

*College of Fort William*

L E T T E R S

ON THE

E L E M E N T S

OF

B O T A N Y.



L E T T E R S  
ON THE  
E L E M E N T S  
OF  
B O T A N Y.

ADDRESSED TO A LADY.

*By the celebrated J. J. ROUSSEAU.*

TRANSLATED INTO ENGLISH,  
WITH NOTES,  
AND TWENTY-FOUR ADDITIONAL LETTERS  
FULLY EXPLAINING THE SYSTEM OF LINNÆUS.

BY THOMAS MARTYN, B. D. F. R. S.  
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IN THE UNIVERSITY OF CAMBRIDGE.

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THE THIRD EDITION,  
WITH CORRECTIONS AND IMPROVEMENTS.

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TO  
THE LADIES  
OF  
GREAT BRITAIN:

NO LESS EMINENT  
FOR THEIR ELEGANT AND USEFUL  
ACCOMPLISHMENTS,

THAN ADMIRER  
FOR THE BEAUTY OF THEIR PERSONS:

THIS THIRD EDITION OF THE FOLLOWING

J. E T T E R S  
IS, WITH ALL HUMILITY,

INSCRIBED

BY

THE TRANSLATOR AND EDITOR.

Wage of Fort William  
1844

T H E

## TRANSLATOR'S PREFACE.

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WHEN the Elementary Letters on Botany<sup>a</sup> first presented themselves to me, in turning over the last complete edition of Rousseau's works<sup>b</sup>, their elegance and simplicity pleased me enough to make me give them a second more attentive perusal. I then thought that they had considerable merit; and that if they were disembarrassed from the chaos of fifteen quarto volumes, and translated into English, they might be of use to such of my fair countrywomen and unlearned countrymen as wished to amuse themselves with natural history.

When the translation was done, I perceived that the foundation only being laid by the ingenious author, it could be of little

<sup>a</sup> Lettres Elementaires sur la Botanique a Madame de L\*. Melanges, tome ii. page 531, &c.

<sup>b</sup> Collection complete des Oeuvres de J. J. Rousseau. Geneve, 1782.

service,

service, without raising the superstructure. This I have attempted; not flattering myself that it is executed in Rousseau's manner, which is inimitable, but merely with the design of being useful.

What books can you recommend, that may enable me to acquire a competent knowledge of Botany? is a question that has very frequently been asked me. To the learned I can readily answer, the works of Linnæus alone will furnish you with all the knowledge you have occasion for; or, if they are deficient in any point, will refer you to other authors, where you may have every satisfaction that books can give you\*. But I am not very solicitous to relieve these learned gentlemen from their embarrassment; they have resources enough, and know how to help themselves. As to the unlearned, if I were to send them to the translation of Linnæus's works, they would only find themselves bewildered in an inextricable labyrinth of unintelligible terms, and would only reap disgust from a study, that is, perhaps, more capable of affording

\* These writings of Linnæus are — *Philosophia Botanica*, that inexhaustible mine of elementary knowledge — *Genera Plantarum* — *Species Plantarum* — and *Systema Vegetabilium*, which is an epitome of the two last.

pleasure than any other. If I were to bid them sit down, and study their grammar<sup>d</sup> regularly; so dry and forbidding an outset might discourage the greater number; and few would enter the temple through a vestibule of so unpromising an appearance. A language however must be acquired; but then it may be done gradually; and the *tædium* of it may, in some measure, be relieved by carrying on at the same time a study of facts, and the philosophy of nature. This seems to have been Rousseau's idea, and I have endeavoured not to lose sight of it in my continuation of his eight ingenious letters.

Let an unlearned person then, who is desirous of acquiring some knowledge of Botany, begin by taking a few plants with flowers, whose parts are sufficiently visible, and examine them patiently by the descriptions and characters which are given in the following pages. You may perhaps know some plants by their names; or if not, you will be unfortunate indeed if you have not a friend who will show you the flower of a lily. If in the course of your examination,

<sup>d</sup> In Lee's Introduction, Rose's Elements, &c.

any term should occur, that is not explained in the page, or mentioned in the index, you may have recourse to the Dictionary, the Introduction, or the Elements. If you can have patience to go through the first seven letters, with a plant or two of each natural tribe explained in them; to make yourself master of the classification in the ninth and tenth; and to examine the obvious plants, whose characters are given in the twenty following letters, as they occur; I flatter myself that you will find little difficulty after that, in determining any plant which you shall happen to meet with, by Linnæus's characters, as delivered by his translators\*: whereas if you had begun with them, I am confident you would have been discouraged from proceeding.

Good plates, or figures of plants, will also be of considerable assistance: those of Mr. Curtis's *Flora Londinensis* will suffice for most of the British natives: especially as he has accompanied his plates with ample and accu-

\* A system of vegetables, &c. translated from the 13th edition of Linnæus's *Systema Vegetabilium*, by a botanical society at Lichfield. — The *Genera Plantarum* is since also translated by the same hands.

rate descriptions in English as well as Latin. Mr. Miller's figures to his Gardener's Dictionary, exhibit a great number of the most remarkable foreigners. There is indeed no want of such help<sup>f</sup>: but the misfortune is, that these books are so very expensive, as to be far beyond the purse of all but the opulent.

I beg leave to protest against these letters being read in the easy chair at home; they can be of no use but to such as have a plant in their hand; nor do they pretend to any thing more, than to initiate such as, from their ignorance of the learned languages, are unable to profit by the works of the learned, in the first principles of vegetable nature. Botany is not to be learned in the closet; you must go forth into the garden or the fields,

<sup>f</sup> Catesby's Carolina. Martyn's Historia Plantarum Rariorum. Oeder's Flora Danica. Dillenius's Hortus Elthamensis. Besler's Hortus Eystettenensis. Rheede's Hortus Malabaricus. Rumphius's Herbarium Amboinense. Trew's Florum Imagines & Plantæ rariores. Jacquin's Flora Austriaca, hortus Vindobonensis, &c. Ehret's Plantæ rariores. Blackwell's Herbal. Hill's Vegetable System. Merian's Surinam and European Plants and Insects. Allionii Flora Pedemontana. Pallas's Flora Rossica; and Scopoli's Flora Insubrica—are all very fine works, but cost an immense sum to purchase them.

and there become familiar with Nature herself; with that beauty, order, regularity, and inexhaustible variety which is to be found in the structure of vegetables; and that wonderful fitness to its end, which we perceive in every work of creation, as far as our limited understandings, and partial observations, give us a just view of it.

In the second edition a few mistakes were corrected, and some improvements were made; the principal of these was, a reference at the foot of the page to some authors who have figured the plants. For this purpose I preferred Curtis and Miller: when these failed me, I had recourse to the *Flora Danica*, &c. and I usually referred to old Gerard, or Morison, or both, for the sake of such as do not possess the more splendid works, and live remote from public libraries.

In this third edition these references are considerably multiplied; and that the plants which are wanted for examination may be the more readily found, the generic names are now first given in the margin, and a running title of the classes and orders is placed at the top of the page.



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WITH  
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2 SHOOTS, STALKS, &c.		8 LEGUMENS,
3 LEAVES,		9 GRAIN,
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## INTRODUCTION.

**T**HE principal misfortune of Botany is, that from its very birth it has been looked upon merely as a part of medicine. This was the reason why every body was employed in finding or supposing virtues in plants, whilst the knowledge of plants themselves was totally neglected: for how could the same man make such long and repeated excursions as so extensive a study demands; and at the same time apply himself to the sedentary labours of the laboratory, and attendance upon the sick; which are the only methods of ascertaining the nature of vegetable substances, and their effects upon the human body? This false idea of Botany, for a long time, almost confined the study of it to medicinal plants, and reduced the vegetable chain to a small number of interrupted links. Even these were very ill studied, because the substance only was attended to, and not the organization. How indeed could persons be much interested in the organical structure of a substance, of which they had no other idea but as a thing

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to

to be pounded in a mortar? Plants were searched for, only to find remedies; it was simples, not vegetables that they looked after. This was very right, it will be said; may be so. Hence nevertheless it follows, that, if men were ever so well acquainted with remedies, they were very ignorant of plants; and this is all that I have here advanced.

Botany was nothing; there was no such study; and they who plumed themselves most upon their knowledge of vegetables, had no idea of their structure, or of the vegetable œconomy. Every body knew by sight five or six plants in his neighbourhood, to which he gave names at random; enriched with wonderful virtues, which he took it in his head they possessed; and each of these plants, changed into an universal panacea, was alone sufficient to render all mankind immortal. These plants, transformed into balsams and ointments, quickly disappeared; and soon made room for others, to which new comers, in order to distinguish themselves, attributed the same effects. Sometimes it was a new plant, decorated with ancient virtues: sometimes old plants, under new names, sufficed to enrich new quacks. These plants had a different vulgar name in every province, and they who pointed them out for their drugs, at most gave them only those names by which they were known on the spot where they lived: thus,

thus, when their recipes travelled into other countries, it was no longer known what plant they spoke of; every body substituted another after his own fancy, without regarding any thing else, but giving it the same name. Such is the whole art that the Myrepfuses, the Hildegardises, the Suarduses, the Villanovas, and the rest of the doctors of that time, employed in the study of those plants which they treat of; and it would be difficult perhaps for any body to know one of them by the names or descriptions which they have given them<sup>a</sup>.

At the revival of learning, every thing disappeared to make room for the works of antiquity; nothing was then either good or true but what was to be found in Aristotle or Galen. Instead of searching for plants where they grew, men studied them only in Pliny and Dioscorides; and there is nothing so frequent in the authors of those

<sup>a</sup> Myrepfus's book is entitled *Antidotarium parvum*. Hildegardis was a lady and an abbess; she flourished about 1180, and wrote, among others, a treatise entitled *Physica Leguminum, Fructuum, Herbarum, &c.* Suardus's book is intitled *Antidotarium*, and was printed at Venice 1551 fol.—Arnoldus de Villanova put together *Regimen Sanitatis Salerni*, printed in 1482, 1484, 1490, 1491, 1493, 1505, 1509, &c. and was author of many other medical and medico-botanical works. He is said to have died in 1313.—But the most popular of these old works, was *Hortus Sanitatis*, ascribed to Cuba. See Pulteney's *Sketches of the Progress of Botany in England*, chap. iv.

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times, as to find them denying the existence of a plant, for no other reason but because Dioscorides has not mentioned it. These learned plants however must be found in nature, in order to make use of them according to the precepts of their master. They bestirred themselves therefore, they set themselves to search, to observe, to conjecture; and made every effort to find, in the plant which they chose, the characters described in their author; and since translators, commentators, and practitioners, seldom agreed in their choice, twenty names were given to the same plant; and the same name to twenty plants; every man maintaining that his own was the true one, and that all the rest, not being that of Dioscorides, ought to be proscribed. From this conflict indeed it followed at length that more careful researches were made, and some good observations, which deserved not to be forgotten; but at the same time such a chaos of *nomenclature*, that the Physicians and Herbarists no longer understood each other: there was no possibility of communicating their mutual lights; nothing remained but disputes upon words and names; and even every useful enquiry and description was lost, for want of being able to decide what plant each author had spoken of.

Real botanists however began to be formed: such as Clusius, Cordus, Cæsalpinus, Ges-



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Gesner<sup>b</sup>; good and instructive books on this subject began to be published, in which already appeared some traces of method<sup>c</sup>. And it has certainly been a loss that these pieces have become useless and unintelligible by the mere discordance of names<sup>d</sup>. But these authors, beginning to unite species and separate genera, according to their own manner of observing the habit and apparent structure, occasioned new inconveniences, and a fresh obscurity; because each author, regulating his nomenclature by his own method, created new genera,

If we follow the order of birth, the arrangement should have been Cordus 1515, Gesner 1516, Cæsalpinus 1519, Clusius 1526: if we range them from the dates of their publications, they should stand thus—Cordus 1535, Gesner 1540, Clusius 1557, Cæsalpinus 1583.

Indeed! some traces only of method in the celebrated work of Cæsalpinus! He who first invented a complete arrangement of plants, and stands unrivalled as the father of method! He to whom every succeeding system-monger owes so many obligations! Though among them all Ray alone confesses it. What Rousseau affirms is true only of the excellent, the illustrious Gesner; the other two thought nothing of arrangement: No, nor the Bauhins, nor any other, till Morison and Ray.

<sup>a</sup> If Rousseau means to speak here concerning the works of the forementioned authors, this is not true. The treatises of Gesner and Clusius are every where referred to, even by Linnæus, and consequently their nomenclature is well known. The principal work of Valerius Cordus is Gesner's History of Plants, which he published in 1561. Cæsalpinus's book is now become rather a matter of respectable curiosity than use.

## INTRODUCTION.

or separated old ones, as the characters of his own required. So that genera and species were so jumbled together, as to leave scarcely any plant without as many names as there were authors who described it; which made the study of the nomenclature as tedious as that of the plants themselves, and frequently more difficult.

At length the two illustrious brothers appeared; who alone have done more for the advancement of Botany than all the rest together who preceded, and even followed them, till Tournefort. Rare geniuses! whose vast knowledge and solid labours, consecrated to Botany, render them worthy of that immortality which they have acquired. For, till this part of natural history falls into oblivion, the names of John and Caspar Bauhin will live along with it in the memory of mankind.

Each of these men undertook an universal history of plants: but what more immediately relates to our present purpose is, that they each of them undertook to join to it a *Synonymy*, or exact list of the names that every plant bore in all the writers which preceded them. This labour was become absolutely necessary to enable us to reap any advantage from their observa-

John the elder was born at Lyon, in 1541, and died in 1613. Caspar was not born till 1560, and died in 1624.

tions ;

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tions ; for without that, it was almost impossible to follow and distinguish every plant among so many names.

The eldest almost completed this undertaking in three volumes in folio, printed after his death ; and he has given such just descriptions of the plants, that we are rarely deceived in his synonyms <sup>f</sup>.

The brother's plan was yet more extensive, as appears by the first volume which he published, and from which we may judge of the immensity of the whole work, if he had found time to execute it <sup>g</sup>; but, excepting this volume, we have no more than the titles of the rest in his pinax <sup>h</sup>; and this pinax, the produce of forty years labour, is still the guide to all those who study

<sup>f</sup> Chabræus was the editor, and Francis Louis de Graffenried, of Bern, was at the expence of the publication. This work derives no excellence from the paper or print. The plates are small and poorly executed ; they belonged to Fuchsius, and were purchased by the bookseller for this purpose ; the editor has not unfrequently put them in wrong places. John Bauhin's History however has great intrinsic excellence, for the number of plants well described, and a judicious compilation of whatever had been done before his time. It is entitled "*Historia Plantarum Universalis Auctore Johanne Bauhino Archiatro, &c. Ebrod. 1651.*"

<sup>g</sup> *Theatri Botanici, pars I. Basil. 1658 and 1663, fol.*

<sup>h</sup> *Pinax Theatrici Botanici sive index in Theophrasti, Dioscoridis, Plinii & botanicorum, qui a seculo scripserunt, opera, plantarum circiter 6000 nomina cum synonymiis & differentiis. Opus XL. annorum. Basil. 1623 & 1671. 4to.*

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this subject and wish to consult ancient authors<sup>1</sup>.

The nomenclature of the Bauhins being formed only from the titles of their chapters, and these titles usually comprising several words, hence came the custom of giving, as the names of plants, long ambiguous phrases; which made this nomenclature not only tedious and embarrassing, but pedantic and ridiculous. I own there might have been some advantage in this, provided their phrases had been better constructed; but being composed indifferently of the names of places whence the plants came, of persons who sent them, and even of other plants to which they fancied them to bear some similitude; these phrases were sources of new embarrassment and fresh

<sup>1</sup> The judicious, the indefatigable Haller, from whose judgment there lies no appeal, says of Caspar Bauhin, that he emulated his elder brother in Botany, that he was laborious in collecting, and knew a greater number of plants, being more enriched with them by his scholars and friends, but that his judgment was less acute; that he admitted too many varieties for species; that he has repeated the same plant under different names; that he was less accurate than his brother in his descriptions, less acquainted with the natural classes, and unfortunate, as well as himself, in being obliged to divide his time between Anatomy and Botany. Bibl. Botan. I, p. 384.

Haller says also of this *par nobile fratrum* that for their unwearied diligence they well deserved to lead the way in a new age of Botany; and accordingly he puts them at the head of the *Collectores* in his sixth book.

doubts,

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doubts, because the knowledge of one plant required that of several others to which the phrase referred, and whose names were not better determined than its own.

In the mean time distant voyages were incessantly enriching Botany with new treasures; and, whilst the old names already overloaded the memory, it was necessary to invent new ones, for the new plants that were discovered. Lost in this immense labyrinth, the botanists were obliged to seek a thread to extricate themselves from it; they attached themselves therefore at last seriously to method; Herman, Rivinus, Ray<sup>k</sup>, severally proposed their own; but the immortal Tournefort carried away the prize from them all<sup>l</sup>; he first ranged the whole vegetable kingdom systematically<sup>m</sup>; and, reforming the nomenclature in part, combined it by his new

<sup>k</sup> The order should have been Ray, Herman, Rivinus. Ray published his first work in 1660, his method in 1682, and even drew up tables for Bishop Wilkins in 1667, which were printed in the year following. Herman began to write in 1687, and printed his method in 1690. Rivinus published the first part of his method in 1690. Morison had before published his in 1669.

<sup>l</sup> Tournefort first published his system in 1697: it was specious, and generally fashionable, till Linnæus's superseded it: the plates of generic characters are excellent.

<sup>m</sup> How far this is true may be seen in note (k). Tournefort's however may be said to have been the first complete regular arrangement; though how it could ever be used to good purpose, without any characters or descriptions of the species, I do not understand.

genera with that of Caspar Bauhin: but, far from freeing it of its long phrases, he either added new ones, or loaded the old ones with additions, which his method obliged him to make. The barbarous custom was then introduced of tagging new names to the old ones by a contradictory *qui quæ quod*, making of the same plant two distinct genera.

For instance—‘ *Dens Leonis qui Pilo-*  
‘ *fella folio minus villoso. Doria quæ Ja-*  
‘ *cobœa orientalis limonii folio. Titano-*  
‘ *keratophyton quod Lythophyton mari-*  
‘ *num albicans.*’

Thus was the nomenclature loaded. The names of the plants became not only phrases but periods. I shall cite one of Plukenet’s, to prove that I do not exaggerate. “ *Gramen myloicophorum caro-*  
“ *linianum seu gramen altissimum, pani-*  
“ *cula maxima speciosa, e spicis majoribus*  
“ *compressiusculis utrinque pinnatis blat-*  
“ *tam molendariam quodam modo referen-*  
“ *tibus, composita, foliis convolutis mu-*  
“ *cronatis pungentibus.*” *Almag* 137<sup>n</sup>.

It would have been all over with Botany, if this practice had continued; the nomenclature being now absolutely insupportable, could no longer subsist in this state; and it was become necessary either that a reformation should be made, or that

\* See Linnæus’s *Critica*, and *Philosophia Botanica*.

the richest, the most lovely, and the easiest of the three parts of Natural History should be abandoned.

At length Linnæus, full of his system, and the vast ideas which it suggested to him, formed the project of new-moulding the whole; a task which every body felt the necessity of, but no one dared to undertake. He did more, he executed it; and, having prepared in his *Critica Botanica* the rules by which it ought to be conducted, he determined the genera of plants in his *Genera Plantarum*, and afterwards the species in his *Species Plantarum*<sup>o</sup>; in such a manner, that, by keeping all the old names that agreed with these new rules, and new casting all the rest, he established at length a clear nomenclature, founded upon the true principles of the art which he had set forth. He preserved all the ancient genera which were truly natural; he corrected, simplified, united, or divided, the rest as their true characters required. And in forming his names he followed, sometimes even, somewhat too severely, the rules which he had laid down.

<sup>o</sup> The first sketch of Linnæus's system was published in 1735; the last edition of *Systema Vegetabilium* in 1784: the *Critica Botanica* in 1737: the first edition of the *Genera* the same year, and the last in 1764: the first edition of the *Species* in 1753, the second in 1762 and 1763. See Dr. Pulteney's excellent account of the writings of Linnæus.

With respect to the species, description and distinctions were necessary to determine them; phrases therefore remained always indispensable; but, by confining himself to a small number of technical words, well chosen and well adapted, he made good short definitions deduced from the true character of the plant, banishing rigorously all that was foreign to it. For this it was necessary to create a new language for Botany, that would spare the long periphrases of the old descriptions. Complaint has been made that the words of this language are not all to be found in Cicero. This complaint would be reasonable, had Cicero written a complete treatise of Botany. Those words however are all either Greek or Latin, expressive, short, sonorous, and even form elegant constructions by their extreme precision. It is in the constant practice of the art, that we feel all the advantage of this new language, which is as convenient and necessary for Botanists, as that of algebra is for mathematicians.

Hitherto Linnæus had indeed determined the greatest part of known plants, but he had not named them; for defining a thing is not naming it: a phrase can never be a true name, nor can it come into common use. He provided against this defect by the invention of trivial names<sup>p</sup>,  
which

These specific or trivial names appear first in the  
*Panz*



which he joined to the generical ones in order to distinguish the species. By this contrivance the name of every plant is composed only of two words, which alone, when chosen with discernment, and applied with propriety, often make the plant better known than the long phrases of Micheli and Plukenet. To be still better and more regularly acquainted with it, there is the phrase, which doubtless must be known, but need not be repeated every time we have occasion to speak of the object.

Nothing is more pedantic or ridiculous, when a woman, or one of those men who resemble women, are asking you the name of an herb or a flower in a garden, than to be under the necessity of answering by a long file of Latin words that have the appearance of a magical incantation; an inconvenience sufficient to deter such frivolous persons from a charming study offered with so pedantic an apparatus.

However necessary or advantageous this reform might be, nothing less was wanting than Linnæus's profound knowledge to execute it with success, and the reputation of this great naturalist to make it be universally adopted. It met with resistance at first, and meets with it still. This could not be otherwise; his rivals in the same

*Pan Suecicus* of 1749; but they were brought to perfection in the first edition of the *Species Plantarum*, published four years after.

career

career look upon this adoption as a confession of inferiority which they do not like to make; his nomenclature seemed so much of a piece with his system, that they could not well be separated. And botanists of the higher order, who think themselves obliged through pride not to adopt the system of any other, but each man to have his own will not sacrifice their pretensions to the progress of an art for which the professors have rarely a disinterested fondness.

National jealousies also oppose the admission of a foreign system. People think themselves obliged to support the famous men of their own country, especially after their death; for even that self-love, which made them scarcely bear their superiority whilst they were alive, is honoured by their glory after they are departed.

The great convenience however of this new nomenclature, and the utility of it, which practice has made known, have caused it to be adopted almost universally throughout Europe, sooner or later, and even at Paris M. de Jussieu has established it in the royal garden; thus preferring public utility to the glory of new-moulding the whole, which the method of natural families, invented by his illustrious uncle, seemed to require<sup>a</sup>.

Not

<sup>a</sup> The royal garden however is certainly arranged by M. de Jussieu's natural method; which was published in 1789, under the title of *Genera Plantarum, secundum ordines*

Not that the nomenclature of Linnæus is without its faults, or gives no handle to criticism; but, till a more perfect one shall be found, in which nothing is wanting, it is far better to adopt this than to have none, or to fall again into the phrases of Tournefort or Caspar Bauhin. I can even scarcely believe that a better nomenclature will in future have success enough to proscribe this, to which the botanists of Europe are at present so wholly accustomed; and, having now the double tie of habit and convenience, they will renounce it with still more unwillingness than they found in adopting it. In order to bring about such a change, an author must be found with credit enough to efface that of Linnæus; one to whose authority all Europe would be willing a second time to submit; which appears to me not likely to happen. For if his system<sup>r</sup>, however excellent it may be, should be adopted by one nation only, it would throw Botany into a new labyrinth, and do it more injury than service.

Even the labour of Linnæus, though immense, remains still imperfect, inasmuch as

*dines naturales disposita, juxta methodum in horto regio Parisiensi exarata, anno 1774.*

<sup>r</sup> He should rather have said *nomenclature* or *language*. It is of no great importance what system we adopt, so that we all agree to talk the same language. That of Linnæus will probably stand the test of ages, whatever may become of the sexual system.

it does not comprehend all known plants and is not adopted by all botanists without exception; for the writings of such as do not submit to it, require from their reader the same labour to settle the synonyms, as they were forced to take for those which preceded it.

We are obliged to Mr. Crantz, notwithstanding his rage against Linnæus, for having adopted his nomenclature, though he rejected his system. But Haller, in his large and excellent work on the Swiss plants\*, rejects both; and Adanson does more; for he makes an entire new nomenclature, and furnishes no information whereby we may refer it to Linnæus's. Haller always quotes the genus, and frequently the specific characters of Linnæus, but Adanson never quotes either. Haller attaches himself to an exact synonymy, by which, even when he does not add Linnæus's enunciation of the species, we may find it at least indirectly by the relation of the synonyms. But Linnæus and his books are absolutely null and void for M. Adanson and his readers, because the latter gives no information whereby we may connect them. So that we are compelled to choose between Linnæus and M. Adanson,

\* Alberti v. Haller *Historia Stirpium Indigenarum Helvetiæ inchoata*. Bernæ 1768 folio, in three volumes.

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who excludes him without mercy ; and to throw all the works of one of them into the fire. Or else we must undertake a new work, which will be neither short nor easy, to connect these nomenclatures, which offer us no point of union.

Linnaeus indeed has not given a complete synonymy. For plants known long since, he has contented himself with quoting the Bauhins and Clusius, with a figure of each plant. For exotic plants lately discovered, he has cited one or two modern authors and the figures of Rheed, Rumphius and some others, and has gone no farther. His undertaking did not require of him a more extended compilation, and it is sufficient that he has given one certain information with regard to every plant which he names<sup>t</sup>.

Such is the present state of things. Now after this account of it, I would ask every reader of common sense, how it is possible to attach one's self to the study of plants, and at the same time to reject that of the nomenclature ? It is just as if a man would make himself skilful in a language, with a determination not to learn the words of it. The names, it is true, are arbitrary, the knowledge of plants has no necessary connexion with the nomencla-

<sup>t</sup> Rousseau means to speak here of the *Species Plantarum*, and what he says is in general true of that. But in his *Flora Lapponica, Suecica, &c.* he has given a much more extensive synonymy.

ture; and it is easy to conceive that an intelligent man might be an excellent botanist, without knowing a single plant by its name. But that one man alone, without books or any assistance from communicated information, should become of himself even a very moderate botanist, is a ridiculous assertion to make, and an enterprise impossible to execute. The question is, whether three hundred years of study and observation should be lost to Botany, whether three hundred volumes of figures and descriptions should be thrown into the fire, whether the knowledge acquired by all the learned, who have consecrated their purse, their life, their time, to distant, expensive, painful, and dangerous expeditions, should be useless to their successors, and whether every one setting out from nothing, could arrive by himself at the same knowledge, that a long series of enquiry and study has spread over the mass of mankind? If not, and if the most lovely part of natural history merit the attention of the curious, let them tell me how we shall manage to make use of the knowledge heretofore acquired, if we do not begin by learning the language of the writers, and knowing to what objects the names employed by them belong. To admit therefore the study of botany, and to reject that of the nomenclature, is a most absurd contradiction.

L E T T E R S

ON THE

E L E M E N T S

OF

B O T A N Y;

TO A LADY.

---

L E T T E R I.

ON THE FRUCTIFICATION AND LILIACEOUS PLANTS.

Dated the 22d of August, 1771.

**I** THINK your idea of amusing the vivacity of your daughter a little, and exercising her attention upon such agreeable and varied objects as plants, is excellent; though I should not have ventured to play the pedant so far as to propose it of myself. Since however it comes from you, I approve it with all my heart, and will even assist you in it; convinced, that at all times of life, the study of nature abates the taste for frivolous amusements, prevents the tumult of the passions, and provides the mind with a nourishment which is salutary, by filling it with an object most worthy of its contemplations.

You have begun with teaching your daughter the names of the common plants which you have about you; this was the very thing you should have done. The few plants which she knows by sight are so many points of comparison for her to extend her knowledge: but they are not sufficient. You desire to have a little catalogue of the most common plants, with the marks by which they may be known. I find some difficulty in doing this for you: that is, in giving you these marks or characters in writing, after a manner that is clear, and at the same time not diffuse. This seems impossible without using the language peculiar to the subject, and the terms of that language form a vocabulary apart which you cannot understand unless it be previously explained to you.

Besides, merely to be acquainted with plants by sight, and to know only their names, cannot but be too insipid a study for a genius like yours; and it may be presumed that your daughter would not be long amused with it. I propose that you should have some preliminary notions of the vegetable structure or organization of plants, in order that you may get some real information, though you were to take only a few steps, into the most beautiful, and the richest of the three kingdoms of nature. We have nothing therefore to do yet with the nomenclature, which is but the



## FRUCTIFICATION.

the knowledge of a herbarist. I have always thought it possible to be a very great botanist without knowing so much as one plant by name; and, without wishing to make your daughter a very great botanist, I think nevertheless that it will always be useful to her to learn how to see, whatever she looks at, well. Do not however be terrified at the undertaking: you will soon know that it is not a great one. There is nothing either complicated or difficult in what I have to propose to you. Nothing is required but to have patience to begin with the beginning. After that, you may go on no farther than you choose.

We are now getting towards the latter season, and those plants which are the most simple in their structure are already past. Besides, I expect you will take some time to make your observations a little regularly. However in the mean while, till spring puts you in a situation to begin and follow the order of nature, I am going to give you a few words of the vocabulary to get by heart.

A perfect plant is composed of a root, of a stem with its branches, of leaves, flower, and fruit, (for in Botany, by fruit, in herbs as well as in trees, we understand the whole fabric of the seed.) You know the whole of this already, at least enough to understand the term; but there is a prin-

principal part which requires an examination more at large; I mean the *fructification*, that is, the *flower* and the *fruit*. Let us begin with the flower, which comes first. In this part nature has inclosed the summary of her work; by this she perpetuates it, and this also is commonly the most brilliant of all parts of the vegetable, and always least liable to variations.

Lily.

Take a lily<sup>a</sup>; I believe you will easily find it still in full flower. Before it opens, you see at the top of the stem an oblong greenish bud, which grows whiter the nearer it is to opening; and when it is quite open, you perceive that the white cover takes the form of a basin or vase divided into several segments. This is called the *corolla*, and not the flower, as it is by the vulgar, because the flower is a composition of several parts, of which the corolla is only the principal.

The corolla of the lily is not of one piece, as you easily see. When it withers and falls, it separates into six distinct pieces, which are called *petals*. Thus the corolla of the lily is composed of six petals. A corolla, consisting of several pieces like this, is called a *polypetalous* corolla. If it

<sup>a</sup> *Lilium candidum* of Linnæus, (Pl. 1.) or any of its congeners, (see *L. chalcidonicum* & *bulbiferum*, figured, in Curtis's Magazine, 30 and 36.) or almost any of the tribe of these which are called *liliaceous* flowers, and are, for the greater part, eminently beautiful. As *Amaryllis formosissima*. Curt. Mag. 47.

were all of one piece, like the bell-flower<sup>b</sup> or bind-weeds<sup>c</sup>, it would be called *monopetalous*. But to return to our lily.

You will find exactly in the middle of the corolla a sort of little column rising from the bottom, and pointing directly upwards. This, taken in its whole, is called the *pistil* or *pointal*: taken in its parts, it is divided into three; 1, the swollen base, with three blunted angles, called the *germ* or *ovary*; 2, a thread placed upon this, called the *style*; 3, the style crowned by a sort of capital with three notches: this capital is called the *stigma*.

Between the pistil and the corolla you find six other bodies entirely separate from each other, which are called the *stamens*. Each stamen is composed of two parts, one long and thin, by which it is fastened to the bottom of the corolla, and called the *filament*; the other thicker, placed at the top of the filament, and called *anthera* or *anther*<sup>d</sup>. Each anther is a box which opens when it is ripe, and throws out a yellow dust, which has a strong smell; this is called *pollen* or *farina*.

<sup>b</sup> *Campanula rotundifolia* Linnæi.

<sup>c</sup> *Convolvulus sepium* (Pl. 12. f. 3.) & *arvensis*, &c. Linnæi.

<sup>d</sup> The old English name of anthera is *summit*; Grew called it *semet*.—The stigma has also been named *fibula*.

Such is the general analysis of the parts which constitute a flower. As the corolla fades and falls, the germ increases, and becomes an oblong triangular capsule, within which are flat seeds in three cells. This capsule, considered as the cover of the seeds, takes the name of *pericarp*.

The parts here mentioned are found in the flowers of most other plants, but in different proportion, situation, and number. By the analogy of these parts, and their different combinations, the families of the vegetable kingdom are determined: and these analogies are connected with others in those parts of the plant which seem to have no relation to them. For instance, this number of six stamens, sometimes only three, of six petals or divisions of the corolla, and that triangular form of the germ, with its three cells, determine the liliaceous tribe; and in all this tribe, which is very numerous, the roots are *bulbs* of some sort or other. That of the lily is *squamous*, or composed of scales; in the asphodel, it is a number of oblong solid bulbs connected together<sup>e</sup>; in the crocus and saffron there are two bulbs, one over the other; in the colchicum<sup>f</sup> they are placed side by side<sup>g</sup>.

The

<sup>e</sup> As in the peony, potatoe, &c. These are called by some *tuberous* roots.

<sup>f</sup> Or meadow saffron.

<sup>g</sup> He might have added that some of these bulbs are solid

## LILIACEOUS PLANTS.

The lily, which I have chosen because it is in season; and also on account of the size of the flower and its other parts, is deficient however in one of the constituent parts of a perfect flower, namely the *calyx*, which is that outer green part of the flower usually divided into five parts or composed of five small leaves; sustaining and embracing the corolla at the bottom, and enveloping it entirely before it opens, as you may have remarked in the rose. The calyx which accompanies almost all other flowers, is wanting in the greater part of the liliaceous tribe; as the tulip, the hyacinth, the narcissus, the tuberose, &c. and even in the onion, leek, garlic, &c. which are also liliaceous, though they appear very different at first sight. You will perceive also that in this whole tribe the stems are simple and unbranched, the leaves entire, and never cut or divided; observations which confirm the analogy of the flower and fruit in this family, by that of the other parts of the plants. If you bestow some attention upon these particulars, and make them familiar to you by frequent observations, you are already in a condition to determine, by an at-

solid like the turnip; others composed of coats, one over another, as in the onion. Linnæus does not allow them to be roots; and indeed it is only their being underground that led former Botanists to call them so. He names them *Hybernacula*, winter gems or buds, into which the whole plant retires during the cold season.

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tentive and continued inspection of a plant, whether it be of the ~~hi~~aceous tribe or not; and this without knowing the name of the plant<sup>b</sup>. You see that this is not a mere labour of the memory, but a study of observations and facts truly worthy of a naturalist<sup>i</sup>. You will not begin by telling your daughter all this at once; and you will be even more cautious, when in the sequel you shall be initiated in the mysteries of vegetation; but you will unveil to her by degrees no more than is suitable to her age and sex, by directing her how to find out things of herself, rather than by teaching her<sup>k</sup>. Adieu, my dear cousin; if all this trash be agreeable to you, I am at your service.

<sup>b</sup> If it should happen to be spring when the reader takes up this letter, he may examine the snow-drop, crocus, daffodil, narcissus, crown imperial, tulip, lily of the valley, hyacinth, &c. always taking care, in the garden, to avoid double flowers. See Letter II.

<sup>i</sup> Botany is frequently, but we see here how unjustly, represented as a science which depends wholly upon the memory, as if it were nothing but to get the names of ten thousand plants by heart.

<sup>k</sup> Rousseau takes every occasion to inculcate this fundamental lesson of education; and indeed it cannot be inculcated too often. See Letter V.

## LETTER II.

## ON CRUCIFORM FLOWERS.

The 18th of October, 1771.

SINCE you understand so well, my dear cousin, the first lineaments of plants, though so slightly marked, as to be able already to distinguish the liliaceous family by their air; and since our little botanist amuses herself with corollas and petals, I am going to set before you another tribe, upon which she may again exercise her little knowledge; with rather more difficulty I own, because the flowers are much smaller, and the foliage more varied, but with the same pleasure both on her side and yours; at least if you have as much delight in following this flowery path as I find in tracing it out to you.

When the first rays of spring shall have enlightened your progress, by shewing you in the gardens hyacinths, tulips, narcissuses, jonquils, and lilies of the valley, the analysis of all which is already known to you, other flowers will soon catch your attention, and require of you a new examination; such are stocks<sup>1</sup> and rockets<sup>m</sup>. Whenever you find

<sup>1</sup> *Cheiranthus incanus* Linnæi. Plate 2.

<sup>m</sup> *Hesperis matronalis* Linnæi.—Or if these are not at hand, wall-flowers, cabbage, turnip, cole-seed, mustard, charlock, radish, &c.

them

them double, do not meddle with them, they are disfigured ; or, if you please, dressed after our fashion : nature will no longer be found among them ; she refuses to reproduce any thing from monsters thus mutilated : for if the most brilliant part of the flower, namely the corolla, be multiplied, it is at the expence of the more essential parts, which disappear under this addition of brilliancy.

**Stock:** Take then a single stock gilliflower, or stock, as it is vulgarly called, and proceed to the analysis of the flower : you will perceive immediately an exterior part, which was wanting in the liliaceous flowers, namely the calyx. This consists of four pieces, which we must call leaves, leaflets or folioles, having no proper names to express them by, as we have that of petals for the pieces which compose the corolla. These four pieces are commonly unequal by pairs ; that is, there are two leaflets opposite and equal, of a smaller size, and two others also opposite and equal, but larger, especially towards the bottom, where they are so rounded, as to exhibit a very sensible protuberance or bump on the outside,

In this calyx you will find a corolla composed of four petals. I say nothing of their colour, because that makes no part of their character. Each of these petals is fastened to the receptacle, or bottom of the calyx, by a narrow pale part, which is called *unguis*, or the *claw* of the petal, and this spreads



spreads out over the top of the calyx into a large, flat, coloured part, called *lamina*, or the *border* <sup>n</sup>.

In the centre of the corolla is one pistil; long and cylindric, or nearly so; chiefly composed of a germ ending in a very short style, and that terminated by an oblong stigma, which is *bifid*, that is to say, divided into two parts, which are reflex on each side.

If you examine carefully the respective position of the calyx and corolla, you will see that each petal, instead of corresponding exactly to each leaflet of the calyx, is, on the contrary, placed between two; so that it answers to the opening which separates them; and this alternate position has place in all flowers which have as many petals to the corolla as leaflets to the calyx.

It remains now to speak of the stamens. You will find six of them in the flower of the stock, as in the liliaceous flowers, but not all equal, or else alternately unequal, as in those; but you will perceive two opposite to each other, sensibly shorter than the other four which separate them, and which are also separate from each other in pairs.

<sup>n</sup> I wonder that Rousseau says nothing of the regular structure of this corolla, the petals generally standing wide from each other, and forming a figure something like the cross of the order of St. Louis, whence these corollas are called *cruciform*, or *cross shaped*.

I shall not enter here into a detail of their structure and position : but I give you notice that, if you look carefully, you will find the reason why these two stamens are shorter than the other four, and why two leaflets of the calyx are more protuberant, or, as the botanists speak, more gibbous, and the other two more flattened.

To finish the history of our stock ; you must not abandon it as soon as you have analysed the flower, but wait till the corolla withers and falls, which it does pretty soon ; and then remark what becomes of the pistil, composed, as we observed before, of the germ, the style, and the stigma. The germ grows considerably in length, and thickens a little as the fruit ripens. When it is ripe, it becomes a kind of flat pod, called *siliqua*.

This siliqua is composed of two valves, each covering a small cell : and the cells are separated by a thin partition. When the seed is ripe, the valves open from the bottom upwards to give it passage, and remain fast to the stigma at top. Then you may see the flat round seeds ranged along each side of the partition ; and you will find that they are fastened alternately to right and left by a short pedicle to the sutures, or each edge of the partition.

I am very much afraid, my dear cousin, that I have fatigued you a little with this long description ; but it was necessary to give you the essential character of the numerous

Numerous tribe of *cruciform* flowers\*, which forms an entire class in almost all the systems of botanists: and I hope that this description, which is difficult to understand here without a figure, will become more intelligible, when you shall have gone through it with some attention, having at the same time the object before your eyes.

The great number of species in this class<sup>p</sup> has determined botanists to divide it into two sections, in which the flowers are perfectly alike, but the fruits, pericarps, or seed-vessels, are sensibly different.

The first order comprehends the cruciform flowers with a silique, or pod, such as the stock, those mentioned in note (m), and the like.

The second contains those whose seed-vessel is a *silicle*, that is, a small and very short pod, almost as wide as it is long, and differently divided within; as whitlow-grass, mithridate-mustard, bastard-cress, &c. in the fields; and scurvy-grass, horseradish, candy-tuft, honesty, &c. in the gardens: though the seed-vessel of the last is very large, it is still a silicle, because the length exceeds the breadth very little. If none of these are known to you, I presume at least that you are acquainted with the

\* See note (n).

<sup>p</sup> 287 Species. In the 17th class, diadelphia, or two brotherhoods, 695, and in the 19th syngenesia, 1247 species. These numbers, here and in the sequel, are given from the 14th edition of *Systema Vegetabilium*, by Chevalier Murray.

*shepherd's-purse*<sup>9</sup>, which is so common weed in kitchen gardens. Well then, cousin, this shepherd's-purse is of the cruciform tribe and *silicle* branch of it, and the form of the silicle is triangular<sup>r</sup>. By this you may form some idea of the rest till they fall into your hands.

But it is time to let you breathe; I will only therefore give you a hint at present that in this class, and many others, you will often find flowers much smaller than those of the stock, and sometimes so small that you cannot examine their parts without the assistance of a glass<sup>s</sup>; an instrument which a botanist cannot do without, any more than he can without a needle, a lancet, or penknife, and a pair of good scissors. Presuming that your maternal zeal may carry you thus far, I fancy to myself a charming picture of my beautiful cousin busy with her glass examining heaps of flowers, a hundred times less flourishing, less fresh, and less agreeable than herself, Adieu, dear cousin, till the next chapter.

<sup>9</sup> Fl. Dan. t. 729. Curt. Lond. 1. Ger. 276. 1.

<sup>r</sup> The young botanist should be advertised that these silicles or little pods differ much in their form: some are flat, and round or oval; others are spherical or spheroidal, (see pl. 2. k, l.) and that of shepherd's-purse has a form peculiar to itself. Pl. 2. i.

<sup>s</sup> This of the smallness of the parts in many flowers is an objection that every idle novice makes to the Linnæan system, ever trembling lest any thorn or obstacle, be it ever so minute, should occur in the flowery path: the difficulty however will in great measure vanish, if he will but have patience to go regularly on his way.

## LETTER III.

## OF PAPILIONACEOUS FLOWERS.

The 26th of May, 1772.

SINCE you continue, dear cousin, to pursue, with your daughter, that peaceable and delightful study which fills up those voids in our time too often dedicated by others to idleness, or something worse, with interesting observations on nature; I will resume the interrupted thread of our vegetable tribes.

My intention is to describe six of these tribes to you first, in order to render the general structure of the characteristic parts of plants familiar. You have already had two of them; there are four remaining, which you must still have the patience to go through, and after that, quitting for a time the other branches of that numerous race, and going on to examine the different parts of the fructification, we shall manage so, that without knowing many plants perhaps, you will at least never be in a strange country among the productions of the vegetable kingdom.

But I must inform you, that if you will take books in hand, and pursue the common nomenclature; with abundance of names, you will have few ideas, those  
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which you have will be confused, and you will not follow properly either my steps or those of others; but will have at most a mere knowledge of words. I am jealous, dear cousin, of being your only guide in this part of Botany. When it is the proper time I will point out to you the books that you may consult. In the mean while have patience to read nothing but in that of nature, and to keep wholly to my letters.

Pea.

Peas<sup>†</sup> are, at present, in full fructification. Seize the moment to observe their characters: they are some of the most curious that Botany affords. One general division of flowers is into regular and irregular. The first are they whose parts all spring uniformly from the centre of the flower, and terminate in the circumference of a circle. This uniformity is the reason why when we view flowers of this kind, we do not distinguish an under from an upper part, nor the right from the left; such are the two tribes which we have already examined. But you will see at first sight that the flower of the pea is irregular, that you easily distinguish the longer part of the corolla, which should be at top, from the shorter, which should be at bottom; and you know very well, when you hold up the flower to the eye, whether it be in its natural situation or not. Thus in examin-

<sup>†</sup> See Plate 3, which is coloured red, to make the flower more conspicuous.

ing

ing an irregular flower, whenever we speak of the top and the bottom, we suppose it to be in its natural situation.

The flowers of this tribe being of a very particular structure, you must not only have several pea flowers, and dissect them successively, to observe all their parts one after another, but you must also pursue the progress of the fructification from the first flowering to the maturity of the fruit.

First you will find a *monophyllous* calyx; that is, one of an entire piece, ending in five very distinct points, the two wider of which are at top, and three narrower at bottom. This calyx bends towards the lower part, as does also the peduncle, or little stalk which supports it: this peduncle is very small and easily moveable; so that the flower readily avoids a current of air, and commonly turns its back to the wind and rain.

Having examined the calyx, you may pull it off, so as to leave the rest of the flower entire, and then you will see plainly that the corolla is polypetalous.

The first piece is a large petal, covering the others, and occupying the upper part of the corolla; it is called the *standard*, or *banner*. We must make use neither of our eyes nor of common sense, if we do not perceive that this petal is designed to protect the other parts of the flower from the principal injuries of the weather. In tak-

ing off the standard; you will observe, that it is inserted on each side by a little process into the side-pieces, so that it cannot be driven out of its place by the wind.

The standard being taken off, exposes to view those two side-pieces to which it adhered; they are called the wings. In taking these off you will find them still more strongly inserted into the remaining part, so that they cannot be separated without some effort. These wings are scarcely less useful in protecting the sides of the flower, than the standard in covering it.

Taking off the wings, you discover the last piece of the corolla; this is that which covers and defends the centre of the flower, and wraps it up, especially underneath, as carefully as the three other petals envelope the upper part and the sides. This last piece, which, on account of its form, is called the boat or keel, is, as it were, the strong-box into which nature has put her treasure, to keep it safe from the attacks of air and water.

When you have well examined this petal, draw it gently downwards, pinching it slightly by the keel or thin edge, for fear of tearing away what it contains. I am certain you will be pleased with the mystery it reveals when the veil is removed.

The young fruit involved in the boat or keel, is constructed in this manner: a cylindric membrane, terminated by ten distinct



ten threads surround the germ, or embryo of the legume or pod. These ten threads are so many filaments, united below round the germ, and terminated each by a yellow anther, whose farina covers the stigma which terminates the style, or grows along the side of it: this stigma, though yellow with the meal which sticks to it, is easily distinguished by its figure and size. Thus do these ten filaments form also about the germ an interior armour, to preserve it from exterior injuries.

If you examine more curiously, you will find that these ten filaments are united into one at the base, only in appearance. For in the upper part of this cylinder there is a piece or stamen which at first appears to adhere to the rest, but as the flower fades and the fruit increases, separates and leaves an opening at top, by which the fruit can extend itself by opening and separating the cylinder gradually; which otherwise, by compressing and straitening it all round, would impede its growth. If the flower is not sufficiently advanced, you will not find this stamen detached from the cylinder; but put a fine pin or needle into two little holes which you will see near the receptacle, at the base of that stamen, and you will soon perceive the stamen with its anther separate from the nine others, which will continue always to form one body, till at length they fade and dry, when the

germ becomes a *legume*, and has no longer any occasion for them.

This *legume* is distinguished from the *siliqua* of the cruciform tribe, by the seeds being fastened to one side only of the case, alternately indeed to each valve of it; but all of them to the same side. You will understand this distinction perfectly if you open the pod of a pea and of a stock at the same time, taking care only to have them before they are quite ripe, that, when the pericarp is opened, the seeds may continue fastened by their proper ligaments to their sutures and their valves<sup>u</sup>.

If I have made myself well understood, you will comprehend, dear cousin, what astonishing precautions have been heaped together by nature to bring the embryo of the pea to maturity; and, above all, to protect it, in the midst of the greatest rains, from that wet which is fatal to it, without inclosing it in a hard shell, which would have made it another kind of fruit. The Creator, attentive to the preservation of all beings, has taken great care to protect the fructification of plants from attacks that

<sup>u</sup> In doing this you will also perceive that the *legume* is unilocular, or has one cell only; whereas you remember that the *siliqua* was said to be bilocular. And if you take a ripe *legume* you will find that it opens by the upper suture, opposite to that to which the seeds are fastened; whereas the *siliqua* opens from the bottom upwards by both sutures. Compare Pl. 3. 8. with Pl. 2. h.

may injure it; but he seems to have doubled his attention to those which serve for the nourishment of man and animals, as does the greater part of the leguminous or pulse tribe. The provision for the fructification of peas is, in different proportions, the same through this class. The flowers have the name of *papilionaceous*, from a fancied resemblance of them to the form of a butterfly (*papilio*); they have generally a *standard* or *banner*, two *wings*, and a *boat* or *keel*; that is, four irregular petals. But in some genera the boat is divided longitudinally into two pieces; and these flowers have in reality five petals: others, as clover<sup>v</sup>, have all their petals united, and though papilionaceous, are however monetalous flowers.

The papilionaceous or leguminous plants form one of the most numerous and useful tribes. Beans, peas, lucerne, saintfoin, clover, lupins, lentils, tares or vetches, indigo, liquorice, kidney-beans, all belong to it; the character of the last is to have the boat spirally twisted, which at first sight might be taken for an accident. There are also some trees belonging to it; among others that which is commonly called acacia, but which is not the true acacia<sup>w</sup>, and many beautiful flowering shrubs. But of these more hereafter. Adieu, cousin, I wish well to every thing that you love.

<sup>v</sup> *Trifolium pratense* *Linnaei*.

<sup>w</sup> *Robinia Pseudacacia* *Linnaei*.

## LETTER IV.

OF LABIATE AND PERSONATE FLOWERS.

The 19th of June, 1772.

LET us talk of plants, my dear cousin, whilst the season for observing them invites us. Your solution of my question concerning the stamens of cruciform flowers is perfectly right, and shows that you have understood me, or rather attended to me; for you have nothing to do but to attend, in order to understand. You have accounted very well for the swelling of the two leaflets of the calyx, and the relative shortness of two of the stamens, in the stock, by the bending of these two stamens. One step more would have led you to the primary cause of this structure; for if you ask once more why these stamens are thus bent, and consequently shortened, I answer that you will find a little gland upon the receptacle, between the stamen and the germ; and it is this gland which, by throwing the stamen to a distance, and forcing it to take a round, necessarily shortens it. Upon the same receptacle are two other glands, one at the foot of each pair of longer stamens; but being on the outside of them, between these stamens and the calyx, they do not oblige them to bend  
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and therefore do not shorten them : so that the two pairs of stamens stand higher than the two single bent ones ; not because they are longer, but because they are straight. These four glands, or at least vestiges of them, are more or less visible in almost all cruciform flowers, and are much more distinct in some than in the stock\*. If you ask me what the glands are for, I answer, that they are one of those instruments destined by nature to unite the vegetable to the animal kingdom, and to make them circulate from one to another. But laying these inquiries aside, in which we anticipate a little too much, let us, for the present, return to our tribes of plants.

The flowers which I have hitherto described to you are polypetalous. I ought perhaps to have begun with the regular monopetalous flowers, which have a much more simple structure, but it was this very simplicity which discouraged me. They constitute rather a great nation than a single tribe ; so that to comprehend them all under one common mark, we must employ characters so general and so vague, that whilst we seem to say something, in effect we scarcely say any thing. It is better to confine ourselves within narrower bounds, which we can mark out with more precision.

\* As in *arabis turrita*, cabbage, mustard, charlock, fish, &c.

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Among the irregular monopetalous flowers, there is a tribe whose physiognomy is so marked, that we distinguish the members of it easily by their air. It is that to whose flowers Linnæus has given the name of *ringent*, because they are cut into two lips, the opening of which, whether natural, or produced by a slight compression by the fingers, gives them the air of a gaping mouth. This tribe is divided into two branches: one of *labiate* or ringent flowers, properly so called<sup>1</sup>, and the other of *persenate* or masked flowers<sup>2</sup>: the Latin word *persona* signifying a mask. The character common to all the tribe is not only a monopetalous corolla, cut into two lips, the upper called the *casque* or *helmet*, the lower, the *beard*; but also four stamens, almost in the same row, distinguished into two pairs, one longer, and the other shorter. The inspection of the object itself will explain these characters better to you than can be done in writing.

Dead  
Nettle.

Let us begin with the labiate flowers. For an example I should willingly give you sage, which is common in almost all gardens: but the singular structure of its stamens, which has occasioned some botanists to separate it from the associates to which it naturally belongs, induces me to look for

<sup>1</sup> Plate 4. f. 1. b.

<sup>2</sup> Plate 4. f. 2. a.

another instance<sup>a</sup> in the *white dead-nettle*<sup>b</sup>; which, notwithstanding its name, has no affinity with nettles, properly so called, except in the shape of the leaves. This plant is so common every where, and continues so long in flower, that it cannot be difficult for you to find it<sup>c</sup>. Without stopping here to consider the elegant situation of the flowers<sup>d</sup>, I will confine myself to their structure. The white dead-nettle bears a monopetalous labiate corolla, with the casque or upper lip arched in order to cover the rest of the flower, and particularly the stamens, which keep, all four or them, very close under cover of its roof. You will easily discern the longer pair and the shorter pair, and in the midst of them the style, of the same colour, but distinguished from them by being forked at the end, instead of bearing an anther like the stamens. The beard or lower lip bends back, and hangs down, so as to let you see the inside of the corolla almost to the bottom. In this genus the lower lip is divided

<sup>a</sup> Rosemary, with some few others not so well known, must also be avoided, because there are only two stamens to the flower.

<sup>b</sup> *Lamium album* Linnæi. Curtis II. 45. Pl. 4. f. 1.

<sup>c</sup> The largeness of the flowers also makes it proper for examination; but if the smell should be any objection, there is ground-ivy, the other lamiums, betony, bore-hound, baum, self-heal, baum of gilead, &c.

<sup>d</sup> Called verticillate.

lengthwise in the middle, but that is general in this tribe.

If you pull out the corolla, you will take the stamens along with it, these being fastened by the filaments to that, and not to the receptacle, whereon the pistil only will remain. In examining how the stamens are fastened in other flowers, we find them generally attached to the corolla in monopetalous, and to the receptacle, or calyx, in polypetalous flowers: so that in the latter case one may take away the petals without the stamens. From this observation we have an elegant, easy, and pretty certain rule to know whether a corolla consists of one piece or several, when it is difficult, as it sometimes is, to be certain of it immediately.

The corolla, when pulled off, is open at bottom, because it was fastened to the receptacle, so as to leave a circular opening by which the pistil and what surrounds it may grow up within the tube. That which surrounds the pistil in this dead nettle, and all the labiate tribe, is the rudiment of the fruit, consisting of four embryos, which become four seeds that are naked; that is, without any pericarp or covering: the monophyllous calyx divided into five segments serving this purpose, so that the seeds, when they are ripe, are detached, and fall to the ground separately. This is the character of the labiate flowers.

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The other branch of section, which is that of the *personate* flowers, is distinguished from the former; first in having the two lips not usually open, or gaping, but closed and joined<sup>c</sup>, as you may see in the snap-dragon<sup>f</sup>, a flower not uncommon in gardens; or for want of that, in the toad-flax, a yellow flower with a spur, so common in the country at this season<sup>g</sup>. But a more precise and certain character is, that instead of having four naked seeds at the bottom of the calyx, like the labiate flowers, these have a capsule or case inclosing the seeds, and not opening till they are ripe, in order to disperse them. To these characters we may add that the greater part of the labiate plants are either strong smelling and aromatic, as marjoram, thyme, basil, mint, hyssop, lavender, &c. or else strong smelling and stinking, as the dead-nettle, hedge-nettle, cat-mint, black horehound<sup>h</sup>, &c. Some few only having little or no smell, as bugle, self-heal, and

<sup>c</sup> There are too many exceptions to this, to form a general character, if under the idea of *personate* flowers we include all the plants in the second order of Linnæus's 14th class, as Rousseau seems to do.

<sup>f</sup> *Antirrhinum majus* Linnæi. Mill. fig. t. 42. pl. 4. f. 2.

<sup>g</sup> *Antirrhinum Linaria* Linnæi. Curtis I. 47.—It flowers later with us. Most of the *personate* tribe flower late.

<sup>h</sup> Here, and in some other places, I have taken the liberty of putting plants better known among us, instead of those which Rousseau has given.

hooded

hooded willow herb : whereas most of the plants with personate flowers are not odorous, as snap-dragon, toad-flax, eye-bright, lousewort, yellow rattle, broom-rape, ivy-leaved toad-flax, round-leaved toad-flax, fox-glove<sup>1</sup>, &c. I know of none that have a strong smell in this branch but the scrophularia, or figwort, which smells strong, without being aromatic. Here I am not able to name any but such plants as may perhaps be unknown to you ; but you will gradually get acquainted with them, and, whenever you see them, you will be able by yourself to determine what class they belong to. I wish you would try to settle the branch or section by its physiognomy ; and that you would exercise yourself in judging at sight, whether a flower be labiate or personate. The exterior form of the corolla may suffice to guide you in this choice, which you may verify afterwards by pulling out the corolla, and looking at the bottom of the calyx ; for, if you have judged right, the flower which you have named labiate will show you four naked seeds, and that which you have named personate will show you a pericarp : the contrary would prove that you were mistaken ; and by a second examination of the same plant you would prevent a like mistake another

<sup>1</sup> Some of these have the mouth of the corolla gaping.  
See pl. 4. f. 3.

## PERSONATE FLOWERS.

time<sup>k</sup>. Here, dear cousin, is business cut out for several walks. I shall not fail to provide something for those that will succeed.

<sup>1</sup> This advice will apply in all the other natural classes. From this passage it is clear that by labiate flowers Rousseau understands all that are included in the first order; by personate flowers all that are in the second order of Linnæus's 14th class: but many of the flowers in the second order have the lips open. Pl. 4.

3.

LETTER

## LETTER V.

## OF UMBELLATE PLANTS.

The 16th of July, 1772.

**C**OMFORT yourself, my good cousin, for not having detected the glands in the cruciform flowers. Great botanists, and quick-sighted ones too, have not been more happy. Tournefort himself makes no mention of them. They are obvious only in few genera, though we find vestiges of them in almost all; and it is by analyzing some of the cruciform flowers, and always observing inequalities in the receptacle, and then examining these inequalities, that we find out that these glands belong to most of the genera; and suppose therefore by analogy that they exist in the others, where we do not distinguish them.

I comprehend that you may not be pleased at taking so much pains, without knowing the names of the plants which you examine. But I own fairly that it did not enter into my plan to spare you that little chagrin. It is pretended that Botany is merely a science of words, which only exercises the memory, and teaches the names of plants. For my part, I know not any reasonable study which is a mere science of words: and to which of these  
shall

shall we give the name of botanist, to him who has a name or a phrase ready when he sees a plant, but without knowing any thing of its structure; or to him who, being well acquainted with this structure, is ignorant nevertheless of the arbitrary name which the plant has in this or that country? If we give our children nothing but an amusing employment, we lose the best half of our design, which is, at the same time that we amuse them, to exercise their understandings, and to accustom them to attention. Before we teach them to name what they see, let us begin by teaching them how to see. This science, which is forgot in all sorts of education, should make the most important part of it. I can never repeat it often enough; teach them not to pay themselves in words, nor to think they know any thing of what is merely laid up in their memory.

However, not to play the rogue with you too much, I give you the names of some plants, with which you may easily verify my descriptions, by causing them to be shown you. For instance, if you cannot find a white dead-nettle, when you are reading the analysis of the labiate or riagent flowers, you have nothing to do but to send to an herbarist for it fresh gathered, to apply my description to the flower; and then having examined the other parts of the plant, in the manner which I shall hereafter

point out, you will be infinitely better acquainted with the white dead-nettle, than the herbarist who furnished you with it will ever be during his whole life ; in a little time, however, we shall learn how to do without the herbarist ; but first we must finish the examination of our tribes. And now I come to the fifth, which, at this time, is in full fructification.

Figure to yourself a long stem, pretty straight, with leaves placed alternately upon it, generally cut fine, and embracing at the base, branches which grow from their *axæ*, or *axils*<sup>1</sup>. From the upper part of this stem, as from a centre, grow several pedicles or rays, which spreading circularly and regularly, like the ribs of an umbrella, crown the stem with a kind of basin, more or less open<sup>m</sup>. Sometimes these rays leave a sort of void in the middle, and represent, in that case, more exactly the hollow of a basin : sometimes also this middle is furnished with other rays that are shorter, which, rising less obliquely, form with the others nearly the figure of a half sphere with the convex side uppermost.

Each of these rays is terminated, not by a flower, but by another set of smaller rays, crowning each of the former exactly as the first crown the stem.

<sup>1</sup> The angles formed by a leaf or branch with the stem.

<sup>m</sup> The figure is that of an inverted cone. Pl. 5. f. 1, 2. & pl. 13.

Here

Here then are two similar and successive ranks : one of large rays, terminating the stem ; another of smaller rays, like the others ; each of them terminating the great ones ".

The rays of the little umbels are no farther subdivided, but each of them is the pedicle to a little flower, of which we shall speak presently.

If you can frame an idea of the figure which I have just described, you will understand the disposition of the flowers in the tribe of *umbelliferous* or *umbellate* plants : *umbella* being the Latin word for an umbrella.

Though this regular disposition of the fructification be striking, and sufficiently constant in all the umbellate plants, it is not that however which constitutes the character of the tribe. This is taken from the structure of the flower itself, which must therefore be described.

But it is expedient, for the sake of greater clearness, to give you in this place a general distinction with regard to the relative disposition of the flower and fruit in all plants ; a distinction which extremely facilitates their methodical arrangement, whatever system you adopt for that purpose.

The greater number of plants, as the

<sup>1</sup> Linnæus calls the first the *universal* ; and the second the *partial* umbel, or *umbellule*.