



Letters to Mme Madeleine-Catherine Delessert

The So-Called "Elementary Letters on Botany"



LETTER I

22 August [1771]

I omitted, dear Cousin, in my preceding letter,¹⁰⁵ to respond to the item of yours concerning plants, because that item alone demanded an entire letter which I could write you more at leisure.¹⁰⁶

Your idea of amusing the vivacity of your daughter a little, and exercising it to [pay] attention to agreeable and varied subjects such as plants, seemed excellent to me; but I would not have dared to propose it for fear of playing the Monsieur Josse;¹⁰⁷ since it comes from you I approve it with all my heart and will concur in it likewise, persuaded that at any age, the study of nature dulls the taste for frivolous amusements, prevents the tumult of the passions, and brings to the soul¹⁰⁸ a nourishment which profits it by filling it with the most worthy object of its contemplations.

You have started by teaching the little one the names of as many plants as you have in common before you. That was exactly what it was necessary to do. The small number of plants she knows by sight are the components of comparison for expanding her knowledge. But they do not suffice. You ask me for a small catalogue of the most well-known plants with marks for recognizing them. There is a hindrance to doing this; it is that of giving you in writing these marks or characters in a clear and nevertheless economical manner. That seems to me impossible without employing the language of the thing, and the terms of this language form a separate vocabulary that you will not know how to understand if it is not first explained to you.

Besides, simply recognizing plants by sight and knowing only their names cannot but be too insipid a study for intellects such as yours, and it is to be presumed that your daughter would not be amused by it for long. I propose to you to note down several preliminary notions of vegetal structure and the organization of plants, in order that, should you take but a few steps into the most beautiful, the most rich of the three kingdoms of nature, you might walk there with at least some enlightenment. It is not a question therefore only of the nomenclature which is merely an herbologist's

knowledge. I have always believed that one can be a very good botanist without knowing one plant by its name, and without wanting to make of your daughter a great botanist, I believe nonetheless that it will always be useful to her to learn to see what she sees well. Do not be dismayed by the rest of the enterprise. You will soon know that it is not much. There is nothing either complicated or difficult to follow in what I have to propose to you. It is only a question of having the patience to begin at the beginning. After that one advances only as far as one wants.

We are approaching the late season and the plants whose structure has the greatest simplicity are already past. Besides I ask that you take some time to bring a bit of order to your observations. But in waiting for Spring to put us in reach of beginning and following the course of nature, I am nevertheless going to give you a few words of vocabulary to remember.

A perfect plant is composed of root, stalk, branches, leaves, flowers, and fruits: for one calls fruit in botany, in herbs as well as in trees, the entire fabric of the seed. You know all this; at least sufficiently to understand the word; but there is a principal part which demands a closer examination. This is the fructification, that is to say, the flower and the fruit. Let us start with the flower, which comes first. It is in this part that nature has enclosed the summary of her work, it is by this that she perpetuates it, and it is also of all the parts of the vegetal usually the most striking, and always the least subject to variations.

Take a Lily.¹⁰⁹ I think you will find some still easily in full flower. Before it opens you see at the top of the stem an oblong greenish bud which turns white as it is ready to open; and when it is completely open, you see its white envelope take the form of a vessel divided into several segments. This enveloping and colored part, which is white in the Lily, is called *the Corolla* and not the flower as it is among the vulgar; because the flower is a composite of several parts of which the Corolla is only the principal one.

The Corolla of the Lily is not of one piece as it is easy to see. When it withers and falls, it falls in six well-separated pieces which are called the *Petals*. Thus the Corolla of the Lily is composed of Six petals. Every Corolla of a flower which is thus composed of several pieces is called a *polypetalous* Corolla. If the corolla consisted of one piece only, as for example in the convolvulus known as field bindweed, it would be called *monopetalous*.¹¹⁰ Let us return to our Lily.

Inside the corolla you find precisely in the middle a kind of small column attached right at the bottom and which points directly upwards. This column taken in its entirety is called *the Pistil*; taken in its parts, it divides into three:

- 1st. its bulging base in cylinder but with three rounded angles all around. This base is called *the germ* or the *ovary*.
- 2nd. A thinner thread placed on the germ. This thread is called *the Style*.
- 3rd. The Style is crowned by a kind of capital with three indentations. This head is called *the Stigma*. This is what comprises the Pistil and its three parts.

Between the Pistil and the Corolla you find six other quite distinct bodies which are called *the Stamens*. Each stamen is composed of two parts, namely, a thinner one by which the stamen holds onto the bottom of the corolla and which is called the *filament*. A thicker one which attaches to the higher end of the filament and which is called the *Anther*. Each Anther is a box that opens when it is ripe and ejects a very fragrant yellow powder of which we will speak later. This powder up to now has no French name; botanists call it the *pollen*, a word which signifies powder.¹¹¹

That is the rough analysis of the parts of the flower. As the Corolla withers and falls, the germ grows and becomes an elongated triangular capsule, whose interior contains the flat seeds distributed in three compartments. This capsule considered as the envelope of the seeds takes the name of *pericarp*. But I will not undertake here the analysis of the fruit, that will be the subject of another letter.

The parts I have just named to you are also found in the flowers of the majority of other plants, but in varying degrees of proportion, situation, and number.¹¹² It is by the analogy of the parts and by their various combinations that the various families of the Vegetal kingdom mark themselves. And these analogies of the parts of flowers are connected with other analogies of parts of the plant which seem to have no relation with them.¹¹³ For example, this number of six stamens, sometimes only three, of six petals or divisions of the corolla and this triangular form with three compartments of the pericarp determines the entire family of the Liliaceae,¹¹⁴ and in this entire family which is extremely numerous the roots are all more or less marked onions or *bulbs*, and varied according to their form or their composition. The onion of the Lily is composed of scales; in the asphodel it is like a bundle of elongated turnips, in the saffron, there are two bulbs one over the other, but [the roots of lilies are] always bulbs.¹¹⁵

The Lily which I have chosen because it is in season and also on account of the size of its flower and its parts which renders them more perceptible, lacks nevertheless one of the constitutive parts of the perfect flower, namely the Calyx.¹¹⁶ *The Calyx* is this green part, usually divided into five leaflets, which supports and holds the corolla by its base, and which envelops it entirely prior to its blooming, as you will have been able to notice in the rose. The Calyx which accompanies almost all the other flowers is

missing from all the true Liliaceae, such as Tulip, Hyacinth, Narcissus, Tuberoses, and even onion, leek, garlic, which are also true lilies, although they seem quite different at first glance. You will also see that throughout this same family the stalks are simple and slightly branched, the leaves whole and never pinked, observations which confirm in this family the analogy of the flower and the fruit with that of the other parts of the plant. If you follow these details with some attention, and make yourself familiar with them by frequent observations, you will already be able to determine by attentive and regular inspection of a plant whether it is or is not of the lily family, and this without knowing the name of this plant. You see that this is no longer a simple exercise of the memory, but a study of observations and of facts truly worthy of a naturalist. You will not start by telling all this to your daughter, and still less subsequently when you will be initiated into the mysteries of vegetation; but you will develop in her by degrees only what can suit her age and sex, in guiding her to find things by herself rather than by teaching them to her.

Good day, dear Cousin, if all this gibberish suits you, I am at your disposal. I await news of the little one.¹¹⁷

LETTER II

18 October 1771

Since you grasp so well, dear Cousin, the first lineaments of plants, although so slightly marked, that your discerning eye already knows how to distinguish a family resemblance in lilies, and that our dear small botanist already amuses herself with corollas and petals, I am going to propose to you another family on which she will be able once again to exercise her small knowledge; I admit nevertheless with a bit more difficulty, on account of the much smaller flowers, the more varied foliage; but with the same pleasure on her part and on yours; at least if you take as much pleasure in following this flowered route as I find in tracing it out for you.

When the first rays of spring have lighted your progress in showing you in the gardens Hyacinths, Tulips, Narcissus, Jonquils, and lilies-of-the-valley whose analysis is already known to you, other flowers will soon attract your attention and will demand from you a new examination. Such will be the Wallflowers or Blistercress; such will be the Rockets or Dame's Violets. To the extent that you will find them double, do not occupy yourself with their examination; they will be disfigured, or if you want, adorned according to our fashion, nature will not find herself in them anymore: she refuses to reproduce by monsters thus mutilated; because if the

most brilliant part, that is, the corolla, multiplies itself, it is at the expense of the most essential parts, which disappeared under this brilliance.¹¹⁸

Take then a simple Wallflower, and proceed to the analysis of its flower. You will first find there an exterior part which is missing in the Liliaceae, that is the Calyx. This Calyx has four pieces which should be properly called leaves or leaflets, since we have no proper word to designate them, like the word Petal for the pieces of the Corolla. These four pieces, ordinarily, are unequal two by two; that is to say, two leaflets opposed one to the other, equal to each other, smaller; and the two others, also equal to each other and opposed, larger, especially at the base where their roundness makes outside a fairly discernible protuberance.

Inside this Calyx you will find a corolla composed of four petals of which I leave aside the color, because it does not constitute [part of the] character.¹¹⁹ Each of these petals is attached to the receptacle at the bottom of the Calyx by a narrow and pale part which people call *the claw*; and overwhelms the calyx by a wider and more colored part which is called *the Limb*.

In the center of the Corolla there is an elongated pistil, cylindrical or approximately so, terminated by a very short style, which is terminated itself by an oblong stigma, *bifid*, that is to say divided in two parts which are recurved on either side.

If you examine with care the respective position of the Calyx and the Corolla, you will see that each Petal instead of corresponding exactly to each leaflet of the Calyx is positioned on the contrary between the two, in such a way that it fits the opening which separates them and this alternating position occurs in all kinds of flowers which have an equal number of petals in the corolla and leaflets in the calyx.

It remains to us to speak of the stamens. You will find them in the wallflower numbering six as in the lilaceae, but not for all that equal among them or alternately unequal; since you will only see two, in opposition one to another, discernibly shorter than the four others which separate them and which are also separated two by two.

I will not enter here into the details of their structure and their position: but I forewarn you that if you look well you will find the reason why these two stamens are shorter than the others, and why two leaflets of the calyx are more protuberant, or to speak in botanical terms, more gibbous, and the two others flatter.

In order to complete the history of our Wallflower, we must not give up after having analyzed the flower, but must wait until the corolla withers and falls, which it will do fairly promptly, and to observe then what the pistil becomes, composed, as we said before, of the ovary or pericarp,

Style, and Stigma. The ovary elongates itself considerably and enlarges a bit to the degree to which the fruit ripens. When it is ripe, this ovary or fruit becomes a kind of flat pod called *siliqua*.

This siliqua is composed of two valves positioned one opposite the other and separated by a very thin partition called *septum*.

When the seed is completely ripe, the valves open from the bottom upward to allow it to pass, and remain attached to the Stigma by their superior part.

Hence one sees the flat and circular seeds mounted on the two sides of the septum, and if one looks with care at how they hold on one finds that it is by a short pedicel which attaches each seed alternately on the right and the left to the Sutures of the Septum, that is to say to its two sides by which it was as if stitched to the valves before their Separation.

I very much fear, dear Cousin, that I have fatigued you a bit with this long description; but it was necessary in order to give you the essential character of the numerous family of the Crucifers or flowers in the shape of a cross, which comprises an entire class in nearly all the Systems of Botanists; and this description, difficult to understand here without illustration will become clearer to you, I dare to hope, when you will Follow it with some attention having the object before your eyes.

The large number of species which comprise the Crucifer family has caused botanists to divide it in two sections which in respect of the flower are perfectly alike, but notably different with regard to the fruit.

The first section comprises the Crucifers with siliqua, like the wallflower of which I just spoke, Rocket, Watercress, Cabbages, rapes, turnips, mustard, etc.

The second section comprises the Crucifers with *silicula*, that is to say, whose siliqua is extremely short, almost as wide as long, and otherwise divided within; as among others Common cress, called *Field Pepperwort* or *Natou*,¹²⁰ Thlaspi called Taraspi by Gardeners, Cochlearia, Lunaria, which, even though the pod is quite large is nevertheless but a silicula, because its length barely exceeds its width. If you know neither Common cress, nor Cochlearia, nor Thlaspi, nor Lunaria, you at least know, I presume, Shepherd's purse, so common among the bad weeds in gardens. Well, Cousin, shepherd's purse is a crucifer with a silicle, whose silicle is triangular. On that one you can form an idea of the others, until you run across them.

It is time to let you breathe, all the more as this letter, before the weather lets you make use of it, will I hope be followed by several others, in which I will be able to add what of necessity remains to be said about the crucifers and which I have not said in this one. But it is good perhaps to forewarn you now that in this family and in many others you will find

often many flowers smaller than the wallflower and sometimes so small that one cannot examine their parts at all except by means of a magnifying glass, an instrument which no botanist can pass up, any more than a needle, and a pair of scissors for cutting. In thinking that your maternal zeal can lead you to that point I imagine to myself a charming tableau of my lovely Cousin with her glass eagerly plucking the piles of flowers a hundred times less flowered, less fresh, and less agreeable than she. Good day, Cousin, until the next chapter.

LETTER III

16 May 1772

I suppose, dear Cousin, that you have indeed received my previous response even though you did not mention it in your second letter, and responding now to this one, I hope, concerning what you brought to my attention, that Mother well restored has departed for Switzerland in good health, and I count on you not to forget to give me news of the result and of the voyage and waters she is going to take. As Aunt Julie was to travel with her, I have charged M. Guyenet who is returning to the Val de Travers with the small herbarium which is intended for her and which I have sent to your address so that in her absence you can receive it and make use of it, if as long as there is something useful to you among these formless sprigs.¹²¹ For the rest, I do not agree that you have rights to this mess. You have them over him who made it, the strongest and most dear that I know; but as for the herbarium, it was promised to your sister, when she herborized with me during our walks in the Croix de Vague, and that you cared for nothing less in this where my heart and my feet followed you with grandmother in Vaise. I blush to have kept my word to her so late and so badly; but finally over you she had my word and priority in that regard. For you, dear Cousin, if I do not promise you an herbarium from my hand it is in order to procure you a more precious one from the hand of your daughter, if you continue to follow with her this sweet and charming study which fills with interesting observations on nature the empty spaces of time which others devote to idleness or worse. For the present let us resume the interrupted thread of our vegetal families.

My intention is to describe for you then six of these families in order to familiarize you with the general structure of the characteristic parts of plants.¹²² You already have two of them; there remain four which it is still necessary to have the patience to pursue. After which, leaving for a time the other branches of this numerous line and passing to the examination

of the different parts of the fructification we will proceed in a way that without, perhaps, knowing many plants you will at least never be in foreign country among the productions of the vegetal realm.

But I forewarn you that if you want to take books and follow the ordinary nomenclature, with many names you will have few ideas; those which you will have will become blurred, you will not follow well neither my progress nor that of others, and will have nothing more than a knowledge of words. Dear Cousin, I am jealous of being your sole guide in this subject. When it is time I will indicate to you the books which you can consult. In waiting have the patience to read only in this book of nature, and to stick to my letters.

The peas are at present in full fructification. Let us seize this moment to observe their character. It is one of the most curious that botany offers. All flowers divide generally into regular and irregular. The first are those all of whose parts depart uniformly from the center of the flower and terminate therefore at their outer extremity in the circumference of a circle. This uniformity means that in presenting to the eye the flowers of this species, there is distinguished neither above nor below, neither right nor left; such are the two families examined above. But at first glance you will see that a pea flower is irregular, which one easily distinguishes in the corolla the longer part which ought to be above, the shorter [part] which ought to be below, and which one recognizes immediately in presenting the flower before the eye if one holds it in its natural position or if one inverts it. Hence when examining an irregular flower all the times one speaks of the top and the bottom it is in placing it in its natural position.

Since the flowers of this family are of a very particular construction, not only is it necessary to have several pea flowers and to dissect them successively to observe all their parts one after another, it is necessary even to follow the progress of the fructification from the first flowering until to the maturity of the fruit.

You will find then a *Monophyllous* Calyx, that is to say, of one sole piece terminated in five quite distinct points, of which two a bit broader are above and the three narrower ones below. This Calyx is bent toward the bottom, just as the pedicel which supports it, which pedicel is very slender, very mobile, such that the flower easily follows the current of the air and ordinarily presents its back to the rain.

The Calyx examined, one removes it by delicately tearing it in such a manner that the rest of the flower remains whole, and then you see clearly that the corolla is polypetalous.

Its first piece is a large and broad petal which covers the others and occupies the Superior part of the corolla, as a result of which this large petal

has taken [in French] the name of *pavillon*. People also call it *the standard*.¹²³ It would be necessary to block the eyes and the mind to not see that this petal is there like an umbrella to protect those [petals] it covers from the principal injuries from the air.

In lifting the standard as you have with the calyx, you will notice that it is boxed in from each side by an auricle in the lateral pieces, in such a way that its position cannot be disturbed by the wind.

The detached standard reveals these two lateral pieces to which it was attached by its auricles; these lateral pieces are called the *wings*. You will find in detaching them that joined even more strongly with that which remains they cannot be separated without some effort. Also the wings are not less useful to protect the sides of the flower than the standard is to cover it.

The detached wings let you see the last piece of the corolla, the piece which covers and guards the center of the flower, and surrounds it, especially at the bottom, as carefully as the three other petals surround the top and the sides. This last piece, which on account of its form people call the *carina* is like a strong coffer in which nature has placed its treasure in safety from the attacks of the air and the water.

After having thoroughly examined this petal, remove it gently by the bottom by pinching it lightly by the keel¹²⁴ that is to say by the thin grip which presents itself to you, for fear of removing with it that which it surrounds. I am certain that at the moment where this last petal¹²⁵ will be forced to let go and reveal the mystery which it conceals, you will not be able upon perceiving it to restrain yourself from giving a cry of Surprise and admiration.

The young fruit which the Carina surrounds is constructed in this manner. A cylindrical membrane terminated by ten quite distinct small threads encircles the ovary, that is to say the embryo of the pod. These ten small threads are so many stamens which reunite at the base around the germ and terminate at the top in just as many yellow anthers whose powder is going to fecundate the stigma which terminates the pistil, and which, even though yellow also from the fecundating powder which attaches to them, is distinguished easily from the stamens by its form and its size. Hence these ten stamens form even around the ovary a last cuirass to preserve it from injuries of the outside.

If you observe from very close, you will find that these ten stamens do not make at their base one body except in appearance. Since in the superior part of this cylinder there is a piece or stamen which first appears attached to the others, but which as the flower spreads open and the fruit grows detaches itself and leaves an opening above through which this growing fruit

can expand in half-opening and pushing away more and more the Cylinder which without this, compressing and strangling it all around, would prevent it from growing and prospering. If the flower is not sufficiently advanced you will not see this stamen detached from the Cylinder; but pass a little pin into two small holes that you will find near the receptacle at the base of this stamen and soon you will see the stamen with its anther follow the pin and detach itself from the nine others which will always continue to make together one sole body, until they wither and dry out when the fecund germ becomes a pod and has no more need of them.

This *pod* into which the ovary changes itself in ripening distinguishes itself from the *siliqua* of the crucifers, in that in the *siliqua* the seeds are attached alternately to two sutures, while instead in the pod they are attached on only one side, that is to say to only one of the two sutures, indeed holding alternately to two valves which comprise it, but always on the same side. You will grasp this difference perfectly, if you open at the same time the *pod* of a pea and the *siliqua* of a wallflower, paying attention to take neither the one nor the other at full maturity, so that after the opening of the fruit the seeds remain attached by their ligaments to their Sutures and their valves.

If I have made myself well understood, you will comprehend, dear Cousin, what surprising precautions have been accumulated by Nature to bring the embryo of the pea to maturity and to protect it especially in the midst of the greatest rains of humidity that are damaging to it, without however enclosing it in a hard case which would have made another sort of fruit. The Supreme Worker, attentive to the conservation of all the beings put a great deal of care into protecting the fructification of plants from the threats which could annihilate it, but he seems to have redoubled his attention for those which serve the nourishment of man and the animals like the majority of the legumes. The apparatus of the fructification of peas is, in various proportions, the same in this entire family. The flowers of this family bear the name *papilionaceae* because people thought to see there something similar to the shape of a butterfly.¹²⁶ They generally have a *standard*, two *wings*, a *carina*, which together make four irregular petals. But there are genera where the carina divides itself lengthwise into two pieces almost attached by the keel, and these flowers have really five petals. Others, like the red clover, have all their parts attached in one single piece, and even though papilionaceae do not need to be Monopetalous.

The papilionaceae or leguminosae Are one of the most numerous and most useful families of plants. One finds there broad beans, Brooms, Lucernes, sweet vetches, lentils, Vetches, Wild Peas, beans, whose character is to have the carina twisted in [a] Spiral, which people took first to be

an accident. There are trees, among others the one commonly calls Acacia, and which is not the true Acacia. Indigo, licorice are in it also: but we will speak of all this more in detail later. Good day Cousin. I embrace all those you love.

LETTER IV

19 June 1772

...
I cannot understand why you have not received the herbarium. In the belief that my Aunt Julie had already departed I gave the packet to M. Guyenet to expedite it to you in passing through Dijon. I do not learn from any quarter that it has arrived either in your hands or in those of your sister, and I cannot imagine what has become of it.

Let us speak of plants while the season for observing them invites us to do so. Your solution to the question which I posed to you about the stamens of the crucifers is perfectly correct, and proves to me well that you have understood me or rather that you have listened to me, because you need only to listen in order to understand. You have made very good sense to me of the gibbosity of two leaflets of the calyx and the relative brevity of two stamens, in the wallflower, by the curvature of these two stamens. Nevertheless a step further would have led you to the first cause of this structure; For if you search still for why these two stamens are thus bent and consequently shortened, you will find a small gland implanted on the receptacle between the stamen and the germ, and it is this gland which, pushing away the stamen and forcing it to take the circumference, necessarily shortens it. There are on the same receptacle yet two other glands, one at the foot of each pair of long stamens; but since they do not at all push them toward the periphery they do not shorten them, because these glands are not, like the first two inside that is to say between the stamen and the germ; but outside that is to say between the pair of stamens and the calyx. Hence these four stamens supported and directed vertically in a straight line overwhelm those which are bent over and seem longer because they are straighter. These four glands, or at least their vestiges, are found more or less visibly in almost all the cruciferous flowers and in several are more distinct than in the wallflower. If you still ask: why these glands? I will answer that they are one of the instruments destined by nature to unite the vegetal realm to the animal realm and to cause them to circulate inside each other: But leaving these a bit too premature inquiries, let us return for the present to our families.

The flowers which I have described to you up to the present are all polypetalous. I should have begun perhaps with the regular monopetals whose Structure is much more simple: this great simplicity itself is what held me back. The regular monopetals constitute less a family than a great nation in which one counts several very distinct families; such that in order to comprehend them all under one common sign, it is necessary to employ characters so general and so vague that one appears to say something in saying in fact almost nothing at all. It is better to confine oneself to more narrow limits, but which one can assign with more precision.

Among the irregular monopetals, there is one family whose physiognomy is so marked that one distinguishes easily the members by their appearance. It is to this one that one gives the name of face flowers, because these flowers are split into two lips whose opening, whether natural or produced by a light pressure of the fingers, gives them the air of a gaping mouth. This family subdivides into two sections or lines, one of lipped flowers or *labiates*, the other of the mask flowers, in mask or *personates*: since the Latin word *persona* signifies a mask, a name certainly very suitable for the majority of people who bear among us that of *persons*. The character common to the entire family is not only to have the monopetalous corolla and as I said split into two lips or pendulous lips, one Upper one called *helmet*, the other lower called *beard*, but to have four stamens almost on the same level distinguished into two pairs the one longer and the other shorter. The inspection of the object will explain to you these characters better than can the discourse.

Let us then take the *labiates*. I will give you gladly as an example the Sage, which one finds in almost all gardens. But the peculiar and bizarre construction of Its stamens, which causes it to be removed by some botanists from among the labiates, even though nature seems to have inscribed it there, impels me to search for another example in the dead nettles and particularly in the species commonly called *white dead nettle*, but which botanists call rather *white lamium*, because it has no similarity to the nettle in Its fructification, even though it has much in its foliage. The white dead nettle, so common everywhere, remaining very long in flower, should not be difficult for you to find. Without stopping myself here at the elegant positioning of the flowers, I limit myself to their Structure. The white dead nettle bears a lipped monopetalous flower whose helmet is concave and bent over in the form of a vault to cover the rest of the flower and particularly its stamens all four of which hold themselves fairly close together under the shelter of its roof. You will discern easily the longer pair and shorter pair, and in the middle of the four the Style, of the same color, but which distinguishes itself in that it is simply forked at its extremity instead

of carrying an anther there as do the stamens. The beard, that is to say the lower lip, curls up and hangs down, and by this position allows one to see almost to the bottom the interior of the corolla. In the *Lamiums* this beard is divided lengthwise in its center, but this does not happen the same way to other labiates.

If you remove the corolla, you will remove with it the stamens, which hold on to it by their threads, and not to the receptacle, where the Style will alone remain attached. In examining how the stamens are attached to other flowers, one finds them generally attached to the corolla when it is monopetalous and to the receptacle or the calyx when the corolla is poly-petalous: such that one can in this last case remove the petals without removing the stamens. From this observation one draws a nice, easy, and even fairly certain rule for knowing if a corolla is of one single piece or of several, when it is difficult, as it is sometimes, to assure oneself of it immediately.

The Corolla that has been removed remains pierced at its base, because it was attached to the receptacle, leaving a circular opening through which the pistil and what surrounds it penetrated inside the tube of the corolla. What surrounds this pistil in the lamium and in all the labiates are four embryos which become four naked seeds, that is to say without any envelope; such that these seeds, when they are ripe, detach themselves and fall to earth separately. This is the character of the Labiates.

The other line or section, which is that of the *personates* distinguishes itself from the labiates, first in its corolla whose two lips are ordinarily not open and gaping but closed and jointed, as you will be able to see in the garden flower called [in French] Mufflaude or *Snapdragon*,¹²⁷ or failing that in the *Linaria*, this spurred yellow flower so common at this season in the country. But a character more precise and more Certain is instead of having four naked seeds at the base of the Calyx like the labiates, the personates all have there a capsule which encloses the seeds and opens only at their maturity in order to disseminate them. I add to these characters that a large number of the labiates Are either scented and aromatic plants such as oregano, marjoram, Thyme, wild thyme, basil, Mint, hyssop, Lavender, etc., or scented and foul-smelling such as various species of dead nettles, Stachys, Ironworts, Horehound; some of them only such as bugle, self-heal, skullcap have no odor. While instead the personates are for the most part plants without odor such as Snapdragon, toad-flax, Eyebright, lousewort, yellow rattle, broomrape, ivy-leaved toad-flax, round-leaved toad-flax, digitalis; I know hardly any scented plant in this branch except Scrophularia, which smells and stinks without being aromatic. I can cite for you here only plants which are truly not known to you, but which little by

little you will learn to know and whose family at least you will be able to determine by yourself upon encountering them. I would wish even that you attempt to determine the line or section by the physiognomy, and that you will exert yourself to judge by a simple glance of the eye if the lipped flower that you see is a labiate or a personate. The exterior form of the corolla can suffice to guide you in this choice, which you can later verify in removing the corolla and looking into the depth of the calyx; because if you have judged well, the flower which you will have named labiate will show you four naked seeds, and the one which you will have named personate will show you a pericarp: the contrary will prove to you that you are mistaken, and by a second examination of the same plant you will prevent a similar error for another time. Here, dear Cousin, is the occupation for several walks. I will not delay in preparing you for those which will follow.

You have not given me the address for which I asked you. Receive the most tender expressions of friendship of my wife and her Husband.

LETTER V

16 July [1772]

I thank you, dear Cousin, for the good news you have given me of your Mother. I hoped for the good effect of a change of air, and I awaited it no less from the waters and especially the austere diet prescribed during their use. I am touched by the memory of this good friend and I pray you to thank her on my behalf. But I absolutely do not want her to write me during her stay in Switzerland, and if she wants to give me her news directly, she has a good secretary with her who will acquit Herself quite well.¹²⁸ I am more charmed than surprised that she thrives in Switzerland; apart from the graces of her age, and Her lively and endearing gaiety, she has in her character a depth of sweetness and even-temperedness, of which I have sometimes seen her give to the grandmother the charming example that she has received from you. Your reflections on the vicissitudes of commerce are very fair and I hope that they are not occasioned by any experience that concerns you. If your sister settles in Switzerland you will each lose a great sweetness in life, and she especially, will lose advantages that are difficult to replace. But your poor Mother who [even] next door nevertheless felt her separation from you so acutely, how will she endure having her [Julie] at so great a distance? It is from you that she will draw her strength and her resources. You administer a precious good in softening in your sweet hands that good and strong stuff of your favorite, who, I do

not doubt, will become through your solitudes as full of great qualities as charms. Oh Cousin, there is no happier mother than yours. The merit of her sons is certainly equally solid, as true as it is universally acknowledged. But it is still more rare to see thus three sisters share so much all kinds of perfections that it is easier to identify the one that dominates in each, than any which is missing from each of the three.

Do you know that I am beginning to be concerned about the small herbarium. I have no news of it from anywhere, although I have some from M. Guenet since his return through his wife who does not herself tell me one word from him about this herbarium. I have requested news of it from him; I am awaiting his response. I am very afraid that not passing through Lyon he entrusted the packet to someone or other who knowing that it was dried herbs will have taken all of it for hay. Nevertheless if as I still hope, it finally makes it to your sister Julie or to you, you will find that I have not neglected to take some care with it. It is a loss which while small would not be easy for me to repair promptly, especially on account of a catalogue accompanied by various small clarifications written in the field, and of which I have not kept a duplicate.¹²⁹

Comfort yourself, good Cousin, for not having seen the glands of the crucifers. Great, very observant Botanists have not seen them better. Tournefort himself makes no mention of them.¹³⁰ They are quite distinct in few genera, although one finds vestiges in almost all, and it is by dint of analyzing the flowers in cross-section and seeing there always the irregularities of the receptacle, that in examining them in detail, it has been found that these glands belonged to most genera, and that they are inferred by analogy in those even where they are not distinguished.

I understand that one is annoyed in taking so much trouble Without learning the names of the plants which one examines. But I assure you in good faith that it has not entered into my plan to spare you this small trouble. People pretend that botany is but a Science of words which exercises only the memory and teaches one only to name plants.¹³¹ For me, I do not know any reasonable study which is merely a science of words; and to which of the two, I pray you, will I give the name of botanist, to the person who knows how to spit out a name or a phrase at the sight of a plant, without knowing anything of its structure, or to the person who, knowing this structure very well nonetheless ignores the very arbitrary names that people give to this plant in this or that country? If we give your children only an amusing occupation, we miss the best half of our aim which is, in amusing them, to exercise their intelligence and accustom them to paying attention. Before teaching them to learn to name what they see, let us begin by teaching them to see it. This science, forgotten in all educations,

ought to comprise the most important part of theirs. I will never repeat it often enough; teach them never to satisfy themselves with words, and to believe they know nothing of what has only entered their memory.

For the rest, in order not to be too difficult, even so I give you the name of the plants on which, in showing them to you, you can easily verify my descriptions. In reading the analysis of the labiates you did not have before your eyes a white dead-nettle, I presume; but you only have to send to the herborist around the corner to look for white dead-nettle freshly cut, apply to his flower my description, and then examining the other parts of the plant in the manner which we will subsequently discuss, you will know the white dead-nettle infinitely better than the herborist who furnished it will know it his entire life, still we will shortly find the way to do without the herborist: but it is first necessary to complete the examination of our families, thus I come to the fifth which in this moment is in full fructification.

Imagine to yourself a long, fairly straight stem, adorned alternately with leaves usually cut fairly finely, which enclose at their base the branches which stem from their axils. From the upper extremity of this stem radiate as from one center several pedicels or rays, which Spreading circularly and regularly like the ribs of a parasol, crown this stem in the form of a more or less open vase. Sometimes these rays leave an empty space in their middle, and resembling thus more exactly the hollow of the vase; sometimes also this center is furnished with other shorter rays, which climbing less obliquely adorn the vase and form together with the first the form approximately of a hemisphere whose convex part is turned upward.

Each of these rays or pedicels is terminated at its extremity, not yet by a flower, but by another set of smaller rays which crown each of the first exactly like the first crown the stem.

Here therefore are two similar and successive sets: the one of large rays which terminate the stalk, the other of similar, small rays which terminate each of the large ones.

The rays of the small parasols do not Subdivide themselves further, but each of them is the pedicel of a small flower of which we will speak in due course.

If you can imagine to yourself the idea of the form which I have just described to you, you will have that of the arrangement of the flowers in the family of the *umbellifers* or [in French] *Porte-parasol*;¹³² because the Latin word *umbella* signifies a parasol.

Even though this regular arrangement of the fructification is striking and fairly constant in all the umbellifers, this is nevertheless not what constitutes the character of the family. This character derives from the very Structure of the flower, which it is now necessary to describe to you.

But it is appropriate, for greater clarity, to give you here a general distinction concerning the relative arrangement of the flower and the fruit in all plants, a distinction which greatly facilitates their methodical arrangement, whichever system one wishes to choose for this.¹³³

There are plants, and these are the greatest number, for example the pink, whose ovary is obviously enclosed in the Corolla. We will give to these the name of *inferior flowers* because the petals embracing the ovary take their birth below it.

In other plants in a fairly large number, the ovary is found placed, not in the petals but below them; which you can see in the rose; because the hip which is the fruit is this green and swollen body which you see beneath the calyx, as a consequence also [is found] below the Corolla which in this manner crowns this ovary and does not envelop it. I will call these *Superior flowers*, because the corolla is above the fruit. One could make these words more French; But it seemed advantageous to me to hold you always as close as possible to the terms admitted in botany so that Without needing to learn either Latin or Greek, you could nonetheless understand tolerably well the vocabulary of this science, pedantically drawn from these two languages, as if to know plants it was necessary to begin by being a learned grammarian.

Tournefort explained the same distinction in different terms: in the case of the *inferior* flower, he said that the pistil became the fruit: in the case of the *Superior* flower, he said that the calyx became the fruit. This manner of expressing oneself could be as clear, but it was certainly not as correct. However that may be, here is an occasion to practice when it will be time for your young pupils to learn how to disentangle the same ideas, rendered completely different by the terms.

I will tell you now that the umbelliferous plants have a *Superior* flower, or positioned on the fruit. The corolla of this flower has five petals called regular, even though often the two petals which Are turned inward in the flowers which border the umbel are larger than the three others.

The form of these petals varies according to the genus, but most often it is in the shape of a heart; the claw which grows over the ovary is very thin; the limb is broadened, its edge is *emarginate* (slightly notched), or rather it terminates in a point which folding itself at the top yet gives to the petal the appearance of being notched, although one sees it is pointed if it is unfolded.

Between each petal there is a stamen whose anther normally bordering the corolla makes the five stamens more visible than the five petals. I do not mention the calyx here because it is not distinct in the umbellifers.

From the center of the flower there emerge two styles adorned each by

their Stigma and fairly visible also, which after the fall of the petals and the stamens, remains in order to crown the fruit.

The most common form of this fruit is a somewhat elongated oval which in Its maturity opens itself in half, and divides into two naked seeds attached to the pedicel, which by an admirable device divides in two just like the fruit, and holds the seeds separately Suspended, until their fall.

All these proportions vary according to the genera, but here is the most common category. It is necessary, I admit it, to have a very attentive eye to distinguish well Without a magnifying glass such small objects; but they are so worthy of attention that one does not regret One's trouble.

Here then is the proper character of the family of umbellifers. Superior Corolla with five petals; five stamens; two Styles borne on a naked *dispermous* fruit, that is to say, *composed of two seeds* joined together.

Whenever you will find these characters united in one fructification, assume that the plant is an umbellifer, even when it has otherwise in its arrangement none of the order indicated above. And if you find that all this set of parasols matches my description, consider that you are mistaken If it is contradicted by the examination of the flower.

If it happened, for example, that in coming away from reading my letter you were to find in strolling along an Elder still in flower, I am almost certain that at first sight you would say; here is an umbellifer. In looking at it you would find large umbel, small umbel, small white flowers, superior corolla, five stamens: this is an umbellifer certainly: but let us see again: I take a flower.

First of all, instead of five petals, I find a corolla with five divisions it is true, but nevertheless of a single piece. Now the flowers of umbellifers are not monopetalous. Here clearly are five stamens, but I see no Styles, and I see more often three Stigmas than two, more Often three seeds than two. Now the umbellifers have neither more nor fewer than two Stigmas, neither more nor fewer than two seeds for each flower. Finally the fruit of the Elder is a soft berry, and that of the umbellifers is dry and naked. The elder is thus not an umbellifer.

If you retrace now your steps in looking more closely at the arrangement of the flowers, you will see that this arrangement is only in appearance that of the umbellifers. The large rays instead of emerging exactly from the same center, take their birth some higher, some lower; the small ones are born still less regularly: all this does not have the invariable order of umbellifers. The arrangement of the flowers of the elder is in a *corymb* or cluster rather than in an umbel. Here is how in sometimes deceiving ourselves we end by learning to see better.

The *Eryngo*, on the contrary, has hardly the appearance of an umbellifer,

and nevertheless it is one, since it has all the characters in Its fructification.¹³⁴ Where does one find, you ask me, the Eryngo? Throughout the countryside. All the big roads Are carpeted with it right and left: the first peasant can show it to you, and you will recognize it almost on your own by the bluish color or sea-green of Its leaves, by their sharp points, and by their consistency, smooth and leathery like parchment. But one can ignore such an unapproachable plant; it does not have enough beauties to make up for the wounds one gives oneself in examining it; and were it a hundred times prettier, my small Cousin with her small, sensitive fingers would soon be repelled from caressing a plant with such a bad disposition.

The family of umbellifers is numerous, and so natural,¹³⁵ that its genera are very difficult to distinguish: These are brothers whose great resemblance often causes them to be mistaken for each other. In order to assist Themselves in recognizing them people have imagined major distinctions which are sometimes useful, but on which it is necessary not to count too much either. The central point whence emerge the rays of the large as well as the small umbel is not always naked; it is sometimes surrounded by leaflets, like a ruffle. People give these leaflets the name of *involucre* (envelop). When the large umbel has a ruffle, one gives this ruffle the name of *large involucre*: One calls *small involucre*s those which sometimes surround the small umbels. This gives rise to three sections of umbellifers.

1st. Those which have [a] large involucre and small involucre.

2nd. Those which have small involucre only.

3rd. Those which have neither large nor small involucre.

It would seem to lack a fourth division of those which have a large involucre and no small ones. But we do not know any genus which is consistently in this situation.

Your astonishing progress, dear Cousin, and your patience have so emboldened me that counting your trouble for nothing I have dared to describe to you the family of umbellifers without fixing your eyes on any model; which has rendered necessarily your attention much more fatiguing. Nevertheless I dare to doubt, reading as you know how to do, that after one or two readings of my letter an umbellifer in flower escapes your intellect in striking your eyes, and in this season you cannot miss finding several in the gardens and in the countryside.

The majority have white flowers. Such are the Carrot, the chervil, the parsley, the Hemlock, the angelica, the Cow-Parsnip, the Water-Parsnip, the burnet saxifrage, the Caraway or chanterelle,¹³⁶ the rock samphire etc.

Some like fennel, Dill, parsnip, have yellow flowers; there are a few with reddish flowers, and none of any other Color.

Here, you will tell me, is a nice general notion of umbellifers: but how

will all this vague knowledge keep me from confusing the Hemlock with Chervil or parsley, which you just named with it? The merest cook will Know the above more than us with all our learning. You are right. But nevertheless if we begin with observations of detail, soon overcome by number, the memory will abandon us, and we will lose ourselves from the first steps in this immense realm; instead if we begin by recognizing the big roads well we will wander rarely into the paths, and we will find our way everywhere without much trouble. Let us nonetheless make some exception for the utility of the object, and not expose ourselves, while analyzing the vegetal realm, to eating out of ignorance a Hemlock Omelet.

The small Hemlock in gardens is an umbellifer just like the parsley and the Chervil. It has the white flower like both of them, it is with the last in the section which has the small envelop and which does not have the large one; it resembles them sufficiently in its foliage so that it Is not easy to indicate to you in writing the differences. But here are characters sufficient in order for you not to be deceived.

It is necessary to begin by seeing in flower these diverse plants; because it is in this state that the Hemlock has Its proper character. It is to have under each small Umbel a small involucre composed of three small pointed leaflets, fairly long, and all three turned inward, while the leaflets of the small umbels of the chervil envelop it all around, and are turned equally from all sides. With regard to parsley, it scarcely has some short leaflets, thin like hairs, and distributed indiscriminately as much in the large umbel as the small ones which are all transparent and thin.

When you will have assured yourself well about the Hemlock in flower, you will confirm yourself in your judgment by lightly crushing and smelling its foliage, because its stinking and noxious odor will not let you confuse it with parsley or with chervil, both of which have agreeable odors. Of Course lastly not to mistake one for the other, you will examine these three plants together and Separately in all their states and by all their parts, especially the foliage, which accompanies them more constantly than the flower; and by this examination compared and repeated until you have acquired the certainty of a glance to know that you will arrive at imper- turbably distinguishing and knowing the Hemlock. Study leads you thus to the door of practice, after which this makes for facility of knowledge.

Take breath, dear Cousin, for this is an excessive letter. I dare not even promise you more discretion in that which ought to follow it; but after this we will have before us a road bordered only by flowers. You deserve a crown for the sweetness and constancy with which you deign to follow me through these bushes without being repelled by their thorns.

2 May 1773¹³⁷

The preceding letter on herbaria should not be put in the order of composition, because it would interrupt the order which I have proposed for myself.

Although there remain, Dear Cousin, many things to be desired in the notions of our first five plant families, and I have not always known how to put my descriptions at the disposal of our small *Botanophile* (lover of botany), I believe nonetheless that I have given you a sufficient idea in order to be able, after some months of herborization to familiarize you with the general idea of the appearance of each family: such that at the sight of a plant, you could conjecture more or less if it belongs to one of the five families and to which one; except then to verify by analysis of the fructification if you are mistaken or not in your conjecture. The Umbellifers, for example threw you into some confusion but from which you can exit when you please by means of the indications that I have joined to the descriptions: For finally Carrots and Parsnips are such common things, that nothing is easier in the middle of summer than to have oneself be shown one or another in flower in a kitchen-garden. Now at the mere sight of the umbel and the plant which bears it one should get so clear an idea of umbellifers that upon encountering a plant of this family One will rarely be deceived at first glance. This is all I have aspired to up to this point; because there is no question so soon of genera and species; and again this is not a nomenclature of parrots that it is necessary to acquire, but a real science, and one of the most agreeable sciences that it is possible to cultivate. I pass therefore to our sixth family before taking a more methodical route. It could confuse you at first as much and more than the umbellifers. But my aim is merely at present to give you a general notion of it; especially since we have ample time before that of Its full flowering, and this time well employed will be able to smooth difficulties for you against which it is not yet necessary to struggle.

Take one of these small flowers which in this season carpet the pastures and which people call here *daisies*,¹³⁸ *little marguerites* or simply *marguerites*. Look at it well; for given its appearance, I am sure to Surprise you in telling you that this flower so small and dainty is really composed of two or three hundred other completely perfect flowers, that is to say, having each its corolla, its germ, its pistil, its stamens, Its seed, in a word as perfect in its kind as a flower of hyacinth or Lily. Each of these leaflets, white above, pink below, which form like a crown around the marguerite, and which seem to you no more than so many small petals are really so many

genuine flowers; and each of these small yellow pieces which you see in the center and which at first you took perhaps for nothing more than stamens are again so many true flowers. If you have already fingers skilled at botanical dissections, if you armed yourself with a good magnifying glass and much patience, I could convince you of this truth with your own eyes; but for the present it is necessary to begin, If you please, by taking me at my word, for fear of fatiguing your attention on the atoms. Nevertheless in order to put you at least on the track, remove one of the white leaflets from the crown, you will believe at first this leaflet flat from one end to the other, but look well at the end which was attached to the flower; you will see that this end is not flat, but round and hollow in the form of a tube and that from this tube emerges a small filament with two horns, this filament is the forked style of this flower, which as you see is not flat except at the top.

Look now at the yellow pieces which are in the middle of the flower and which I have told you are themselves so many flowers. If the flower is sufficiently advanced you will see several of them all around which are open in the middle and even cut in several parts. These are monopetalous corollas which Are opening, and in which the magnifying glass allows you to distinguish easily the pistil and even the anthers with which it is surrounded. Ordinarily the yellow florets that one sees in the center are still rounded and not pierced. These are flowers like the others, but which are not yet open, since they do not Open except successively, in advancing from the edge toward the center. Here is enough to show you by eye the possibility that all these pieces, white as well as yellow, are really so many perfect flowers, and it is a very constant fact. You see nevertheless that all these small flowers are pressed and enclosed in a Calyx which is common to them and which is that of the Marguerite. In considering the entire Marguerite as a single flower, we will therefore give it a very suitable name, that of calling it a *composite flower*. Now there is a large number of species and genera of flowers formed like the marguerite of an assemblage of other smaller flowers, contained in a common calyx. This is what constitutes the sixth family of which I have to speak to you, That is to say that of the *composite flowers*.

Let us begin by avoiding here the ambiguity of the word flower,¹³⁹ in restricting this name in the present family to the composite flower, and giving that of *florets* to the small flowers which make it up; but let us not forget that in the precise meaning of the word these florets themselves are so many true flowers.

You have seen in the Marguerite two sorts of florets, That is those of yellow color which fill the middle of the flower and the small white ligular

flowers¹⁴⁰ which surround them. The first are in their smallness fairly like in form to the flower of Lily-of-the-Valley or Hyacinth, and the second have some relation to the flowers of Honeysuckle. We will leave to the first the name of florets and to distinguish the others we will call them demi-florets: Since in fact they have rather the air of Monopetalous flowers which have been gnawed on one side leaving there only a strap which would scarcely make up one-half of the corolla.

These two sorts of florets combine themselves in the composite flowers in such a way as to divide the entire family into three quite distinct sections.

The first section is formed from those which are composed only of ligular flowers or demi-florets¹⁴¹ in the middle as well as at the periphery, in the middle as well as at the circumference; they call them *demi-floret flowers* and the entire flower in this section is always of a single color, most often yellow. Such is the flower called Lion's Tooth or dandelion; such are the flowers of lettuce, chicory (this one is blue), scorzonera, salsify, etc.

The second section comprises the *floretted flowers*, that is to say those composed only of florets, all ordinarily also of one single color. Such are the flowers of everlasting, Burdock, Absinth, Artemisia, thistle, and of Artichoke which is a thistle itself of which people eat the Calyx and the receptacle still in bud, before the flower is open or even formed. This down that people remove from the middle of the artichoke is nothing but the assemblage of florets which are beginning to form and which are separated from each other by the long hairs implanted on the receptacle.

The third section is that of the flowers which gather together the two types of florets. This is always made in such a way that the complete florets occupy the center of the flower, and the demi-florets form the rim or the circumference, as you have seen in the Daisy. The flowers of this section are called *radiates*, botanists having given the name of *ray* to the circumference of a composite flower, when it is formed of ligular flowers or demi-florets. With regard to the area or the center of the flower occupied by the florets, people call it the *disk*, and they give also sometimes this same name of disk to the Surface of the receptacle where all the florets and the demi-florets are planted. In the radiate flowers the disk is often of one color and the ray of another, however there are also genera and species where both are of the same color.

Let us try for the present to fix well in your mind the idea of a *composite flower*. The common clover blossoms in this season; its flower is purple; If one falls into your hands, in seeing so many small flowers thus gathered together you might be tempted to take the whole for a composite flower. You would deceive yourself: in what? in that, in order to form a composite flower, an aggregation of several small flowers does not Suffice, but it is

necessary that more than one or two of the parts of the fructification be common to them, such that all have a share in the same one, and that none has its own separately. These two common parts are the Calyx and the receptacle. It is true that the flower of the clover or rather the group of flowers which appear to be but one seem at first sight to be borne on a sort of Calyx, but push away a bit this so-called calyx, and you will see that it is not attached at all to the flower, but that it is attached below it to the pedicel which bears it. Hence this apparent calyx is not one at all; it belongs to the foliage, and not to the flower; and this supposed flower is in fact but an assemblage of very small leguminous flowers, of which each has its own calyx, and which have absolutely nothing in common among them except their attachment to the same pedicel. The practice is nonetheless to take all this for a single flower; but it is a false idea, or if one absolutely wishes to regard as one flower a bouquet of this kind, it is at least not necessary to call it a *composite flower*, but an *aggregate flower*, or a head (*flos aggregatus*, *flos capitatus*, *capitulum*) and these designations are in fact sometimes employed in this sense by botanists.

Here, dear Cousin, is the simplest and most natural notion that I can give you of the family or rather the numerous class of Composites, and of the three sections or families in which they subdivide themselves. It is now necessary to speak to you of the structure of the fructification peculiar to this class, and this will lead us perhaps to determine its character with more precision.

The most essential part of a composite flower is the receptacle on which are planted first the florets and demi-florets, and then the seeds which succeed them. This receptacle which forms a disk of a certain extent comprises the center of the Calyx, as you can see in the Dandelion that we will take here as an example. The Calyx in this entire family is ordinarily divided almost down to the base in several pieces so that it can close up, open, and peel back, as happens in the course of the fructification, without causing it to tear. The Calyx of the dandelion is formed of two rows of leaflets inserted one inside another, and the leaflets of the exterior row which support the other curve and fold downward toward the pedicel, while the leaflets of the interior row remain upright to surround and contain the demi-florets which comprise the flower.

One form yet more common to calyxes of this Class is to be *imbricate*, that is to say formed of several rows of leaflets the one covering the junctions of the others [with the stem] like the tiles of a roof. Artichoke, Cornflower, Knapweed, the scorzonera offer you examples of imbricate calyxes.

The florets and demi-florets enclosed in the Calyx are planted very

densely on its disk or receptacle in staggered rows or like the squares of a Checkerboard. Sometimes they touch Each other naked With no intermediary, sometimes they are separated by the partitions of hairs or small scales which remain attached to the receptacle when the seeds have fallen. You are here on the way to observing the differences of Calyxes and receptacles; let us speak now of the Structure or the florets and demi-florets in beginning with the first.

A floret is a monopetalous flower, usually regular, whose corolla splits at the top into four or five parts. In this corolla are attached to its tube the five filaments of the stamens: these five filaments rejoin at the top in a small round tube which surrounds the pistil, and this tube is nothing but the five anthers or stamens reunited in a circle in one body. This reunion of the stamens forms in the eyes of Botanists the essential character of composite flowers, and belongs only to their florets, exclusive of all other sorts of flowers. Thus you will in vain find several flowers borne on the same disk as in the scabious and the Teasel; if the anthers do not reunite in a tube around the pistil and if the corolla is not carried On a single naked seed, these flowers are not florets and do not form a composite flower. On the contrary, when you find in a single flower the Anthers thus reunited in one body, and the superior corolla positioned on a single seed, this flower, even alone, would be a true floret, and would belong to the family of the composites, from which it would be better to draw therefore the character of a precise structure, rather than a deceiving appearance.

The Pistil bears a Style usually longer than the floret above which one sees it rise through the tube formed by the anthers. It terminates most often at the tip with a forked Stigma on which one sees easily two small horns. At its foot the pistil does not rest directly on the receptacle or on the floret, but each holds on by the germ which serves them as a base which grows and Elongates as the floret dries out, and finally becomes a rather long seed that remains attached to the receptacle until it is ripe. Then it drops if it is naked or the wind carries it far away if it is crowned with a tuft of plumes, and the receptacle remains to be unprotected, completely naked in some genera, or adorned with scales or hairs in others.

The structure of the demi-florets is like that of the florets; the stamens, the pistil, and the seed are arranged there about the same: only in the radiate flowers there are several genera where the demi-florets of the circumference are subject to aborting, either because they lack stamens or because they are sterile and do not have the capacity to fecundate the germ, thus the flower seeds only by the florets of the center.

In this entire Class of composites the seed is always *Sessile*, that is to say that it rests directly on the receptacle without any intermediate pedicel.

But there are seeds whose summit is crowned with a tuft that is sometimes sessile, and sometimes attached to the seed by a pedicel. You will understand that the purpose of this tuft is to disperse the seeds afar by giving the air more of an opportunity to carry them off and scatter them some distance.

To these rough and truncated descriptions, I should add that the calyxes have usually the property of opening Themselves when the flower Blooms, of closing when the florets wither and fall so as to contain the young seed and prevent it from scattering prior to its maturity, finally of reopening and completely peeling back to offer a larger area in their center to the seeds which grow larger in ripening. You should have often seen the Dandelion in this state, when children cut it to blow into its tufts which form a globe around the peeled-back calyx.

In order to know this Class well, it is necessary to follow the flowers from before their opening until the full maturity of the fruit, and it is in this succession that one sees metamorphoses and a chain of marvels which hold every healthy mind who observes them in a continual admiration. A flower that is convenient for these observations is that of the sunflower that one frequently encounters in vineyards and in gardens. The sunflower, as you see, is a radiate. The china aster which in autumn adorns flower beds is also one. The Thistles are floretted; I have already said that the scorzonera and the dandelion are half-floretted. All these flowers are large enough to be dissected and studied with the naked eye without fatiguing it too much.

I will not tell you any more today About the family or Class of the composites. I fear already having too much abused your patience with the details that I should have made clearer, if I had known how to make them shorter; but it was impossible for me to avoid the difficulty which is born of the smallness of objects. Good day, dear Cousin.

I cannot keep myself from communicating to you a doubt which came to me in rereading your last letter. Can it be that you have thus seen on your own the florets of the large Marguerite?¹⁴² I confess that this amazes me. Despite your attention and your insight, you should have naturally taken the yellow points of the disk for so many stamens, and the white demi-florets of the circumference for so many petals. I beg you to tell me with the veracity that I expect of you if someone put you on the trail. If you have found this on your own, and if your small companion with her keen eyes saw it then, I predict to you boldly that in a few years you will both be, alone of your sex with Madame the Duchess of Portland among the very few true botanists, and that the covering of the earth will soon offer nothing foreign to your eyes.¹⁴³

LETTER VII

Undated [late March/early April 1774]¹⁴⁴

I was waiting for your news, dear Cousin, without impatience, because M. Tessier¹⁴⁵ whom I saw since the receipt of your previous letter told me of having left your mother and your entire family in good health. I rejoiced in having confirmation of this by yourself, as well as the good and recent news you gave me of my Aunt Gonceru.¹⁴⁶ Her memory and her blessing opened with joy a heart that for a long time has scarcely experienced these sorts of feelings. It is through her that I still hold on to something precious on this earth, and to the extent that I preserve it, I will continue however one can to love life. This is the time to profit from your usual kindnesses toward her and me, it seems that my small offering takes on real value in passing through your hands. If your dear Husband soon comes to Paris as you make me hope, I will ask him to take charge of my annual tribute; but if he waits a bit I ask you to indicate to me to whom I should give it so that there will be no delay and you will not make the advance like last year, which I know you do with pleasure but to which I do not wish to consent without necessity.

Here, dear Cousin, are the names of the plants you have sent me in the last instance. I added a question mark to those of which I am in doubt, because you did not take care to place the leaves with the flower, and the foliage is often necessary to determine species for as shallow a botanist as myself. Upon arriving at Fourvière, you will find the majority of the fruit trees in flower, and I recall that you desired some directions on this subject. I cannot at this moment trace for you below more than some words very much in haste, being very pressed, so that you do not lose another season for this examination.

It is not necessary, dear friend, to give to botany an importance it does not have; it is a study of pure curiosity and which has no other real utility than that which a thinking and sensitive being can draw from the observation of nature and the marvels of the universe. Man has denatured many things in order to convert them better to his use, in that he is not at all to be blamed; but it is not less true that he has often disfigured them and that when in the works of his hands he believes he truly studies nature, he deceives himself. This error occurs especially in civil society; it likewise occurs in gardens. These double flowers that people admire in flower-beds are monsters deprived of the faculty of producing their like with which nature has endowed all organized beings. Fruit trees are more or less in the same state through the graft; you will in vain plant the pips of pear or apples of the best species, there will never grow from them anything but

wild stock. Hence, to know the pear and the apple of nature, it is necessary to look for them not in kitchen gardens but in forests. The flesh is not as large and as succulent, but the seeds ripen better, in multiplying more, and the trees are infinitely taller and more vigorous.¹⁴⁷ But I am raising a topic here which would lead too far; let us return to our kitchen gardens.

Our fruit trees, although grafted preserve in their fructification all the botanical characters which distinguish them, and it is through the attentive study of these characters, as well as through the transformations of the graft that one assures oneself that there is for example only one species of pear under a thousand different names by which the form and the flavor of their fruits have made them separated into so many purported species which are at bottom nothing but varieties. Moreover: the pear and the apple are but two species of the same genus, and their very characteristic unique difference is that the pedicel of the apple enters a recess in the fruit, and that of the pear attaches to a slightly elongated extension of the fruit. In the same way all the kinds of cherries, heart-cherries, morellos, bigarons are but varieties of the same species;¹⁴⁸ all the plums are but one species of plum; the genus of the plum contains three principal species, that is the plum proper, the cherry, and the apricot which is also but a species of plum.¹⁴⁹ Hence when the learned Linnaeus, dividing the genus into its species denominated the *plum* plum, the plum cherry and the plum apricot, the ignorant made fun of him, but good observers admired the correctness of his reductions, etc. It is necessary to run, I make haste.

Fruit trees fall virtually all into a numerous family, whose character is easy to grasp, in that the stamens, in large number, instead of being attached to the receptacle are attached to the calyx, at the intervals which the petals have between them; All their flowers are polypetalous and usually with five petals. These are the principal generic characters.

The genus of the Pear, which comprises also the apple and the Quince. Monophyllous calyx with five points. Corolla with five petals attached to the calyx, twenty stamens all attached to the Calyx. Germ or ovary inferior, that is to say below the corolla, five styles. Fleshy fruit with five compartments containing seeds, etc.

The genus of the plum which comprises the apricot, the Cherry and the Laurel-cherry. Calyx, corolla and Anthers about like the pear. But the germ is superior, that is to say in the corolla, and there is but one Style. Fruit more watery than fleshy containing one stone, etc.

The genus of the Almond which comprises also the peach. Almost like the plum, if it were not that the germ is hairy, and that the fruit, soft in the peach, dry in the Almond contains a hard stone, rough, sprinkled with cavities, etc.

All this is only roughly sketched, but it is enough to amuse you this year. Good day, dear Cousin.

Undated (1773 or 1774) annex to preceding letter

PLANTS IN THE LAST SHIPMENT

N^o 11. *CENTAUREA JACEA*.

Brown Knapweed.

N^o 12. *Campanula rotundifolia*.

Small campanula.

Linnaeus calls it round-leaved even though the leaves are long and narrow; but if you follow its long and thin stem right down to the root, you will find its two first leaves (called radical leaves) almost round.

N^o 13. *Leontodon hirtum*?

Feather-brush or hairy dandelion?

What makes me hesitate is that the plant thus named has forked hairs, and that I have noticed on this one only simple ones. The leaves cannot decide the matter for me, because there are none.

N^o 14. *Scabiosa arvensis*.¹⁵⁰

You have named this scabious well, but it is not a composite flower, it is an aggregate flower. If you look well at its stamens, you will see four very distinct ones which are not united at their *tops*.

N^o 15. *Medicago lupulina*.

Kind of small Lucerne [Alfalfa], called in Dauphiné *black clover*.

N^o 16. *Campanula glomerata*.

This is the balled-up or conglomerated campanula which by chance has here only a single flower instead of the tuft which it usually bears.

N^o 17. *Saponaria officinalis*.

This is the saponaria or soap-wort.

N^o 18. *Daucus carotta*.

This is the wild Carrot of which I have sent you an umbel in a letter before.

N^o 19. *Dactylis glomerata*.

Ask my Aunt Julie: it is a *grass*.

N^o 20. *Holcus lanatus*.

Meadow soft-grass. Another grass. ~

N^o 22. *Achillia millefolium*.

Milfoil [yarrow]. It is a composite.

N^o 21. *Lotus corniculatus*.

Lotus or common bird's foot trefoll, on account of its form and its pods.

N.B. I have by oversight transposed these two numbers.

N^o 23. *Galium verum*.

Yellow bedstraw [cheese rennet].

N^o 24. *Galium molugo*.

White bedstraw [cheese rennet].

N^o 25. *Melissa nepeta*?¹⁵¹

Calamint with the odor of Pennyroyal?

N^o 26. *Heracleum sphondylium*?

Hogweed, or False-branch ursine?

N^o 27. *Spiraea filipendula*?¹⁵²

Filipendula? You will recognize it easily if it is; for in uprooting it in Autumn, one finds its root of grains like small *peas* attached by very loose threads.

N^o 28. *Polygonum orientale*.

Prince's feathers. This plant is foreign, and you certainly did not find it in the countryside.

N^o 29. *Antirrhinum linaria*.¹⁵³

Linaria.

N^o 30. *Borrago officinalis*.

Borage. How Cousin? Do you not know the borage?¹⁵⁴

LETTER VIII¹⁵⁵

11 April [1773] in great haste

Thank Heavens, dear cousin, you are well again. But it is not without your silence and that of M. Gaujet whom I had insisently asked to write me a word upon his arrival having caused me plenty of alarms. During this sort of distress nothing is more cruel than silence because it makes everything worse. But all that is already forgotten and I sense nothing more now than the pleasure of your return to health. The return of beautiful weather, the less sedentary life of Fourvière, and the pleasure of filling with the sweetest success as well as the most respectable of functions will soon strengthen it and you will feel less sadly the temporary absence of your Husband in the midst of the dear signs of his attachment and the continual cares your children demand of you.

You know that at this moment I also plan to ask you on my account the same cares that you have kindly taken in previous years to arrange to pass my Aunt the small tribute of my remembrance and my attachment. If your dear Husband comes promptly, I will ask him to take charge of this shipment; but as I am already late, If he is still late in coming I would like you to indicate to me here someone to whom I can remit this money in order

to send it to you as soon as possible, so that my good aunt not be kept waiting any longer.

The earth begins to turn green the trees to bud, The flowers to Blossom; there are already some over; one moment of delay for botany would put us behind an entire year: Hence I proceed to it without any other preamble.

I fear that we have treated botany thus far in too abstract a manner, in not applying our ideas to specific objects. This is the error into which I have fallen principally with regard to the umbellifers. If I had begun by placing one before you I would have spared you a very fatiguing work on an imaginary object and myself the difficult descriptions which a simple glance would have done duty for. Unfortunately, at the distance where the law of necessity keeps me from you, I am not in a position to show you objects first-hand; but if we can both have some similar ones before our eyes, we will be able to understand each other very well in speaking of what we see. The entire difficulty is that it is necessary that the indication come from you; since to send you dry plants from here would do nothing. In order to recognize a plant well, it is necessary to begin by seeing it standing. Herbaria serve as reminders of those one already knows; but they make those one has not seen before difficult to recognize. It is therefore for you to send me the plant that you want to know and that you will have cut on the stalk; and it is for me to name them to you, to Classify them, to describe them; until by comparative ideas having become familiar to your eyes and your mind you arrive at Classifying, arranging, and naming yourself those that you will see for this first time. Science alone distinguishes the true botanist from the herborist or nomenclaturist. This means learning to prepare, dry, and preserve plants or samples of plants in a way to render them easy to recognize and determine. In a word, I propose that you begin an herbarium. Here is a great occupation which from a distance prepares itself for our small lover of botany: since at present and for some time still it will be necessary that the skill of your fingers make up for the weakness of hers.

There is first of all one provision to make: that is to say five or six quires¹⁵⁶ of gray paper and about as much white paper of the same size fairly strong and well made, without which the plants would rot in the gray paper or at least the flowers would lose their color, which is one of the features which makes them recognizable and which make an herbarium pleasant to see. It would moreover be desirable if you had a press of the size of your paper, or at least two pieces of board well joined, in such a way that in placing your leaves between them you could hold them pressed, by stones or other heavy bodies with which you weigh down the top board. These prepara-

tions made, here is what it is necessary to observe in order to prepare your plants in a way to conserve them and recognize them.

The moment to choose for this is the one when the plant is in full flower, and when even some flowers begin to fall in order to make room for the fruit which is beginning to appear. It is at this point when all the parts of the fructification are perceptible, that it is necessary to try to take the plant in order to dry it in this state.

The small plants can be taken completely whole with their root which one is careful to clean well with a brush so that no more soil remains. If the soil is damp one lets it dry in order to brush it or indeed washes the root, but it is necessary to pay the greatest attention to rinsing and drying it well before placing it between the papers, without which it will inevitably rot and will communicate its rot to the other neighboring plants. It is not necessary however to persist in conserving the roots unless they have some remarkable peculiarities; for in the greatest number, the ramified and fibrous roots have such similar forms that it is not worth the trouble to conserve them. Nature, which has done so much for elegance and ornament in the form and the color of plants in what strikes the eyes, has destined the roots exclusively to useful functions, since being hidden in the earth giving them a pleasing structure would have been to hide the light under the bushel.

Trees and all the large plants can be taken only by samples. But it is necessary that this sample be so well chosen that it contains all the constitutive parts of the genus and the species, so that it can suffice for recognizing and determining the plant which furnished it. It does not suffice that all the parts of the fructification be perceptible which serves only to distinguish the genus; it is necessary that one sees well the character of the foliation and of the ramification; that is to say, the birth and the form of the leaves and the branches, and even as much as possible some portion of the stem; for as you will see in the following; all this serves to distinguish the different species of the same genus which are perfectly alike in flower and fruit. If the branches are too thick one thins them down with a knife or penknife in adroitly reducing underneath their thickness as much as possible without cutting and mutilating the leaves. There are botanists who have the patience to slit the bark of the branch and from it draw out adroitly the wood, in such a way that the rejoined bark seems to show you the whole branch even though the wood is no longer there. By means of which one does not have between the papers too considerable thicknesses or protuberances that spoil and disfigure the herbarium and give a bad form to the plants. In the plants where the flowers and the leaves do not arrive at the same time, or originate too far from each other one takes a small branch in

flower and a small branch with leaves and places them together on the same paper thus one offers to the eye the various parts of the same plant, sufficient in order to make it recognizable. With regard to plants where one finds only leaves and whose flower has not yet arrived or which is already past, it is necessary to leave them, and to wait in order to recognize them until they show their visage. A plant is no more surely recognizable by its foliage than a man by his clothing.

Such is the choice that it is necessary to put into what one cuts. It is also necessary to put some also into the moment one takes for this. The plants cut in the morning at dawn, or in the evening in the dampness, or in the daytime, during the rain do not last. It is absolutely necessary to choose dry weather, and even in that weather the driest moment and the hottest of the day, which is in summer between eleven o'clock in the morning and five or six o'clock in the evening. Even then if one finds there the least dampness one must leave them; for inevitably they will not last.

When you have cut your samples you bring them home always very dry in order to place and arrange them on your papers. For this you make your first layer of two sheets at least of gray paper on which you place one sheet of white paper, and on this sheet you arrange your plant, taking great care that all its parts, especially the leaves and the flowers are wide open and spread out in their natural position. The somewhat withered plant, but without being too much so, usually lends itself better to the arrangement that one gives it on the paper with the thumb and fingers. But there are rebels which curl up on one side while one is arranging them on the other. In order to prevent this inconvenience I have weights, large coins, farthings with which I make steady the parts I have just arranged, while I arrange the others, so that when I have finished, my plant finds itself almost completely covered with these pieces which hold it in place. After this one places a second white sheet on the first and one presses it with the hand in order to hold the plant constrained in the position one has given it, advancing thus the left hand which presses as one withdraws with the right the weights or large coins which are between the papers; one then places two other sheets of gray paper on the second white sheet without ceasing for a moment to hold the constrained plant, for fear that it not lose the position that one has given it; on this gray paper one places another white sheet, on this sheet a plant that one arranges and covers as above, until one has placed the entire harvest one has brought back, and which ought not to be numerous for each time; as much to avoid the length of the task, as for fear that during the drying of the plants the paper not take up some dampness from their large number; which would inevitably spoil your plants if you do not hasten to change the paper with the same atten-

tion; and this is even what it is necessary to do from time to time until they have fully taken their shape and are completely dry.

Your pile of plants and papers thus arranged ought to be put in the press, without which the plants would curl up; there are some that wish to be more pressed, others less; experience will teach you this, in the same way changing their paper at the right time and also often as necessary, without giving you a useless task. Finally when your plants are completely dry, you will place them very neatly each on a sheet of paper, one on top of the other without having need of intermediate papers; and you will have thus begun an herbarium which will grow without ceasing with your knowledge, and will finally contain the history of all the vegetation of the country; For the rest it is always necessary to keep this herbarium well closed and a bit pressed; without which the plants however dry they are will attract the humidity of the air and will curl up again.

Here now is the use of all this work to arrive at the particular knowledge of plants and to allow us to understand each other well when we speak about it.

It is necessary to cut two samples of each plant; the larger one to keep, the other smaller to send to me. You will number them with care so that the large and the small sample of each species have always the same number. When you will have one or two dozen species thus dried you will send them to me in a small book at some point. I will send you the name and the description of the same plants, by means of the numbers you will recognize them in your herbarium, and from there on the ground, where I expect that you will have begun to examine them well. Here is a sure way to make progress as certain and as rapidly as possible from your guide.

You will not be able to read this paper, I fear; for myself I do not have the time to reread it; it is lacking for me and I finish. Good day, cousin.

Many greetings, I beg you, to Monsieur De Lessert, to the dear Mother, to the whole family. My compliments to M. Gaujet. My wife embraces you with all her heart.

NB.— I forgot to tell you that the same papers can serve several times so long as one has taken care to let them air out well and dry beforehand. I ought to add also that the herbarium ought to be kept in the driest place of the house, and on the first rather than on the ground floor.

Since my letter was written I just received the visit of Monsieur de Lessert. I mean to apprise you neither of his arrival nor of the pleasure this agreeable surprise gave me. But I can tell you at least that he seemed not at all fatigued by the voyage and that I have never seen him either so fat or looking so well.

105. Rousseau refers to his letter of 13 August 1771.

106. This paragraph is missing from the manuscript of the letters at the library of Neuchâtel, presumably because the addressee, Mme Delessert, did not wish any matters of a personal nature to be relayed in the published version. It was restored by Godet and Boy de la Tour. The originals are in the possession of one of Mme Delessert's descendants (see *Pléiade*, IV, 1886).

107. M. Josse is a character in Molière's *L'Amour médecin* "who counsels Sganarelle to purchase jewelry to cure his daughter, because he himself is a goldsmith (act I, scene 1)." *Pléiade*, IV, 1808.

108. Rousseau's term is "*Vâme*," which Martyn and Ottevangner both misleadingly translate as "mind" (*esprit*). Martyn, 19; Ottevangner, 26 (see n. 71).

109. Rousseau chooses as the first subject for study one of the largest and most important plant families, comprising more than 200 genera and about 2000 species.

110. The plant referred to here belongs to the genus *convolvulus* of the morning-glory family. The plant known in French as "clochette des champs" seems to be field bindweed (*C. arvensis*), also known in French as "liseron des champs."

111. See "Poussière prolifique." Martyn (23) introduces "farina" in this passage as a synonym for "pollen."

112. This is a reference to the classification criteria developed by Linnaeus. Martyn (24) omits a rendering of the phrase "*à divers degrés*."

113. Martyn (24) does not translate the phrase "des parties des fleurs."

114. Rousseau's "famille des liliacées" can be translated as "family of liliaceae" (the technical name for the lily family) or simply as "lily family." Martyn (24) translates "famille" as "tribe." By "tribe" he means an "order," a synonym for a "family." There is, however, nothing incorrect about Rousseau's use of the term "famille" to describe the "famille des Liliacées" and, according to modern authorities, the lilies form a family in the technical sense. Rousseau's "famille" is therefore translated literally as "family."

115. Martyn (24) omits the phrase, "mais toujours des bulbes," but Rousseau seems to have been trying to make an interesting, if slightly incorrect, point about the similarity of lilies in this respect; most, but not all lilies grow from bulbs, but bulbs are not roots. See *Pléiade*, IV, 1810, n. 2, in reference to p. 1154.

116. Martyn's translation (25) of the statement "ses parties qui les rend plus sensibles" by the abbreviated phrase "its other parts" avoids the difficulty in translating this sentence, but it is also an inadequate, even erroneous, translation. Rousseau emphasizes the pedagogical importance of using a flowering plant with easily visible parts, for many flowers are so small that their parts are visible only through a magnifying glass or microscope. Rousseau employed these instruments in his own investigations, but seems to have preferred to do without them in teaching a five-year-old. See *Pléiade*, IV, 1174–1175.

117. Per the wishes of Mme Delessert, this last sentence was not included in earlier published versions. It refers not to her daughter, the recipient of this course of instruction, but to her son, Jules-Jean-Jacques.

118. Sébastien Vaillant pointed out the diminished reproductive capacities of double flowers as "a typical degeneration." Vaillant is quoted in Carolus Linnaeus, *Systema naturae* 1735, trans. with introduction by M. S. J. Engel-Ledeboer and H. Engel (Amsterdam: Nieuwkoop & B. de Graaf, 1964), 11. See also *PB*, §150. In his *Discours sur la sexualité des fleurs* (1717), Vaillant writes:

it happens fairly often that in some species of certain genera of polypetalous flowers, they dress as women in petals simply to create these agreeable monstrosities that we raise with so much care under the name of double flowers and among which we find but few or no testicles at all: these unnatural mothers devour them so to speak from the cradle in appropriating to themselves all their nourishment.

Quoted in French in Vaillant, 204; see Stevens, 299, for a similar view ex-

pressed by Antoine-Laurent de Jussieu. On sterile hybrids "accompanied by an excess of size or great brilliance," see also Darwin, 265.

119. "Character" or "caracter," a technical term of Linnaean systematics, refers to those characteristics of a plant or animal used to classify it. Linnaeus' system considered the number and position of stamens and pistils, but not color, as "characters" of a plant. Rousseau deplors the fact that color is not considered a systematic character. See letter of 12 February 1767 to the Duchess of Portland.

120. "Nasitord" is known also as "Field Peppergrass." "Natou" has no direct English equivalent. These plants belong to the species *Lepidium campestre*, which is a member of the same genus as the common cress, or "cresson alénois," *L. sativum*.

121. The herbarium did eventually reach its intended recipient, Mme Delessert's sister, "Aunt Julie," Julie-Emilie Willading-Boy de la Tour (1751–1826). It contains 101 plants and is housed in the Stadtsbibliothek of Zürich. See Théophile Dufour, "Petit Herbar pour Mademoiselle Julie Boy de la Tour," *Annales de la Société Jean-Jacques Rousseau*, Vol. 2 (1906): 260–268, and Ruth Schneebeli-Graf, *Das Zürcher Herbar von Jean-Jacques Rousseau*, guide to the exhibit of 12 January–13 March 1980, Wohnmuseum Bäreneggasse, Zürich.

122. Rousseau chooses six of the seven main families recognized in the natural system worked out by Bernard de Jussieu: Liliaceae, Cruciferae, Leguminosae, Labiateae, Compositae, Umbelliferae, and the grasses or Gramineae. See Stevens, 298.

123. See "Etendart" on p. 107 above. "Pavillon" is used only in French.

124. We have translated *quille* as "keel" and the virtually synonymous term, *na-celle* (or *carène*) as "carina." According to Peter Stevens, Rousseau "is making some sort of distinction between the keel as a whole, and the edge of the keel," personal communication.

125. Actually, two petals are involved.

126. The French word for butterfly is *papillon*.

127. Snapdragon goes under several names in French, *Gueule de loup*, *Musflor*, *Musfle de veau*, *Musflande*, and *Musfleau*.

128. A reference to Mme Boy de la Tour's daughter, Julie, for whom Rousseau made the herbarium discussed in this and the preceding letters.

129. See Dufour and Schneebeli-Graf, n. 121.

130. See n. 9 on Tournesfort.

131. Rousseau here echoes the pedagogical approach he previously outlined in *Emile*, Book III: "No book other than the world, no instruction other than the facts" (Bloom, 169). "In general never substitute the sign for the thing except when it is impossible for you to show [the thing]" (Bloom, 170). In short, Rousseau distrusted memorization of words as an effective means of learning. See also A.-L. de Jussieu, "Examination of the Family of the Ranunculii" (Mémoire read before the Académie royale des sciences in 1773), in which he pleads the case "for making Botany not a Science of memory and names, but a new Science, which has its combinations and affinities. . . ." (translated in Stevens, 275).

132. I have not been able to find this term attested in French.

133. Rousseau refers here to the various competing systems of plant classification of his day, among which the most prominent were those of Linnaeus and the Jussieus.

134. Chardon-roland or -roulant (*Eryngium campestre*) is a thistle-like plant,

for which the general English name is eryngo; alternative names are sea holly and snakeroot. Descriptions of a related species, *Eryngium alpinum*, appear in Rousseau's unpublished notes from Jean Bauhin's *Pinax* and Albrecht von Haller's *Enumeratio methodica stirpium Helvetiae*, 1st ed. (Göttingen, 1742).

135. By "natural" Rousseau refers to the natural family system of Bernard and Antoine-Laurent de Jussieu, based in large measure on traditional family classifications long in use in Europe. See S. M. Walters, "The Shaping of Angiosperm Taxonomy," *The New Phytologist*, Vol. 60 (1961): 74-84. While the designation "natural" stands in opposition to Linnaean "artificial" classification, Linnaeus did in fact recognize this group as containing eryngium-type plants. See P. D. Giseke, *Prælectionis in ordinis naturales plantarum* (Hamburg, 1792).

136. Rousseau refers to *girole*; if we take this to mean *girolle*, which is the closest corresponding French vernacular plant name, we find that he is referring to an edible mushroom also known in both English and French as *chanterelle*. This reference does not make sense in this context.

137. Godet and Boy de la Tour place this seventh in the series of eight letters.

138. All marguerites are indeed some form of daisy, but I have translated only *paquerettes* as daisies, in order to maintain the distinction between this plant and related ones.

139. See "Fleur," pp. 108-110 above.

140. Rousseau's term is *languette*, defined in Littré as "particularly, in botany, appendix which terminates the demi-florets of composite flowers, called also and more often ligule." In English the *languette* is known as as "ligular flower."

141. See "Demi-fleuron," pp. 105-106 above.

142. The flower known in French as "grande marguerite" refers to several species: *Chrysanthemum x superbum*, *C. maximum*, *C. vulgare*, and *C. leucanthemum*. Its English equivalents include Shasta daisy, Oxeye daisy, Bachelor's Buttons, and Marguerite.

143. See Rousseau's letters to the Duchess of Portland in this volume.

144. Godet and Boy de la Tour give the date as probably some time during the Spring of 1774 and place it last in the series of eight letters. They justify this chronology on evidence that it postdates Rousseau's letter of 21 January 1774 and predates that of 28 May 1774, "as one can see from certain details in the text. (See the last line of the letter of 21 January and the allusion to the 'fruit trees' in that of 28 May.)" See Godet and Boy de la Tour, 158, n. 1.

145. Leigh speculates that M. Tessier might perhaps have been a member of the banking family of Jean Texier. See Leigh, Vol. XL, 197, n. (c).

146. Suzanne Goncerut (1682-1775), sister of Isaac Rousseau, took care of Jean-Jacques Rousseau as a child. Rousseau sent her an annual monetary gift through the Delessert banking house. In the *Confessions*, Book I, Rousseau speaks of his adoration for her and his belief that her own musical gifts inspired his taste for music (*Collected Writings*, Vol. 5, 9-10).

147. Compare Darwin: "When, on the one hand, we see domesticated . . . plants, though often weak and sickly, yet breeding quite freely under confinement . . . we need not be surprised at this system . . . acting not quite regularly, and producing offspring not perfectly like their parents or variable." Darwin, 9.

148. These "kinds" of cherries are known as "cultivars."

149. Plums and related fruits listed here belong to the genus *Prunus*, a member of the family Rosaceae. Hence the common plum, or “plum proper,” goes under the Latin name *Prunus domestica*. Some authorities place the peach and the almond in the genus *Amygdalus*.

150. This was a valid species according to Jackson and Hooker, but it is not recognized in *Fl. Eur.*; the genus is still valid, however.

151. This is now *Calamintha nepeta*.

152. This is now *Filipendula vulgaris*.

153. This is now *Linaria vulgaris*.

154. Rousseau questions how his correspondent would be unaware of this plant, used in France for both culinary and medicinal purposes.

155. Godet and Boy de la Tour place this letter sixth in the series of eight letters, in accordance with the chronology of composition, even though Rousseau himself placed this one last because his discussion of herbaria interrupted the order of his treatment of families of flowering plants. See Pléiade, IV, 1179, n. (a), 1195, n. 1. This letter treats the purposes and manufacture of herbaria, a subject of great import for botany then as today; Rousseau follows a tradition dating back to Luca Ghini (1490?–1556), who is credited with having produced the first herbarium in Europe, and Adriaan van den Spiegel (1578–1625), who produced an early written treatise on the subject, *Isagoges in rem herbarium libri duo* (Padua, 1606). The entry “Herbier” in the second edition of Claude Richard’s revised fourth edition of J. B. F. Bulliard’s *Dictionnaire élémentaire de botanique* (Paris, 1802) reproduces a similar text, which is taken from a purported manuscript of Rousseau on herbaria. See Leigh, Vol. XXXIX, 145–146, who reproduces the entry in part, as do the editors of the Hachette edition of Rousseau’s *Œuvres Complètes*, vol. 6 (Paris, 1857), 300–302, note. See also Stafleu and Cowan, s.v. “Richard, Louis Claude Marie.”

156. As a quire comprises 25 sheets of paper, Rousseau advises having 125 to 150 sheets each of gray and white paper on hand for this project.