ages, and not merely in those which are just about discharging their pollen. In some flowers, which were only so far expanded that they would barely admit a bistre, and whose anthers were not near bursting, the filaments appeared almost as irritable as in flowers fully opened; and in several old flowers, some of whose petals with the stamens adhering to them were falling off, the remaining filaments, and even those which were already fallen to the ground, proved full as irritable as any I had examined.

From some flowers I carefully removed the germs, without touching the filaments, and then applied a bistre to one of them, which immediately contracted, and the stigma being out of its way, it was bent quite over to the opposite side of the flower.

Observing the stamens in some flowers which had been irritated referring to their original situations in the hollows of the petals, I found the same thing happened to all of them sooner or later. I then touched some filaments which had perfectly resumed their former stations, and found them contract with as much facility as before. This was repeated three or four times on the same filament. I attempted to stimulate, in the midst of their progress, some which were returning, but not always with success; a few of them only were slightly affected by the touch.

The purpose which this curious contrivance of Nature answers in the private economy of the plant, seems not hard to be discovered. When the stamens stand in their original position, their anther are effectually sheltered from rain by the concavity of the petals. Thus probably they remain till some insect, coming to extract honey from the base of the flower, thrusts itself between their filaments, and almost unavoidably touches them in the most irritable part; and thus the impregnation of the germens is performed; and as it is chiefly in fine sunny weather that insects are on the wing, the pollen is also in such weather most fit for the purpose of impregnation.

The Barbary is not the only plant which exhibits this phenomenon. The stamens of Cactus Tune, a kind of Indian Fig, are likewise very irritable. These stamens are long and slender, standing in great numbers round the inside of the flower. If a quill or feather be drawn through them, they begin in the space of two or three seconds to lie down gently on one side, and in a short time they are all recumbent at the bottom of the flower.

* Pontedera was professor of Botany at Pisa, and published, in 1722, his "Anthologiae, sive De Floris Natura." " A Discourse on the Nature of Flowers." In his preface he expresses that his chief design in this publication was to repress the prevailing belief of the Sexes of Plants. "Quin etiam cum multos videmus praecellit indulis juvenes tum veterum, tum recentiorum postissimum traditibus haec aliis, ut per facile imperita et infimiora ingenia in ipsis rei Botanici principis decipi possint, succurrere conuenisse, et utis viribus providendum, ne latius malum deficiatur, judicari. Quod sane et illis, quos in horto anno superiore habitat, dissertationibus ex parte præstili, auditores non subinde memendo, ut ab illis opinioribus, que ingenii specie blandiorum, cavereint. Perfaciopium juvenilis et inventiosaculis, que nivate aliícunt, capillus non incutientur per se seue vitiae tempus sapere non servari. Et reverta non video quid alium huic potius teneure de beamus, cum homines autoritatem eximia, ut animos rerum impressio ad se convertant, et aliicent, ista locuntur: esse stirpes in mares, in formias, in aromagras distributas; partisque ilias, quas in deliciis habemus, floresque vacuam, nihil aliud esse, nisi generationis organa: datur in plantis, ut Plini verbi utar. Feronia intellectum, maresque affluit quodam, et pulvere etiam finem maritare? Quis istos, qui haec se ab alios non accipieant, sed vidisse profertantur, qui conjungi tempora tradant, qui rationem, quae frigida in Venerem stipis solicitationem, docent, etiam si non omnino assentiantur, tanum non legendarum edendamque judicabit? Quas exsistit alii incisi illis esse adjectum. Quare eventit, ut vel bujusmodi opinionibus usque obscurantur, illicque perpetuo atque aei generosisse: de quibus jam actum esse supra indicavimus; vel ut vanae et comrenocias rejeicient, atque una totam rem Botanicam in contemplu habeant. His itaque de causis maturandam esse cogovni.

Quaepropter libellum anno proxime elapsa de bujusmodi rebus conscripsum."
Non I ad, videlicet

Romanum cultura est d sermonem. Sed ante omnia illum explanae aggrandiz, ut ostendas, Palum dactyliferae extra Egypti-

De nature somne, cognoscit, quia scient in Cultura sterilib et similitudine aequae esse in re. Puncta, tumae, quia sunt etemae.

Primamit sine prole dis, sine frutibus arbor
Utique, frronquas et sine frugis conin.
Ant postquam patulas fserant brachia ramos,
Cereper et corlo librorum frui
Fremodique apices se complexere, virisque
Iiis sae vestis, conjugis ille sui
Haenere et blandum venis silentibus ignem.
Optatum fortis sponte tulere sua:
Omnieron ramos geminis, minime dicta.
Impelle ver suae multe liquente favos.


Quae non hoc in loco de Palmis quas peculiari regiones regis fuerant, tantum dicere aggreditur. Eippus itaque humum in deserti et vestra solitudinis Arulic regibus eius cultum illum quiu in Aegytho et circumpositis provinciis, Palmis adhibitum neque alimoni.

"Hoc credendum" (verba sunt Galladini apud Prupemum Alpum) "tatem Palmum conspicuous, quae est arte a te narrata, arguere videtur immiseri duxy, qui in Arulse deserts fuerat; in quibus sybretionem Palmum sybrre repertorim, quae sine hominum cultu optimos fructus ac copiosis producunt, retineat, ac matutatur.

Hoc autem iva est validum, ut impat ad refellendum Alpum ad ventorum prodienses se convertet. Aretis, "at, "Palmum cultum petiti respondentis, Palmum facunditatem in Arullic desertia, lictet arte non flat (quando in hi locis hac arbore, ut dictum est, sine illa cultura fructus producent) adjuvare venias, mariae e ramis pluvios thronuktes ad ramus ferminaurum aparents.

Nam cur in Aegyrho loci sui cultum non fiat? Numquid venit in euis regionibus ita doceles non sunt, ut in deserti?

II. "Quo the reason why art is usually employed, is to carry flesis to the female flowers to pierce the spathebus for the admission of air, or to convey the nutrient secreted in the anthers to the pistilbus.

"That copulation is used, rests wholly on the authority of the father of history, Herodotus, in contradiction to all modern authorities.

"Nunc autem summam Dei Opt. Max. providentiam minwi subit, qui divino beneficio illius popula ut eset, quo vitam sustentat, succurrendum judicavit. Nam cum success qui in perditione vassula colligere vel ob partes quibus compositur, vel quid minus effrassit quam par es, tita affectus ad palmulas fortasse desperatur, ut palmulas quidem explicantur, et crescent, sed ad maturitatem nulla ratione produci possit, immutavit ac insulile ad termam delubratur. Hinc itaque peculiare Cedarum genus creatum fuisse opus est quid sterilum Palmarum frutibus innanescerent: hi ad fructiferarum embiones delati esse tereschunt, illius succu viam apertum, aecen et solen quibus loci craniee utricularum auri subgradient, inferunt, partetque Medico velut quodam morum illa affectant, ut poma anniais reinstaurant, ut perfectionem habent.

Quare Palmum cultos, ut propius cultos nascantur, inter fecundas et fructiferas Palmal frutibus et floribus ordinare solent, sique longius sita sunt, funibus appendis, per quos Calliis repere possit, conjungere, tunc sterilum spadices abscissos per fructiferarum spatibus distribuant, duraque putrescent acque tum Calliis super biaosta spatibus discutere. Hanc Palmalum per Callis cultum vetausissimas Auctor Herodotus, duxit ibi illas regiones ita facet, diligentissimae omnia rimando princeps deprehendit, litterisque ad hunc modum manipulavit in


Namquid Historici mentiri licet, Botanic nequeant? 
Mibi coetae videtur fides quam amplexissimae esse Herodoti babendi, tum quod naturalis modo copesitionis exemplo, quae et illa tempestate et hoc etiam tempore in tota Graicia nihil eliis perceperit, istam Palmalum culturae explicare, tum possumimus quod non ex quod ab aliis posset acceptur, sed utque ipsi vident, scipcia relinquere. Theophrastus vero ex aliorum relatione in Palmarum conjugia litterae mandavit, ut et ipse faxus est: quae inquit, in oculis alius, vis in quibus persequatur. Quam ab hunc modum redduntur: "quippe apud Babylonem, ubi Palmal nascuntur, sic esse affirmatur.

Cupidat nec quoque Ficus in Aegyrho, in Syria, et alibi, quae ad Palmal frutibus inscratet, ad fructiferum poma delatis ut tereschunt, at ut ad materinaren prudentiam, praeendent. Ideo etiam spatios circumque absceduntur, ut per vulnas succi eam engentur, et sole ac acer molliniscuc embiones facilis friti possint."

'Exceptaque leve auris, et sape sine ulla
Conjugis veno gravida (mirabile dictu)'

fru. Sed lex ex Philosophis festibus haustus sententiae non videtur. Nec enim his difficultatibus nobilitatis naturae opera involvens sunt. Ergo tamen haec oriens, quae nulla ratione firi possi apparat, ulterior ducem itaque concederem, si illud explannaretur, quod profecto me fugit, quam ratione ex sua involvens embryoyn protudentur, quibus successum grandiosum facti tubas explicat. Haeque semenalia exprò- cula ina fructu cavitatione defere non possunt, nisi per tubas; tuba autem se se explicare noceunt, nisi ina fructum succi ingrediantur. Quare, antequam ad embryoyns defuntur seminalia corpuscula, embryoyn esse jam facundos, necesse est ut fassetur, Versum hoc de Palmis agenes plenius et clarus explicationem.

Conclusurus itaque Mortum, Juniperum, Ficus, Cannabina, Lupulum sine apicem pulviscolae fructus gigante, et ad naturam rem producore. Si dixit hoc levis esse ostendi, necesse est ut plantas sine apicibus fecundari fassatur." To condente his reasoning. His first argument is derived from the Mulherry. He says, 'There are many kinds of these, and if there was any truth in the marriage of plants, these by intermixing would give a cross-breed, whereas each sort always produces its own kind.'

Had Postedera made the experiment, he would have found the hybrid breed he speaks agast.

Of the Juniper he mentions, ‘that the female plant often produces at a very considerable distance from the male tree.' Hence he concludes, ‘That the plant is so replete with volatile oily materials, that this is sufficient of itself to feed the embryos, without the assistance of the nutritive athers, so necessary in other flowers.'

A more careful observation, and direct experiment, would have shown that the insulted Juniper-tree would not produce its berry.

Respecting the Pro, he makes capsification to depend upon the flies admitting air to the embryos, or to the convenion from them, of the nutritive juices from the male, or wild fig.

Of the Herba he denies that the intermixtature of the male and female plants has any effect.'
And this Doctrine, more recently yet, the learned Alston has endeavoured to overturn.*

Linnaeus's direct experiment in this Essay proves the fallacy here. Of the Hop, he says, "that the female produces its court of flowers equally well when separated from the male plant, as Tournefort found in the Royal Gardens of Paris." This arose from the cone of the hop being a single, which grows equally in both instances; but the seeds so produced have not been found to vegetate.

The reader now sees upon what flimsy ground the opposition to the sexes of plants is founded, and is enabled to form his own conclusion, as to the truth of this doctrine, so admirably confirmed as it has been by LINNAEUS.

Linnaeus, in the Hortus Cliffortianus, page 441, however, does his opponent ample justice as an accurate botanist. "Clarissimus Pon.,

terea, qui osculatissimus est succus, et in examinando Flores nulli inferior,'

* The arguments against the sexes of plants, very similar to those of Ponsedan, are collected by the ingenious Professor Alston, in his "Tyroricinum Botanicum," and in a Dissertation on the Sexes of Plants, to be found in the first volume of the "Edinburgh Physical and Literary Essays." In page 256 of that essay, Alston says, "I shall pass a variety of later authors who have treated on this subject; and come to the most strenuous defender of the sexes of plants, who has collected all the arguments for it that perhaps can be advanced, and pretend to have demonstrated it fully: I mean the famous and very learned Carolus Linnaeus, professor of medicine and botany in the university of Upsal, fellow of a great many philosophical societies; and certainly one of the greatest botanists of this age. For this great man thus writes: "Anthea et stigmata constituere securum plantarum, a palmscoba, Millingtonas, Grewio, Rayo, Caramsino, Godofredo, Morlando, Vaillantio, Blario, Josievio, Bredleys, Rayono, Lagano, etc. detectum, descripturn, et pro inutilissimum assumpturn: Nec ullam, apertis oculis anatem constituere plantae flores, interro que; quod demonstratum in Spinosalius Plantorum, Upsilon 1745, 4 to." And elsewhere, "Genetionem vegetabilium fieri, interdum pollinis antherum ilapsa supra stigmatic mala, qua rampstart pollens, effacitque autum semen, quod absolvet ab humano stigmatum; quod confirmit oculus, propertian, locum, tempus, pluvia, palmiscl, flores mutantis, submero, synergens: immo omissum forum generis considerandurn.

"Yet I cannot help thinking this doctrine not capable of demonstration, far less that the genuine consideration of any flower can make it probable: Camerarius himself doubted of it; Tournefort disbelieved it; and Ponsedan uses many arguments to refute it."

In order to do away all belief in the sexes of plants, he relates the following experiments.

1. "In the spring 1741, I transplanted three sets of the common Spinage, long before it could be known whether they were flowering or seed-bearing plants, from a little bed on which they were raised, into a place of the garden, full eighty yards distant, and almost directly south; there being two hawthorn and three holly hedges, all pretty thick and tall, between them and their seed-bed; and six other spinage in the garden, nor so near them by far: all the three proved fertile plants, and ripened plenty of seeds. I sowed them; they grew and prospered as well as any spinage-seed possibly could do. This, I own, made me at first call in question the sexes of plants, which I formerly too implicitly believed.

2. "The same year, a few plants of the common hemp, which I had raised for a specimen from the seed, being accidentally destroyed when very young; and finding afterwards, about the end of June, a pretty strong but late plant of Hemp, growing in the inclosure to the east of Hloneywood-house, commonly called the Bowling-green, by itself: I caused great care to be taken of it, there not being that year any hemp raised within a mile of it, that I could find. This plant grew luxuriantly; and, though bad weather in the autumn made me pluck it up a little too soon, yet I got about thirty good seeds from it, which the succeeding spring produced as thriving male and female plants, as if the mother-hemp had stood surrounded with males, and.

3. "In the spring 1741, I carried two young seedling plants of the French Mercury, long before there was any flower, from the city physic-garden, the only place where it was then to be found in this country, to the king's garden at the Abbey; which are more than seven hundred yards distant from one another, with many high houses, trees, hedges, and part of a hill between them; and planted one of them in one inclosure, where it was shaded from the sun the greatest part of the day; and the other, in another, twenty-five yards distant, exposed to the south and west. Both plants ripened fertile seeds; and the last shed them so plentifully, that it proved a troublesome weed for several years, though none of the species was to be found in that garden, for more than twenty years preceding."

In answer to such stubborn facts, it were to be wished, that the learned professor had continued from year to year these experiments, and multiplied them, and under different circumstances, as he would have fixed conviction on the mind. As the case now stands, these experiments are contradicted by the experiments of Millar recorded in his Dictionary, under article Generation, also by those of Linnaeus in this Essay.

His experiments on the Spinach and Dog's Mercury, (of the Hemp we shall speak when we come to Linnaeus's experiment on that plant), were either defective as not being made sufficiently apart for the winds, or insects, to perform the office of bridgegroom; or, as later observers remark, mark that on Pistilliferous plants, males will occasionally appear, especially in the Spinaceo, and hence the fallacy of the experiment, when they turn out contrary to the sexes of Plants.

Speaking of the Spinaca, Baron De Gleichen, in his "Observationes Microcopae," says, "Je eni assi fait avec cette plante l'expérience ordinaire, en plantant les plantes mâles, pour empêcher les plantes féminelles d'être fécondées. Dans ce temps j'ai pris environ quarante grains de la semence mâle, et ai les mis en terre en rang pièce par pièce séparément, dans une distance assez considérable l'un de l'autre. Aussi bien que je découvris une plante mâle, je l'arraihi, et l'enterrai, jusqu'à ce que mes plantes furent enfin réduites au nombre de douze, desquelles je fus bien assuré, que ce n'étoit que des mâles. Je visai bien souvent ces plantes, et j'ouvris de temps en temps quelques ouvrages seminaux, que j'examini à l'aide du Microscope, et que je trouvai presque tous vides, et biené après tous fécondés. Aussi bien que je visai les plantes encore une fois bien séparément pour voir, s'il en y ait pas qu'elle quelque amant caché. Mais sans découvrir une seule plante mâle, je fus bien surpris de voir, que presque la moitié de mes plantes étoient des Hermaphrodites, dont les vaisseaux de la pousière avoient poussé en grand nombre entre les fleurs mâles, et dont je prends bien assuré, bien que je n'y voie pas trop souvent, des Hermaphrodites parmi les plantes d'Epinars."

"Cependant cette nouvelle expérience est à nous rendre plus attentifs, et à nous dessier les jeux dans des paroles ensens. Mr. Möller, qui s'est avisé de combattre le Systeme de fécondation, en appelant aussi à la semence féconde, qu'il avait obtenu d'une seule plante d'Epinars trouvé par hazard parmi les plantes de pesteur, n'auront pas eu cette main joye, s'il aurait examiné cette plante plus souvent et avec plus d'attention,
In order rightly to understand this subject, it is necessary properly to comprehend the nature of vegetable bodies.

This will be best understood, if we trace downwards the great Chain of Nature; that is, if we begin with man, next consider quadrupeds, then birds, fishes, reptiles, worms, insects, and lastly, descend to vegetables.

que probablement il n'a pas fait. Il est aussi vraisemblable, que ce qui arrive ici parmi les plantes d'Epinars, arrive plus souvent parmi les Diphytes, et je ne crois pas me tromper, en supposant, que ma plante de Chaunvre XVIII, que j'avais quittée féminelle et trouvée mâle quelque temps après, a été sujette à la même métamorphose. Nous avons vu en son lieu la même chose dans les Monophytes, comme dans le Mays et dans la noisette, où ce changement de sexe est plus constamment, que chez les Diphytes, puisque dans celles-là il peut dépendre d'une confusion ou d'une distribution irrégulière de la seve mâle et féminelle et des organes sexuels, qui se trouvent ensemble dans la même plante, mais dans celles-ci, c'est à dire dans les Diphytes, où chaque plante est pourvue de ses propres vaisseaux et de ses organes sexuels, ce changement devient un événement de quel j'abandonne l'explication aux Botanistes, que leur métier oblige à instruire le monde là-dessus. Aussi jugeront-ils cette peine très nécessaire, s'ils considèrent les conséquences importantes, qu'en on peut tirer au sujet de la génération, et que Mr. Linnaeus nous ait fait entrevue par sa conjecture. Car ce fustav so perspective, que le sexe originaire de toutes les plantes était celui des Hermaphrodites."

Spalanzani, a philosopher of the highest character, after numerous experiments on bisexual flowers, where he found that removing the anthers produced always barrenness of the seeds, proceeded upon those plants which staggered Alston. Like that professor, he experienced a contradiction to the general doctrine, and confesses an accident not very uncommon in the unisexual flowers, viz. the occasional production of seed without the aid of pollination on the females. "It has been observed," says Spalanzani, "by Linnaeus, Haller, Duhamel, and others, that male flowers are not very frequently found upon female individuals: a root of spinach, of which I shall speak below, furnished me with a remarkable instance; and the hemp in question is subject to the same accident, as I was informed by Mr. Bonnet, in a letter dated August 15, 1778. The letter gave me notice of an experiment which he undertook upon hemp, after I had communicated mine to him. The paragraph to which I allude in the following: "I began this year some experiments upon hemp. I have followed the method which I employed for rearing the insects on plants in solitude. My plants were covered with large tubes of glass, hermetically sealed at the top, and with the bottom sunk in the earth. But Fortune did not favour me—instead of a female I had a male plant in one instance, and in another a plant of great expectation, after putting forth many flowers with pistils, produced some with stamens, close to the former, which totally disappointed the experiment."

Speaking of the spinach he found the same thing. "In one of my daily visits to my three plants, I perceived upon one individual an unexpected conjunction of male and female flowers, growing close together, and forming very elegant groups. The blossoms with pistils were very conspicuous, but those with stamens were so little advanced, that they could not be distinguished by the naked eye. Both sorts appeared to be equally numerous, but the union extended only to two branches—all the rest bore female blossoms only. I may here incidentally remark, that the great abundance of the male flowers, in the present case, is a very singular phenomenon. I have read in botanical writers, that a few male flowers are sometimes found in company with females, but never that they amount to an equal number, a circumstance that excited my admiration with respect to this individual; for I counted two hundred and seventy-five male buds."

But all his experiments on the Dog's Mercury, or French Mercury, turned out according to the now prevailing opinion.

"The next and last plant producing male and female individuals, on which I made experiment, is the Mercurellus Azurua, (French Mercury). Five very small plants were removed from a garden, on the 22d of August, into five pots. They were managed in the same manner as the spinach during the winter (xxxx), and were all so far advanced at the beginning of spring, that there was no difficulty in distinguishing the males from the females; of the latter there were three, and those alone were preserved. By the 24th of March blossums with pistils appeared upon several branches, growing out of the axil of the leaves, and in a few days more the number was exceedingly increased. They were borne upon short flower-stalks, and, as usual, consisted of two small seeds or spheroidal anthers. They were of a green colour and hairy. But here the event was just contrary to what happened in hemp and spinach. The greater part of the blossoms dropped prematurely; of the few that remained the seeds grew for some time, but fell before they were ripe, and when sown, they did not spring. At this took place before the male plants in the gardens and the fields about Pavia were in flower, I began to suppose mercury to be one of those numerous vegetables, which cannot propagate the species without the powder of the stamens. Meanwhile my three plants continued to put forth new branches, and the old ones, instead of withering, vegetated with great vigour; but still the seeds dropped prematurely. This gradual evolu-

"It therefore became necessary to vary the mode of conducting it. Being more confined in my suspicion, the sterile seeds arose from want of pollen, which, though it was at no great distance, did not reach my plants, I determined to bring it nearer; without, however, setting individuals of the different sexes in the same place. Two male plants of mercury, reared the next year in two pots, were placed on the outside of a window, and two females growing likewise in pots, were set on the outside of another window. Both windows belonged to one room, and had the same aspect. The four roots of mercury were nearly of the same age, and of the same size. And I waited with great anxiety to see whether the females, on account of their vicinity, would be impregnated by the males. The seeds were constantly falling, but not in such abundance as in the former experiment, when the males were at a much greater distance. Those which adhered went on thriving, and seemed as if they would ripen; and they did accordingly arrive at maturity, and, what is of more consequence, were productive; for soon after I had sown them in a pot, I had the pleasure of seeing them spring. It therefore appeared probable, that the vicinity of the males to the females had been instrumental in occasioning fertilisation: their influence could scarce be derived from any source, beyond the action of the contiguous pollen.

"This experiment obviously required another: it was proper to bring the different individuals nearer to each other; I accordingly placed two males and two females upon the same window. It now became manifest, how much influence the approximation of the two sexes has upon fertilisation. The two females retained almost all the seeds which were produced at this time, exceeding an hundred. The seeds grew perfectly ripe, and when put into the ground, were unfolded into as many plants."
In the more perfect animals are many instruments, and various senses, which are denied to the lower tribes of animated beings.

Thus Serpents and Fishes have no feet.

There is no nose in Insects and Worms.

There are many Worms without eyes.

Thus the farther we descend in this chain, the more simple the last links will appear; so that in worms, as the *Tania, Gordion, and Lumbricus*, many parts are wanting which appear in higher animals, hence called perfect, and in the remotest limits of the animal kingdom, we observe the *Zoophyta* nearly approaching the vegetable, having diffused branches, radical at the base, unfolding into flowers, in one word, more like to a plant than an animal, unless in this they approach the higher order of animals, that by means of nerves they have voluntary movement, hence these animal flowers have sensation, and vibrate without the medium of the external air, which affords motion to plants, some of these being placed in

* For a full account of the "Chain of Nature," vide the admirable "Contemplation of Nature," by the Philosopher Bonnet, who has ably discussed this subject. But the different functions of animated beings will be seen at one view in the following table.

### A Table of the Functions, or Gradation, of Living Bodies

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the abysses of the sea, as the Serratula, which has been so admirably illustrated in the works of Ellis.

Plants so nearly approach the lower tribe of Zoophyta, that it is hardly possible to distinguish the one from the other.

Plants have no stomach or intestinal tube, but absorb fluids by their roots, and also throughout their whole surface. Hence a small cutting of a branch placed in water imbibes nourishment at its several pores. So neither the stomach nor intestines of the Serratae or Polyphi have yet been demonstrated. Plants have no heart, yet they have vessels in which flows the sap, which rises to the extreme branches, so neither can any heart be discovered in this lower tribe of animals.

Hence it appears, that the vegetable kingdom only differs from the animal in having no nerves for voluntary movement.*

He who inquires into the generation of plants, should also consider what passes in the animal kingdom. We see insects undergo a metamorphosis, and when this is accomplished, these become sexual. And when these have undergone this change, for example, the butterflies, they are not more dissimilar from their cruda, or larva, than flowers are to their plants.

The moth of the silk-worm has no mouth, and after its metamorphosis its whole employment is to propagate its kind.†

* In the "Philosophia Botanica," LINNÆUS makes the same discrimination, "Lapides crescent, Vegetabilia crescent et vivunt. Animalia crescent, vivunt et aestuant." That is, Minerals grow. Vegetables grow and live. Animals grow, live, and feel. The perceptivity, or feeling of plants, has been maintained by some writers, as Dr. Percival and the Bishop of Landaff. Vide the learned Bishop's "Chemical Essay," vol. v. p. 158; also the "Philosophy of Botany," chapter "On the supposed Perceptivity of Plants."

† Caterpillars may be easily distinguished from worms or maggots, by the number of their feet; and by their producing butterflies or moths. When the sun calls up vegetation, and riviles the various eggs of insects, the caterpillars are the first that are seen, upon almost every vegetable tree, eating its leaves, and preparing for a state of greater perfection. They have feet both before and behind; which not only enable them to move forward by a sort of steps made by their fore and hinder parts, but also to climb up vegetables, and to stretch themselves out from the boughs and stalks, to reach their food at a distance. All of this class have from eight feet, at the least, to sixteen; and this may serve to distinguish them from the worm tribe. The animal into which they are converted, is always a butterfly or a moth; and these are always distinguished from other flies, by having their wings covered over with a painted dust, which gives them each various beauty. The wings of flies are transparent, as we see in the common fly, and, while those of beetles are hard, like horn; from such the wing of a butterfly may be easily distinguished; and words would obscure their differences.

The life of a caterpillar seems one continued succession of changings; and it is seen to throw off one skin only to assume another; which also is divested in its turn; and thus for eight or ten times successively. We must not, however, confound this changing of the skin with the great metamorphosis which it is afterwards to undergo. The throwing off one skin, and assuming another, seems, in comparison, but a slight operation among these animals; this is but the work of a day; the other is the great adventure of their lives. Indeed, this faculty of changing the skin, is not peculiar to caterpillars only, but is common to all the insect kind; and even to some animals that claim a higher rank in nature. We have seen the lobster and the crab eat-growing their first shells, and then bursting from their confinement, in order to assume a covering more roomy and convenient.

With respect to caterpillars, many of them change their skins five or six times in a season; and this covering, when cast off, often seems so complete, that many might mistake the empty skin for the real insect. Among the hairy caterpillars, for instance, the cast skin is covered with hair; the feet, as well glistening as memecoonous, remain fixed to it; even the parts which nothing but a microscope can discover, are visible in it; in short, all the parts of the head; not only the skull, but the teeth.

In proportion as the time approaches in which the caterpillar is to cast its old skin, its colours become more feeble, the skin seems to wither and grow dry, and in some measure resembles a leaf, when it is no longer supplied with moisture from the stock. At that time, the insect begins to find itself under a necessity of changing; and it is not effected without violent labour, and perhaps pain. A day or two before the critical hour approaches, the insect ceases to eat, loses its usual activity, and seems to rest immovable. It seeks some place to remain in security; and no longer timorous, seems regardless even to the touch. It is a new and then seen to bend itself and elevate its back; again it stretches to its utmost extent; it sometimes lifts up the head, and then lets it fall again; it sometimes waves it three or four times from side to side, and then remains in quiet. At length, some of the rings of its body, particularly the first and second, are seen to swell considerably, the old skin distends and bursts, till, by repeated swellings and contractions in every ring, the animal disengages itself, and creeps from its inconvenient covering.

How laborious over this operation may be, it is performed in the space of a minute; and the animal, having thrown off its old skin, seems to enjoy new vigour, as well as having acquired colouring and beauty. Sometimes it happens that it makes a new appearance, and colours very different from the old. Those that are hairy, still preserve their covering; although their ancient skin seems not to have lost a single hair; every hair appears to have been drawn, like a sword from the scabbard. However, the fact is, that a new crop of hair grows between the old skin and the new, and probably helps to throw off the external covering.

The caterpillar having in this manner continued for several days feeding, and at intervals casting its skin, begins at last to prepare for its change
In the same manner all plants undergo a metamorphosis, they shake off their larva state, and change into an **aurelia**. It is most probable that, from the beginning, all the parts of the butterfly lay hid in this insect, in its reptile state; but it required time to bring them to perfection; and a large quantity of food, to enable the animal to undergo all the changes requisite for throwing off these skins, which seemed to clothe the butterfly form. However, when the **caterpillar** has fed sufficiently, and the parts of the future butterfly have formed themselves beneath its skin, it is then time for it to make its first great and principal change into an **aurelia**, or a **chrysalis**, as some have chosen to call it; during which, as was observed, it seems to remain for several days, or even months, without life or motion.

Preparatory to this important change, the **caterpillar** most usually quits the plant, or the tree on which it fed; or at least attaches itself to the stalk or the stem, more gladly than the leaves. It forms its food, and prepares, by fasting, to undergo its transmutation. In this period, all the food it has taken is thoroughly digested; and it often voids even the internal membrane which lined its intestines. Some of this tribe, at this period also, are seen entirely to change colour; and the vivacity of the tints in all, seem faded. Those of which they are capable of spinning themselves a web, set about this operation; those which have already spun, await the change in the best manner they are able. The web or cone, into which some cover themselves, hides the **aurelia** contained within the view, but in others, where it is more transparent, the caterpillar, when it has done spinning, strikes into it the claws of the two feet under the tail, and afterwards forces in the tail itself, by contracting those claws, and violently striking the feet one against the other. If, however, they be taken from their web at this time, they appear in a state of great languor; and, being incapable of walking, remain on that spot where they are placed. In this condition they remain one or two days, preparing to change into an **aurelia**; somewhat in the manner they made preparations for changing their skin. They then appear with their bodies bent into a bow, which they now and then are seen to straighten; they make no use of their legs; but if they attempt to change place, do it by the contractions of their body. In proportion as their change into an **aurelia** approaches, their body becomes more and more bent; while those extensions and convulsive contractions become more frequent. The hinder end of the body is the part which the animal first disengages from its caterpillar skin; that part of the skin remains empty, while the body is drawn up contractedly towards the head. In the same manner they disengage themselves from the two succeeding rings; so that the animal is then lodged entirely in the fore part of its caterpillar covering; that half which is abandoned, remains flaccid and empty; while the fore part, on the contrary, is swollen and distended. The animal, having thus quitted the hinder part of its skin to drive itself up into the fore part, still continues to live and work as before; so that the skull is soon seen to bust into three pieces, and a longitudinal opening is made in the three first rings of the body, through which the insect thrusts forth its naked body, with strong efforts. Thus at last, it entirely gets free from its caterpillar skin, and for ever forsakes its reptile form.

The caterpillar, thus stripped of its skin for the last time, is now become an **aurelia**; in which the parts of the future butterfly are all visible; but in so soft a state, that the smallest touch can discompose them. The animal is now become helpless and motionless; but only waits for the assistance of the air to dry up the moisture on its surface, and supply it with a crust capable of resisting external injuries. Immediately after being stripped of its caterpillar skin, it is of a green colour, especially in those parts which are distended by an extraordinary influx of animal moisture; but in ten or twelve hours after being thus exposed, its parts harden, the air forms its external covering into a firm crust, and in about four-and-twenty hours, the **aurelia** may be handled without endangering the little animal that is thus left in so defenceless a situation. Such is the history of the little pod or cone that is found so common by every path-way, sticking to nettles, and sometimes shining like polished gold. From the beautiful and resplendent colour, with which it is thus sometimes adorned, some authors have called it a **chrysalis**, implying a creature made of gold.

Such are the efforts by which these little animals prepare for a state of perfection; but their care is still greater to provide themselves a secure retreat, during this socerous of their immobility. It would seem like erecting themselves a monument, where they were to rest secure, until Nature had called them into a new and more improved existence. For this purpose, some spin themselves a cone or web, in which they lie secure till they have arrived at maturity; others, that cannot spin so copious a covering, suspend themselves by the tail, in some retreat where they are not likely to meet disturbances. Some mix sand with their gummy and moist webs, and thus make themselves a secure incrustation; while others, before their change, bury themselves in the ground, and thus avoid the numerous dangers that might attend them. One would imagine that they were conscious of the precise time of their confinement in their **aurelia** state; since their little squirlchets, with respect to the solidity of the building, are proportioned to such duration. Those that are to lie in that state of existence but a few days, make choice of some tender leaf, which they render still more pliant by diffusing a kind of glue upon it; the leaf thus gradually curls up, and widening as it enfolds, the insect wraps itself within, as in a mantle, till the genial warmth of the sun enables it to struggle for new life, and burst from its confinement. Others, whose time of transformation is also near at hand, hasten their tails to a tree, or to the first worn-hole they meet, in a beam, and wait in that defenceless situation. Such caterpillars, on the other hand, as are seen to lie several months in their **aurelia** state, act with much greater circumspection. Most of them mix their web with sand, and thus make themselves a strong covering; others build in wood, which serves them in the nature of a coffin. Such as have made the leaves of willows their favourite food, break the tender twigs of them first into small pieces, then pound them as it were to powder; and, by means of their glutinous silk, make a kind of paste, which they wrap themselves in. Many are the forms which these animals assume in this helpless state.

The **aurelia**, though it bears a different external appearance, nevertheless contains within it all the parts of the butterfly in perfect formation; and laying each in a very orderly manner, though in the smallest compass. These, however, are so fast and tender, that it is impossible to examine without discomposing them. When either by warmth, or increasing vigour, the parts have acquired the necessary force and solidity, the butterfly then seeks to disencumber itself of those bands which kept it so long in confinement. Some insects continue under the form of an **aurelia** not above ten days; some twenty; some several months; and even for a year together.

The butterfly, however, does not continue so long under the form of an **aurelia**, as one would be apt to imagine. In general, those caterpillars that provide themselves with cones, continue within them but a few days after the cone is completely finished. Some, however, remain buried in this artificial covering for eight or nine months, without taking the smallest sustenance during the whole time; and though in the caterpillar state no animals were so voracious, when thus transformed they appear a miracle of abstinence. In all, sooner or later, the butterfly bursts from its prison; not only that natural prison which is formed by the skin of the **aurelia**, but also from that artificial one of silk, or any other substance in which it has encased itself.

The efforts which the butterfly makes to get free from its **aurelia** state, are by no means so violent as those which the insect had in changing from the caterpillar into the **aurelia**. The quantity of moisture surrounding the butterfly is by no means so great as that attending its former change; and the shell of the **aurelia** is so dry, that it may be cracked between the fingers. If the animal be shut up within a cone, the butterfly always gets rid of the natural internal skin of the **aurelia**, before it quits its way through.
are seen naked in the flower, whose only business then is to increase and multiply its kind: for the exit of the butterfly from the larva, and the evolution of flowers is accomplished in the same way.

The outer bark (cortex) splits, and is converted into a permanent CALYX, which becomes the outer covering of the flower, and protects the tender fruit.

The inner bark (liber) more pliant, and diaphanous, is further extended into the CORolla adorned with colours, which placed like the wings of the butterfly, through the medium of the air, vibrates and flutters, which motion otherwise it would not be able to procure.

But the principal parts of the flowering body are the STAMINA and PISTILLA, so much so, that no flower can be said to be without them. This appears to be the case up to the present time, in the examination of so many thousands of flowers, so that there exists no true flower, which does not possess these two organs.

The STAMINA derive their origin from the ligneous substance (cortical part), which was formerly the inner bark (liber).

This appears most evident in the asarum (asarabacca), whose twelve stamens proceed from twelve fibres found in the composition of the inner bark.

Flowers with a plentitude of corolla (double flowers) illustrate this doctrine, where the stamens, by receiving too much nutriment, are so softened and dissolved, that these become actual petals, for the ligneous substance in them is thereby converted into the soft nature of the liber, whence petals were, as we saw before, derived.

All stamina possess vessels containing farina, which indeed they discharge, but not without the strictest observance of the laws of Nature.

through the external covering which its own industry has formed round it. In order to observe the manner in which it thus gets rid of the aurelia covering, we must cut open the cone, and then we shall have an opportunity of discovering the insect's efforts to emancipate itself from its natural shell. When this operation begins, there seems to be a violent agitation in the humours contained within the little animal's body. Its fluids seem driven, by an hasty fermentation, through all the vessels; while it labours violently with its legs, and makes several other violent struggles to get free. As all these motions concur with the growth of the insect's wings and body, it is impossible that the brittle skin which covers it should longer resist; it at length gives way, by bursting into four distinct and regular pieces. The skin of the head and legs first separates; then the skin at the back flies open, and dividing into two regular portions, discards the back and wings; and then likewise happens another rupture in that portion which covered the rings of the back of the aurelia. After this, the butterfly, as if fatigued with its struggles, remains very quiet for some time, with its wings pointed downwards, and its legs fixed in the skin which it had just thrown off. At first sight the animal, just set free, and permitted the future use of its wings, seems to want them entirely; they take up such little room, that one would wonder where they were hidden. But soon after, they expand so rapidly, that the eye can scarce attend their unfolding. From reaching scarce half the length of the body, they acquire, in a most wonderful manner, their full extent and bigness, so as to be each five times larger than they were before. Nor is it the wings alone that are thus increased; all their spots and paintings, before so minute as to be scarce discernible, are proportionably extended; so that, what a few minutes before seemed only a number of confused, unmeaning points, now become distinct and most beautiful ornaments. Nor are the wings, when they are thus expanded, unfolded in the manner in which earwigs and grasshoppers display theirs, who unfurl them like a lady's fan; on the contrary, those of butterfly actually grow to their natural size in this very short space. The wings, at the instant it is freed from its late confinement, is considerably thicker than afterwards; so that it spreads in all dimensions, growing thinner as it becomes broader. If one of the wings be plucked from the animal just set free, it may be spread by the fingers, and it will soon become as broad as the other, which has been left behind. As the wings extend themselves so suddenly, they have not yet had time to dry; and accordingly appear like pieces of wet paper, soft, and full of wrinkles. In about half an hour they are perfectly dry, their wrinkles entirely disappear, and the little animal assumes all its splendor. Those aurelias which are enclosed within a cone, find their exit more difficult, as they have still another prison to break through; this, however, they perform in a short time; for the butterfly, freed from its aurelia skin, bats with its head violently against the walls of its artificial prison; and probably with its eyes, that are rough and like a file, it rubs the internal surface away; till it is at last seen bursting its way into open light; and, in less than a quarter of an hour, the animal acquires its full perfection.

Thus, to use the words of SWAMMERDAM, we see a little insignificant creature distinguished, in its last birth, with qualifications and ornaments, which man, during his stay upon earth, can never even hope to acquire. The butterfly, to enjoy life, needs no other food but the dew of heaven; and the honeyed juices which are distilled from every flower. The pageantry of princes cannot equal the ornaments with which it is invested; nor the rich colouring that embellishes its wings. The skies are the butterfly's proper habitation, and the air its element: whilst man comes into the world naked, and often roves about without habitation or shelter; exposed, on one hand, to the hoot of the sun; and, on the other, to the damps and exhalations of the earth; both alike enemies of his happiness and existence.—A strong proof that, while this little animal is raised to its greatest height, we are as yet, in this world, only candidates for perfection!
Of these vessels, which are called anthers, the figures, the cells, the modes of opening, are no less accurately defined, than the capsules of fruits, and the farina, like seeds, has its precise magnitude, colour, and figure.

The PISTILLUM derives its origin from the medullary substance in plants, and therefore is placed in the center of each flower; and in this part are always found the rudiments of the seed, which advances by degrees into a fruit.

This part is called the Germen, to which is always affixed another part, which is named Stigma, and is most in vigour at the period of flowering.

The medullary, is the most essential part in vegetables, and is multiplied and extended ad infinitum, so that whenever this is lost, the plant of necessity must die.

When considering this subject, we must carefully avoid being led into error by two seeming objections; first, as regards the culms of grasses, and other hollow stems, where the medullary part will be found to line the inner part of the bark; and, secondly, in large trees, where the trunk is altogether solid, but here the extreme branches have their necessary medulla.

Thus vegetables, like insects, are changed by a metamorphosis, and with this distinction only, that flowers remain fixed to one spot, nor are they furnished with chylepoietic viscera, as with most insects, and these are also fed by the parent plants to which they are attached.

Thus it is, that the Cortex is changed into the CALYX; the Liber into the COROLLA; the Wood into the STAMINA; and the Medulla into the PISTILLUM.*

Thus it is, that the fructification exhibits the common parts of plants naked and unfolded.

Thus it is, that fructification puts an end to growth in that part where it springs, otherwise it would have shot forward into branches, and so on, ad infinitum, but now becomes expended here by explicating new and distinct animated bodies, with their seeds.

And since the seeds are the medulla naked in the germen, and this medulla requires to be fed and increased by the cortical substance, (whence all nourishment and growth proceeds in plants, as well as animals), hence these seeds cannot advance a step without this necessary aid from that active supporter of life, which these have become separated from.

Hence the medullary seeds require to receive the cortical covering from the farina in the anthers, which, as we have proved before, is derived from the Cortex (outer bark). How this investment takes place has been variously explained.

Morland† and others assert, led to it by the doctrine of Leuwenhoek, that the farina enters by the stigma, passes along the style, and then pervades the tender rudiments of the seeds.

That this doctrine is not founded in fact, appears from several observations.

A most evident contradiction is furnished by the Amaryllis Formosissima (Jacobean Amaryllis), which explains this mysterious circumstance.

The flower of the Amaryllis, when produced in the hot-house, has its pistillum pointing downwards, when from its stigma there oozes about midday a limpid clear drop, which shortly increases to such a size, that one expects every instant to see it fall.

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* This doctrine of Linnaeus is considered at full in our "Philosophy of Botany," to which we refer the reader.
† The arguments of Morland are stated at length in our "Philosophy of Botany."
By degrees, about three or four o'clock, it is reabsorbed into the style, and entirely vanishes, until the following day, about ten o'clock, when it again begins to appear, and attains its full perfection about midday; and afterwards a second time, by a scarce perceptible decrease, it returns whence it originated.

Now each particle of farina possesses, enclosed by an elastic membrane, a fine aura, which escapes oftentimes with a vehement explosion, when this farina is made to fall on warm water, although so subtle in its nature, as nearly to escape detection by the naked eye.

Hence it is, if we agitate some of the anthers over the stigma of this Amaryllis, so that their contained farina shall meet this limpid drop, we shall soon see, as I have often experienced, the globules of the farina lose their determinate shape, assume irregular broken forms, and the clear fluid on the stigma become clouded and yellow, and even opaque streaks may be observed running along the style towards the embryo-seeds. Immediately after this the whole liquid drop on the stigma entirely disappears.

Another evident example is furnished also by the Mirabilis (Marvel of Peru), whose farina is so very coarse, that each globule nearly exceeds the dimensions of the style itself, along which therefore, only the subtle aura, or pollen, can pass, leaving behind the reliquiae of the farina, or membranous covering, in broken fragments on the stigma, as in the former instance.†

When the plants are in flower the farina falls from the anthers, and is dispersed, just as seeds escape from their plants, the fruit being ripe.‡

At the time of flowering, or what is the same, when the farina is shedding, the stigma appears on the pistillum most vivid, and moistened with dew, certainly at some part of the day.

The stamina either surround this stigma, or, if the flowers nod, the pistillum curls upwards; so that the farina may the more readily fall upon the stigma, upon which it is not only affixed by its dew, but in that moisture split, and made to discharge the fructifying aura, or pollen. This mixing with the lymph of the stigma, is then absorbed, and carried down to the embryo-seeds.

† Grew had before explained this in the same way as Linnaeus. "In discourse hereof with Sir Thomas Millington, I observed, that it was very credible that the powder, or farina, by falling upon the pistillum did communicate to the seeds a prolific virtue, that they did not enter in gross substance, but only some subtle and vivific effluvia, to which the visible powder is but a vehicle."

‡ Some of these have the remarkable property, like the seed-vessel of the moli me tangere (balsam), the wood sorrel, &c. to ejaculate their farina to a distance. The kalmias have their stamina enclosed in nitches of the corolla, and hence the filaments are curled like a bow, so that when the curve is at the utmost, the anthers are liberated from their cells, and the farina spatied over the pistillum.

The stamina of the Pasteuraria are also held in such a constrained curved position by the leaves of the calyx, that as soon as the latter become fully expanded, or are by any means removed, the stamina, being very elastic, fly up, and throw their pollen about with great force. I have lately, says Doctor Smith, observed a similar circumstance in the flowers of Medicago folinate. In this plant the organs of generation are held in a straight position by the carina of the flower, notwithstanding the strong tendency of the infant germen to assume its proper facilitated form. At length when the germen becomes stronger, and the carina more open, it obtains its liberty by a sudden spring, in consequence of which the pollen is plentifully scattered about the stigma. The germen may at pleasure be set at liberty by nipping the flower so as gently to open the carina, and the same effect will be produced.

FIRST
Anatomy of the Kalimia

A Cutting.

Leaf. Front View.

Leaf of the Norway Laurel. Front View.

Leaves of the Same Leaved Kalimia. Stalked.

Leaves of the Broad Leaved Kalimia.

London. Published by S. Thoroton. Sold by shop.
Gloriosa Superba: or, Superb Lily.
FIRST EXPERIMENT.

*In the month of January of this year the Antholyza Cunonia (Scarlet-flowered Antholyza) flowered in a pot placed in the window of my dining-room, but it produced me no fruit, because the confined air had not power to waft the farina to the stigmas.

Observing about midday one of the stigmas very devy, I plucked off, by means of a fine pair of forceps, an anther, and gently brought it into contact with it. The spike remained eight or ten days longer adorned with flowers.

Then, indeed, cutting the stem in order to preserve it as a specimen in my herbarium, I observed a fruit in that single flower, over which I had placed the anther, which had swollen to the size of a bean.

SECOND-EXPERIMENT.

The Ixia Chinensis (Chinese Ixia) flowered in the stove, the windows being shut, and all the flowers had abortive fruit.

I therefore took away the anthers from the flowers of another Ixia, and with these I sprinkled two of the flowers, and the following day only one stigma of a third flower.

The germini remained only in these three flowers, which swelled and bore seed; but, indeed, the fruit was in one of these three matured only in one cell.

THIRD EXPERIMENT.

The exterior petals of the Ornithogalum (Star of Bethlehem) so closely connive, that although they admit air to the germini, they scarcely suffer the intrusion of the farina arising from another flower. This daily presented new flowers furnishing fruit; nor did fecundation fail in any one instance. I therefore carefully, with a bent hook, removed the anthers from a single flower, and, as I had expected, it happened, that this single flower proved abortive.

After eight days I repeated the same experiment, and with a similar result.

FOURTH EXPERIMENT.

The Nicotiana Fruticosa (Shrubby Tobacco) was growing in a garden-pot, and produced flowers and fruit most abundantly.

From a flower newly opening, I extracted the anthers which had not yet burst, and removed at the same time all the other flowers.

The germin here neither produced a fruit, nor swelled.

FIFTH AND SIXTH EXPERIMENTS.

The Asphodelus Fistulosus (Onion-leaved Asphodel) growing in an urn, I removed to one corner of the garden, and from one of the flowers which opened on that same day, I withdrew the anthers.

Hence that germin proved abortive.

* This dissertation is divided into heads, or sections; and the first section relates to the Bisexual Flowers, or flowers where the two sexes are in the same corolla.
On another day I repeated the same experiment, and by using a flower furnished from another quarter of the garden, I sprinkled the pistillum of this with its farina. Hence this germ proved fruitful.

SEVENTH AND EIGHTH EXPERIMENTS.
From a Chelidonium corniculatum (Scarlet-horned Poppy) growing in a remote quarter of the garden, I removed all the anthers in a flower which first appeared, and then carefully plucked away all the rest of the flowers.

On another day I made a similar experiment, but over the pistillum of this last I sprinkled the farina taken from another flower of the same species.

The result was, that the first flower produced no seed. From the second experiment I obtained perfect fruit.

CONCLUSION FROM THESE EXPERIMENTS.
These Experiments decisively prove that the Anthers are the male organs in plants, and perfectly disprove the opinion of some who have taught, that the Stamina are those parts of the fructification, which only separate excrementitious matter.*

PROOFS TAKEN FROM OBSERVATIONS.

FIRST OBSERVATION.
What might have convinced them on the contrary, is the universal appearance of the Stamina and Pistilla in all flowers, for none want these organs, although many flowers are devoid of Calyx, and many even have neither Calyx or Corolla, as the Hippuris.†

SECOND OBSERVATION.
All farmers know, that when rain falls upon the rye in flowers, it washes off the Farina on the Anthers, and hence occasions many glumes in the spike to be empty of seeds.

THIRD OBSERVATION.
Even gardeners remark the same every year in their fruit-bearing trees. The flowers, by long exposure to rain, from this cause disappoint the expectation of fruit.‡

FOURTH OBSERVATION.
Aquatic plants at the time of flowering rise above the water, for no other purpose than that the Farina may reach the Stigma unimpaired, for after impregnation they dip under water.¶

* This is levelled against the illustrious Tournefort, who held this doctrine, as did Ablton.
† This is also an argument in favour of the Senses of Plants used by Ray. "The flowers of plants may want their ornamented parts, as the calyx and petals, but none are found to want the stigmas" (stamina). Sylvius Steph. extra Brittan.
‡ The anthers of rye hang out beyond the flower, and if rain falls while it is in flower, the dust is lost, and hence the husbandmen do truly predicate a bad crop; but the same holds not with barley, where the anthers lie close within the husk.
¶ This especially applies to the cherry, whose anthers become mature all at once; but in the apple and pear the numerous anthers open at different periods. Hence gardeners are disappointed of fruitful seeds, who at this time make much use of the watering pot, unless they apply the water in a pan beneath, as many are in the habit of doing.

Vide our account of the Nymphaea Nelmbo. The
Pear Blossom.
State of the flower after 7 o'Clock A.M.

State of the flower in the morning before 5.

Petals closed.
Petals open.

Green Aria: Aria spectabilis, ssp. maculata, var. viridis.
The *Nymphaea alba* (White Water-Lily) every day in the morning rises from the water and opens its flower, so that at midday it rises above the surface, by means of its peduncles, nearly three inches.

In the evening it is entirely closed, and shut up, when it sinks into its watery bed.

It is about four o'clock in the evening when it first contracts its flower, and it passes the whole night under water, which was observed two thousand years back, in the time of Theophrastus, who observed this in the *Nymphaea lotus*, a plant so resembling our *Nymphaea*, that it scarcely can be distinguished from it, unless in its foliage, which is toothed in the *lotus*.

Thus Theophrastus hath written in his History of Plants (Book 4. Chap. 10.) concerning the *lotus*.

"They report, that its head and flowers sink into the *Euphrates*, and descend even to the middle of the night, and sink to that depth, that even at daybreak it cannot be reached with the extended arm; then it returns, and emerges out of the waves, and opens its flowers more and more to the rising sun, advancing through the day, and the flower being completely expanded, it even then rises higher, so that at length it reaches to a considerable height above the water."

The same is nearly the custom of our *White Nymphaea*.*

**FIFTH OBSERVATION.**

Many flowers are closed at night and before the coming on of rain; but the *farina* being shed, they remain afterwards always open.†

* It is still open to doubt, whether this beautiful history of the *Nymphaea lotus* be not a fable. (Vide the Account of our Picturesque Botanical Plate of the *Nymphaea nelumbi*). Might not the dipping of the flowers after impregnation, with their closing in the evening, being then covered by an unctuous calyx, before foundation; give birth to the belief, that the *full-blown flowers* of the *Nymphaea* do actually immerse, and rise again for several successive mornings? Still, however, it cannot fail to strike the observer, that the peduncles, or flower-stalks, hang at right angles to the root, and thus elevate themselves so as to reach different heights, so that the flowers shall be above the water, however swollen.

But the greatest prodigy in this way, is the *Ficinalis*, which grows plentifully in the rivers of Italy. The female plant, for the *seces* are upon different plants, has a spiral stem, like a *screw*, which it contracts or unwinds, according to the depth of the currents it inhabits. The male has a short stalk, which snaps asunder, and the male flowers being liberated from the plant then expand, and swim on the surface of the water, and are conveyed in this way often to distant brigs, with whom they celebrate their nuptials.

† Several plants, especially those with compound yellow flowers, nod, and during the whole day turn their flowers towards the sun; to wit, to the east in the morning, to the south at noon, and to the west toward evening; which is very observable in the *sandcale arvensis*, the sow-thistle. And I believe every body knows, that a great part of plants in a serene sky expand their flowers, and, as it were, with cheerful looks behold the light of the sun; but before rain they shut them up; e.g. the *Tulip*. The flowers of the *Dryas Alpina*, Alpine whitlow grass, the *Parthenium foliis acutis crenatis*, bastard fever-few with egg-shaped crenated leaves, and the *trientalis*, or winter-green, hang down in the night, as if the plants were asleep, lest rain or the moist air should injure the fertilizing dust. The trefolios, and one species of wood-sorrel, shut up or double their leaves before storms and tempests, but in a serene sky expand or unfold them, so that the husbandman can pretty clearly forecast tempests from them. And it is well known that the *Ramburia*, or mountain ebony, sensitive plants, and *Cassia*, observe the same rule. The flowers of goats-beard open in the morning at the approach of the sun, and shut about noon, hence it is called John-go-to-bed-at-noon. *Parkinsonia*, tamarind tree, *Erythroxylene*, or bastard sensitive plant, and several others of the *dianthophilus* class, in serene weather, expand their leaves in the day-time, and contract them in the night. The tamarind tree is said, by Alpinus and Acosta, to enfold within its leaves the flowers or fruit every night, to guard them from cold or rain. Hence the *Hepacium*, or *Botanical Watch*, is formed from numerous plants, of which the following are those most common in this country. *Leonurus taraxacum*, *Dandelion*, opens at 2–5, closes at 8–9. *Hedera canariensis*, Mouse-ear *Hedgebind*, opens at 8, closes at 2. *Sonchus lathyris*, smooth *Sow-thistle*, at 2 and at 11–12. *Lactuca sativa*, cultivated *Lettuce*, at 7 and 10. *Tragopogon luteus*, *yellow Goatsbeard*, at 2–5 and at 9–10. *Lapsana*, *Nipplewort*, at 2–5 and at 9–10. *Nymphaea alba*, white *water Lily*, at 7 and 3. *Papaver rhoeas*, *rhubarb*, at 7 and at 7. *Mentha aquatica*, *water Mint*, at 5 and at 7–8. *Convallaria*, at 5–6. *Malva*, *Mallow*, at 9–10, and at 1. *Anemona purpurea*, *purple Sandwort*, at 9–10, and at 2–3. l

† *Anagallis*,
SIXTH AND SEVENTH OBSERVATIONS.

In what manner the Parnassia and Saxifrage approach their Anthers to the Stigmas is well known.*

EIGHTH OBSERVATION.

The Ruta Graveolens (Common Rue), a very familiar plant, moves one of its Anthers every day over its short Pistillum, until each of them, in order, has deposited its Farina.†

NINTH OBSERVATION.

The Ornithogalum Nutans (Neapolitan Star-flower) has six broad Stamina conniving in the form of a bell, of which the three exterior are shorter than the others by one half, so that it would appear that the Anthers of these could never pass their Farina over the Stigma, but Nature, with admirable wisdom, has turned the anthers inwards towards the bell, the shorter ones becoming first mature, so that they do actually accomplish their office.‡

II. A day would sooner fail me than examples,§ but I pass these by, and hasten to the consideration of the unisexual flowers.

FIRST EXPERIMENT.

Several species of Monordica (Cucumbers) which are cultivated with us, like other Indian vegetables, in close stoves, have there very frequently produced female flowers, and these, although at first very flourishing, in a short time have begun to wither, nor have they produced seed, until I instructed the gardener, as soon as he should discover a female flower, to pluck a male, and place it over the female flower. By this art, for a certainty, we have produced fruit,


So is almost all sorts of flowers we see how they expand or open by the heat of the sun, but in the evening, and in a moist state of the air, they close or contract their flowers, lest the moisture getting to the dust of the antherae should coagulate the same, and render it incapable of being blown on the stigma; but (which is indeed wonderful) when once the fecundation is over, the flowers neither contract in the day, in the evening, nor yet against rain.

* It is a pleasing sight to see the staminæ in many flowers advance over the pistillum. In the Parnassia, and Saxifrage, the staminæ regularly rise, but after impregnation the staminæ fall back in a circle. I have often witnessed this in the several Sempervivums (house-leeks), where the six more mature staminæ advance to the central females, then they retreat, and the remaining six next advance, as regular as with a troop of horse, and then the whole twelve fall back in a circle.

† I examined, says the illustrious Dr. Smith, the Ruta Chalepensis (African Rue), which differs very little from the common Rue, and found many of the staminæ in the position which Linnaeus describes, holding their antherae over the stigma; while those which had not yet come to the stigmas were lying back upon the petals, as well as those which, having already performed their office, had returned to their original situation. Tying with a quill to stimulate the staminate, I found them all quite devoid of irritability. They are stout, strong, conical bodies, and cannot, without breaking, be forced out of the position in which they happen to be. The same phenomenon has been observed in several other flowers; but it is no where more striking, or more easily examined, than in the Rue. Vide Tracts on Natural History, p. 174.

‡ Where there are several staminæ in a flower, these are often of a disproportionate size, and then the lower tier become first mature, and embrace the young pistillum, which increasing in growth, in a few days after celebrates her amours with the taller beseck. Thus the Lychnis Floe Covuli (Monoflor Lychnis) has ten staminæ, of disproportionate sizes, five of which arrive at their maturity before the other five. The same may be seen in our common Blue Bell (Hyacinthus). The position of the anthers on their filaments as respects the pistillum, is worthy also of observation. Vide our Picturesque Plate of the Rhododendrons Ponticum (Poetic Rhododendron) which illustrates both these observations.

§ The reader will find a great many other examples among our Select Plants.
Lychnis Flo Curculi, or Ragged Robin.
and such is our present confidence, that we could pledge ourselves to make any female flower fixed upon, fertile.*

SECOND EXPERIMENT.

In the month of April I sowed Hemp-seed (Cannabis) in two pots.

The young plants came up in such abundance, that each pot contained thirty, or forty, plants.

I placed both to the light on a window-seat, but in opposite parts of the house, so that all communication was necessarily prevented.

In both situations the Hemp flourished greatly.

In one of the pots I suffered the male and female plants to grow together, to flourish, and produce fruit, which was ripe in the month of June, and afterwards being macerated in water, and committed to the earth, shot up within twelve days.

But in the second I plucked up all the male plants as soon as they had advanced, so that I could discern the anther-bearing males from the pistil-bearing females.

The surviving females indeed flourished, and copiously presented their long pistils, but the flowers remained a very long time, as if all that length of time in expectation of marriage; so that in the mean time in the other pot the fruit had reached maturity, and the pistils, in a quite different way, had instantly faded, after the males had discharged their farina.

Undoubtedly this is a pleasing sight, and very much to be admired, that the unmarried females in so opposite a way retained their pistilla green and flourishing, nor first allowed these

* The Cucumber affords a familiar example of the Sexes of Plants, for it produces on the same trailing branches flowers male and female; that is, some of the flowers have only staminu (or pistilla), and others again only the pistilla, without the stamens, and being cultivated under glass for early produce, it is a known fact, that gardeners are obliged to pluck the males, or stameniferous flowers, and place them in the corolles of the females, or pistilliferous flowers. This process is thus celebrated by the illustrious Cowper in his poem called "The Garden."

Plants have their sex, and when Summer shines
The Bee transports the fertilizing seed,
From flower to flower, and on the breathing air
Wafts the rich prize to its appointed use.
Not so when Winter seizes. Assistant art
Then acts in Nature's office, brings to pass
The glad espousals, and ensures the crop.

It is curious to observe, that all stameniferous, or male flowers, produce honey.

One of the most singular ways of the fecundation of plants through insects, we have in the Aristolochia Clematidis (Common Birthwort). It has a longiform corolla, which at its inferior part is spherical, towards the top it becomes long and tubular, and its margins end in a flat and sparsely pointed extremity. The pistil is placed in the round cavity of the corol, the germin of which is surrounded by six anthers, which are shorter than the germin itself. The germin has no style, but is provided with an hexagonal stigma, which is very shallow, and on its upper surface has inhalings pores. The anthers cannot empty the pollen upon the stigma, as the flower stands always straight upright during the period of flowering. The pollen therefore must necessarily fall to the bottom of the flower without being used, if no insects come near the flower. And indeed if it be tried, and all insects kept from the flower by a thin, but firmly closed piece of gauze, no seeds will be formed. It happens indeed not unfrequently, that as it is a particular insect which impregnates the flowers, when it is wanting or not able to find the flower, this last withers without having a single seed. This insect is the Tipula Pennicornis. The round bottom of the flower is, in its interior, quite smooth, but the tubular extremity is fitted with dense hair, every one of which is turned towards the interior, so as to form a kind of funnel, through which the insect may very easily enter; but cannot without great difficulty return, and is obliged to remain in the cavity. Uncan to be confined in so small a space, it creeps constantly to and fro, and so deposits the pollen on the stigma.

After this is done, the flower sinks, the hair, which obstructed the passage, shrinks and adheres closely to the sides of the flower; by which means the insect gets free. Who but must admire the wise provision of Nature in fecundating this seemingly sterile flower!
to collapse, before that they had been a very long while exposed for the access of the male farina.*

And, lastly, when these virgin plants began to be affected with age, I diligently searched along with several botanists for all the calyces, and I found these large and flourishing, but the seeds, as many as were found, were yellow, compressed, membranaceous, dry, not exhibiting the slightest trace of cotyledons or pulp.

THIRD EXPERIMENT.

The Clutia Pulchella (Broad-leaved Clutia) was also, during the months of June and July, kept in the same window of my room.

The male and female plants were in different pots.

The female in consequence abounded in fruit, and indeed, not a single flower drop abortive.

Then I separated the pots to different windows in the same room, nevertheless, all the female flowers produced perfect fruit.

I lately removed the male altogether, and only left the female plant, having first removed all the former, and newly expanded; flowers.

From the axilla of each leaf there daily appeared fresh ones, which remained for the space of eight or twelve days, but afterwards the peduncles turning yellow, they fell off empty of fruit.

A friend, a botanist, who was delighted with this experiment with myself, one day persuaded me, that I should bring a single male flower from the stove in the garden, which he

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* Linnaeus elsewhere observes, "The act of flowering seems greatly to exhaust the living principle. In the moth and butterfly it may be observed, how after marriage the wings drop, and life expires. But if this butterfly be confined like a nun in a convent, it will survive many months. So annual plants will become biennial; if they do not happen to blow the first year, they will resist the cold of winter, as the planks, Lynchines, &c, even to the third winter, but once having blown, they soon after perish.

The Musa (Plantain) often lives to an hundred years: but having once opened its flowers, no art or experience teaches how to save this superb plant from perishing that same year.

The Cyclus (Flax Plant) was sterile for thirty-five years, and grew to the height of seventy feet, and in four months it rose to thirty feet in height, and produced fruit that same year, which being accomplished, the whole plant died. Hart's Cliff. 482.

The Lavatera Angora (Tree Lavatera) rises to the height of a pear-tree, supporting mostly the cold of winter, but having once put forth any blossom, neither the friendly hand of the gardener, nor stoves, nor attention, can save it from perishing in the coming winter. Lin. Amaran. Arab. Tum. I. 272.

The same remark holds good as respects the Algae Americana (American Algae); vide the description accompanying our Picturesque Botanical Plate of that superb plant.

Hence it is that all double flowers last so much longer than single, and that tulips deprived of their anthers retain for a great while their corolla-leaves.

† This experiment of the Hemp has been repeated by Sapplin, and a contrary conclusion drawn; but the plants grow in places where comfrey is made, and where Hemp was cultivated in the neighbourhood—but in sequestered spots in the country, where I have procured these experiments, the results have been exactly as recorded by Linnaeus. Vide our "Philosophy of Botany," where the experiments of Sapplin, and the confutation of them, will be recorded at considerable length. Cursus, however, must be taken, that on the female Hemp no males are found intermixed amongst the females, flowers, a common Locus Nature; and even it has been experienced, that a female plant has in course of time produced only male flowers, and vice versa. John Beavins (Hist. Plant. tom. I. p. 321.) describes the whole fructification of a Palm, which he saw growing at Montpellier, and which not only produced branches of male flowers, but also female ones bearing dates. Ray tells us in his History of Plants, (vol. 2. p. 355.) that he himself saw, many years after, this same remarkable tree mentioned by Bashine. This variety in the fructification has been noticed by several other authors. The learned Juncker, in his Doxologia (Chap. iv. p. 114.), mentioning that class of trees which are male and female in different parts of the same tree, says, "That such kind of trees, when they have for many years produced flowers without fruit, afterwards sometimes will produce fruit without flowers. Thus," he thinks, "should be farther enquired into." This, since Jungius's time, has been done, and it has been found, that sometimes the trees of this class are wholly male, while young; but as they advance in age, they have flowers of both sexes, and afterwards become entirely female. This fact Miller has frequently himself observed in the Mulberry-tree; and the Chevalier Rathereau, a gentleman excellently versed in whatever relates to botany, has observed, that a large Lantana (Mallow Tree) in his garden, for thirty years had produced only male flowers, but that for three years past, it had also produced plenty of fruit.
The Imperial Jatropha,

Named in honor of the wise, magnanimous, and magnificent Alexander, Emperor of Bithynia.
placed in contact with a female flower recently open, and tied this flower with a piece of red silk to know it again.

The next day I removed the male flower, and this one germen indeed remained, and produced fruit.

After the experiment, I took another male flower from the stove, and by means of a slender forceps, I removed from it one of its Anthers, and having scratched it gently with the knife of a pen, I took care that a little of its farina might fall upon one of the Stigma, having guarded the remaining two stigmata by a cap made by an hollow roll of paper.

This Germen also grew to a fruit of the ordinary size, and afterwards being transversely dissected, it alone produced a large seed in one of the three cells, the other two being empty.

The other flowers, not having suffered impregnation, every one of them, becoming withered, dropt.

The repetition of this experiment is also as readily to be repeated as the former.

FOURTH AND FIFTH EXPERIMENTS.

The Jatropha Urens (Stinging Jatropha) flowers every year in my hot-house, but the female flowers have preceded the males, and before eight days they lost their petals, and faded, before the male flowers were expanded.

Hence not only they produced no fruit, but the flowers themselves dropt.

Thus it happened that, until the year 1752, we could obtain no fruit of the Jatropha.

But in this year, the male flowers were in vigour upon a taller tree, at the precise time the females appeared on a small Jatropha growing in a pot.

This pot I placed under the tree producing male flowers, and in this manner I accomplished, that the female flowers produced seed, which, being sown in the earth, grew.

Two years after I placed these male flowers under a piece of paper, until the Farina had fallen upon it, which I preserved rolled up, if I recollect right, for four or five weeks, when this same Jatropha on another branch produced female flowers.

Then I sprinkled that Farina so long preserved in paper upon three flowers, the only ones at that time expanded.

These three female flowers only became fruitful, whereas all the other flowers which appeared in the same corymbus fell off abortive. *

I have frequently since amused myself by taking the male Farina from one plant, which by sprinkling upon the females of another, I have always found the seeds thereby rendered fruitful.†

* The same experiment was made on the Jatropha Inperialis (Imperial Jatropha), and with exactly the same result. The male flowers usually occupy the upper part of the plant, and are soon to be distinguished from the females.

† A similar experiment was made on the Begonia Nydia (oblique-leaved Begonia), which forms one of our Picturesque Botanical coloured plates, where the male and female flowers are very readily distinguished from each other, even at their first appearance, the males having a corolla consisting of four petals, the females of five, which gave the same confirmation of the Sexual Hypothesis.
SIXTH EXPERIMENT.

The Datisca cannabina (Smooth-stalked Bastard Hemp) was raised from seed about ten years ago in my garden.

It abounded in flowers, but these being females, therefore proved abortive.

In order to obtain a male plant I procured some seeds from Paris.

These also grew well, but what vexed me was, they all proved females, and, therefore, produced me also flowers without fruit.

At length, in the year 1757, I procured other seeds.

Out of these some plants were males, and in the year 1758 flowered.

These I removed into a border very remote from the females.

Therefore, when the male flowers were mature for shedding their Farina, I held a paper under them, and gently agitated the loose spike of flowers with my finger, until the whole surface was nearly covered with yellow Farina.

I carried this to the female flowers, which were produced in another part of the garden, and sprinkled it over them.

The result was, these female flowers alone ripened their fruits where I had dispersed the Farina, and their seeds attained their due magnitude; but in all the rest, being fertilized by no Farina, there appeared not a vestige of any seeds.

SEVENTH EXPERIMENT.

The Phoenix dactylifera (Date-bearing Palm) a long time flowered at Berlin, but produced no fruit.

*Koslauer, a famous experimental botanist, sent, from Karlsruhe to Gleditsch, the farina of the male Cannabis humilis by post, with which, by means of a camel’s-hair brush, he impregnated a female plant in his garden, and, for the first time, obtained ripe seeds, from which he raised young plants.

†Sometimes, however, under such circumstances, the seeds arrive at their due magnitude, but, as was long since observed, are barren.

Mr. Jacob Bobart, overseer of the Physic Garden at Oxford, about thirty-eight years ago, which was before the doctrine of the different sexes of plants was well understood, herborising in the country, observed a plant of the Lychnis Sylvesteria simplex, whose flowers, though they had staminata, yet there were no stipes; and finding this not in one, but in all the flowers upon the same plant, this made him imagine it might be a new species, and therefore he marked the plant, and took care to have it preserved till the seeds were ripe; and he at length procured them full hard and firm, and to outward appearance Remplis des gerem (as Mr. Godfrey has it). He failed not to sow them in his garden next season in a proper place; but there was never a plant which sprung up.

I had this account from the celebrated Dr. Sherred, at whose desire I have inserted it, and both of them being persons of such esteem, and so good credit, I may venture to say it sets the opinion of the different sexes of plants upon another footing than it is received by most of our modern authors; for this imports that it is not the nourishment of the gross substance of the seed itself, which is hereby meant, nor the increase of the seed-veast, which is thereby designed, for, as is observed, a hen can lay an egg without previous congress with the cock, and this shall be the same for colour, taste, (when new-laid) smell, bigness, with another egg which has the tend (as they call it), i.e. that has been fecundated by the Materiae Seminalis Masculinae; but the difference appears when both are put under the hen to be hatch’d, the one shall pullulate or chud, and the other shall become fœtid and rot.

The Lychnis Dioica (Wild Red Lychnis) being made by me the subject of experiment, gave additional confirmation of the Sexes of Plants.” Vide Blair on the Generation of Plants, in his Botanical Essays.

The learned Dr. Hope, late professor of botany in the university of Edinburgh, a strenuous advocate for the sexes of plants, made the following experiment. He found of this Lychnis dioica two kinds, the white and the red; and he was convinced (as are since this time Professors Martyn and Mr. Curtis) that these are not varieties, but distinct species, and that the white never produces naturally red flowers. He placed under the same bell the red and the white Lychnis Dioica, the one a male and the other a female plant, and the bell terminated in a tube for the admission of air, but filled with moss, to hinder the access of any other farina; and from this white female Lychnis he obtained seeds, which produced him some red Lychnises. Vide Note * in the description of the Carnation to our Picturesque Plate, where the doctrine of the Sexes of Plants is further confirmed by observations on that flower.

Some
The Two-housed Spheniscus.
Some of the male flowers, from a tree flourishing at Leipsic, were sent by the post, and in this way fruit was obtained, and some of these I planted in my own garden, and they germinated, and at this present time are in a very flourishing state.*

Kempfer has long since reported, how necessary it was found by the nations in the East, who live by the fruit of the Palm-tree, and are the true Lotophagi, to plant a few male plants amongst the female trees, if they expected any harvest; hence, upon an invasion, they were led to cut down the males, that the enemy might feel a want of provisions, and sometimes this destruction was made as a vengeance upon a resisting country.†

* This curious account of the date-bearing Palm is to be met with in the Philosophical Transactions, vol. xivv. p. 160, including a letter which was read to that society May 2, 1731, with some ingenious observations on that subject by one of the members of that learned society, Doctor Watson, to whom it was addressed.

Professor Melius's letter to Dr. Watson, dated at Berlin, Feb. 20, 1750—51. "The sex of Plants is very well confirmed, by an experiment that has been made here on the Palmae major falki, falkiiformibus. There is a great tree of this kind in the garden of the Royal Academy. It has flowered and bore fruit these thirty years, but the fruit never ripened, and, when planted, it did not vegetate. The palm-tree, as you know, is a Plantas Dioecis, that is, one of those in which the male and female parts of generation are upon different plants. We having therefore no male plants, the flowers of our female were never impregnated with the fronds of the male. There is a male plant of this kind in the garden at Leipsic, twenty German miles from Berlin. We procured them from thence, in April 1749, a branch of male flowers, and suspended it over our female ones; and our experiment succeeded so well, that our palm-tree produced more than an hundred perfectly ripe fruit: from which we have already eleven young palm-trees. This experiment was repeated last year, and our palm-tree bore above two thousand ripe fruit. As I do not remember a like experiment, I thought it convenient to mention it to you; and, if you think proper, be pleased to communicate it to the Royal Society."

† As Linnaeus aimed at brevity in this dissertation, we have here, as concisely as possible, commented upon his text, hoping that our readers will not feel fatigued by our enlarging a little upon to very curious a topic by renewing again the subject of the Palm.

"The palm-tree grows very high forming one stem.—A sort of bough shoots out and bears the fruit in a kind of sheath, which opens as it grows. The male bears a large bunch something like millet, which is full of a white flower, and unless the young fruit of the female is impregnated with it, the fruit is good for nought; and to secure it they tie a piece of this fruit of the male to every bearing branch of the female. Strabo observes that the palm-tree in Judæa did not bear fruit, as at present; which probably may be owing to their not having the male tree; concerning which I could get no information. But the fruit of the female tree, without the male, drops off, or comes to no perfection." Vide Pocock's Description of the East, vol. i. 206.

"On the morning of the 21st, I had the pleasure of seeing from my window one of the most remarkable sights in nature. A female palm (Phœnis dacty¯ifornis Linnæi) had in the night put forth its blossoms from the spatha; I went thither at sunrise to see it, whilst the dew was yet falling. I saw a gardener, the proprietor of the palm, climbing up the palm, which equalled our largest fir in height. He had a bunch of male flowers with which he powdered the female, and by these means fecundated them." Vide Hasselquist's Voyages and Travels in the Levant, English Transl. p. 112.

"The first thing I did after my arrival in Egypt, was to see the Date-tree, the ornament and a great part of the riches of this country. It had already blossomed, but I had, nevertheless, the pleasure of seeing how the Arabs assist its fecundation, and by that means secure to themselves a plentiful harvest of a vegetable, which was so important to them, and known to them, many centuries before any botanist dreamed of the different sexes in vegetables. The gardener informed me of this before I had time to inquire, and would show me, as a very curious thing, the male and female of the Date or Palm-tree; nor could he conceive how I, a Frank, lately arrived, could know it before; for, says he, all who have yet come from Europe to see this country, have regarded this relation either as a fable or a miracle. The Arab, seeing me inclined to be further informed, accompanied me and my French interpreter to a Palm-tree, which was very full of young fruit, and had by him been wedded or fecundated with the male, when both were in blossom. This the Arabs do in the following manner: when the spadix has a female flower that comes out of its spatha, they search on a tree that has male flowers, which they know by experience for a spadix which has not yet burst out of its spatha: this they open, take out the spadix, and cut it lengthways in several pieces, but take care not to hurt the flowers. A piece of this spadix, with male flowers, they put lengthways between the small branches of the spadix which hath female flowers, and then lay a leaf of a Palm over the branches. In this situation I yet saw the greatest part of the spadices which bore their young fruit; but the male flowers which were put between were withered. The Arab besides gave me the following anecdotes: First, unless they, in this manner, see and fecundate the Date-tree, it bears no fruit. Secondly, they always take the precaution to preserve some unopened spathæ with male flowers, from one year to another, to be applied for this purpose, in case the male flowers should miscarry or suffer damage. Thirdly, if they permit the spadix of the male flowers to burst or come out, it becomes useless for fecundation: it must have its male duæt, (these were the words of the Arab), which is lost in the same moment the blossoms burst out of their case. Therefore the person, who cultivates Date-trees, must be careful to hit the right time of assisting their fecundation, which is almost the only article in their cultivation. Fourthly, on opening the spatha, he finds all the male flowers full of a liquid, which resembles the finest dew; it is of a sweet and pleasant taste, resembling much the taste of fresh dates; but much more refined and aromatic: this was likewise confirmed by my interpreter, who hath lived thirty-two years in Egypt, and therefore had opportunities enough of tasting both the nectar of the blossoms, and the fresh dates.

"Thus much have I learned of this wonderful work of Nature, in a country where it may be seen every year. I shall have the honour to give a relation of the use, and divers other qualities of the Date-tree, at some other opportunity." Vide Hasselquist's Letters to Linnaeus.

"In one of our excursions we had an opportunity of observing a curious process in the vegetable world. It has already been observed by naturalists, but is too uncommon to be known to readers of every class. The Date-trees were now in blossom; and we remarked the Arabs to be busied about the branches. It is necessary to ingraft all fruit-trees to obtain good fruit; but the propagation of the Date is in another
EIGHTH EXPERIMENT.

The experiments on the Maize related by Logan are perfectly conclusive.

manner, and intimately resembles that of the animal creation. There is a male as well as a female Date-tree, which are distinguished from each other by the colour and shape of the blossoms. The male-tree yields no fruit; but the gardener must be careful, every spring, to call as many blossoms from the male as will serve his purpose. One of these at least he must imprison and bind up in the blossom of the female-tree; without which she will prove as barren as the male." Vide Irwin's Series of Adventures in the Course of a Voyage up the Red Sea. 8vo. Edit. 1787.

Sonnini, the latest traveller in Egypt, gives us the following account of the uses of the Date-tree.

"Among the trees of Egypt there is none more widely dispersed than the Date-tree: it is every where to be found, in the Thebais and in the Delta; in the sands as well as in the cultivated districts. Although it requires little culture, it yields a considerable profit, on account of the immense consumption of its fruits. The date varies in quality: that which is produced in the environs of Rosetta is delicious, and boats are laden with it for the market of Cairo.

"To climb trees which have no branches but at their top, and the straight and slender stem of which cannot support a ladder, the Egyptians employ a sort of girth fastened to a rope, that they pass round the tree. On this girth they seat themselves, and rest their weight; then, with the assistance of their feet, and holding the cord in both hands, they contract to force the noose suddenly upwards, so as to catch the rugged protuberances with which the stem is symmetrically studded, and forced at the origin of the branch-like leaves, that are annually cut. By means of these successive springs, the people of this country reach the top of the Date-tree, where, sitting, they work at their case, either in opening the females, or gathering the clusters of fruits: they afterwards descend in the same manner.

"The dates are not the only produce of this species of Palme-tree: from hard beating its back, its branch-like leaves, as well as the rind of its clusters of fruit, threads are obtained, from which are manufactured ropes and sails for boats. The leaves serve likewise for making baskets and other articles. The very long ribs of the branches, or leaves, is called in Arabic farida. From its combined lightness and solidity, it is employed by the Mamlucks, in their military exercises, as javelins, which they throw at one another from their horses when at full speed." Vide Sonnini's Travels into Egypt, 4to. Edit. 1800. p. 400.

* His book is entitled, "Experiments and Reflections on the Generation of Plants, by James Logan, President of the Council, and Chief Justice of the Province of Pensylvania," and was published in 1739. From this Essay I shall extract what the ingenious author has related respecting the Maize, or Indian Corn.

As several doubts had formerly occurred to me in respect to the generation both of plants and animals, when I first heard of the Farina facundans, or impregnating male dust, I conceived great hopes that those would be easily solved, and the whole of this intricate affair receive considerable light from the discovery. And as I had long ago observed, with surprise, the singular way of growth of our Indian Wheat or Maize, I judged it, of all the plants I had seen, or perhaps of any that Nature produces, the most proper one for experiments of this kind.

Indian Wheat grows to the height of six feet, eight, and sometimes ten feet. At the top of the stalk it bears a thready tuft or tassel (called by Malphigi, Mascariun) furnished with apices, which yield the farina. From the joints of the stalk below, the ears grow out, which are six, eight, ten, and sometimes even twelve inches long. These consist of a pretty solid substance, about an inch thick, set quite round with grains regularly disposed in rows, in a very beautiful manner. Generally there are eight such rows, often ten, sometimes twelve; and I once saw sixteen: there are commonly forty grains in each row, more or less; which, in their first rudiments, and whilst the stalk they grow upon is soft and tender, may justly be called the seed or eggs: to each ear there adheres a white, fine, smooth filament, which, excepting that it is hollow, resembles a thread of silk. These filaments are disposed one by one in order, between the rows from that end where the ear rises from the stalk to the other, where they creep from under the case that incloses the ear, and make their appearance, in the open air, in a bundle or skein: their colour in this part is mostly whitish, though sometimes a little yellow, red, or purple. According to the nature of the plant they grow from: these filaments, as I formerly suspected, are the real styles of the eggs.

Intending therefore to make some experiments on this plant, towards the end of April, I planted four or five grains on hillocks, as is usual in sowing maize, in each corner of a little garden I had in town, which was about forty feet wide, and eighty long. About the beginning of August, when the plants were full grown, and the tufts on the top, and the ears on the stem, had acquired their full extent, I cut off these tufts from every plant on one hillock. On another, without meddling with this tuft, I merely opened the leaves that covered the ears, and cut away from some all the styles, and then closed the leaves again: from others a quarter part, from others one half, and from others three quarters, and left the rest untouched. I covered another ear, before the skein of styles appeared out of the case, with a piece of very fine and soft muslin, but so loosely, that its growth could not be injured: and whilst the furry texture of the muslin suffered it to receive all the benefit of the sun, air, and showers, the farina was effectually secluded. I left the plants on the fourth hillock, as I did these, except in the circumstances above-mentioned, unmolested, till they were fully ripe.

After the beginning of October, when it was time to inquire into the success of my experiments, I made the following observations. In the first hillock, where I had cut off all the tufts, the ears, whilst they remained covered with their husks, looked indeed very well, but were small, and felt light when handled; and not one perfect grain to be found in them, except in one large ear, which grew out somewhat farther from the stalk than usual, and on that side too which faced another hillock in a quarter from whence: our strongest winds most commonly blow: in this ear alone I found about twenty grains which were full grown and ripe. I attributed this to some farina brought by the wind from a distant plant. In those ears from which I had plucked off some of the styles, I found just as many ripe grains as I had left styles untouched. In those covered with muslin, not one ripe grain was to be seen: the empty or barren ears were nothing but mere dry husks.

From these experiments, which I made with the utmost care and circumjpection; as well as from those made by a great many other persons, it is very plain that this farina, emitted from the summits of the stamens, is the true male seed, and absolutely necessary to render the grain fertile. A truth which, however certain, yet was unknown till the present age: the discoverer of this grand secret of Nature, therefore, ought ever to be remembered with due applause. Sir Thomas Miersm, sometime Savilian Professor, seems first to have taken notice of
The REV. JOSEPH TOWNSEND, M.A.
Author of a Journey through Spain.

Title: "Book of the Council by Moonlight".

Published: London, Published by J. Richardson, 1821.
To relate more examples would fatigue the reader unnecessarily.*

All Nature proclaims the truth of this doctrine, and every flower of every sort† might be adduced as a witness in its favour. The day would sooner fail me than matter.

III. Leaving innumerable other proofs behind, from both bisexual and unisexual flowers, I hasten to the consideration of hybrid, or male plants, a subject indeed meritings every attention.

Some have ascribed every thing to the female, after Harvey.

Others again to the male, after Lewenhock.

As for myself, I ascribe the offspring to both, which the production of mules does confirm.

To instance this, there are two different kinds of mules.

From the mare and male ass proceeds the most useful mule, which in its gentle nature resembles its mother; but in its mane and tail, and cross on its back, the ass. This animal, which fetches an high price in Spain, is called Hinnus.‡

* The reader will call to mind, that the author of the prize dissertation was required to produce chiefly new facts. The Question was, Pro Præmio proposita " Sexum Plantaem argumentis et experimentis novis, proter adhue jux cognita, vel corebutata, vel impugnata, praemissa expositione historiae et physica omnium Plantae partium, quæ aliquid ad feminationem et perfectionem seminis et fructus conuenire creditur." So that the useful proofs of the Sexum of Plants, which were before known, he could not properly introduce into this dissertation, which will form an apology for the number and length of some of our Notes. The subject is considered more at large in "Philosophy of Botany."

† It has always been an interesting subject of enquiry, to all philosophical admirers of the Sexual System, whether the numerous and intricate tribes of plants, which, on account of the obscurety of their fructifications, were all put together by Linnaeus into the class called Cryptogamia, were really endowed with flowers and seeds, like other vegetables, or totally destitute of both. Much has been written on Cryptogamia, were really endowed with flowers and seeds, like other vegetables, or totally destitute of both. Much has been written on Cryptogamia, were really endowed with flowers and seeds, like other vegetables, or totally destitute of both.

‡ This doctrine by Morland has been refuted by Linnaeus, from his observations on the Amaranth and Marvel of Peru, before recorded. Such as may be curious to see the reasonings upon which Morland founded this opinion, will please to consult our "Philosophy of Botany."

Dr. Smirh.
From the female ass and horse the other kind of mule is engendered, with a disposition as obstinate as the ass, but the beauty and outward appearance of the horse.

Experience also shews us, that if the male goat of Angora marries with the she goat, the kid, the offspring of that intercourse, will inherit the external structure and valuable coat of its father; whereas, if the marriage is reversed, the kid so produced will have the vile, worthless hair of its father.

The breed from Spanish rams and Swedish ewes will resemble the Spanish sheep in wool, stature, and external form; and have the hardiness of Swedish sheep. An English ram without horns, and a Swedish horned ewe, will produce sheep without horns.

I shall now call the attention of my readers to only three or four vegetable mules, the origin of which I have witnessed myself.

three sons, were hid, attended by their servants. For many days previous to this, two thousand men had been dispersed in parties over the whole country to disturb the game, and to drive it towards the common centre, by parading night and day, and constantly, yet slowly, drawing nearer to each other. Soon after we had occupied our station on a rising ground, we began to see the deer at a vast distance bounding over the plain from every quarter, and making towards the fatal spot. As they approached, we heard, faintly at first, then more distinctly, the sound of game, and saw the confusion of the game, moving quick in all directions, but changing their course at every instant, as if uncertain where to look for safety. When the ensuing parties (usually about two thousand) came first in sight, they appeared to be separated by intervals, and to confine the game merely by their shouts and by the firing of their arms; but as they advanced upon the plain they formed a wall, and as they drew nearer, they strengthened this by the doubling of their ranks, compelling thus the game to pass in vast streams before the royal marksmen. Then began the carriage: and for more than a quarter of an hour the firing was incessant. Some of the deer, who had either more discernment than the rest, or a better memory; who were actuated by stronger fears, or, perhaps, by more excited courage, absolutely refused to proceed, when they approached the ambuscade; and, making a quick turn, notwithstanding the shouts, the motions, and the firing of the guards, they leaped clean over their redoubled ranks, and escaped into the woods.

When the firing ceased, the carriages all advanced towards the wood, and the company sighed to pay their compliments, and to view the game. We found part of it spread in two rows upon the field of battle, and the king, with his sons, surveying it. The game-keepers were returning loaded with such as had been mortally wounded, but had yet escaped to a considerable distance; and, as fast as they arrived, they deposited the spoil at the sovereign's feet. Having the curiosity to count the numbers, I found one hundred and forty-five deer, with one wild boar. Whilst thus engaged, I heard a murmur, and saw every one in motion. Directing my attention to the spot to which all were pressing, I saw at a distance a little company coming with a boar tied neck and heels together, and flung upon a pole. As they approached; the monarch and his sons, arming themselves already, drew up in a line, and standing at a convenient distance, the harriers was deposited; the hounds, one after another, were out; and the poor crippled animal was assaying to move, when a well directed volley freed him from his furs.

The expense of that day's sport was reckoned at these hundred thousand reals, or, in sterling, three thousand pounds.

In the evening the game, as usual, was all deposited in the room where the king took his supper, and there the family ambassadors attended to pay their compliments. By family ambassadors are understood those of Naples, Portugal, and France, who having more free access, and being expected to pay more minute attention, think it incumbent upon them to express their interest in every thing which gives him pleasure, and not only congratulate him upon these great occasions, but each night, whilst he is at supper, make inquiries, and afterwards inform their friends what the king has killed.

Mr. Elton, desirous of quitting the Escurial previous to the departure of the court, ordered a Coche de Colliers to be ready the day after the Batida. This precaution is taken by the foreign ministers to secure mules, because, when the court is in motion, no less than twenty thousand being required for their use, the whole country is laid under an arrest, and neither horse nor mule can be obtained for any other purpose.

In this little journey I was exceedingly diverted and surprised with the docility of the mules and the agility of their drivers. I had travelled all the way from Barcelona to Madrid in a Coche de Colliers, with seven mules, and both at that time, and on subsequent occasions, had been struck with the quickness of understanding in the mule, and of motion in the driver; but till this expedition I had no idea to what extent it might be carried. The two coaches sit upon the box, and, of the six mules, none but the two nearest have reins to guide them; the four leaders being perfectly at liberty, and governed only by the voice. Thus harnessed, they go upon the gallop the whole way, and when they come to any short running, whether to the right or to the left, they instantly obey the word, and move all together, bending to it like a spring. All must undergo toil, and require frequently some correction; should any one refuse the collar, or not keep up exactly with the rest, whether it be, for example, Coronela or Capitana; the name pronounced with a degree of venomousness, rapidly in the three first syllables and slowly in the last, being sufficient to awaken attention; and to secure obedience, the ears are raised, and the mule instantly exerts his strength. But, should there be any failure in obedience, one of the men springs furious from the box, quickly overtakes the offending mule, and thrashes her without mercy; then, in the twinkling of an eye, leaps upon the box again, and calmly finishes the tale he had been telling his companion. In this journey I thought I had learnt the names of all the mules, yet one, which frequently occurred, created some confusion, because I could not find to which individual it belonged, nor could I distinctly make out the name itself. It sounded like Cagliastro, and led me to imagine that the animal was so named after the famous impostor Cagliostro, only altering the termination to the sex, because the mules in harness are usually females. In a subsequent journey the whole difficulty vanished, and my high estimation of the mule, in point of agility, was confirmed. The word in question, when distinctly spoken, was aquella otra; that is, you other also; and then supposing Corinuela and Capitana to be pair, if the coachman had been calling to the former by name, aquella otra became applicable to the latter, and was equally efficacious as the snarest stroke of a long whip; but if he had been calling Capitana, in that case, aquella outra acted as a stimulus to Corinuela, and produced in her the most prompt obedience."

The
The Bee Larkspur
An Hybrid Plant from the interchange of the Larkspur & Meakahsowir

London: Published by W. Thomam and Co., 1825.
FIRST EXAMPLE.

The *Veronica Spuria* (Bastard Veronica) is derived from the *Veronica maritima* (Sea Veronica) for its mother, and the *Verbena officinalis* (Officinal Vervein) for its father.

It agrees with its mother in fructification, and in foliage it resembles the father.

It is not to be raised by seeds, but may easily be produced by means of layers.

SECOND EXAMPLE.

The *Delphinium Hybridum* (Hybrid Larkspur) was produced in that quarter of the garden where the *Delphinium Elatum* (Bee Larkspur) and *Aconitum Napellus* (Common Monk's-hood) grew together.

It resembles its mother most in the fructification, (the Larkspur,) and its father in its stately form, and appearance of its foliage.

Owing its origin to plants so nearly allied to each other, it is easily propagated by seeds.

THIRD EXAMPLE.

The *Hieracium Hybridum* (Mule Hawkweed) was gathered in 1763 in our Alps by Dr. Solander.

From its thick brown woolly calyx; from the bracteae, as well as in every other part of the fructification, it so perfectly resembles its mother the *Apargia Taraxici* (Alpine Apargia) that no tyro but would at once perceive the plant; but in the smoothness of the leaves, by its teeth, and whole structure, it so manifestly resembles the father, the *Leontodon* (Dandelion), that no one can hesitate whence the same was derived.

FOURTH EXAMPLE.

The *Tragopogon Hybridum* (Hybrid Goat's-beard) after two years appeared in the garden, where the *Tragopogon Pratense* (Common Goat's-beard), and *Tragopogon Porrifolius* (Purple Goat's-beard) grew together.

Last year, as the *Tragopogon Pratensis* (Common Goat's-beard) was in flower, I castrated the flowers in bloom, and sprinkled their widowed pistilla with the farina obtained from the *Tragopogon Porrifolius* (Purple Goat's-beard) and I obtained seeds, that being sown produced, in 1759, the *Tragopogon Hybridum* (Bastard Goat's-beard), as before described, the seeds of which I now send.

FIFTH EXAMPLE.

He who has once seen the *Achyranthus Aspera* (Rough Achyranthus), its spike, the parts of the flower, its peculiarly formed nectary, and fructiferous reflexed calyces, would readily believe, that no one could be mistaken in naming the same the *Achyranthus Indica* (Indian Achyranthus); but seeing its broad obtuse, undulated foliage, before flowering, the same person would as positively have pronounced the same to be the *Xanthium Strumarium* (Small Burdock).
I could name, unless I had chosen to adopt brevity, a multitude of other hybrid plants.*

It is more than probable, that Nature at first created but a few species, and by the intermixture of these arose the extensive genera, or families of plants, and even by the union of nearly allied genera, other kinds were produced: for Nature proceeds "from simple to more compound."

The variety of plants arises, I think, chiefly from sexual intercourse: for, unless this were the case, when removed into different quarters, and changed in their soil, the variety of the Species would return to their original appearance; but nothing of this sort takes place, as is daily seen in our most esteemed varieties of culinary plants.

* Koelreuter, who for thirty years made experiments upon plants, performed what he calls "a complete metamorphosis of one natural species of plants into another," which shows, that in seeds as well as in buds, the embryo proceeds from the male parent, though the form of the subsequent mature plant is in part dependent on the female.

M. Koelreuter impregnated a stigma of the Nicotiana Rustica (Common English Tobacco) with the farina of the Nicotiana Paniculata (Pamiced Tobacco); and obtained prolific seeds from it.

With the plants, which sprung from these seeds, he repeated the experiment, impregnating their pistils with the farina of the Nicotiana Paniculata; and they became more and more like the male parent, till he at length obtained six plants in every respect perfectly similar to the Nicotiana Paniculata, and in no respect resembling their female parent the Nicotiana Rustica.

This ingenious experiment took the form of the Dipsalis purpurea (Purple Foxglove), and impregnated the pistillum of the Dipsalis lutea (Small Yellow Foxglove), and he obtained an hybrid, which, instead of being either purple or yellow, was striped, and proved unisexual, although its father is a hermaphroditic plant. Vide Memoir in the Transactions of the Academy of Petersburgh, for the year 1788.

The Male Plants which have been ascertained are extremely numerous.

One of the most extraordinary hybrids, unless it can be better referred to some of those very remarkable sportings of Nature, is seen in the Peach.

This hybrid is so named from the Greek word ὁμος, wonder, or astonishment, for when first presented to Linnaeus by one of his students in botany, he was greatly surprised to see an Antirrhinum Lusoria (Common Twaddel) in the shape of its leaves, its manner of growth, in its peculiar smell, but its flowers, instead of being penemate, with one spur-like nectarine, and four unequal stamens, had five equal stamens, five spur-like nectarine, a corolla formed like an inverted funnel, with the neck of it revolute, more nearly, therefore, resembling Erica (Heath) in its fructification, but yet differing from this as to the number of stamina.

Being a male from distinct genera, it cannot be propagated by seeds, but only by cuttings.

The Quadrangular Passion-flower appears to us to be an offspring between the Winged and the Common Blue Passion, hence it most resembles its father the Winged Passionflower in its foliage, but its mother the blue in its flower. Vide our Picturesque Botanical Plates of the several Passion-flowers, and description.

Vide also our Notes to the description of the Carnation, where a Male Pink is in one of the notes particularly mentioned.

Here
Peloria, or the Wonder

A Male Plant; so named by Linnaeus on account of the astonishment that this hybrid production excited, when it was first shown to him.
A Vegetable Monster.

All the flowers barren.

Flowers in the center of the barrens.

Spiraea opulifolia, or Currant-leaved Golder Rose.
Vegetable Monsters

Double Piont.

Single Piont.

Petals, Staminas & pistil.

Different stages of the flower.

The Author's Engraved.
Here then is a new field open for botanists, and a number of new varieties may be raised by artificial impregnation, and if what I have written meets with your approbation.

† A new cabbage is described in the Bath Agriculture, Vol. I. Art. 4, which is said to fatten a beast six weeks sooner than turneps. It is there said, "that the sort of cabbage principally raised, is the tallow-boof, or drum-handed cabbages; but it being too tender to bear sharp frost, I planted some of this sort and the common purple-cabbage seed for pickling; (it being the hardest I am acquainted with) alternately; and when the seed-pods were perfectly formed, I cut down the purple, and left the other for seed. This had the desired effect, and produced a mixt stock of a deep green colour with purple veins, retaining the size of the drum head, and acquiring the hardiness of the purple."

In another curious paper of the Bath Society, Vol. V. p. 28, Mr. Wimpsey relates, that he planted a field with garden-beans in rows about three feet asunder in the following order, mazzagan, white-blossom, long-podded, Sandwich-taker, and Windsor-beans. The mazzagan and white-blossom were thrashed first, when to his great surprise he found many new species of beans; those from the mazzagan were mottled black and white; the white blossoms were brown and yellow instead of their natural black; and they were both much larger than usual.

Mr. Knight has given a curious experiment of his impregnating the stigmas of the pea-blossoms of one variety with the farina of another. He says, Vide his Treatise on the Apple and Pear, p. 42, "Blossoms of a small white garden-pea, in which the males had previously been destroyed, were impregnated with the farina of a large clay-coloured kind with purple blossoms. The produce of the seeds thus obtained were of a dark grey colour, but those having no fixed habit, were soon changed by cultivation into a numerous variety of very large and extremely luxuriant white ones; which were not only much larger and more productive than the original white ones, but the number of seeds in each pod was increased from seven or eight, to eight or nine, and not infrequently to ten. The newly made grey kinds I found were easily made white again by impregnating their blossoms with the farina of another white kind. In this experiment the seeds, which grew towards the point of the pod, and were by position first exposed to the action of the male, would sometimes produce seeds like it in colour, whilst those at the other end would follow the female."

"In other instances the whole produce of the pod would take the colour of one or other of the parents; and I had once an instance in which two peas at one end of a pod produced white seeds like the male, two at the other end grey ones like the female, and the central seeds took the intermediate shade, a clay colour. Sometimes very similar appears to take place in animals, which produce many young ones at a birth, when the male and female are of opposite colours. From some very imperfect experiments I have made, I am led to suspect that considerable advantages would be found to arise from the use of new or regenerated varieties of plants, and these are easily obtained, as this plant readily sports in varieties, whenever different kinds are sown together."

This practice of the very ingenious Mr. Knight is not, however, a new one, for it was recommended by Bradley as far back as 1736.

"By this knowledge," says Bradley, "we may perhaps alter the property and taste of any fruit, by impregnating the one with the farina of another of the same class: as, for example, a Coddlin with a Pearmain, which will occasion the Coddlin so impregnated to last a longer time than usual, and be of a sharper taste; or if the winter fruits should be fecundated with the dust of the summer kinds, they will decay before their usual time: and it is from this accidental coupling of the farina of one with the other, that in an orchard where there is variety of apples, even the fruit gathered from the same tree differ in their flavour and times of ripening: and moreover, the seeds of those apples so generated, being changed by that means from their natural qualities, will produce different kinds of fruits, if they be sown.

"It is from this accidental coupling, that proceeds the numberless varieties of fruits and flowers which are raised every day from seed. The yellow and purple Auriculas, which were the first we had in England, coupling with one another, produced seed which gave us other varieties; which again mixing their qualities in like manner, has afforded us, by little and little, the numberless variations which we see at this day in every curious flower-garden; for I have saved the seeds of near a hundred plain Auriculas, whose flowers were of one colour, and stood remote from others, and that seed I remember to have produced no variety: but on the other hand, when I have saved the seed of such plain Auriculas as have stood together, and were differing in their colours, that seed has furnished me with great varieties, different from the other plants. I believe I need not explain how the male dust of plants may be conveyed by air from the one to another, by which this genealogal and production of new plants is brought about; but I shall hint by the bye, to such as plant orchards for cider, that they ought to plant only one sort of apple in those orchards; and that such plantations be likewise remote from other kinds of apples, whose farina would else certainly spoil the cider-fruit, by ripening some sooner, and others later, which would occasion almost a continual ferment in the liquor, and never permit it to settle or grow fine."

"Moreover, a curious person may, by this knowledge, produce such rare kinds of plants, as have not yet been heard of, by making choice of two plants for his purpose, as near alike in their parts, but chiefly in their flowers or seed-vessels: for example, the Carnation and Sweet Williams are in some respects alike; the farina of the one will impregnate the other, and the seed so enlivened will produce a plant differing from either, as may now be seen in the garden of Mr. Thomas Fairchild of Hoxton, a plant neither Sweet William nor Carnation, but resembling both equally, which was raised from the seed of a Carnation that had been impregnated by the farina of the Sweet Williams. These couplings are not unlike that of the more with the one, which produces the male; and in regard to generation, are also the same with males, if of different kinds, not being able to multiply their species, no more than other monsters generated in the same manner.

"We may learn from hence, that the fruit of any tree may be adulterated as well by the farina of one of the same sort, which perhaps may be sickly, and of a dwarf kind, as by the dust of some other kind near akin to it, and worse than itself. Now, as such couplings may be very frequent in common woods, so would I recommend the choice of seed to be made only from such plants or timber-trees as excel in gender, or other good qualities, and are far distant from others of meaner sorts, which might degenerate their seeds, and cross our expectations when they come to grow up; and this is necessary to be observed among vegetables, to maintain their good qualities in the young plants they are to produce, as it is in the breeding of game-cocks, spaniels, or running-horses."

There is an apple described in Bradley's work, which is said to have one side of it a sweet fruit, which boils soft, and the other side a sour fruit, which boils hard. This Mr. Bradley so long ago as the year 1723 ingeniously ascribes to the farina of one of these apples impregnating the other; which would seem the more probable, if we consider, that each division of an apple is a separate womb, and may therefore have a separate impregnation, like puppies of different kinds in one litter. The same is said to have occurred in oranges and lemons, and grapes of different colours.

I have seen myself a curious instance of a Nectarine Tree produce its fruit half Nectarine half Peach.

DURAMEL.
tion, I shall consecrate the remainder of my days to making these experiments, so much re-
commended from their agreeable results.

DUMAS has also greatly extended our knowledge on this curious and interesting subject.

Il est vrai que la fleur de cette espèce est de forme telle que le pollen est difficile à assembler et de la baguette d'automne.

Je suis persuadé que si tu as goûté à la grande attention les fruits d'espèces nouvelles, on trouvera plusieurs exemples de pareils mérités ; j'avoue néanmoins qu'il se trouve des fruits d'un goût et d'une forme telle que l'assemble d'autant mieux que nous avons été aidés de ces positifs d'une façon infinie, qui n'est pas capable de décrire ma conjecture, puisque ces bizarreries peuvent être occasionnées par un mélange des deux seuls ; d'autant plus que dans les animaux, entre les chiens par exemple, la même incurvité arrive fréquentemente.

Le contraire de cette observation se présente dans certains fruits, où les espèces sont aussi distinctes pour qu'on puisse manger un quartier d'un fruit séparément de celui avec lequel il est joint lors de la fécondation. Tel est, par exemple, dans les oranges, l'espèce que l'on nomme improprement monotube, qui sur le même arbre produit des bigarades, des citrons, et des baies, séparés, ou même semblables par quartiers dans le même fruit ; telle est aussi cette espèce de raisin qui produit sur un même cep des grappes rouges et des grappes blanches, et sur une même grappe des grains rouges et des grains blancs ; ou d'autres, dont les grains sont par moi, ou même par quartiers rouges et blancs. Je crois pouvoir attribuer ces variétés au mélange des poussieres des étamines. Il arrive très-fréquemment que dans la même plante, une chêne met bas des petits dont les uns tiennent entièrement de leur mere, les autres du pere, et d'autres tiennent de tous les deux ; ou tellement confondus, qu'aucune de leurs parties se ressemble exactement aux mêmes parties du pere ni du mère, ni d'une façon aussi distinctive pour qu'une partie de leur corps ressemble au père, et l'autre à la mere : ce que j'ai pu assurer, c'est que je n'ai senti aucun cas dans les moyens que les Auteurs proposent comme propres à opérer ces bizarreries de la nature.

Je pense donc qu'on peut avoir recours à la même conjecture, pour rendre raison des variétés indiennes qui fournissent certains genres de plantes ; puisqu'elles sont d'autant plus fréquentes, que les différentes espèces d'un même genre se trouvent rassemblées en plus grand nombre ; au lieu que les plante d'un même genre qui croissent à la campagne, étant en quelque façon isolées, ne donnent aucune variété. Je vais en rapporter des exemples.

Personne n'ignore que tous les Caprifolium qui croissent naturellement dans les campagnes, portent des fleurs rouges ; que les Primu-
ceres des prés ont des fleurs couleur de citron ; et que ces mêmes plantes transplantées dans nos jardins nous fournissent une quantité prodigieuse de variétés. D'où peut venir cette différence ? Je l'attribue à cette fécondation d'une plante par une autre ; et je vais rapporter une expérience qui pourra confirmer que cette cause existe réellement dans la nature.

Je suppose qu'on eût deux sortes de plante, une de ces Primu-ceres, qui ne portent constamment que des fleurs couleur de citron ; qu'on divise cette plante en deux, qu'une moitié soit plantée dans un lieu éloigné de toute autre espèce de Prinete-ceres, et l'autre dans un jardin, au milieu d'une plate-bande où l'on aura élu une grande suite de Primu-ceres de toutes couleurs ; il est certain que ces deux tailles produiront, comme dans les prés, des fleurs couleur de citron ; mais si l'on ramasse ensuite les graines qui fourniront ces deux tailles, et qu'on les semer séparément, on remarquera que les plantes qui viendront des semences qui auront été produites par le pied qui était resté isolé, ne donneront que des fleurs jaunes pareilles à celles des prés, parce que ces graines n'auront pu être fécondées que par elles-mêmes ; au lieu que les pieds qui viendront de la taille qu'on aura élevée dans la plate-bande, produiront quelques variétés ; par la raison que quelques semences auront pu être fécondées par d'autres pieds voisins. Je dis qu'on n'aura que quelques variétés, parce que la plupart des embryons auront été fécondés par les étamines de la plante même ; et que d'ailleurs plusieurs qui auront été fécondés par les pieds voisins, conserveront nombres unes dis-
position à tenir de la nature du pied qui les aura produits.

Je crois qu'on peut attribuer à une pareille cause, le succès qu'on a eu quelques Fleuristes qui se sont procuré par le moyen des semences de belles variétés ; puisque rien n'est plus propre aux occasionner que le soin particulier que prennent certains curieux de mélanger les espèces dans leurs planteaux de Tulipes, d'Orelles d'ours, de Semi-doubles, etc. Leur intention est, à la vérité, de frapper la vue par une diversité et un émail qui est toujours plus agréable qu'une uniformité dans les couleurs ; mais ils se procurent, sous le vrai, un avantage qu'ils ont souvent attribué à différentes infusions dans lesquelles ils avaient mis tremper leurs graines, à quelques couleurs qu'ils inclinaient dans la terre de leur jardin, à des objets différents colorés qu'ils présentèrent à leurs plantes, ou encore, à une faveur singulière du hasard qu'ils croient personnelle. J'ai essayé sans succès ces infusions et ces mélanges de couleurs, et j'ai cru qu'il n'était pas besoin d'expérience pour détruire les deux autres moyens.

Les Observateurs attentifs peuvent trouver dans les potagers beaucoup d'exemples de ces variétés dont nous venons de parler, et cessant d'attribuer à la nature de leur terrain, ces changements qu'ils expériment en disant, que leurs plantes dégénèrent. J'en vais rapporter un ex-
emple qui est sans doute bien frappant.

Nous cultivons dans nos potagers, la Rave-curcul, qui est cette râve rouge qu'on a élevée aux environs de Paris : nous cultivons aussi une râve blanche et moins délicate, qu'on nomme Haifort à Orléans ; enfin, des Râves blancs et des Râves gris. Quand nous semons des graines de ces plantes que nous tirons des pâturés communément cultivés, nous recevons ces râves très-parfaites chacune dans leur espèce ; mais comme nous avons souvent remarqué que les semences que nous recueillons dans nos potagers nous donnent de ces métis qui tendent plus ou moins à ces différentes râves, nous avons pris le parti de planter fort éloignés les uns des autres, les pieds que nous destinons à nous nourrir de la graine ; au moyen de quoi nos espèces se conservent plus constamment les mêmes ; cette observation que nous avons parle-
illement faite sur les Corotets pâles, jaunes et rouges, confirme bien fortement ce que nous avons dit qui peut résulter du mélange des poussi-
ères.

Après cela, il est très-facile de concevoir quelle prodigieuse multitude de variétés doit naître de ces différentes mélangeons ; en effet lorsque la poussière des étamines d'une ORelle-OUras rouge aura fécondé une ORelle-OUras Blanche, la graine qui en viendra doit nécessaire-
ment produire des pieds dont les pétales seront non-seulement rouges ou blancs, ou panachés de rouge et de blanc, mais encore dont les em-
bossons et les poussiers des étamines participeront de l'un et de l'autre pied ; ensuite qu'une de ces plantes n'a plus besoin, pour être panachée, d'être dans la soue fécondée par une autre, puisqu'elle se trouvera posséder non-seulement la disposition des parties propres à produire le rouge et le blanc, mais encore celle d'opérer différents mélangeons de ces deux couleurs, lesquelles combinées ensemble pourront faire différentes coupes de nuances fort agréables à la vue.

" Je
I shall not tire your patience any longer, having, I hope, demonstrated the *Sexes of Plants* by every kind of argument, even by that of *Hybrid Plants*, which I hold to be the most conclusive.

This question on the sexes of Plants, so honourably proposed by the Imperial Academy, was destined to end this controversy, and much to the honour of that great Nation, Nornbeck, who had furiously written against the Sexual System, and was Professor of Botany at Petersburgh, not being able to reply, was rejected from among the Members of the Imperial Academy, and afterwards humbly solicited Linnaeus to become a superintendent, or head gardener, at Upsal. Linnaeus, who never wished to triumph over a fallen enemy, named a plant *Sigesbeckia*, in honour of this fallen Professor.
PART
SECOND.
LINNÆUS IN HIS LAPLAND DRESS.
Drawn and painted by F. Thornen.
LINNAEUS EXPLORES LAPLAND.

Fis'd by the charms of Nature's reign,
View the bold sage advent'rous stray:
Rude storms around him rage in vain,
And torrents cross his dang'rous way.

Alone beside the roaring main
'Mid shelving rocks he loves to roam,
Where craggy cliffs, and caverns wide,
Re-bellow to the whitening foam.

Nor flies the fowl, nor mid the deeps
Swim in bright maze the silver brood,
Nor springs the plant, nor insect creeps,
That can his piercing glance elude.

New scenes his raptur'd sight surveys
Amid Lapponia's peaceful soil;
And while with ardent zeal he strays,
Fair science crowns his pleasing toil.

Through many a forest dark and drear,
O'er many a desert's trackless side,
With fearless foot he ranges round
With Heaven and Nature for his guide.

Now to yon mountain's airy height
With look elate behold him rise,
And view with still increas'd delight
A midnight sun illume the skies.

The simple swain with wond'ring eye
Beholds him spring with eager bound;
Chase with fleet steps the noxious fly,
Or pore upon the moss-clad ground.

Now down Lulea's haunted stream
His vent'rous bark pursues its way,
While round the waving meteors gleam,
And cataracts urge their dashing spray.

Hail Nature's boast! triumphant sage!
Whom distant cent'ries shall admire;
Whose name, rever'd through ev'ry age,
Shall never but with time expire!

SHAW.
ORIGIN OF THE SEXUAL SYSTEM.

Linnaeus was ushered into the world in the month of May, 1707, and, as this great Naturalist observes in his Diary, "his parents received their first-born with joy, and devoted the greatest attention to impressing on his mind the love of virtue, both by precept and example. The same thing that is said of a poet, 'Nascitur non fit,' may be, without impropriety, applied to the subject of this memoir. From the very time that he first left his cradle, he almost lived in his father's garden, which was planted with some of the rarer shrubs and flowers; and thus were kindled, before he had well left his mother's arms, those sparks, which afterwards produced such a blaze." As he advanced in youth, it is mentioned in the Diary, "that he never ceased harassing his father with questions about the names, qualities, and nature of every plant he saw, and often used to enquire more than even his father, who was an expert botanist, was able to answer." "Whilst at school," the Diary continues, "he employed his play hours hunting after plants," hence he was called "The Little Botanist." He had made an Herbarium "at this early period," and "his plants were classed after the system of Tournefort." From school he went to "the university of Upsal." Thence he removed to the famous university of "Upsal." Here an accident brought him early into notice. "In the autumn of the year 1729, Linnaeus was examining very intensely some plants in the Academic Garden, when Celsus, a venerable Divine, happened to have repaired thither for the same purpose. They fell into conversation, and Celsus was so struck with admiration at the vast knowledge of plants discovered by Linnaeus, that he requested him to bring his Herbarium along with him, which was even then very rich, and live with him free of every expense." Linnaeus frankly observes in his Diary, "that in the library of Celsus he first saw a review in the Leipsic Commentaries of Vaillant's 'Discourse on the Structure of Flowers,' which strongly incules the Sexes of Plants, and that this induced him to be more attentive to the Stamina and Pistilla in flowers, and that after minute and diligent examination, he found them to vary even as much as the Petals themselves; upon which last circumstance the famous system of Tournefort is founded." The result of this extended enquiry Linnaeus committed to writing, and Celsus was so pleased with this manuscript treatise on the Sexes of Plants, that he sent it to Rudbeck, the Professor of Botany at Upsal, who expressed much approbation, and in consequence desired Linnaeus to be sent to him. The result of their meeting was the appointment of Linnaeus as lecturer in the room of Rudbeck, who was now too far advanced in years to continue lecturing. Linnaeus, therefore, gave his first public lecture in that university in the spring of 1730, and although only twenty-three years of age, was received by the pupils with every flattering mark of approbation; and Rudbeck appointed him also tutor to his sons, and he enjoyed, in the house of the aged professor, every

* The discovery of the Sexes of Plants is often arrogated by the French to Vaillant, but justly belongs to our own countryman, Sir Thomas Millington. Vide a note to our translation of Linnaeus's "Dissertation on the Sexes of Plants," where the time and manner of this discovery is given.
opportunity of further improvement. Rudbeck had formerly travelled over Lapland in the year 1679, at the command of Charles XI., but his journal was destroyed by the great fire at Upsal in 1702; but the ancient professor, with the garrulity of old age, would often discourse with him of his “young encounters,” what he had seen, the new plants he had discovered, and he kindled up an ardent desire in the youthful mind of Linnaeus to visit those regions. Providence appears always to have interfered for his advancement. Gustavus Adolphus, the reigning monarch, had directed the Royal Academy of Sweden to appoint some person to explore the natural productions of the Arctic Regions. Every eye was on this occasion naturally turned towards Linnaeus, and, notwithstanding the sacrifice, even Rudbeck wished to see his former labours revive by those of his successor. Linnaeus had even at this period planned out his Sexual System, but no body of plants had been arranged under it, which was another great stimulus to the active enterprising mind of Linnaeus to accept the lure of ambition held out by the Royal Academy. Accoutred as he appears in our painting, he visited the whole of Lapland in the year 1732.

Solus Hyperboreas glacies, Tanasimque nivalem,
Arraqua Rhipaes nunquam viduata pruinis
Lustrabat.

Verc. Georg.

This gave origin to his first immortal work, the “Flora Lapponica,” where Linnaeus relinquished all former systems, and arranged the Northern Plants he had collected according to their Sexes, which greatly excited the attention of the botanist, and the world, towards THE SEXUAL SYSTEM.*

This system at first had to encounter the opposition of men of the highest literary eminence in every country. In Russia it met with a most violent and bigotted opposition from Sigesbeck; in Germany, the envious resentment of Heister; in France, the ridicule of Buffon; in Switzerland, the enlightened, but still prejudiced, rejection of Haller; in Italy, the decided and laborious opposition of Pontedera; and in England, the sarcastic and futile objections of Alston; whilst at home it was much opposed from the general envy of merit. But it soon triumphed over every obstacle, and notwithstanding the celebrated works of a Tournefort and a Jussieu, it is, even at this day, received as the predominant system in France, a country justly celebrated for the number of its learned men, and the general thirst after real knowledge, and great encouragement to science, and men of letters, but suspected of being extremely national; whilst in Russia, Germany, Switzerland, Italy, and England, although there are fifty-two different systems of Botany, and we can boast of a Ray, yet the Sexual one is the only System that is universally adopted.

* The reader must feel gratified at being informed, that “A View of the Life and Writings of Linnaeus,” was some time back published by the late learned Dr. Punnett, of which admirable performance a new edition has lately appeared, with very considerable additions and improvements, by his very ingenious and no less learned nephew, Dr. Maton, Vice-President of the Linnean Society, in which the Diary complete, from the MS. of Linnaeus, may be seen, which cannot fail to interest every person who has any taste for science, or regard for extraordinary talents, and pre-eminent virtue. For further, and full particulars, respecting the life of so transcendent a genius, we must beg leave to refer to that excellent work, and also to “Travels into Lapland,” a translation of which, from Linnaeus’s MS. will shortly be published by the illustrious President of the Linnean Society, Dr. Smith.
CAROLUS LINNEUS, KNIGHT OF THE POLAR STAR, FIRST PHYSICIAN TO THE KING, PROFESSOR OF BOTANY IN THE UNIVERSITY AT UPPLAND.

From the Original Picture in the Extensive Collection of Portraits, Engrav'd by Dr. War, President of the Linnean Society.
The Rev. Thomas Martin, D.D. F.R.S.

Printed at the Press of the University of Cambridge.

View of King's College Chapel, the Public Library, and Senate House.

-engraved by W. Daniell, R.A.

London: Published for R. Taylor, June 1793.
WILLIAM CURTIS, F.L.S.
AUTHOR OF THE FLORA LONDONENSIS

London: Published by T. Newcombe, March 1, 1825.
AYLMER BOURKE LAMBERT Esq. F.R.S.
Vice-President of the Linnaean Society.
THE

Sexual System

of

CAROLUS VON LINNÆUS
EXPLANATION OF THE ANALYSIS

OF THE

SEXUAL SYSTEM

OF

CAROLUS VON LINNÆUS.

The method of Analysis is called by Logicians, that of invention, for it is the mode in which knowledge is acquired, and shews the progressive steps by which we advance in the acquisition of complex ideas. Here we are taught to compare, to reason, to determine, to adopt, and separate; and, finally, in this way we arrive at certain conclusions, or truth. It is a mode admirably calculated for the exercise and strengthening of our reasoning powers, being the same also as that pursued by Mathematicians.

Thus then is the systematic study of Botany one of the best books of logic, or reasoning, in the world; or, as some persons might wish to degrade it, a manly sort of Puzzle, but surely as instructive as it is amusing!

A person who is in the pursuit of the Class and Order of any unknown flower may be said to be upon a BOTANICAL JOURNEY, and the plant being his Directory, if he can read the botanical characters impressed on it by the pen of Nature, he will certainly, following system, very soon arrive at his journey's end.

In our first start we have two 'Comparisons' to make,

I. Whether the Sexes are 'visible,' or
II. Whether the Sexes are 'invisible.'

That is, whether the naked eye can discern the Pistillum and Stamina, or not.

If 'the sexes are not visible,' he has already reached the object of his destination, the plant, whose fructification he holds in his hand, comes under Class XXIV. 'CRYPTOGAMIA' of Linnaeus.

If, on the reverse, 'the sexes were visible,'...that is, the Stamina and Pistilla apparent to sight...he has now three Comparisons to make, which may be called the 'second stage' of his Journey. He has carefully to examine

* Vide Plate of the Analysis of the Sexual System.
I. Whether the flowers are 'Bisexual,'
II. Whether the flowers are 'Unisexual,' or
III. Whether the flowers are 'Mixed.'

By 'Bisexual' plants are underflood such, whose flowers have their Stamina and Pistill (the male and female parts of Plants) inclosed within the same corolla.

By 'Unisexual,' such as produce flowers with the Stamina and Pistilla placed in different corollas

Lastly, by 'Mixed,' is understood a mixture of the two kinds of flowers, 'Bisexual,' and 'Unisexual.'

Having made the necessary examination, if the Sexes are 'Mixed,' he is at once arrived at his journey's end, his plant is of the Class XXIII. POLYGAMIA.

If 'Unisexual,' he has one of two roads to take,

I. The two Sexes are either 'on the same plant,' or
II. The two Sexes are 'on different plants.'

That is, Stamen-bearing flowers (male flowers) and Pistil-bearing flowers (female flowers) are in the former instance to be found on the same plant, produced from the same root...and in the latter case, the correspondent male and female flowers, are found on different plants, produced on different roots.

His plant being as the directing post, he reads the botanical inscription, and discovers his plant to come either under the Class XXII. *DIGECIA,' or Class XXI. *MONOECIA.'

But if the flower was Bisexual, he has another course to take, and he has to see,

I. Whether the 'Anthers' are 'separate,' or
II. Whether the 'Anthers' are 'united.'

If he finds five 'Anthers united' round the Pistillum, he has reached the object of his destination, namely Class XX. 'SYNGENESIA.'

If the 'Anthers' were 'separate,' he has to advance a 'fourth stage,' and to see,

I. Whether the 'Filaments' are 'separate,' or
II. Whether the 'Filaments' are 'united with each other,' or,
III. Whether the 'Filaments' are 'united with the pistillum.'

If the Filaments arise from any part of the Pistillum, or from a pedicle (column) elevating the Pistillum, the plant is then of Class XIX. 'GYNANDRIA.'

If the 'Filaments are united with each other,' (these being joined together with a membrane), they are either,

I. All of them united, 'forming one body,' or,
II. Divided into 'two parcels,' making two bodies, or,
III. Divided into 'three, or more parcels,' each parcel being united.

If united together, but forming 'three, or more parcels,' the flower falls under the Class XVIII. *POLYADELPHIA,'...if forming 'two bodies,' under Class XVII. *DIADELPHIA,'...and only 'one body,' Class XVI. 'MONODELPHIA.'

But if the 'Filaments' were 'separate,' he has to examine,

I. Whether these are 'proportionably long,' or,
II. Whether these are of 'different lengths.'
Of different lengths relate only to four or six stamina. If his flower has 'six stamina,' and of these he finds 'four long and two short,' he has reached his destination, Class XV. 'TETRADYNAMIA,'...if 'four stamina,' 'two' of these 'being long and 'two short,' he discovers his plant to be of the Class XIV. 'DIDYNAMIA.'

If his flower falls under none of the former considerations, he has an easy task now assigned him, only count 'numbers;' but if these amount to 'twenty or more stamina,' he has also to attend to 'insertion.'

I. Whether 'inserted on the calyx or corolla, or,

II. Whether 'inserted on the receptacle.'

If 'inserted on the receptacle,' the Class is XIII. 'POLYANDRIA,'...and if on the calyx or corolla, Class XII. 'ICOSANDRIA.'

The other comparisons are equally easy, as Class XI. 'DODECANDRIA, twelve to nineteen stamina,'...Class X. 'DECANDRIA, ten stamina,'...Class IX. 'ENNEANDRIA, nine stamina,'...Class VIII. 'OCTANDRIA, eight stamina,'...Class VII. 'HEPTANDRIA, seven stamina,'...Class VI. 'HEXANDRIA, six stamina,'...Class V. 'PENTANDRIA, five stamina,'...Class IV. 'TETRANDRIA, four stamina,'...Class III. 'TRIANDRIA, three stamina,'...Class II. 'DIANDRIA, two stamina,'...Class I. 'MONANDRIA, one stamen.'

After this Analysis or Separation, the student should take the classes in the reverse order, commencing with Class I. MONANDRIA, and ending with Class XXIV. CRYPTOGRAPHIA.*

* Vide our Synthesis of the Classes and Orders of the Sexual System, immediately following the Table of Analysis.
The Sexual System
As illustrated by Linnaeus in his Botanical Works

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London published by J. D. Druce, 1806.
SYNTHESIS OF THE SEXUAL SYSTEM.

I. Classes derived from the Consideration of the Number of Stamens.

Class I. **Monandria**
- Order I. Monogynia. Order II. Digynia.
Class II. **Diandria**
Class III. **Triandria**
Class IV. **Tetrandria**
Class V. **Pentandria**
Class VI. **Hexandria**
Class VII. **Heptandria**
Class VIII. **Octandria**
Class IX. **Enneandria**
Class X. **Decandria**
Class XI. **Dodecandria**

II. Classes derived from the Consideration of Number and Insertion.

Class XII. **Icosandria**
Class XIII. **Polyandria**

III. Classes derived from the Consideration of Number and Proportion.

Class XIV. **Didynamia**
- Order I. Gymnandria. Order II. Anginandria.
Class XV. **Tetradynamia**

IV. Classes derived from the Consideration of Union.

Class XVI. **Monadelphia**
Class XVII. **Diadelphia**
Class XVIII. **Polyadelphia**
Class XIX. **Syngenesia**

V. Classes derived from the Consideration of Separation.

Class XXI. **Monogynia**
Class XXII. **Dichogynia**
Class XXIII. **Polygynia**

VI. A Class derived from the Consideration of Concealment.

Class XIV. **Cryptogamia**
The Sexual System as represented by modern Authors.

CLASSES.

CLASS I. Monadica.
CLASS II. Biplicata.
CLASS III. Trilobata.
CLASS IV. Trilobata.
CLASS V. Pentalobata.
CLASS VI. Hexalobata.
CLASS VII. Septalobata.
CLASS VIII. Bilateral.
CLASS IX. Proteranthos.
CLASS X. Monopetalae.
CLASS XI. Dicotyledonae.
CLASS XII. Monocotyledonae.
CLASS XIII. Polygamous.
CLASS XIV. Graminaceae.
CLASS XV. Rosaceae.
CLASS XVI. Compositae.
CLASS XVII. Cucurbitaceae.
CLASS XVIII. Convolvulaceae.
CLASS XIX. Caryophyllaceae.
CLASS XX. Rhamnaceae.
CLASS XXI. Monocotyledonae.
CLASS XXII. Dicotyledonae.
CLASS XXIII. Polygamous.
CLASS XXIV. Cryptogams.
ORDERS of the Sexual System.

TABLE.

SECTION I. Orders of the following Station Orders, i.e. Menoparia, i.e. Botanica, in Tetraramia, i.e. Pentaramia, in Hexaramia, in Octaramia, in Ennearamia. Diodora, in Deideramia, in Dodecamia, in Enneagramia, etc. are taken from the Number of Orders and terminate in Orders, as the Orders did in Angles, with the Greek Numbers preceding them.

Explanation.

Orders.

1. FILOCHORUS...
2. HYDRA...
3. TRICHOS...
4. PENTACNA...
5. HEXACNA...
6. OCTAMNA...
7. NINEAMNA...
8. DODECAMNA...
9. ENNEARAMNA...

SECTION II. Angles, i.e. Octaramia, has an Order, taken from the Initiation of the Number.

Orders.

1. CORONARCHIA...
2. ARECADIA...

SECTION III. Orders, i.e. Tetraramia, has an Order from a different in the angles of the Hexaramia.

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. PENTACNA...
5. HEXACNA...
6. OCTAMNA...
7. NINEAMNA...
8. DODECAMNA...
9. ENNEARAMNA...

SECTION IV. Orders, i.e. Megarhynia, i.e. Diaphyes, are taken from the Number of Specifics, etc.

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...

SECTION VI. Orders, i.e. Megarhynia, i.e. Diaphyes, etc. are taken from the Number of Specifics, etc. as explained in our Analysis of the Order, etc.

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...

SECTION VII. Orders, i.e. Megarhynia, i.e. Diaphyes, etc. are taken from the Number of Specifics, etc. as explained in our Analysis of the Order, etc.

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...

Orders.

1. TRICHOS...
2. HEXACNA...
3. OCTAMNA...
4. NINEAMNA...
5. DODECAMNA...
6. ENNEARAMNA...

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...
6. DODECAMNA...
7. ENNEARAMNA...

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...
6. DODECAMNA...
7. ENNEARAMNA...

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...
6. DODECAMNA...
7. ENNEARAMNA...

Orders.

1. PENTACNA...
2. HYDRA...
3. TRICHOS...
4. OCTAMNA...
5. NINEAMNA...
6. DODECAMNA...
7. ENNEARAMNA...
ORDERS.

I. Monocotyledons (1 Family).

II. Dicotyledons (2 Families).

IV. Monocotyledons (3 Families).

V. Monocotyledons (4 Families).

VI. Monocotyledons (5 Families).

VII. Monocotyledons (6 Families).

VIII. Monocotyledons (7 Families).

X. Pteridophytes.

XI. Spermatophytes.

XII. Pteridophytes.

XIII. Monocotyledons (8 Families).

XIV. Monocotyledons (9 Families).

XV. Monocotyledons (10 Families).

XVI. Monocotyledons (11 Families).

XVII. Monocotyledons (12 Families).

XVIII. Monocotyledons (13 Families).

XIX. Monocotyledons (14 Families).

XX. Monocotyledons (15 Families).

XXI. Monocotyledons (16 Families).

XXII. Monocotyledons (17 Families).

XXIII. Monocotyledons (18 Families).

XXIV. Monocotyledons (19 Families).

XXV. Monocotyledons (20 Families).

XXVI. Monocotyledons (21 Families).

XXVII. Monocotyledons (22 Families).

XXVIII. Monocotyledons (23 Families).

XXIX. Monocotyledons (24 Families).

XXX. Monocotyledons (25 Families).

XXI. Monocotyledons (26 Families).

XXII. Monocotyledons (27 Families).

XXIII. Monocotyledons (28 Families).

XXIV. Monocotyledons (29 Families).

XXV. Monocotyledons (30 Families).

XXVI. Monocotyledons (31 Families).

XXVII. Monocotyledons (32 Families).

XXVIII. Monocotyledons (33 Families).

XXIX. Monocotyledons (34 Families).

XXX. Monocotyledons (35 Families).
A View
ILLUSTRATION
of the
Sexual System
of
Vincent

Round Script
Vincent Script
Anatomy of the Nodding Runcalmena

London: Published by J.T. Wood, 1844.
EXPLANATION.

1. 1. 2. The three upright broad Petals of the Corolla.
2. 2. 3. The three upright narrow Petals of the Corolla.
4. 4. The two called Leaves constituting the Nectary.
5. The Anther inserted on the margin of one of the Leaves of the Nectary.
6. 6. 7. Leaves of the Calyx.
8. 8. 9. Leaves of the Corolla.
10. 10. Two scales constituting the Corona.
11. 11. petals.
Jasminum: The Jasmine
An exact Copy from the Hortus Cliffortianus of Swanns.

Gladiolus angustus; or, narrow-leaved Gladiolus.

Anatomy of the Meadra

Anagallis Arvensis, or Old Man's Weather-glass.
Anagallis Trailla, or Bog-Pimpernel.
Coffee Arabica, or Arabian Coffee-tree.
The Egg Plant.
Dissection of the Queen Flower

1. 2. 3. The three ciliate Leaves.
4-5. Stem of the Flower exposed.
6. A stalk of flower bound together in a cluster.
7-8. The other Flowers.
9-10. Similar Flowers, which form stalks & encompass each Flower.
11. The large internode (stalk).
A Cymobus.

Scilla Peruviana, or Peruvian Hyacinth.
No Universal Involucre, but a Partial Involucre.

Chervillium Sylvestre, or Wild Cervil.
Anatomy of the White Lily

1. The outer petals.
2. The inner petals.
3. The three outer petals which look like the three inner petals into the longitudinal prominence in the bud.

London. Published by J. Thornton, 1808.
Anatomy of the Hyacinth.
Anatomy of the Agave or American Aloe
Anatomy of the Superb Lily
A Plate to illustrate the World Genus

Long-tubed Marvel of Peru
Esculus Hippo-Castanum, or Common Horse-Chestnut
Butomus umbellatus, or Flowering Rush.
Anatomy of the Pentax Rhododendron

Blindlyson, J.

London, Published by D. Thomson, March 1795.
Arbutus Andruleaceae: or Oriental Strawberry Tree.
Lithospermum Salicaria, or Purple-spiked Willow-herb.

Published by J. Thornton, Jr.

London.
Calyx opened.

African Calla

Calla Ethiopia, or African Calla.
The Dog Rose.

Anatomy of the Rose.

Published by W. Thornton, May 1st.
Anatomy of the Night-Slowing Cereus:

Cactus Grandiflora of Linnæus.

London, Published by J. Thornton, May 1806.
Cardamine pratensis, or Common Ladies-smock.
The Sweet Pea
Anatomy of the 'Sweet Pea'.
The Leucaena, or India, resemble a Bird's Foot.

Flowers pachycaulous.

Lentis Cimiculatus, or Common Birds-foot Clover.
Melaleuca Ericifolia, or Heath-leaved Melaleuca.
Hypericum Perforatum, or Perforated St. John's Wort.
Anatomy of the Quadrangular Passion Flower.
Anatomy of the Dragon Arum
A poisonous Plant

[Diagram of a plant, labeled with descriptions and annotations]
Dandelion

Petal

Ligule

Floret

Nec

Stipe

Seed

Root

Ligulate Flora infertile

Seed

Legume

A Ligulate Flora of the same kind

Papre

Ligule

Legume

The stalk depressed

London Published by H. Champion, Del. Etch.

W. & S. Flandes, etch.
Anatomy of the Sunflower
Echinops spicoccephalus, or Great Globe Thistle

London: Published by R. Thornton, Esq.
THE MALE FLOWER.

1. Male flower, produced by a staminate bud.
2. Male flower in flower before separation.
3. Male flower in flower before separation.
4. The five divisions of the male flower.
5. The male bud, or the male flower.
7. The Five Parts of the male flower, to show.
8. The important divisions in the base of the male flower.

THE FEMALE FLOWER.

12. The Five Parts of the female flower.
13. A flower, of a female flower in the flower before separation.
14. A flower, of a female flower in the flower before separation.
15. One of the petals, or the petals, or the petals.
16. A female flower, one of the petals.
17. A leaf.
Male & Female Flowers on the same Plant.

Male Flowers above.

Female beneath.

Leaf sword-shaped, and

Michel.

Flower.

Natural Size.

Male Flower.

Narrowed at the base of the Calyx which delined the Male Flowers.

T. s. Opening the Calyx which delined the Male Flowers.

T. x. Opening the Calyx which delined the Male Flowers.

Female Flower.

Narrowed at the base of the Calyx which delined the Female Flowers.

T. s. Opening of the female flowers of Calyx.

T. x. Opening of the female flowers of Calyx.

Teparymax Dactyloides, or jointed Teparymax.

Male & Female Flowers on the same Plant.

Cereus Pendularis, or Great Pendulous Cereus.
Male & Female Flowers on the same Plant.

Male Flowers in a cluster above.

Female, smooth.

Sparagium, simplex, or smaller Bur-reed.
Veratrum album, or White Hellebore.
Agaricus Campestris, or Common Field Mushroom.
THE REFORMED SEXUAL SYSTEM.

CLASSES.

I. **Monandria**............ one Stamen.
II. **Diandria**............ two Stamens.
III. **Triandria**.......... three Stamens.
IV. **Tetradenia**........... four Stamens.
V. **Pentandra**............ five Stamens.
VI. **Hexandra**............ six Stamens.
VII. **Heptandra**.......... seven Stamens.
VIII. **Octandra**.......... eight Stamens.
IX. **Enneandra**.......... nine Stamens.
X. **Decandra**............. ten Stamens.
XI. **Dodecandra**........ twelve to nineteen Stamens.
XII. **Polyandra**......... twenty or more Stamens.

ORDERS.

I. Orders taken from the Number of Pistillas.

<table>
<thead>
<tr>
<th>Class</th>
<th>Pistillas</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. <strong>Oenogynia</strong></td>
<td>one Pistilla</td>
</tr>
<tr>
<td>II. <strong>Dicygynia</strong></td>
<td>two Pistillas</td>
</tr>
<tr>
<td>III. <strong>Trigynia</strong></td>
<td>three Pistillas</td>
</tr>
<tr>
<td>IV. <strong>Tetragynia</strong></td>
<td>four Pistillas</td>
</tr>
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</tr>
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<td>XII. <strong>Polygynia</strong></td>
<td>twenty or more Pistillas</td>
</tr>
</tbody>
</table>

Class **Cryptogamia** has the natural orders, I. **Filices**. II. **Musci**. III. **Algae**. IV. **Pungi**.

REMARKS.

I. The Class IV. **Tetradenia**, being a numerous one, **Linnaeus** chose to separate it into two orders, and an opportunity presented itself from the consideration of the differences which occur in plants having four stamens, from the proportions of these. **Dichogamy** expresses this difference; and the flowers are either **ringent or parvumata, a natural tribe**. But as all the **ringent flowers** are not included in the class **Dichogamy**, some coming under Class II. **Diandria**, there can be no good reason for not making this real division of a class into an order. The system becomes more easy and regular, and in fact frequently, more natural.

II. The Class VI. **Hexandra**, also readily separates into two parts, from the like consideration of the proportions in the stamens, and **Tetradynamia** contains the natural tribe of cross-coupled plants.

III. The Class XIII. **Polyandra**, also readily divides into two parts, from the consideration of the insertion of the stamens, and one of these, the **Icosandra**, of Linnaeus, possesses many edible fruits, but as it is not altogether a natural class, therefore no one can regret seeing this part distinguished as an order.

IV. In the **Monadelphia** of Linnaeus, many of the numerical names, which had been used to characterize the Classes, are employed to distinguish the Orders, or subdivisions, as **Pentamora**, **Decamora**, &c., and hence arises a confusion unavoidable perplexing to the young student, and which our Method, as it is evident, completely removes. The same observation applies to the Classes **Diadelphia**, **Polyadelphia**, **Syngenesia**, **Monocha**, **Dicia**, where the same (may I call it so) impropriety occurs. This class in **Linnaeus** is not natural, but being made into orders, many of them then become natural as orders, as the **Colurnates**.

V. The **Papilionaceous Flowers**, so as they are generally termed, form the Order **Diaspomena** in the Class **Diadelphia** of Linnaeus; but the author, unwilling, as it would seem, to make any breach in an natural an assemblage of plants, has so far deviated from the principles of his System, as to refer to that Class several genera, which strictly belong to the preceding Class, being in fact **Monadelphia**. This inconvenience is entirely obviated in the present scheme, where **Monadelphia** and **Diadelphia** constitute two successive Orders in our Class X. **Decamora**.

VI. **Polyadelphia** is a small, and, as **Doctor Smith** observes, "rather an unnatural class." Most persons are shocked to see Citrus, the orange, in this class, and not in the **Icosandra** class; for **Linnaeus** describes it of the Class XVII. **Polyadelphia**; Order III. **Icosandra**. Now in our Reformed Sexual System, it comes under Class XIII. **Polyandra**, Order **Icosandra**, in juxtaposition with other edible fruits, in the subdivision **Palaedadelphia**.

VII. Class V. **Pentandra**, a very numerous class, is subdivided by **Syngenesia**, and so formed into two classes by **Linnaeus**, the latter of which, however, as containing an order **Monogynia**, is not therefore altogether a natural class. We obviate this by making **Syngenesia** an order, and the subdivision **Polygynia** to contain the natural flowers of compound flowers; whilst, under another subdivision, **Monogynia**, many plants, not having compound flowers, arrange themselves.

VIII. Against **Gynandra**, which **Doctor Smith** calls, "an odd and miscellaneous class," there lies the same objection, as we observed above, as against the Class **Diadelphia**, the numerical names of Classes being applied to Orders. In our scheme, Class II. **Diandra**, has an Order **Gynaecia**, which contains the natural tribe of **Orchideae**; and thus the mind is delighted to see a natural assemblage embraced in an order, if not in a class. The separation of the remainder cannot be regretted, as not possessing amongst such other the smallest affinity.

IX. **Monogynia** is a miscellaneous class, and borrows the names of its secondary divisions from most of the other classes, as **Monandra**, **Diandra**, &c., even from **Monadelphia**, **Syngenesia**, and **Gynaecia**; for all these become, in **Linnaeus's Sexual System**, Orders in our scheme. Class **Triandra**, Order **Monogynia**, contains mostly grasses, hence we retain this natural assemblage in the same class at least, if not in the same order.

X. **Dicia**. The same remarks apply here, as in **Monogynia**.

XI. **Polygynia** subdivides the classes **Monogynia** and **Dicia**; therefore in the logic of science it is in reality an order.
APOLGY.

FACITUR IN VIVIS LIVOR, POST FATA QUIESCIT
TUM SUIS XX MERITIS CUCUR TUITUR HONOS.

Some apology is certainly necessary, after any endeavour to reform so celebrated and established a System, as the Sexual System of the illustrious Linnaeus. Many alterations in this system have been attempted. The enlightened pupil of Linnaeus, ThuRBER, abolished the classes XX. Gynandria, XXI. Monoece, XXII. Dicono, and XXIII. Polygamin. GheLin, Professor at Gottingen, to the alterations introduced by Thunberg, in publishing a new edition of Linnaeus's Systems Natura, added the abolition of Class XII. Icosandria; and the no less celebrated Dr. Smith, preserving the rest of the System entire, has abolished Order V. Monogamia in Class IX. Syn grenades, and Class XII. Polygamin. "To his Class Polygamin," says Dr. Smith, "many students of tropical plants justly objected in his lifetime, and he, as well as his son, listened to their observations." Dr. Withering, in his Arrangement of British Plants, has followed the system of Gmelin. Professor Martyn, speaking of the changes introduced by Schreber, in his new edition of Linnaeus's Genera Plantarum, says, that his reduction of Class XX. Gynandria, appears "reasonable," yet the singularity of the Order Diandria surely demanded a separate place to itself. But when he comes to mention the incorporation by Gmelin of the Class Icosandria into the Polygamin, he declares this change to be "abominable."

I am aware, that venturing to reform in such a degree the Sexual System, as I have done, will bring upon me, with some, much severe reproach. I am conscious, indeed, as well as others, that the credit of the Sexual System of Linnaeus, as an invention, surpasses all power of praise, and hence has found enthusiastic admirers; and with timid hands I have ventured to take to pieces the superstructure he raised, and build up from the old materials, which I have carefully and religiously preserved, a new edifice, suited to modern improvement and convenience; hoping, however, that those who may, hereafter, publish the works of Linnaeus, will edit the Sexual System as delivered by himself, and not bring forward, in the works said to be those of Linnaeus, what he never either thought or wrote. For a full defence of the Reformed Sexual Systemvide my "Practical Botany, being a New Illustration of the Genera of Plants, with dissections of each Genus," where this subject has been particularly considered and discussed.

In a word, as by system is only meant a plan to facilitate the acquisition of the knowledge of plants, the more easy this is contrived to accomplish the proposed end, the better such a system will be accounted; and I have endeavoured so to contrive this, that I hope no longer any very great obstacles can arise in the way of the student, and that this will plead my excuse with a discerning and indulgent public for venturing to step out of the beaten path, to attempt the reformulion of a system which has conferred immortal honour upon the inventor, and received the general plaudits and admiration of the learned throughout Europe. It appeared to me more advisable to reform the whole, than to make any partial amendments; either to adopt the system as delivered to us by Linnaeus, or to have the present system, as erected out of the materials of the old; a system which I hope may not moulder, like the other systems, into the sand of which they were composed, but resemble the piousful Parkia arising from the ashes of its parent, or as a rock in the midst of the ocean, may remain until "the wreck of matter and the crash of worlds."

It is certainly a great satisfaction for me to find, that although the learned and respectable Professor Martyn has long openly disapproved of the changes made in the Sexual System by the several Reformers, yet he writes to me—

EXTRACT OF A LETTER TO DR. THORNTON, FROM THE REV. M. MARTYN.

"I by no means disapprove of your new attempt to render the Sexual System, by the manner in which you have done it, an easier medium of attaining a knowledge of Plants; and have been long convinced in my own mind, that we arrive in vain to unite a natural with an artificial arrangement. Upon your plan, I see no impropiety in bringing the Orchideae into the Second Class; nor can I ever object to your altering, as you have done, the separated classes of Linnaeus, Icosandria and Polytandria. Your method is wholly considered throughout; for along with you I hold our great Master's System as sacred, and can never approve of those greater alterations" (he might have said mutilations) "which some of his pupils have made, so differently as is to be estimated the conduct of persons engaged in the same object."

The Rev. Doctor Milan, the learned author of "A Botanical Dictionary," writes to me—

EXTRACT OF A LETTER TO DR. THORNTON, FROM THE REV. D. COLIN MILNE.

"Your Reformed Scheme of the Linnaean System has my entire approbation. It possesses all the admirable and elegant simplicity of that of Rivinus, which has always been a great favourite with me, from the steady adherence of the author to the Principles of his Method, and is eminently adapted for practice. Your remarks respecting the Sexual System are truly excellent; your New Illustration admirable."

Doctor Shaw, of the British Museum, a gentleman not less eminent as a botanist, than a naturalist, declares, "that he believes, had Linnaeus been alive, the Reformed Sexual System would be that which he himself would have instantly adopted."

Similar are the flattering opinions also of several other distinguished botanists, who have expressed their approval of the Reformed Sexual System. But with extreme diffidence I submit it to the judgment of the world.

* Not less than fifty-two systems of Botany have been published, several of them of very considerable merit, but not practionally good, hence most of them are now forgotten.