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Contents

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List of Figures

CHAPTER 2

An Idea Ahead of Its Time: Jean-Jacques Rousseau's Mobile Botanical Laboratory

Alexandra Cook

Introduction

Despite his well-known polemics against the sciences as a source of moral degeneration, Jean-Jacques Rousseau (1712–1778) pursued a sustained engagement with the natural sciences.[1] These included chemistry and botany, in that order. The manuscript of Rousseau's *Institutions Chymiques*, discovered in 1882, attests to Rousseau's detailed knowledge of chemistry. Furthermore, references to "experiments"[2] appear in works as diverse as Rousseau's *Lettre sur la Musique Françoise*[3], and *Discours sur l'Origine et les Fondements de l'Inégalité* and *Confessions*. Experimentation, broadly construed, thus provides an important basis for the domains in which Rousseau philosophized. This experimental orientation likewise significantly shaped the practices Rousseau applied in his botanical expeditions.

This argument may seem improbable in light of the objections Rousseau mounted against chemistry when he rejected it in favour of botany.[4] He asserted that in preferring the dead to the living chemistry gives no insight into the mystery of life,[5] that it is dirty, expensive and dangerous. Chemistry, Rousseau alleged, is more attached to pride than to knowledge for its own sake: "From all this sad and tiresome toil

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much less knowledge than pride ordinarily results, and where is the most mediocre chemist who does not think he has penetrated all the great operations of nature because he has discovered, perhaps by chance, a few small tricks of the art?"[6] Worst of all, chemistry's connection with alchemy and metallurgy taints it with greed and economic inequality.[7] Yet, despite Rousseau's polemics against chemistry, his botanical expeditions derived inspiration from the laboratory and experimentation taken in its broad eighteenth-century sense (described below): (1) Rousseau regularly tested others' reports during his botanical expeditions and encouraged others to do so as well; (2) he used instruments as aids to the senses and (3) carefully organized the work to be done. These expeditions were experimental in another key respect: they were open-ended, their final results not known until the end, even if every attempt was made to control for the desired outcome.

Moreover, despite its association with a discredited science, the chemical laboratory fundamentally shaped Rousseau's general concept of doing botany: he declared that the fields adorned with flowers provide the botanist's "only laboratory".[8] At first sight this statement may seem paradoxical. Why refer to the fields as a laboratory for the botanist while criticizing the "sedentary work of the laboratory"?[9]

There is certainly more than one way to interpret this statement. On the one hand, Rousseau could be understood to subvert the notion of the laboratory by moving from a smoky, enclosed space into the sun and open air where collection, identification and preliminary preservation of plant specimens supplant the destructive transformations effected in chemistry. At the same time, the laboratory, which relies on a hierarchical division of labour and complicated, fixed and costly apparatus affordable only by the wealthy, gives way to fresh air, open spaces and beauty accessible to anyone able to acquire a few simple instruments.

In this sense, the choice of botany is therefore not only scientific or philosophical, it is also political. The botanist's realm is more transparent and democratic than that of the chemist; unlike the chemist, who relies on costly apparatus that requires servants to use, the botanist independently studies plants while "easily carrying all his tools in his [or her] pocket".[10] This independence is coupled with the moral and aesthetic appreciation of "nature, who never lies".[11] Hence unlike the chemistry laboratory, the woods and fields are tainted neither by human vanity nor by deception.[12]

On the other hand, rather than being seen to subvert the concept of the laboratory, Rousseau can be understood to invoke the broad eighteenth-century understanding of the laboratory as the site of the *work*. Such a meaning derives directly from the Latin verb "*laborare*": to work. This meaning is mooted in the *Dictionnaire de l'Académie Française* (1762) which defines the laboratory as the "[p]lace where Chemists have their furnaces & their vessels for *working*".[13] This broad, non-restrictive definition allows ample room for botanical practices to supplant chemical ones, thereby preserving the laboratory's virtues minus some of its less savoury connotations. Hence, to invoke the "laboratory" in the middle of the eighteenth century was to refer to a broad notion of work and work space, a space that botany could claim equally with chemistry.[14]

Rousseau may have had all these interpretations of the fields as the botanist's laboratory in mind. It is entirely consistent with his way of philosophizing to entertain two contrary or apparently inconsistent ideas at the same time. So he might both subvert the chemistry laboratory's social and scientific status while nonetheless deriving conceptual mileage from introducing the term "laboratory" into botany.

While the Academy's definition of laboratory does not explicitly refer to "experiment", its reference to the "[p]lace where Chemists have their furnaces & their vessels for *working*" strongly implies experimentation. The contemporary understanding of the term "experiment" originates in the Latin verb, *experiri*, to "try". The 1762 edition of the *Dictionnaire de l'Académie Française* preserved this meaning, giving a broad definition that relates to daily experience, as well as to scientific work: "Test that one makes of something, either by design or by accident. *A strange experience/experiment. New experience/experiment. To have a sad experience, an annoying experience. Experience/experiment is the mistress of the arts. I know this by experience/experiment. I have had experience of it.* […] Philosophers conduct experiments on nature every day."[15] Understood as "test" the term "experiment" can apply to a wide range of scientific activities, including ones that might not seem to fall under a strict modern construction of the term. These activities might include testing evidence one collects against assertions by other authorities. Moreover, the definition of the verb "*experimenter*" tracks with the meaning of the noun, "experience": "*To test* a remedy, a recipe, a secret by experiment/experience. I have tested 100 times that […]. If you doubt the effectiveness of this medicine, you can test it."[16]

The Chemical-Experimental Moment

Rousseau's importation of the laboratory into the botanical context is probably attributable to his youthful involvement with chemistry over the better part of a decade. This involvement started in the 1730s during his cohabitation with Françoise-Louise de la Tour, Mme de Warens (1699–1762), who provided the maternal care that Rousseau, whose mother died shortly after his birth, otherwise lacked. Rousseau called her "Maman"; she sponsored his conversion to Catholicism and supported his autodidactic endeavours. She also introduced him to the chemistry of plant-based pharmacology. Hence, even though Rousseau does not clearly indicate when and where he learned the practical side of chemistry, he probably acquired much of this knowledge while helping Maman manufacture herbal medicines in her home. In fact she probably used the same procedures and ingredients as did apothecary-chemists of the time since the "material culture of academic laboratories overlapped strongly with the realm of instruments, reagents, technologies and materials applied and produced in apothecary's laboratories, assaying shops, and distilleries".[17] For example, the apothecary-chemists of the Royal Academy of Sciences (Paris) focused on extracting medicinal properties from plants by distillation and solvent analysis.[18] Rousseau's acquaintance with what was known as "vegetal chemistry" is attested by an undated list of sixty-six of the Paris Academy's *Mémoires* and *Histoires* on chemistry.[19] In the *Confessions* he reports temporarily blinding himself in an experiment with invisible ink. Rousseau continued these studies after moving to Paris in 1741.

That Rousseau was influenced by Maman's pharmaco-chemical milieu, and an introduction to academic chemistry in Paris in May 1743, is suggested by his account in the *Confessions* of three "experiments" he conducted during his diplomatic service in Venice from September 1743 to August 1744. Rousseau intended these experiments to show the superiority of Italian over French music; they comprised (1) a technical comparison of two songs, one from each tradition, and equally esteemed; (2) giving French songs by Jean-Baptiste Lully (1632–1687) to Italian singers, while giving Italian songs to French singers, and (3) a performance of both Italian and French songs before an Armenian who allegedly had never heard music before (an improbable claim). In his descriptions of these experiments, Rousseau refers to the "precautions" he applied, and assesses the outcomes as more or less "decisive". These comments suggest that he was already well-versed in basic experimental procedure.[20]

Upon returning to Paris from Venice in late summer 1744, Rousseau's chemical education was stimulated by his relationship with the wealthy Dupin family. The heir to this fortune, Charles-Louis Dupin de Francueil (1716–1780), aspired to membership in the Royal Academy of Sciences (Paris)[21] and enlisted Rousseau in this pursuit: "I became attached to Chemistry. Along with M. de Francueil I took several courses with M. Rouelle, and for good or ill we began to scribble on paper about that science whose elements we barely possessed."[22] Rousseau and Francueil studied chemistry with Guillaume-François Rouelle (1703–1770), who taught at the Jardin du roi in Paris and played a key role in eighteenth-century French chemistry.[23] While he never published a work on chemistry, Rouelle was an important teacher and Academician who popularized the phlogiston theory.[24] Rouelle's teaching was experimentally and quantitatively grounded, paying close attention to temperature regulation and sealing vessels to avoid loss of reagents and products.[25]

After Rouelle's course, Rousseau set up a laboratory with Francueil at the chateau of Chenonceaux, the Dupin family home[26]: "In 1747 we went to pass the autumn in Touraine at the Chateau de Chenonceaux, the royal house on the Cher, built by Henri II for Diane de Poitiers […]. I composed other little works there […] and all that was done without discontinuing my work on Chemistry […]."[27] From the 1730s into the late 1740s or even 1750s Rousseau invested considerable time and energy in chemistry.[28]

An experimental basis likewise supported Rousseau's subsequent work in other domains. For example, Rousseau portrays the *Discours sur l'Origine et les Fondements de l'Inégalité* as conjectural and hypothetical.[29] In this same work, he invokes an experimental result as evidence for his thesis concerning the fertility of an originally forested planet: "My third and most important remark is that the fruits of Trees furnish animals with a more abundant food supply than other plants can, a result that I myself obtained in comparing the products of two pieces of land equal in size and quality, one covered with chestnuts and the other planted with wheat."[30] In *Emile*, Book III, Rousseau teaches practical chemistry in the context of food adulteration. His later polemics against chemistry (referred to above) likewise reveal his familiarity with the investigative methods applied to plants in the laboratory.[31] Given that these works were written during or after Rousseau's chemical phase, it seems reasonable to infer that chemical experimentation played a key role in inspiring these experimental approaches to various philosophical issues.

Instruments and Expeditions

> *Instrument*. Masculine noun. Tool that serves the worker, [and] the artisan to make something. *Good instrument. Necessary instrument. Surgical instrument. Instrument of the Carpenter, the Mason, etc. A worker furnished with all his instruments* […].[32]

Artisans made instruments and understood how to use them; hence Francis Bacon (1561–1626) and Dénis Diderot held up artisans and their skill-sets as crucial to the progress of science and technology. Indeed, apparatus and instruments play a key role in chemistry to this day. As an instrument-based science, chemistry is rooted in the artisanal milieu from which Rousseau—born into a family of Geneva watchmakers—came. A strong artisanal bent is revealed in his interest in book-binding, compiling herbaria and making laces.[33] His ability to use his hands to create useful and beautiful things harked back to his grandfather, David Rousseau (1641–1738), one of Geneva's great seventeenth-century watchmakers.[34]

In the *Institutions Chymiques*, Rousseau states that natural processes should be studied in "an *artificial Laboratory* on the model of nature", where "it does not suffice to look in a general way at the means she employs, one must above all perfectly know the *instruments* of which she makes use".[35] The work divides these "instruments" into "natural" and "artificial": the "natural instruments" discussed in Book 2 comprise the traditional four elements inherited from antiquity—earth, air, fire and water—while the "artificial" ones discussed in Book 3 comprise "furnaces and vessels, other chemical instruments, solvents and precipitates"[36]—the usual apparatus of the chemistry laboratory employed in distillation and solvent analysis.

Later, critiquing chemistry and mineralogy from the standpoint of a one-time adept, Rousseau displayed an accurate knowledge of the equipment used in chemical experimentation:

> To make progress in the study of minerals, it is necessary to be a chemist and a physicist. It is necessary to perform tedious and costly *experiments*, to work in *laboratories*, to spend much money and time in the midst of charcoal, *crucibles*, *furnaces*, *retorts*, smoke, and suffocating fumes, always at the risk of life and often at the expense of health.[37]

This focus on instruments was not ephemeral; from the beginning of his botanical studies Rousseau exercised great care in his selection and use of instruments, enlisting the Genevan geologist, Jean-André Deluc (1727–1817),[38] to help him acquire the indispensable portable kit of

the field botanist on the move: magnifying glasses ("*loupes*"), small scissors, and tweezers for plucking small plant parts. In a letter to Deluc, Rousseau explained his reasons for acquiring these instruments: "as you have inferred, the microscope is for botany; hence I want it to have a field [*champ*] sufficient to encompass the pistil and stamens of a small flower. For the rest I rely completely on you."[39] Like Rousseau, Deluc was a master watchmaker's son and his good connections with Geneva's artisans facilitated privileged access to precision instruments:

> if our friend [Jean-André Deluc] were able to make the small tools necessary for the dissection of flowers, I am certain that his intelligence would supplement that of the workers. These tools consist of three or four magnifying glasses of different magnifications, small, delicate and slender tweezers to hold the flowers, very fine scissors, pocketknive*s* and lancets to cut them. I would be very happy to have them in duplicate, except for the magnifying glasses; because there is someone here who has the same taste as I do, and who has been ill served.[40]

This letter likewise demonstrates Rousseau's sophisticated awareness of what the botanical fieldworker's work entails; in it he engages Deluc to obtain a second set of instruments for an unnamed botanist friend, probably Pierre Alexandre du Peyrou (1729–1794).[41] With its already highly developed technical capabilities, Geneva offered Rousseau and his circle unparalleled access to the best instruments available for pursuing his botanical fieldwork.[42]

Thus, despite his objections to the values and goals of chemistry, this discipline nonetheless shaped Rousseau's approach to botanical expeditions in several ways: he (1) accepted the utility of experiments as tests across many fields of study, (2) enthusiastically adopted instruments as aids to the senses and (3) envisioned the fields as a laboratory, shifting the locus of the work from the inside to the outside where, as we shall see, "[t]he excursion is his sole *work*".[43]

The Mobile Botanical Laboratory

For Rousseau, the exemplary botanist was not a chemist or an apothecary, but rather a philosopher such as Theophrastus (ca. 370–285 BCE), who sought knowledge of plants for themselves alone[44]: "botany […] is a study of pure curiosity that has no other utility than that which can attract a thinking being who is sensitive to the observation of nature and the

marvels of the universe".[45] Botanists have traditionally preferred to collect uncultivated plants in the wild, for they consider these true species rather than mere varieties created through cultivation. For Rousseau, an added attraction of the wild plant is the beauty, variety and finality bestowed on it by the Author of nature.[46]

Collection in the field entails expeditions. Key figures in sixteenth-century botany such as Luca Ghini (c. 1490–1556), Ulisse Aldrovandi (1522–1605), Andrea Cesalpino (1519–1603) and Gherardo Cibo (1512–1600) recognized the importance of field trips to botanical teaching. Ghini established "the field trip as a standard part of student training […]. Botanizing further strengthened the ties between mentors and disciples, as an essential rite of inclusion."[47] Having opined throughout his œ*uvre* that "nature never lies", Rousseau happily joined travelling botanists to find plants in the field.

Like the chemistry experiment, the botanical expedition can test the veracity of information generated by others and yield *discoveries*: (1) finding new plants, (2) observing already known ones in new locations, and/or (3) ascertaining whether a given species/genus is found in a particular habitat or location. These activities entail using instruments, organizing animals, people and things, and recording information just as one would in a stationary, indoor laboratory. Like the chemist's laboratory, the botanist's movable laboratory has its own peculiar set of risks and problems: for Rousseau these included bad weather, spoiled specimens or none at all, soggy bedding and even lost pets!

Rousseau's depiction of Carolus Linnaeus (1707–1778) as having "studied too much in herbaria and in gardens and not enough in nature itself" highlights the importance of fieldwork.[48] In other words Rousseau believed Linnaeus regarded enclosed, controlled spaces such as herbaria and gardens as his laboratories rather than spending sufficient time in the less predictable, more open-ended field laboratory.

Yet Rousseau's characterization is misleading because Linnaeus's requirement that every botanist make a herbarium actually fostered botanical fieldwork: the first steps in constituting a herbarium are collection, preservation and identification of specimens gathered in the field.[49] Furthermore, Linnaeus promoted scientific travel by his "Apostles" to far-flung places worldwide[50] and personally led many botanical trips closer to home.[51] Similarly, the Swiss botanist, Albrecht von Haller (1708–1777), established alpine botany by making arduous excursions, as well as working from specimens collected by his many assistants and colleagues;

these efforts culminated in his landmark *Historia Stirpium Indigenarum Helvetiæ Inchoata* (1768).[52]

For his part, Rousseau adapted his already engrained habit of walking to examining the wild, uncultivated plant still "on the stalk", growing in the ground.[53] While he agreed with Linnaeus that botanists should make herbaria, Rousseau stressed that they must start their studies with the living plant, not from a dried specimen which may be missing parts, may have faded, or deteriorated: "one herborizes uselessly in an herbarium […] if one has not started by herborizing *on the earth*. These sorts of collections should serve only to facilitate recollecting, but not for first instruction."[54]

Organization

Always keen on flawless organization, Linnaeus famously emphasized the importance of the well-organized field trip, the *herbatio*. His field trips were open to any and all paying participants of either sex and sometimes included foreign visitors and dignitaries.[55] In his *Philosophia Botanica*, Linnaeus specified procedures and details of the botanical field trip[56]: "There are RULES for those who come late, depart early, or are absent. And for the division [of labour], lunch at 2, rest at 4, and for a secretary."[57] He stipulated the length of the journey,[58] what was to be collected, recorded, and taught: the professor should give a "single DEMONSTRATION […] lasting not longer than half an hour."[59] Linnaeus even prescribed the clothing to be worn: "Very light and very loose CLOTHING proper to botanists"[60] and the instruments [*instrumenta*] to be used—books, magnifying glass, Dillenian case, botanical needle and knife.[61]

As an admirer of *Philosophia Botanica*, Rousseau presumably knew this list even if he rather unfairly suggested that Linnaeus did not do enough field botany.[62] On all his expeditions—whether solitary walks, or group expeditions with or without a guide, whether for a day or several days—organization mattered just as much to Rousseau as it did to Linnaeus. In fact, Rousseau assumed a major role in these expeditions, issuing his own instructions to participants. In the "*collège de botanique*" with whom he explored the Val de Travers "Rousseau, as the oldest, was the captain of the small troop, charged with the discipline of the corps, and with maintaining order and subordination."[63]

It should be stressed that these expeditions entailed a significant degree of organizational complexity: the scientific side of the undertaking required not only small instruments such as magnifying glasses and

cutting tools, but also the proper types of grey and white paper for drying the specimens, containers for holding the specimens and writing supplies for making notes in the field.[64] The care Rousseau took to record important observations about specimens right away in the field was revealed by his fear that the herbarium he had made for Julie Boy de la Tour[65] had been lost along the way: "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 on the spot*, and of which I have not kept a duplicate."[66]

In addition, several days' provisions had to be obtained and prepared for the journey. Pack animals had to be procured and a good guide was indispensable. Lacking many conveniences that we take for granted, such as good roads and comfortable transport, an expedition posed many logistical challenges. The group therefore needed a clear division of labour, which Rousseau spearheaded:

> Concerning the donkey for [carrying] provisions, I completely approve of it; this is a procession in which I wish to take part more than anyone: We must also agree on a treasurer or bursar who is in charge of all the supplies and the budget. As you are one of the four who knows the country the best, the only one who speaks the language, I agree that you should be asked to take charge of this duty […].[67]

Another participant reported on the result of these discussions:

> Judge[68] Leclerc supplied the provisions. M. du Peyrou had responsibility for the herbaria. Colonel de Pury was our guide; he carried the compass, for in the dark thickets of the forests it's only possible to be guided by knowing where north lies. […] I had furthermore custody of the coffee and the task of making it; armed with a lighter[69] that I preserved very carefully, it was I who lit the fire in the woods […] and gave the coffee its proper preparation.[70]

Rousseau attended to such details as reminding du Peyrou to bring the requisite books and everything needed to make coffee en route:

> I advise you not to forget our provisions of coffee, sugar, coffee pot, lighter, and the entire apparatus so that we can make coffee in the woods when we wish. Bring Linnaeus and Sauvages,[71] an amusing Book, and some games for us to entertain Ourselves somewhat if we are stuck inside during bad weather. It is necessary to foresee all eventualities in order to avoid boredom and idleness.[72]

Rousseau not only led expeditions, but also initiated them; in July 1768 he prepared "to herborize at the Grande Chartreuse with a fine and good company of botanists that I found and recruited in this region".[73]

As in the formal laboratory setting, team-work played an important role in botanical expeditions that involved more than one person. The camaraderie that Rousseau promoted in the group facilitated cooperation. Recalling "the ease and gaiety of walking journeys", Rousseau reminded one of his companions, "none of us were at all glum at Brot".[74] This sense of camaraderie is reflected in his characterizing his fellow botanists as a congenial group—a "Caravan" or "Crew".[75] Rousseau mobilized this esprit de corps to facilitate mutual research assistance, which he emphasized in a letter of introduction to one such companion: "we will help each other, and will return as little Linnaeuses. […] I salute you, Sir, and embrace you warmly; since we shall be travel companions[,] permit me to address you with familiarity in advance."[76]

Expeditions Testing the Reports of Others

Visiting the field laboratory offers the possibility of performing *tests*—a core aspect, as we have seen, of the eighteenth-century understanding of experiment. Fieldwork might test, for example, whether a species allegedly found in the past in a particular location could be found there again. Local florae provided such testable reports in spades; Rousseau made a point of verifying against such reports what could actually be found on the ground:

> [I]t seems to me that one of the great charms of botany is, in addition to seeing for oneself, that of *verifying* what others have seen; to give, on the *testimony* of my own eyes, my assent to the fine and just observations of an author seems to me a real delight: instead, when I *cannot find* what he says, I am always troubled if it is not I who sees badly. Besides, being able to see only very little on my own, I have to rely for the rest on what others have seen […].[77]

Rousseau recounts an expedition in May 1771 to Montmorency (north of Paris) with the "crew" of the Jardin du roi in which he took the initiative to test reports by three distinguished botanists—Tournefort, Bernard de Jussieu (1699–1777) and Sébastien Vaillant (1669–1722)—that *Plantago monanthos* or *P. uniflora* L. (names bestowed by Joseph Pitton de Tournefort [1656–1708][78] and Linnaeus, respectively) was growing by

the lake in Montmorency.[79] The participants, led by Antoine-Laurent de Jussieu (1748–1836)[80] and André Thouin (1747–1824)[81] of the Jardin du roi, took this mission so seriously that they nearly suffered heat stroke.[82]

The botanists from the Jardin du roi (including Bernard de Jussieu's nephew, Antoine-Laurent) tested these reports and found them wanting—*P. monanthos/uniflora* was in fact nowhere to be seen:

> I would be ungracious to show off to you a herborization that I undertook at Montmorency last summer with the Crew from the Jardin du Roi; But it is certain that on my part it was an enterprise only for finding the *plantago monanthos*, which I looked for in vain. M. de Jussieu the younger[83] […] will have been able to tell you with what ardour I begged all these Gentlemen, as soon as we approached the end of the pond, to assist me in the search for this plant; which they did, and among others M. Thouin with a kindness and a solicitude which would merit a better success. We found nothing, and after two hours of useless searching, in the heat of the day and on the hottest day of the year, we stopped to breathe and rest under the trees which were not far, concluding unanimously that the *Plantago uniflora* indicated by Tournefort[84] and M. de Jussieu[85] in the neighbourhood of the pond of Montmorency *had absolutely disappeared*.[86]

In a later account of this expedition, Rousseau describes the same outcome, but instead of citing Bernard de Jussieu's *Nouvelle observation*, he refers to a report in Vaillant's *Botanicon Parisiense*:

> Last year on May twentieth at Montmorency […] I found […] that the indications of Tournefort and Vaillant are very *defective*, or that since them, many plants have *changed habitat*. I searched and engaged everyone to search with care for, among others, the *Plantago monanthos* at the end of the pond of Montmorenci, and in all the places that Tournefort and Vaillant[87] indicated, and we could *not find even one stalk* […].[88]

This expedition yielded another important result—the discovery of plant species that had *not* been reported in the floras: "On the other hand I found *several plants of note* and even quite close to Paris in places where they were *not indicated at all*."[89] Rousseau had similar experiences on other expeditions: he was surprised to find alpine mossy sandwort (*Moehringia muscosa* L.) growing in profusion in the sub-alpine Swiss Jura: "Never grows except in the Alps. I found it growing abundantly at Môtiers on the walls of the mayor's office of Verrières."[90] Similarly on Mont Pilat he found mossy strapwort (*Corrigiola litoralis* L.), a native of shorelines and sandy

places rather than mountain tops: "This small plant loves the sand and riverbanks; I nevertheless found it at the top of Mont Pilat."[91]

These examples expose another experimental characteristic of the botanical expedition: its open-endedness. Before setting out there was no way to predict whether any specimens would present themselves, and if they did appear, in what state—complete, incomplete, flowering or past flowering, with or without seeds, wet or dry? An expedition might yield some, many or no collectable specimens whatsoever. The weather, the knowledge and experience of the participants, and the quality of the guide, if any, were all key factors contributing to the success or failure of the expedition.

Aware of the importance of a good guide, Rousseau and his "botanical college" explored the Swiss Jura under the tutelage of Dr Abraham Gagnebin (1707–1800), a fount of botanical knowledge.[92] While we lack detailed information about their finds, we can presume they found good specimens since Rousseau refers later to dried plants collected in Switzerland that may have derived from his outings with the "botanical college".[93]

Rousseau also showed an impressive sensitivity to the difficulties of acquiring specimens suitable for preservation; one of the greatest logistical challenges facing botanists then and now is obtaining and preserving high-quality herbarium specimens. They need to be in good condition (not too wilted or damaged) and intact, displaying leaves, reproductive organs and roots. In his letter on herbaria to Mme Delessert, which ends his eight famous letters on botany, Rousseau enumerates the precautions necessary to collect good specimens, especially in damp or unpredictable weather:

> 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.[94]

Expeditions yielding rich finds undoubtedly offered a sharp contrast with those that yielded little or nothing. An expedition in August 1769 provides a good example of the latter. Rousseau travelled from Monquin

to Mont Pilat with a Dr Meynier,[95] the Abbé Baurin and Luc Antoine Donin de Champagneux (1744–1807).[96] The group lacked a guide, experienced bad weather, endured unpleasant conditions and found little to collect:

> [W]e had bad weather during practically the entire trip […] we found a very bad hut on the mountain. Outside of [which] one mattress stuffed with fleas […]. [We had] accidents of all kinds: one of our Gentlemen was bitten by a dog on the mountain. Sultan[97] was half-massacred by another dog; he disappeared, I believed him dead from his wounds or eaten by a Wolf […]. The fifth point, and the worst, is that we *found almost nothing*, having arrived too late for the flowers, too early for the seeds, and having *no guide* to help us find the good spots.[98]

This largely failed expedition no doubt offered a standard against which to judge more successful ones.

Conclusion

As a site of often risky experimentation and hard-won discoveries, the conventional indoor laboratory played a critical role in the development of sciences such as chemistry and physics. The laboratory is less often associated with early-modern botany, traditionally seen as a science of collecting, observation and classification. Modern DNA analysis has of course changed the relation of botany to the laboratory.

In offering a vision of the fields as the botanist's "only laboratory", Jean-Jacques Rousseau provides a powerful way to understand key aspects of eighteenth-century botanical fieldwork. The fields can more readily be envisioned as a kind of laboratory when the laboratory—chemical or otherwise—is understood as the site of the *work*.

Botanical fieldwork shared key characteristics and goals with work in the conventional laboratory where: (1) an experience/experiment is understood as a test, (2) use of the correct instruments/tools is indispensable, and (3) difficulties and risks abound, including bad weather, deficient guide books, loss of specimens and threats from wild animals. Botanical expeditions were probably more logistically complicated and difficult than they are today, lacking conveniences that we take for granted. Yet, then as now, outcomes remain uncertain and difficult to control: an expedition might yield many excellent specimens worth preserving or none at all; expected species might elude discovery while totally unexpected ones

might appear instead. Poor conditions might call the undertaking to a halt. Like the experiment in the traditional laboratory, the botanical expedition entailed risk and difficulty, but also the possibility of a good result. The botanist's excursion was therefore truly "work" and the fields his or her "only laboratory".

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Notes

1. Jean-Jacques Rousseau, "Discours sur les Sciences et les Arts", in Bernard Gagnebin and Marcel Raymond, eds., *Œuvres Complètes*, iii (Paris: Gallimard, 1964—hereafter *OC*), 1–30. For a discussion of Rousseau's paradoxical position on the sciences, see Alexandra Cook, *Jean-Jacques Rousseau and Botany, the Salutary Science* (Oxford: Voltaire Foundation, 2012), Chapter 1.
2. Jean-Jacques Rousseau, *Institutions Chimiques*, ed., Christophe van Staen (Paris: Honoré Champion, 2010). In contrast to Rousseau, van Staen uses the spelling "*chimiques*".
3. The French term, "*expérience*", denotes both "experiment" and "experience"; so the French term generally has a broader meaning than "experiment" in modern English, not to mention in philosophy of science, which applies strict canons in defining what constitutes an experiment. See for instance Karl Popper, *The Logic of Scientific Discovery* (London: Hutchinson, 1959) on experiment's role in falsification; see Hans-Jörg Rheinberger's notion of "experimental systems" in *Toward a History of Epistemic Things: Synthesizing Proteins in a Test-tube* (Stanford: Stanford University Press, 1997).
4. A full discussion of these reasons lies beyond the scope of this essay. See Cook, *Jean-Jacques Rousseau and Botany*, Chapter 2.
5. All translations are mine unless otherwise indicated. Jean-Jacques Rousseau, "Fragments de botanique", in *OC*, iv (1969), 1249–56, here 1249–50.
6. Jean-Jacques Rousseau, "Reveries of the Solitary Walker", Charles E. Butterworth (trans.), in *Collected Writings of Rousseau* (Hanover, NH: University Press of New England, 2000; hereafter designated as *CW*), vol. 8, 1–90, here 63; Jean-Jacques Rousseau, "Les Rêveries du Promeneur Solitaire", in *OC*, i (1959), 993–1099, here 1067.

7. Jean-Jacques Rousseau, "Discours sur l'Origine et les Fondements de l'Inégalité", in *OC*, iii (1964), 131–223, here 194.
8. Rousseau, "Fragments de botanique", 1250.
9. Jean-Jacques Rousseau, "Introduction" to "Fragmens pour un Dictionnaire des Termes d'Usage en Botanique", in *OC*, iv (1969), 1201–9, here 1201. Note that this so-called "Introduction" was probably an unrelated document added by Rousseau's editors to other documents of uncertain provenance to form the posthumous *Fragmens pour un Dictionnaire des Termes d'Usage en Botanique*. See Cook, *Jean-Jacques Rousseau and Botany*, 306–7.
10. Rousseau "Fragments de botanique", 1250. Rousseau refers to "tools" while Linnaeus, as discussed below, uses the term "instruments" to designate the very same tools. That the terms might be synonyms is suggested by the *Dictionnaire de l'Académie* (Paris: Chez la Veuve B. Brunet, 1762), which defines "instrument" by reference to "tools", discussed below.
11. Rousseau, "Fragments de botanique", 1250; see also Rousseau, "Discours sur l'Origine de l'Inégalité", 133; Jean-Jacques Rousseau, "Rousseau Juge de Jean Jaques, Dialogues", *OC*, i (1959), 667–976, here 833.
12. Rousseau, "Rêveries", 1073.
13. My emphasis; *Dictionnaire de l'Académie Française*, 2.
14. *Pace* Kuklick and Kohler, we should not assume that Rousseau's reference to the laboratory invests the fields and thereby botany with a seriousness and significance that they were thought to lack; botany had long been a respectable part of medicine while chemistry was a relative newcomer trying to shed dubious associations with alchemy. See Henrika Kuklick and Robert E. Kohler, "Introduction", *Science in the Field*, *Osiris* 11, 2nd series (1996), 1–14.
15. Original emphasis; *Dictionnaire de l'Académie Française*, 698.
16. My emphasis; *Dictionnaire de l'Académie Française*, 699.
17. Ursula Klein and Wolfgang Lefèvre, *Materials in Eighteenth-Century Science: A Historical Ontology* (Cambridge, MA: MIT Press, 2007), 34; see also Bernadette Bensaude-Vincent and Bruno Bernardi, "Pour Situer les Institutions Chymiques", *Corpus* 36 (1999): 5–38, here 11.
18. See Alice Stroup, *A Company of Scientists*: *Botany*, *Patronage*, *and Community at the Seventeenth-Century Parisian Royal Academy of Sciences* (Berkeley: University of California Press, 1990), 98 and Cook, *Jean-Jacques Rousseau and Botany*, 36 ff.
19. "Catalogue de tous les mémoires de chymie contenus dans tous les volumes de l'histoire de l'Académie R[oyale] des Sciences", MsR 81, fol. 2–26, Bibliothèque Universitaire et Publique de Neuchâtel; see also Cook, *Jean-Jacques Rousseau and Botany*, 43.

20. Jean-Jacques Rousseau, "Lettre sur la Musique Françoise", in *OC*, v (1995), 291–328, here 299–302.
21. The Dupin family owed their great wealth to tax farming, which Rousseau condemned in "Les Confessions de J. J. Rousseau", in *OC*, i (1959), 5–656, here 363–4.
22. Jean-Jacques Rousseau, "The Dupin family owed their great wealth to tax farming, which Rousseau condemned in "Les Confessions", 292–3.
23. Rhoda Rappaport, "G.-F. Rouelle: An Eighteenth-Century Chemist and Teacher", *Chymia* 6 (1960): 68–101.
24. Now a discredited reject in the dustbin of science, phlogiston was widely accepted in the eighteenth century and played a crucial conceptual role in the evolution of chemistry. John Christie, "Experimental and Speculative Work in Eighteenth-Century Britain: Franklin, Priestley, Cavendish and Hutton", paper presented at iCHSTM, Manchester, UK, 27 July 2013.
25. Rappaport, "G.-F. Rouelle", 98. Notes from Rousseau and Dupin de Francueil's course with Rouelle can be found in J. J. Rousseau, "Procédés du Cours de M. Rouelle", fol. 117–38 and MSR 86, "Table des Procédés du Cours de Chymie M. Rouelle", fol. 139–50, Bibliothèque Publique et Universitaire de Neuchâtel, MSR 85.
26. Bensaude-Vincent and Bernardi, "Pour situer les *Institutions Chymiques*", 17.
27. Rousseau, "Confessions", 287; Rousseau, "Les Confessions", 342.
28. Bensaude-Vincent and Bernardi, "Pour situer les *Institutions Chymiques*".
29. Rousseau, "Discours sur L'Origine et les Fondements de l'Inégalité", 132–3.
30. Rousseau, "Discours sur l'Origine et les Fondements de l'Inégalité", 198. Nothing further is known about this experiment. *OC*, iii, 1362, n. 5.
31. This knowledge is revealed by phrases such as "the combination of their compounds" and "more inaccurate chemical analysis". Rousseau, "Fragments de botanique", 1249. For the translation of "*mixtes*", see Jon Eklund, *The Incompleat Chymist: Being an Essay on the Eighteenth-Century Chemist in his Laboratory, With a Dictionary of Obsolete Chemical Terms of the Period*, Smithsonian Studies in History and Technology 33 (Washington, DC: Smithsonian Institute Press, 1975), 32. Rousseau's reference to "inaccurate chemical analysis" might point to distillation, which yields similar results across a wide range of plants. See Cook, *Jean-Jacques Rousseau and Botany*, 40–2.
32. Original emphasis; *Dictionnaire de l'Académie Française*, 939. Other examples given are musical and mathematical instruments. Note that "instrument" is defined as "tool" and "tool" is defined as "instrument", so the two terms are virtually synonymous, although "tool" might be slightly more strongly associated with manual labour: "TOOL. Masculine noun. Any instrument of which Artisans, Labourers, Gardeners, etc. make use for their work. *The tools of a joiner, of a Carpenter. Ploughing tools. The hammer*

is a tool of great use. Bring your tools." Original emphasis; *Dictionnaire de l'Académie Française*, 274.

33. These "laces" are used to tie shoes or corsets.
34. David Rousseau's impressive watches were displayed for Jean-Jacques Rousseau's 2012 tercentenary at the Patek Philippe Museum in Geneva: "Des Montres Signées Rousseau/Timepieces Signed Rousseau".
35. My emphasis; Rousseau, *Institutions Chimiques*, 103.
36. Rousseau, *Institutions Chimiques*, 407.
37. Rousseau, *Reveries of the Solitary Walker*, 63. Rousseau had earlier alluded to "the considerable number of unhealthy occupations that shorten life expectancy or destroy the constitution such as mining, the preparation of metals, [and] minerals, especially Lead, Copper, Mercury, Cobalt, Arsenic and Realgar". Rousseau, *Discours sur l'Origine et les Fondements de l'Inégalité*, 205, n. ix.
38. See Marita Hübner, *Jean Andrè Deluc (1727–1817): Protestantische Kultur und moderne Naturforschung* (Göttingen: Vandenhoeck & Ruprecht, 2010).
39. Rousseau to Jean-André Deluc, 20 December 1764, *Correspondance Complète*, ed. Ralph A. Leigh, 52 vols. (Genève: Institut et Musée Voltaire, 1965–98—hereafter *CC*), xxii, 256.
40. Rousseau to François-Henri d'Ivernois, 20 July 1765, *CC*, xxvi, 106–7; see also Rousseau to Jean André Deluc, 15 December 1764, *CC*, xxii, 240–1.
41. Du Peyrou, a wealthy plantation owner and businessman of Dutch and Huguenot extraction, lived in the Prussian principality of Neuchâtel, where he protected Rousseau as best he could up until 1765. The two men shared an interest in botany and du Peyrou fostered Rousseau's early botanical pursuits. He largely directed the posthumous publication of Rousseau's works. See Cook, *Jean-Jacques Rousseau and Botany*, 122–3.
42. On Rousseau's interest in scientific instruments, see Bernadette Bensaude-Vincent, "La Nature Laboratoire", in Bernadette Bensaude-Vincent and Bruno Bernardi, eds., *Rousseau et les Sciences* (Paris: L'Harmattan, 2003), 155–74, here 161 ff.
43. My emphasis; recall the origin of the word "laboratory" in the Latin *laborare*, "to work". Rousseau, "Fragments de botanique", 1250.
44. Rousseau, "Rêveries", 1063.
45. Rousseau to Mme Delessert, March/April 1774, *CC*, xxxix, 234. As a part of natural philosophy botany "was an autonomous study separate from theology and natural theology, but whose practitioners had at the forefront of their minds […] the same God whose attributes the theologians studied". Andrew Cunningham and Perry Williams, "De-Centring the 'Big Picture': *The Origins of Modern Science* and the Modern Origins of Science", *British Journal for the History of Science* 26 (1993): 407–32, here 421.

46. According to Rousseau, studying botany soothes the tumults of the soul and lifts our sights to the Author of nature; rather than providing ingredients for medicines, plants promote psychological well-being by serving as a subject of contemplation. See Cook, *Jean-Jacques Rousseau and Botany*, 2–3, 11–16.
47. Paula Findlen, *Possessing Nature*: *Museums*, *Collecting*, *and Scientific Culture in Early Modern Italy* (Berkeley: University of California Press, 1994), 166.
48. Rousseau, "Confessions", 538; Rousseau, "Les Confessions", 643.
49. Carolus Linnaeus, *Linnaeus' Philosophia Botanica*, trans. S. Freer (Oxford: Oxford University Press, 2003), 18.
50. Mariette Mantelkow and Kenneth Nyberg, "Linnaeus's Apostles and the Development of the Species Plantarum", *Symbolae Botanicae Upsalienses*; *Arbeten från Botaniska Institutionen i Uppsala* 33 (2005): 73–80.
51. These were recorded in Linnaeus's travel reports on Lapland, Öland and Gotland. See his *Öländska och Gothländska Resa* (Stockholm and Uppsala: Gottfried Kiesewetter, 1745).
52. Albrecht von Haller, *Historia Stirpium Indigenarium Helvetiæ Inchoata* (Bern: Societatis Typographicæ, 1768); see also Alix Cooper, *Inventing the Indigenous*: *Local Knowledge and Natural History in Early Modern Europe* (Cambridge: Cambridge University Press, 2007).
53. Rousseau, "Les Confessions", 643.
54. My emphasis; Rousseau, in "Letters to Chrétien-Guillaume de Lamoignon de Malesherbes", 230; Rousseau to Malesherbes, 19 December 1771, *CC*, xxxviii, 301.
55. See Hanna Hodacs, "Linnaeans Outdoors: The Transformative Role of Studying Nature 'on the Move' and Outside", *British Journal for the History of Science* 44 (June 2011): 183–209.
56. Such field trips or "herbationes" were "public events, open not just to students but to any man or (occasionally) woman who cared to learn natural history the Linnaean way (assuming, that is, that they could afford the fee)". See Hanna Hodacs, "In the Field: Exploring Nature with Carolus Linnaeus", *Endeavour* 34(2) (published online January 2010): 45.
57. Linnaeus, *Philosophia Botanica*, 331.
58. "Milliaria ad summum duo cum dimidio": 2.5 miles at most.
59. Linnaeus, *Philosophia Botanica*, 331. Linnaeus would have certainly dominated any expedition in which he took part, however informally.
60. Linnaeus, *Philosophia Botanica*, 330.
61. Linnaeus, *Philosophia Botanica*, 331. Note that Linnaeus refers to the same items that Rousseau calls "tools" in his letter to d'Ivernois cited above (n. 39).
62. Rousseau expressed his admiration of Linnaeus's *Philosophia Botanica* as greater than all the books of "morality". Rousseau to Linnaeus, 21 September 1771, *CC*, xxxviii, 267–8.

63. François Louis d'Escherny, *Mélanges de Littérature, d'Histoire, de Morale et de Philosophie*, vol. 3 ("Rousseau et des philosophes", Paris: Bossange et Masson, 1811), 66.
64. Rousseau to Mme Delessert, 11 April 1773, *CC*, xxxix, 139.
65. Julie Emélie Willading née Boy de la Tour (1751–1826) was a younger sister of Madeleine Catherine Delessert née Boy de la Tour (1747–1816), the recipient of Rousseau's eight letters on botany. Rousseau made a magnificent herbarium for Julie Willading-Boy de la Tour that her descendants donated to the Zentralbibliothek Zürich. See Ruth Schneebeli-Graf, *Das Zürcher Herbar von Jean-Jacques Rousseau* (Zürich: Wohnmuseum Bärengasse, 1980) and Alexa Renggli, "Das 'Petit Herbier pour Mademoiselle Julie Boy de la Tour' von Jean-Jacques Rousseau", *Jahrbuch der Schweizerischen Gesellschaft für die Erforschung des 18. Jahrhunderts/Annales de la Société Suisse pour l'Étude du XVIIIe siècle/Annali della Società Svizzera per lo Studio del Secolo* xviii 4 (2013): 113–27.
66. My emphasis; Rousseau, "Letters to Mme Madeleine-Catherine Delessert, the so-called *Elementary Letters on Botany*", in *CW*, 8, 130–72, here 144; Rousseau to Mme Delessert, 16 July 1772, *CC*, xxxix, 81.
67. My emphasis; Rousseau to Abraham de Pury, 10 June 1765, *CC*, xxv, 32.
68. D'Escherny's term, "*justicier*", translated here as "judge", means "member of the tribunal". See Fritz Berthoud, *J.J. Rousseau au Val de Travers, 1762–1765* ([Paris, 1881] Geneva: Slatkine Reprints, 1970), 178, n. 2. Compare the old English term, "justiciar".
69. The term d'Escherny uses is "*briquet*", which the *Dictionnaire de l'Académie* defines as a "small piece of iron that is used to draw fire from a stone". *Dictionnaire de l'Académie*, 217. He might have used iron pyrite rock and a flint.
70. D'Escherny, *Mélanges*, 66.
71. D'Escherny, *Mélanges*, 41. Rousseau is referring to fundamental Linnaean works such as the *Systema Naturae* (first published in 1735 and expanded in several later editions); see Carolus Linnaeus, *Systema Naturae 1735: Facsimile of the First Edition*, introduction and trans. M. S. J. Engel-Ledeboer and H. Engel (Nieuwkoop: B. De Graaf, 1964). He also mentions François Boissier de Sauvages de la Croix (1706–67), a famous professor of medicine at Montpellier, who generally favoured Linnaeus, but argued that characters such as leaves should also be used in classification. See *Methodus Foliorum Seu Plantæ Floræ Monspeliensis/Methode Pour connoître les Plantes par les Feüilles* (The Hague: n.p., 1751). Rousseau requested this work from Nicolas Bonaventure Duchesne in a letter of 19 May 1765, *CC*, xxv, 301–2 and received it in late summer or early fall of the same year. He sold it—heavily annotated with Linnaean binomial names and other information—to Daniel Malthus (1730–1800) circa

1775; Malthus's son, the economist Thomas Robert "population" Malthus (1766–1834), willed it with his book collection to Jesus College, Cambridge. See Alexandra Cook, "Jean-Jacques Rousseau's Copy of Albrecht von Haller's *Historia Stirpium Indigenarum Helvetiae Inchoata* (1768)", *Archives of Natural History* 30(1) (2003): 149–56; Henry Cheyron, "Ray et Sauvages Annotés par Jean-Jacques Rousseau", *Littératures* 15 (1986): 83–99.

72. Jean Jacques Rousseau, "Letters to Pierre-Alexandre du Peyrou", in *CW*, 8 (2000), 196–9, here 196; Rousseau to Pierre Alexandre du Peyrou, 11 June 1765, *CC*, xxvi, 32.
73. This "company" included Marc-Antoine-Louis Claret de Latourrette and the Abbés de Grange-Blanche and Jean Baptiste François Rozier. Rousseau to du Peyrou, 6 July 1768, *CC*, xxxvi, 8; see also Rousseau to Luc Antoine Donin de Champagneux, 12 August 1769, *CC*, xxxvii, 126–7.
74. Brot (now Brot-Dessous) is in the Val de Travers in the Swiss canton of Neuchâtel. Rousseau, "Letters to Pierre-Alexandre du Peyrou", in *CW*, 8 (2002), 201–3, here 202; Rousseau to du Peyrou, 16 September 1769, *CC*, xxxvii, 142. Similarly, "my voyages on foot having always been up until now all very cheerful, conducted with companions who were in as good a mood as I was". Rousseau to the Count de Laurencin, 10 October 1769, *CC*, xxxvii, 158.
75. Rousseau to du Peyrou, 29 April 1765, *CC*, xxv, 204.
76. Rousseau to the Abbé Baurin, 8 August 1769, *CC*, xxxvii, 119. Little is known about Baurin (fl. 1769–87), a Catholic priest and archdeacon of Salmorenc in the present-day Department of Rhône-Alpes.
77. My emphasis; Rousseau, "Letters to Malesherbes", in *CW*, 8, 233; Rousseau to Malesherbes, 17 April 1772, *CC*, xxxix, 37.
78. This is probably an abbreviation of *Plantago Palustris*, *Gramineo Folio*, *Monanthos Parisiensis*. See Joseph Pitton de Tournefort, *Institutiones Rei Herbariae*, vol. 1 (Paris: de l'Imprimerie Royale, 1700), 128. This plant is known in English as shore plantain.
79. *P. uniflora* L. replaced earlier names conferred by Tournefort, Leonard Plukenet (1642–1706), Robert Morison (1620–83) and others; see Carolus Linnaeus, *Species Plantarum*: *A Facsimile of the First Edition 1753*, with introductory essays by William T. Stearn, vol. 1 (London: The Ray Society, 1957), 115. The scientific name of this plant is now *Littorella lacustris* E.H.L. Krause.
80. Antoine-Laurent de Jussieu (1748–1836) was the nephew of Bernard de Jussieu (1699–1777), demonstrator at the Jardin du roi, Paris, and a father of the natural method in botany. Known as "the nephew" or "the younger", Antoine-Laurent de Jussieu likewise contributed to the development of the natural method. See his *Genera Plantarum* (Paris: Herissant and Barrois, 1789).

81. André Thouin was head gardener at the Jardin du roi (Paris) during the *ancien régime* and professor of cultivation at the Jardin du roi's successor, the Jardin des plantes; he coordinated an immense botanical network documented in Emma C. Spary, *Utopia's Garden*: *French Natural History from Old Regime to Revolution* (Chicago: University of Chicago Press, 2000).
82. Antoine-Laurent de Jussieu confirms Rousseau's regular participation in these expeditions: "[d]uring the last five years of his life, he regularly attended the special herborization that the nephew M. de Jussieu conducted every week, in summer, with M. Thouin and a small number of friends or selected students." My emphasis; Antoine-Laurent de Jussieu, "Sixième Notice sur le Muséum", *Annales du Muséum d'Histoire Naturelle* 11 (1808): 14, note (1).
83. That is, Antoine-Laurent de Jussieu.
84. According to Tournefort, this plant grew around the lake now known as Lake of Enghien: "[t]his plant is found around the pond of Montmorency, when one has passed la Chaussée on the ascent toward Saint-Gratien". Joseph Pitton de Tournefort, *Histoire des Plantes qui Naissent autour de Paris* (Paris: de l'Imprimerie Royale, 1698), 517–18. Rousseau probably knew this area well, having resided there from April 1756 to June 1762.
85. Bernard de Jussieu refers to this plant growing "on the shore of Saint Gratien pond", hence concurring with Tournefort, *Histoire des Plantes*, 128. See Bernard de Jussieu, "*Observation nouvelle sur les fleurs d'une espèce de Plantain nommée par M. De Tournefort dans ses Élemens de botanique*, Plantago palustris gramineo folio monanthos Parisiensis, pag. 104", *Histoire de l'Académie Royale des Sciences. Avec les Mémoires de Mathématique et de Physique*: *Tirés des Registres de cette Académie 1742* (Paris: de l'Imprimerie Royale, 1745), 137.
86. My emphasis; Jean-Jacques Rousseau, "Letters to Marc-Antoine-Louis Claret de Latourette", in *CW*, 8, 214–27, here 225; Rousseau to Latourrette 25 January 1772, *CC*, xxxix, 22.
87. "It is found in abundance beside the pond of Montmorency on the walled side by of the park of Saint-Gratien." Sébastien Vaillant, *Botanicon Parisiense* (Leiden: Jean and Herman Verbeek and Amsterdam: Balthazar Lakeman, 1727), 160.
88. My emphasis; Rousseau, "Letters to Malesherbes", in *CW*, 8, 234; Rousseau to Malesherbes, 17 April 1772, *CC*, xxxix, 38.
89. My emphasis; Rousseau to Malesherbes, 17 April 1772, *CC*, xxxix, 38.
90. Note accompanying a specimen of mossy sandwort (*Moehringia muscosa* L.) in Rousseau's herbarium for Julie Boy de la Tour. The towns of Môtiers (737 metres) and Verrières (930 metres) in the Val de Travers, are located in the Swiss Jura, whose highest peak is 1720 metres.

91. Note accompanying a specimen of mossy strapwort (*Corrigiola litoralis* L.) in the herbarium Rousseau made for Julie Emélie Willading-Boy de la Tour. The Pilat massif rises about 1000 metres (3300 ft) above its surroundings and lies in the extreme east of the French Massif Central range looking over the Rhône valley. The orientation of the massif from south-west to north-east creates a variety of climates in a relatively small area. Fruit trees and vineyards are cultivated on the south-facing slopes, while conifers, juniper and ferns grow on the cooler north side.
92. Gagnebin was Albrecht von Haller's most important botanical correspondent. Urs Boschung et al., eds., *Repertorium zu Albrecht von Hallers Korrespondenz 1724–1777*, vol. 1 (Basel: Schwabe, 2002), 157. On Gagnebin's vast knowledge, see d'Escherny, *Mélanges*, 42–3.
93. Rousseau to the Duchess of Portland, 20 October 1766, *CC*, xxxi, 41.
94. My emphasis; Rousseau, "Letters to Mme Delessert", 162; Rousseau to Madeleine-Catherine Delessert, 11 April 1773, *CC*, xxxix, 141.
95. Little is known about Meynier, who "gave the impression of liking Botany, and desiring to cajole me, why I do not know, thought there was nothing better to achieve this than to assume an affected air". Rousseau to du Peyrou, 16 September 1769, *CC*, xxxvii, 142.
96. "There has been much speculation concerning the composition of the small group that accompanied JJ on the famous expedition to Mont Pilat. JJ himself declares that he was accompanied by only 'three gentlemen.' There was, therefore, besides Baurin and Meynier, a third person, perhaps Donin de Champagneux (see nº 6599)." Rousseau to the Abbé Baurin, 8 August 1769, *CC*, xxxvii, 119, editor's note.
97. Sultan was Rousseau's beloved dog. Not only did Sultan survive, he reappeared at his master's home "calm and completely healed". Rousseau to du Peyrou, 16 September 1769, *CC*, xxxvii, 142. Recounting the same incident, Rousseau wrote: "A botanical excursion […] that I made to Mont Pila[t] […] was disastrous, with rain the whole time; I found few plants, and I lost my dog who was injured by another one, and ran away; I feared him dead from his wound in the woods, when upon my return I found him here in good shape, I could not imagine how he could have travelled twelve leagues and crossed the Rhône in that state." Rousseau to Laliaud, 27 August 1769, *CC*, xxxvii, 129–30.
98. Rousseau, "Lettres to Pierre-Alexandre du Peyrou", 202. Rousseau to du Peyrou, 16 September 1769, *CC*, xxxvii, 142.