

Appendix 3.3: from *Phytologia* (1800)

In the Introduction to *Phytologia*, ED observes, “AGRICULTURE and GARDENING, though of such great utility in producing the nutriment of mankind, continue to be only Arts, consisting of numerous detached facts and vague opinions, without a true theory to connect them, or to appreciate their analogy; at a time when many parts of knowledge of much inferior consequence have been nicely arranged, and digested into Sciences” (p. vii). *Phytologia* is his attempt to form such a “theory of vegetation,” drawing on recent research, including that of Linnaeus and his followers, “with a few observations and opinions of my own; some of which have in part already appeared in *Zoonomia*, and in the notes to the Botanic Garden, but are here corrected and enlarged” (p. vii).

Selections are copied from *Phytologia; or the Philosophy of Agriculture and Gardening. With the Theory of Draining Morasses, and with an Improved Construction of the Drill Plough*. London: J. Johnson, 1800.

from Part the First. Physiology of Vegetation. Section VII. Their Organs of Reproduction.

from Section VII.2.2

[p. 107]

Dr. Peschier of Geneva thinks, he has discountenanced this idea of amatorial sensibility of vegetables by two experiments, which are related in *Journal de Physique de Lametherie*, T. II. p. 343.¹ One of these consisted of his tying down the stigma of *epilobium angustifolium*, and yet in due time the anthers burst and shed their pollen, and thus committed a kind of vegetable Onanism; and also that he castrated the stamens of this flower, and yet the stigma opened and arose, as if the anthers had been present. The other experiment² consisted in his confining a branch of barbery, *berberis*, in a glass, and subjecting the stamina of the flowers to the vapour of nitrous acid, which by this stimulus arose from their petals to the stigma, and after a few minutes again retired to their petals. Both these experiments rather seem to confirm than to enfeeble the analogy between plants and animals; as the amatorial motions of these flowers were thus produced by internal or external stimuli, as in the healthy or diseased states of animals.

from Section VII.2.4

[p. 110]

In many tribes of insects, as the silk-worm, and perhaps in all the moths and butterflies, the male and female parents die, as soon as the eggs are impregnated and excluded, the eggs

remaining to be perfected and hatched at some future time. The same thing happens to the male and female parts of flowers; the anthers and filaments, which constitute the male parts of the flower, and the stigma and style, which constitute the sensitive or amatorial organ of the female part of the flower, fall off and die, as soon as the seeds are impregnated, and along with these the petals and nectary. Now the moths and butterflies above mentioned, as soon as they acquire the passion and the apparatus for the reproduction of their species, lose the power of feeding upon leaves, as they did before, and become nourished by what?—by honey alone.

Hence we acquire a strong analogy for the use of the nectary, or secretion of honey, in the vegetable economy; which is, that the male parts of flowers, and the female parts, as soon as they leave their fetus-state, expanding their petals, (which constitute their lungs) become sensible to the passion, and gain the apparatus, for the reproduction of their species; and are fed and nourished with honey like the insects above described; and that hence the nectary begins its office of producing honey, and dies or ceases to produce honey, at the same time with the birth and death of the anthers and the stigmas; which, whether existing in the same or in different flowers, are separate and distinct animated beings.

Previous to this time the anthers with their filaments, and the stigmas with their styles, are in their fetus-state sustained in some plants by their umbilical vessels, like the unexpanded leaf-buds, as in

[p. 111]

colchicum autumnale, and daphne mezereon; and in other plants by the bractes, or floral-leaves, as in rhubarb, which are expanded long before the opening of the flower; the seeds at the same time existing in the vegetable womb yet unimpregnated, and the dust yet unripe in the cells of the anthers. After this period the petals become expanded, which have been shewn to constitute the lungs of the flower; the umbilical vessels, which before nourished the anthers and the stigmas, coalesce, or cease to nourish them; and they acquire blood more oxygenated by the air, obtain the passion and power of reproduction, are sensible to heat, and light, and moisture, and to mechanic stimulus, and become in reality insects fed with honey; similar in every respect except that all of them yet known but the male flowers of vallisneria, continue attached to the plant, on which they are produced.

Section VII.2.8

[p. 118]

8. [...] it appears, that not only new varieties may be procured from the seminal offspring of plants [...] but that more curious or useful fruits or flowers may be obtained by shedding the farina of some valuable plant on the stigma of another variety of the same species, as of two different but equally excellent apple-trees, or tulip-flowers, hyacinths, anemonies, and geraniums. And thirdly, that mules may be produced by a mixture of different species of plants, and perhaps of different genera; as of pines³ and melons; grapes and gooseberries; oranges and

apples; apricots and nectarines; nuts and acorns; which may be afterwards propagated by the lateral progeny, if not by the seminal one.

The facility of generating vegetable mules seems forcibly to have struck the great Linneus; who in the preface to his natural orders of plants at the end of his *Genera Plantarum*⁴ thinks, that about sixty vegetables were at first created corresponding with his natural orders. That a mixture of these orders amongst themselves produced the genera; that a mixture of the genera amongst themselves produced the species; and that a mixture of the species produced the varieties, which he believes to accord with the general progress of nature “*from simpler things to the more compound.*”

In the same manner it may be supposed, that many of the present species of animals were originally mules produced by a mixture of animals of different genera; and that all such mules, as had perfect organs of reproduction, continued their species. But as these organs

[p. 119]

seem to be the chef d'œuvre of nature, as above remarked, they often become imperfect in the generation of mules, and the species then becomes extinct; as it could not be propagated by sexual generation, it is possible, that many new kinds of mules, which might be useful for labour, or by their milk or wool, or for food, might still be produced by the method of Spallanzani;⁵ who diluted the seminal fluid of a dog with much warm water, and by injecting it fecundated a bitch, and produced puppies like the dog.

Thus new animal combinations might possibly be generated numerous as the fabled monsters of antiquity; as between the ram and the female goat; the stag and the cow; the horse and the doe; the bull and the mare; boar and bitch; dog and sow. And secondly, as Spallanzani diluted the seminal fluid of a male frog with water, and fecundated some female spawn with it, and produced perfect tadpoles,⁶ there is reason to conclude, that new combinations of fish might thus be generated, and people our rivers with aquatic monsters. And lastly, that it is not impossible, as some philosophers have already supposed, if Spallanzani should continue his experiments, that some beautiful productions might be generated between the vegetable and animal kingdoms, like the eastern fable of the rose and nightingale,⁷ and which might be propagated by lateral or paternal, though not by sexual or seminal generation.

The classic reader will here be reminded of the metamorphoses of Ovid, of gods turned into bulls and swans, men into frogs and partridges, ladies into trees and flowers, of sphinxes, griffins, dragons, mermaids, centaurs, and minotaurs; Pasiphae and her bull; Leda and her swan; Arethusa and her fish-god Alpheus, and conclude that mules in early times were more frequent than at present, which occasioned the poets and the priests of antiquity to invent so many fabulous monsters, and impose them on the credulity of mankind.

from Section VII.3.11

[p. 129]

11. From this new doctrine of a threefold vegetable mule by lateral propagation, as the new bud on the summit of a tree, which has had two scions ingrafted on it one above another, in which it is incontestibly shewn, that different fibrils, or molecules, are detached from different parts of the parent caudex to form the filial one, which adheres to it; and that it then acquires the power of producing new radicles, or a new plumula;⁸ we may safely conclude, as it is deducible from the strongest analogy, that in the production of sexual

[p. 130]

mules, whether vegetable or animal, some parts of the new embryo were produced by, or detached from, similar parts of the parent, which they resemble. And that as these fibrils, or molecules, floated in the circulating blood of their parents, they were collected separately by appropriated glands of the male or female; and that finally, on their mixture in the matrix the new embryo was immediately generated, resembling in some parts the form of the father, and in other parts, the form of the mother, according to the quantity or activity of the fibrils or molecules at the time of their conjunction.

And lastly, that various parts of the new organizations afterwards acquired new appetencies, and formed molecules with new propensities, and thus gradually produced other parts of the growing fetus, as the skin, nails, hair, and the organs which distinguish the sexes.

If the molecules secreted by the female organ into the pericarp of flowers, or into the ovary of animals, were supposed to consist of only unorganized or inanimate particles; and the fibrils secreted by the male organ only to possess formative appetencies to select and combine with them; the new embryo must probably have always resembled the father, and no mules could have had existence.

from Part the Third. Agriculture and Horticulture. Section XIX, Production of Flowers.

Section XIX.7. The Happiness of Organic Life.

[p. 556]

All organized nature may be divided into stationary organizations, and locomotive organizations; the former of which are called vegetables, and the latter animals. All those parts of vegetables, which are most nutritious to animals, consist, as observed above, of aliment secreted from the vegetable blood, and laid up in reservoirs for the future sustenance of their embryo or infant progeny; which reservoirs are plundered by locomotive animals, and devoured along with the progeny, they were designed to support! add to this, that the stronger locomotive animals devour the weaker ones without mercy. Such is the condition of organic nature! whose first law might be expressed in the words, "Eat or be eaten!" and which would seem to be one great slaughter-house, one universal scene of rapacity and injustice!

1. Where shall we find a benevolent idea to console us amid so much apparent misery?— I hope the sympathizing reader will not think the following account of the happiness, which

organized beings acquire from irritation only, impertinently inserted in this place; their happiness derived from imagination and volition may be treated of in some future work.

It may first be observed, that the seeds of plants and the eggs of animals, when they have left the pericarp or uterus, and have not yet commenced their new growth upon the soil, or beneath the wings of the mother, exist in a torpid state, not possessed of sensitive life; and cannot therefore at this time be supposed to suffer pain, when they are destroyed by other animals; though those animals obtain pleasure from the activity, into which their vascular systems are excited by the stimulus of the aliment thus supplied.

Secondly, that the young of lactescent animals both acquire and communicate pleasure to the enamoured mother, from whom they

[p. 557]

receive their nutriment, as mentioned in *Botanic Garden*, Vol. I. Canto I. l. 278, note; which constitutes the most beautiful and most benevolent part of the great system of nature.

Thirdly, all animals, and, I suppose, vegetables, receive pleasure in the reproduction of their species; and where seeds are dispersed on the soil, and the eggs of some animals and of many insects are buried beneath it, to be revived and hatched by the warmth of the sun; there can be no pain in these cases inflicted on the mother, when they are destroyed by animals or by insects, as she is unconscious of their destruction.

Fourthly, as all animal existence must perish in process of time, by the inirritability and consequent debility occasioned by the repetition of stimulus, which is termed habit, and appears to be an universal law of nature: it is so ordered, that as soon as any organized being becomes less irritable and less sensible, and in consequence feeble or sickly, that it is destroyed and eaten by other more irritable and more sensible, and in consequence more vigorous organized beings; as insects attack the weaker vegetable productions in preference to the healthy ones; and beasts of prey more easily catch and conquer the aged and infirm, and the young ones are defended by their parents. By this contrivance more pleasurable sensation exists in the world, as the organized matter is taken from a state of less irritability and less sensibility, and converted into a state of greater; that is in other words, that the old organizations, whether stationary or locomotive ones, are transmigrated into young ones: whence it happened, that before mankind introduced rational society, and conquered the savage world, old age was unknown on earth!

Finally, the aged and infirm, from their present state of inirritability and insensibility, lose their lives with less pain, and which ceases instantly with the stroke of death; insomuch that death cannot so properly be called positive evil, as the termination of good.

[p. 558]

To this should be added, that a long continued or a great excess of pain cannot afflict an organized being; as syncope or sudden death, and consequent decomposition, attends very violent pains; and a lingering death attends the continuation of less violent ones. Hence it becomes a consoling circumstance, that misery is not immortal.

A philosopher, whom I left in my library, has perused the above paragraphs, and added the subsequent one to my manuscript. "It consoles me to find, as I contemplate with you the whole of organized nature, that it is not in the power of any one personage, whether statesman or hero, to produce by his ill-employed activity so much misery, as might have been supposed. Thus, if a Russian army, in these insane times, after having endured a laborious march of many hundred miles, is destroyed by a French army in defence of their republic, what has happened? Forty thousand human creatures dragged from their homes and their connexions cease to exist, and have manured the earth; but the quantity of organized matter, of which they were composed, presently revives in the forms of millions of microscopic animals, vegetables, and insects, and afterwards of quadrupeds and men; the sum of whose happiness is perhaps much greater than that of the harassed soldiers, by whose destruction they have gained their existence!—Is not this a consoling idea to a mind of universal sympathy?"

"I well remember to have heard an ingenious agricultor boast, that he had drained two hundred acres of morassy land, on which he now was able to feed a hundred oxen; and added, 'is not that a meritorious thing?' 'True,' replied one of the company, 'but you forget, that you have destroyed a thousand free republics of ants, and ten thousand rational frogs, besides innumerable aquatic insects, and aquatic vegetables.'

"Having written the above, I fear you may think me a misanthrope, but I assure you a contrary sensation dwells in my bosom;

[p. 559]

and though I commiserate the evils of all organic being, *Homo sum, humani nihil a me alienum puto.*"⁹

2. The vascular systems of animal bodies are excited into action by the stimulus of fluids, which they absorb, circulate, and secrete; and when this action is exerted in its natural or most usual quantity, it is attended with agreeable sensation, which constitutes the pleasure of organized existence. These vascular actions of animals, which perform digestion, sanguification, and secretion, convert the aliment, after its solution in the stomach, into more compounded and more solid materials; as into muscles, membranes, nerves, bones, and shells; at the same time that pleasurable sensation attends this activity of the system. The vascular actions of vegetables, which perform their digestion, sanguification, and secretion, convert the elements of air and water, or other aliments, which they receive from organized matter decomposing beneath the soil, into more compounded or more solid materials, as into vegetable vessels, muscles, membranes, nerves, and ligneous¹⁰ fibres; and a degree of pleasureable sensation must be supposed from the strongest analogy to attend this activity of their systems.

3. Many of the materials, which have been thus produced by the digestion and secretion of organized beings, and have given pleasure in their production, have been slow in their decomposition after the death of the creature; as the shells of fish were originally thus formed, and were left at the bottom of the ocean, till they became wonderfully accumulated, were afterwards elevated by submarine fires, and constitute at this day the immense rocks and unmeasured strata of limestone, chalk, and marble. As mentioned in Sect. X.10.1.

The strata, which are incumbent on the calcareous ones, which consist of coals, sand, iron, clay, and marl, are all of them believed to have been originally the products chiefly of vegetable organization; whatever changes they have since undergone in the long

[p. 560]

progress of their decomposition, and that all those solid parts of the earth have been thus fabricated from their simpler elements by vegetable and by animal life, and have given pleasure to those organized beings, which formed them, at the time of their production.

We hence acquire this sublime and interesting idea; that all the calcareous mountains in the world, and all the strata of clay, coal, marl, sand, and iron, which are incumbent on them, are MONUMENTS OF THE PAST FELICITY OF ORGANIZED NATURE!—AND CONSEQUENTLY OF THE BENEVOLENCE OF THE DEITY!

¹ “Dissertation sur l’Irritabilité des animaux & des Plantes. Par J. Peschier de Genève, Docteur en Médecine,” *Journal de physique, de chimie, d’histoire naturelle, et des arts [...] par Jean-Claude Lametherie* Vol. 2 (1794): pp. 343–57. ED refers to the sixth section, subtitled “Examen de l’opinion du Docteur Darwin” (pp. 353–57). The idea of “vegetable Onanism” is ED’s; Peschier writes, “les liens du pistil ont trouble [sic] la volupté” [the ties of the pistil disrupted the pleasure], and asks why the stigma opened and the stamens shed pollen since the pistil was “impuissant” [impotent].

² In Peschier’s article, the first experiment in the first section, p. 345.

³ Presumably pineapples rather than coniferous trees and shrubs.

⁴ Translated by ED in *The Families of Plants* (1787; Vol. 2, p. 770).

⁵ Italian biologist Lazzaro Spallanzani (1729–1799) pursued a broad range of scientific research, and was particularly interested in reproduction. His *Dissertazioni di fisica animale e vegetabile*, published in Italian in 1780, was translated into English as *Dissertations relative to the Natural History of Animals and Vegetables* in 1784 by ED’s friend, chemist and physician Thomas Beddoes (1760–1808). ED’s reference is to Vol. 2, Dissertation 2, section 173, pp. 196–97; see also Letter 2 from Swiss scientist Charles Bonnet (1720–1793), p. 241. Spallanzani does not mention mixing the semen with warm water but does say he heated the syringe to body temperature. In the Appendix, Spallanzani writes (in a letter to the Marquis Lucchesini, Chamberlain to the King of Prussia) that the success of this experiment inspired him with the idea that “artificial fecundation [...] might be an excellent way to procure, if the thing be possible, different sorts of strange mules” (p. 375–76). He injected cats with dog semen without success, but insisted that “the failure of these attempts, ought not to prevent us from making others upon animals differing in their nature” (pp. 375–79).

⁶ *Dissertations relative to the Natural History of Animals and Vegetables*, Vol. 2, Dissertation 2, sections 142–145 describe Spallanzani’s experiments with artificially fertilizing frog eggs with diluted frog semen.

⁷ Referenced in *LOTP* IV:299–20.

⁸ The part of a plant embryo that develops into the system of shoots.

⁹ Terence, *Heauton Timorumenos* [*The Self-Tormentor*], 1.1.25. [I am human, I consider nothing human alien to me.]

¹⁰ Woody.