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Plants as Aristotelian Substances

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Farewell, beloved Fritz!

When Aristotle lists the things that exist by nature, as he does, for instance, in the first line of *Physics* 2. 1, he mentions “the animals and their parts . . . and the plants and the simple bodies (earth, fire, air, water)”¹ 192b9–10 (and cf. *Metaph.* 7. 2, 1028b9–13). Things like these, he says in *Metaphysics* 7. 7, “are substances if anything is” (1032a20). Since, then, plants are full-fledged natural substances for Aristotle, it should be of interest to give them some special attention. After all, as he reminds us in the *de Partibus*, “respecting perishable plants and animals we have abundant information, living as we do in their midst, and ample data may be collected concerning their various kinds, if only we are willing to take sufficient pains” (1. 5, 644b26–31).

In this paper I first collect some information about Aristotelian plants, then try out the thesis that in some respects his plants are superior to his animals, and, finally, discuss some of the philosophical implications of an interesting distinction made by Aristotle between two grades of nutrition, a topic having special relevance to plant function.

I

As things that come to be and pass away, plants will naturally be subject to Aristotle’s general principles for perishable things, as, for example, the principle of substratum. “For,” he says, “we find in every case something that underlies from which proceeds that which comes to be; for instance, animals and plants from seed” (*Ph.* 1. 7, 190b3–4). The direction of coming to be is of course towards form, and, in the normal Aristotelian way, runs true to type: Not only does man beget man, but plant begets plant (cf. *EE* 2. 6, 1222b18–19 and *PA* 2. 1, 646a34).

To this point nothing has been said about plants which does not apply equally to animals, but if we consider the location of natural substances in

¹ Translations of Aristotelian passages are from the Revised Oxford Translation, ed. J. Bames (Princeton 1984) unless otherwise noted.

the cosmos, a difference at once appears. In the *Generation of Animals* Aristotle attempts a systematic correlation of living things with the elements in which they spend their time and flourish: "Plants belong to the earth, aquatic creatures to the water, and land-animals to the air . . ." (3. 11, 761b13-14, Peck). This correlation is certainly not an unqualified success: It immediately occurs to one to ask, what about birds? Do they not also belong to the air? And, as Aristotle is himself aware, the scheme is not complete without the identification of a group of living creatures whose natural element is fire. "This fourth tribe," he concludes, "must be looked for on the moon" (761b22). (The possibility that anyone would actually *do* this no doubt seemed to him remote.) Aristotle does not make much use of this projected scheme, but that plants have a special relationship to earth is a point of which he remains convinced.

This special relationship of plants to earth calls for some additional comment. Plants not only, as is obvious, have earth as their natural habitat, but earth is the principal element of which they are themselves composed (*Juv.* 19 [13], 477a28). That such should be the case is not surprising, since earth is an important part of the diet of plants. "It might be thought," Aristotle says, "that [plants] are fed by one substance only, viz. by Water," but in fact they "are fed by more than one, for Earth has been mixed with the water" (*GC* 2. 8, 335a12-14).

The close relationship between plants and earth accounts for another characteristic of plants, their disinclination to move. Unlike animals, who must go about to acquire their food, plants are fed *in situ*. Having no need, then, to seek food elsewhere, they remain in one place. As a result they are able to dispense with a whole complex of functions needed by animals: Plants do not need sensation or imagination in order to apprehend the location of food, nor appetite to encourage them to pursue it, nor locomotion to accomplish this pursuit.

This simplicity of plant functions (these are, of course, restricted to nutrition, growth, and reproduction) is, furthermore, reflected in their structure. As Aristotle puts it concisely in the *de Partibus*:

Plants . . . inasmuch as they are without locomotion, present no great variety in their heterogeneous parts. For, where the functions are but few, few also are the organs required to effect them. (2. 10, 656a1-4)

In other words, it is because plants have nowhere to go that they have no feet. Not only do they have no feet, but, in spite of the fact that they take in food, they have no stomachs. "The earth and its heat serv[es] them in the place of a stomach," Aristotle tells us in the *de Partibus* (2. 3, 650a23). The function of the stomach is the concoction of food into nutriment; the food of plants, however, is "already treated and prepared" (650a21, Peck). Animals here are at a definite disadvantage. Being creatures of locomotion, they not only have to search for food, but need also to carry supplies. They have, Aristotle says, "as it were an earth inside them" (650a25, Peck), and it

is from this ambulatory dining-room, the stomach, that they draw their concocted food.

The fact that plants are so wedded to their native habitat has its effect not only upon their diet and upon their structure, but also upon their position. By this I mean not simply their position in the scale of nature, which is firmly inferior to that of animals, but their position with respect to function. "All living beings have a superior and an inferior part," Aristotle observes in the *de Incessu* (4, 705a30), and he emphasizes the point that this arrangement is to be found just as much in plants as in animals. The superior part, however, is so designated with respect to its function as a recipient of food, and since plants, as we have seen, obtain their nourishment from the earth, they are, strictly speaking, *upside down*, their roots being their mouths. As Aristotle remarks epigrammatically in the *de Anima*, "up and down are not for all things what they are for the whole world" (2. 4, 416a4). Empedocles, then, was wrong in attempting to explain "the downward rooting [of plants] by the natural tendency of earth to travel downwards, and the upward branching by the similar natural tendency of fire to travel upwards" (416a1-2). Not only does Empedocles display a fine disregard for function, but he also consigns the growing plant to a dreadful fate: As earth and fire rush in opposite directions, the unfortunate plant will be torn in two. Aristotelian plants, however, being unified by soul, are in no such peril.

A final point concerning plants and earth has to do with epistemology. Plants, in Aristotle's view, have no sensation, and the reason is that "they consist of earth" (*de An.* 3. 13, 435b1). Their bodies are uncompounded (Aristotle does not, apparently, think of water as a significant part of plants in spite of its role in their nutrition), and thus they cannot have even the most basic sense, the sense of touch (*de An.* 3. 12, 434b28). Sensation requires the possession of a mean of contrary qualities, and the ability to receive the forms of sensible objects without their matter (*de An.* 2. 12, 424a32-b3). Plants, however, are affected by form and matter together. Their manner of apprehending objects is, in fact, to eat them, as is evident from the beginning of 2. 4. Perhaps this simply shows their low earthy natures and their preoccupation with food.

What I have said about plants so far has, I hope, indicated that they are subject to Aristotle's general philosophical principles, and that what he tells us about them, although sometimes rather quaintly expressed, is not at all unexpected. As we proceed, it will continue to be evident that plants have a well-defined and also quite an important place in Aristotle's scheme.

In emphasizing, in the first part of this paper, the relation between plants and earth, I have, one might say, emphasized the lower side of vegetable nature. It may even be said of plants, and is said by Aristotle in the *History of Animals* (8. 1, 588b9), that the whole genus, if compared with that of animals, is "devoid of life." But then, "as compared with other corporeal entities," plants are "endowed with life" (588b10-11). In fact,

“there is observed in plants a continuous scale of ascent towards the animal.” And, if we turn to final causes, more can be said than this: We shall find that plants as well as animals are interested in eternity.

This mood of aspiration on the part of plants is most neatly expressed in *de Anima* 2. 4, when Aristotle writes (in a mood reminiscent of Plato’s *Symposium* 207d):

... for any living thing that has reached its normal development ... the most natural act is the production of another like itself, an animal producing an animal, a plant a plant, in order that, as far as its nature allows, it may partake in the eternal and divine. (415a27–29, and cf. *GA* 2. 1, 731b32–36)

The nature of such partaking is, as Aristotle indicates, not completely successful: the individual plant or animal must perish, leaving the attainment of eternity to the species. As he says, again in the *de Anima*, the living thing “remains not indeed as the self-same individual, but continues its existence in something like itself—not numerically but specifically one” (2. 4, 415b6–8). The final cause, then, of plants is reproduction, and the other plant functions, those of nutrition and growth, subserve this end. To speak more generally, plants, like other Aristotelian entities, are controlled by teleology. As Aristotle himself expresses it in the *Physics*, “in plants too we find that for the sake of which, though the degree of organization is less [than it is in animals]” (2. 8, 199b10–11), and, in the *de Anima*, he points out that “the parts of plants in spite of their extreme simplicity are organs” (2. 1, 412b29).

Clearly, in spite of their resemblance to animals in the matter of teleology, plants retain their inferior position in the scale of nature. They are less highly organized and, as a result, have fewer functions. I now proceed, however, to mention a few respects in which it might be argued (and argued on purely Aristotelian grounds) that plants are superior to animals.

II

For one thing, the functions of plants, that is, those of nutrition, growth, and reproduction, are the absolute minimum conditions for admission to the scale of nature. Life can exist without the animal and rational functions; it cannot exist without the plant functions. Aristotle even goes so far as to write, in the *Generation of Animals*, that “the business of most animals is, you may say, nothing else than to produce young, as the business of a plant is to produce seeds and fruit” (1. 4, 717a22–23), implying that even in things higher than plants, the plant functions remain dominant. Of plants themselves he writes that “to the essence of plants belongs no other function or business than the production of seed” (1. 23, 731a25–26).

Then again, it is quite noticeably the case that plants are longer-lived than animals; the date-palm is a good example (*Long.* 4, 466a9, and cf. 6, 467a6–b3). Although, like animals, plants will die if deprived of nourishment, yet they “continually renew themselves and hence last for a long time” (6, 467a12). Animals are not only less efficient in this respect, but also, because of their inveterate habit of running about, they are far more prone to suffer accident and come to an early grave.

Further, there is at least one instance in which plants may be said to *benefit* from an experience which for animals constitutes a serious and usually mortal injury. I refer here to division, an event which Aristotle mentions quite often, usually in relation to insects²: A divided insect will live for a short time, but lacks the organs necessary for continued self-maintenance. But with plants, Aristotle says, there is a difference: “The portions of the divided insect live only for a limited time, whereas the portions of the plant actually attain the perfect form of the whole, so that from one single plant you may obtain two or more” (*PA* 4. 6, 682b32–34). In other words, division (through the taking of slips or separation of bulbs), far from being an injury to a plant, is a means by which it attains its reproductive purpose.

One final way in which, it might be argued, plants have the advantage over animals, is in the matter of sex differentiation. It has been mentioned that plants share with animals the final cause of reproduction, and also that nutrition, which is a function of animals as well as of plants, subserves reproduction. Animals, unlike plants, do not have the good fortune to be rooted in their source of nourishment, but must move about to seek it. Such being the case, Nature has provided them with the needful organs, that is, mouths, stomachs, and feet, in varying forms. Food, however, is not the only thing sought by animals: Each, or at any rate each male animal, is seeking its reproductive partner. Thus in animals male and female are distinct and separate. In plants, however, Aristotle writes, “male and female are not found” (*GA* 1.1, 715b19, Peck); in them “these powers are mingled, female not being separated from male” (1. 23, 731a1–3). What is more, the copulation of animals is really an attempt to achieve the plant condition:

For when there is need for them to generate the sexes are no longer separated any more than in plants, their nature desiring that they shall become one; and this is plain to view when they copulate and are united [that one animal is made out of both]. (1. 23, 731a11–14)

It could be argued, further, that sexual contact on the part of animals is not only an attempt at physical integration, of a type already existing in plants, but also an attempt at metaphysical integration, and that this too already exists in plants. The point will be made clear if we remember that

² I have discussed some of these points at greater length in a paper entitled “Aristotle and Divided Insects,” *Metaphis* 2 (1989) 29–40.

for Aristotle the male parent is the vehicle of form, and that the female provides the matter. The sexual union of male and female may be regarded, then, as an effort to achieve the union of form and matter. This union takes place most obviously in the new substance, which will utilize the parental contributions as the basis for its own matter and form. But it takes place, in a different way, in sexual contact, where the parents as it were imitate the new substance by coming as close to each other as is physically possible. In animals, of course, this parental union is extremely transitory, but in plants it is permanent. Thus plants, I should say, attain better than animals to the status of natural substances.

Aristotle comes close to saying this himself when he writes, in the *Generation of Animals*, that "animals seem to be almost like divided plants, as though one should separate and divide them, when they bear seed, into the male and female existing in them" (1. 23, 731a21-23). He implies, that is, that plants are the norm and animals the aberration. In the beginning of Book 2, however, he makes a spirited defence of the separation of the sexes in animals, arguing that because form is more divine than matter—I suspect he really means that men are more divine than women, who are, after all, "deformed males" (2. 3, 737a27)—it is *better* that the sexes should be separate. But he was also the philosopher who maintained in the *de Anima* that questions about the unity of matter and that of which it is the matter were beside the point: "It is as though we were to ask whether the wax and its shape are one" (2. 1, 412b8). Plants, I should say, represent this fundamental type of unity far better than animals. In the case of animals, in fact, Nature, by separating male from female for what appears to be the sole purpose of bringing them back together, comes perilously close to doing things in vain.

Now I am conscious of being in a sense perverse in attempting to argue for the thesis that in some respects plants are superior to animals for Aristotle. After all, reproduction is not the only road to divinity; there is the way of contemplation, and contemplation, in anything other than the Unmoved Mover, is normally performed by animals—rational animals, it is true, but still animals. Plants, although they may be thinking deep vegetable thoughts, are hardly, I should guess, devoting themselves to philosophical tasks such as distinguishing between Socrates and Socrates seated. Then too it might be said that whereas there is a certain efficiency in being rooted to the spot if the spot is one's source of nourishment, there is also a certain divinity in motion, in that in moving one comes closer to the condition of the heavenly bodies. That locomotion is primary and therefore superior to the other types of motion such as growth (the kind peculiar to plants) is clear from *Physics* 8. 7, where Aristotle writes:

Now all things that go through the process of becoming acquire locomotion last. It is this that accounts for the fact that some living things, e.g. plants and many kinds of animals, owing to the lack of the

requisite organ, are entirely without motion, whereas others acquire it in the course of their being perfected. (261a14–18)

And we know, of course, that “what is posterior in the order of becoming is prior in the order of being” (261a12). Perhaps it would be somewhat unkind, in the circumstances, to point out to Aristotle that the most divine entity in his philosophy, the Unmoved Mover, is rather plant-like in not moving at all.

III

The topic with which I wish to conclude has a particular relation to the doctrine of the categories, and possibly—although this is a good deal more speculative—to the doctrine of *hexis*. It concerns a distinction made by Aristotle between two types or grades of nutrition, a distinction which is therefore of special relevance to the vegetable soul.

It will be convenient to begin by reminding ourselves that the basic functions of the vegetable soul are nutrition and growth. (The third plant function, reproduction, is dependent on the other two.) Now nutrition, Aristotle tells us, “though the same as growth, is yet different from it in its being” (*GC* 1. 5, 322a25). What is the meaning of this somewhat cryptic remark?

The easiest way of answering this question is to consider the particular phenomena that Aristotle is intending to describe. In the life of any creature possessing soul, the following stages are discernible: 1) coming-into-being from appropriate seeds or parents; 2) growth to a certain limited size (a size controlled by *logos*); 3) a stage concurrent with but also succeeding growth that may be called preservation or maintenance; 4) reproduction (not essential to life but a natural expectation of any mature living thing); 5) decay, a stage in which maintenance weakens; 6) death, or passing-out-of-being.

Aristotle’s distinction between two grades of nutrition relates to the second and third of these stages, that is, to the stage of growth and to the stage of maintenance. He delineates this difference as follows:

In every instance, of course, there is nourishment of two grades present: 1) “nutritive,” that is to say, which provides both the whole and the parts with being; 2) “growth-promoting,” that is to say, which causes increase of bulk. (*GA* 2. 6, 744b33–37, Peck)

It is to clarify and emphasize this distinction that Aristotle employs the doctrine of the categories. Growth is motion occurring in the category of quantity; nutrition, however, is motion occurring in the category of *substance*. The point is particularly well stated in *de Anima* 2. 4:

Food has a power which is other than the power to increase the bulk of what is fed by it; so far forth as what has soul in it is a quantum, food

may increase its quantity, but it is only so far as what has soul in it is a "this-somewhat" or substance that food acts *as* food; in that case it maintains the being of what is fed, and that continues to be what it is so long as the process of nutrition continues. (416b11-14)

Reproduction does of course also involve motion in the category of substance, since, in reproduction, a new substance comes into being. But, as Aristotle is precise in pointing out, nutrition concerns a substance which is already in being: "Nothing generates itself, but only maintains itself" (416b16).

I did, however, mention (and this is the most speculative part of the paper) that there might be some connection between Aristotle's distinction between two grades of nutrition, quantitative and substantive, and his doctrine of disposition or *hexis*. As a preliminary we need to bear in mind that, roughly speaking, *hexis* corresponds to first actuality. That is, if we think in terms of a progression from potentiality to actuality, there is a stage at which certain functions may be possessed or *had* without necessarily being exercised. The subsequent exercise or use of these functions may be called (although Aristotle inconsiderately failed to coin the expression) "second actuality." This type of terminology enables Aristotle to give accurate ontological descriptions of, say, the powers of sensation with which we are born (we already *have* them ready for exercise and are not born with a mere potentiality of acquiring them: *de An.* 2. 5, 417b17-19 and *EN* 2. 1, 1103a26-32) or of a sleeping animal (which may be regarded as possessing life without utilizing life: *de An.* 2. 1, 412a25-26).

The point which suggested to me the parallel with nutrition was the fact that Aristotle, in contrasting the transition from initial potentiality to first actuality or *hexis* with the transition from *hexis* to second actuality or use, speaks of the first transition in terms of the extinction of contraries, and the second in terms of maintenance or preservation. So at *de Anima* 2. 5 he writes:

Also the expression "to be acted on" [as for instance by food] has more than one meaning; it may mean either the extinction of one of two contraries by the other, or the maintenance of what is potential by the agency of what is actual and already like what is acted upon, as actual to potential. (417b2-5)

The two types of nutrition fit neatly into this pattern: Growth involves the extinction of smallness and immaturity by maturity and size; after a certain point, however, maturity and the appropriate size are possessed and growth ceases. The work of nutrition is then devoted to maintenance, and, as an extension of maintenance, to reproduction. If the parallel was in fact in Aristotle's mind, it could then be said that one of his most important philosophical distinctions was intimately associated with his reflections on nutrition and the vegetable soul.

A connection between philosophical reflection and the phenomena of nutrition and growth can be seen as far back as Anaxagoras, who had asked the question, "How can hair come from what is not hair and flesh from what is not flesh?" (fr. 10). Such questions were no doubt the sort of thing that caused Socrates to say, at *Phaedo* 96c, that his study of the natural philosophers had caused him to unlearn what he had previously thought he knew "about the cause of growth in human beings." And it was Aristotle's detailed consideration of such problems in a more generalized form in the first book of *On Generation and Corruption* that occasioned the remark with which I began this section, that "nutrition, though the same as growth, is yet different from it in its being" (322a25).

Conclusion

In giving some attention to Aristotelian plants, I have merely scratched the surface of an intrinsically interesting topic. There is the ecological observation in the *Politics* (1. 8, 1256b15–19) that as animals are for the sake of man, so plants are for the sake of animals. The special connection of plants with eating and growth leads to consideration of such topics as mixture and the void. Oysters are a kind of water-plant and could do with inspection. There are intriguing details such as that "it is among plants that tastes occur in richest variety" (*Sens.* 4, 441b7), and that, although plants derive from the air assistance in the preservation of their natural heat (*Juv.* 6, 470a21–22), yet they do not breathe (*de An.* 1. 5, 410b31). Nor indeed do they sleep, as Aristotle explains in detail in the *de Somno*, as at 1, 454b26–31 and 454a12–17. It is sufficient here, however, to point out that plants, being genuine Aristotelian substances, cannot be discussed apart from such normal Aristotelian concepts as potentiality and actuality, form and matter, and final cause.³

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³ Portions of this paper were presented in lecture form at the Georgia State University, the South Carolina Society for Philosophy, and the Open University (London).

