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Homeopoesis:
Aristotle on Nutrition and Growth
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In its broad outline, at least, we know the Aristotelian story about nutrition. We eat food; the food is ‘concocted’ in our stomach by the resident natural heat and broken down into its elements; impurities are cast off and pure nutriment, blood, is extracted. This blood then travels to the various parts of the body, where it dries up and leaves a deposit, a *perittôma*; this dried deposit is flesh. And so we grow.

But here is a question. Why don’t we grow cancerously? Why doesn’t the deposit of flesh accruing in, say, our fingers, just make our fingers grow longer and longer throughout our lives? Why don’t our earlobes become great sails about our heads? Why don’t our nostrils fill up with flesh? What stops these various parts, indeed all bodily parts, from simply becoming formless blobs as time goes on? Why don’t our arms become clubs, our eyelids immovable heavy curtains, our lips amorphous masses? Why don’t our tongues gradually fill our mouths? And so forth.

Aristotle was aware of this question, and he gives a kind of answer to it in II.5 of *de Anima*:

The soul is the principal cause of growth, for... in the case of all complex wholes formed in the course of nature there is a limit or ratio (*peras kai logos*) which determines their size and increase, and limit and ratio are marks of soul.... (*DA.* 416a15ff; tr. Smith)

This is, however, a purely *formal* reply. And it is a distinguishing feature of Aristotle’s work in biology that he is not content with purely formal replies. He seeks always to replace ‘soul’ as a term in an explanation with a physiological story. It isn’t ever enough just to say “soul does it” in answer to a question about vital functions; such an answer would be a refuge of ignorance, an *asylum ignorantiae*. Now it may be that, at the end of the day, at the final limit of our efforts to explain higher psychic functions like desire or locomotion or thought, we shall have to acknowledge our ignorance with such a formulaic refuge. But here we are dealing with the lowest, the most basic psychic function, the one that is shared among not just all animals, but all living things. Surely here, if anywhere, Aristotle’s scientific program requires that he be able to furnish an answer. So, what is the physiological story about nutrition and growth? How is the process controlled?

First Answer

In the first two books of *de Generatione animalium* Aristotle is working at the elaboration of a theory of animal reproduction; he seeks to find an alternative to pangenesis. That is, he does not like the theory that semen is drawn from every part of the

body at the time of coition. This theory would explain, at least in outline, why it is that offspring resemble their parents; but Aristotle resists it on various other grounds. His own theory is that semen is a refined secretion of nutrient blood, a portion of the nutrient that is not actually needed by the body for the purpose of nourishment.

So we must say the opposite of what the ancients said. For whereas *they* said that semen is that which comes *from* all the body, *we* shall say it is that whose nature is to go *to* all of it.... (*GA* 725a21-23; tr. Platt)

The Oxford translator Platt helpfully expands this picture in a footnote:

Because semen is derived from the nutriment which is conveyed by the blood-vessels *to* every part of the body. Though it does not itself go to every part it is a sort of quintessence of that which does.

Now it is implied by this picture that the nutrient blood, concocted out of the food we ingest, before it travels out to the various parts of the body, *already has imposed upon it the signature of the form it is destined to assume*. That is, at the end of the digestive process in the stomach, or at any rate in the entrails, the blood is already somehow infused with a blueprint of the shape of the flesh it is going to become. There would thus be portions of blood that are destined to become nose-flesh; and these already have a nose-flesh-plan in them; other portions already have an eyelid-flesh-plan, others liver-flesh-plan, and so forth. Each portion of nutrient blood already has its distinct entelechy. Thus it is that by taking the excess of this nutrient blood and refining it further you get the building blocks of a complete offspring: semen.

This theory, then, requires a subtle mechanism for the control of growth. It requires that digestion should be a process that not only breaks down food into its elemental constituents, and creates blood, but also one that, along the way, imposes a body-part-plan on each portion of that blood. And we have no sketch of how *that* part of the process might work.

And although the reproductive theory of the *GA* grows more subtle and more complex as the treatise progresses, this one element is not abandoned: semen is the ultimate secretion of the nutriment. (766b8)

At least this much can be said, however. Aristotle has progressed beyond the merely formal remark of *DA* II,5, according to which it is soul that controls growth. And he has also produced a theory that economically connects reproduction with nutrition: both are functions of the vegetative soul, and, in this account, they turn out to be joined at the hip.

Something, however, is missing. These portions of blood that are to travel to the parts of the body are only *potentially* nose-flesh, or hand-bone, or knee-sinew. Something is needed to actualize that potentiality in each case. The *GA* gives us nothing here.

Second Answer

These texts of the *GA* provide an answer to our question only indirectly, only as a by-product of a different theoretical focus, namely that of explaining animal

reproduction. It is otherwise in the *de Generatione et corruptione*; here we find a chapter (I.5) that is explicitly and solely devoted to explaining the operation of nutrition and growth. Unfortunately, however, the text at the very end of the chapter where Aristotle seems to be offering his explanation of the control of growth is quite unclear, and is in particular troubled by a very striking textual uncertainty.

The broad context is that Aristotle makes a distinction between organic parts (*anomoimerê*) and tissues (*homoimerê*), and he points out that in the growth of the organic parts there is proportional increase, that is, the form grows in every part of itself; in tissues this is less evident. More narrowly, the context is that of explaining the difference between growth and mere nutrition. Aristotle writes (Joachim's translation):

The form of which we have spoken is a kind of power immersed in matter – a duct, as it were. If, then, a matter accedes – a matter, which is potentially a duct and also potentially possesses determinate quantity – the ducts to which it accedes will become bigger. But if it is no longer able to act – if it has been weakened by the continued influx of matter, just as water, continually mixed in greater and greater quantity with wine, in the end makes the wine watery and converts it into water – then it will cause a diminution of the *quantum*; though still the form persists. (GC 322a28-33)

τοῦτο δὲ τὸ εἶδος [ἄνευ ὕλης], οἷον αὐλός, δύναμις τις ἐν ὕλῃ ἐστίν. ἐὰν δὴ τις προσίῃ ὕλῃ, οὕσα δυνάμει αὐλός, ἔχουσα καὶ τὸ ποσὸν δυνάμει, οὗτοι ἔσσονται μείζους αὐλοί. ἐὰν δὲ μηκέτι ποιεῖν δύνηται, ἀλλ' οἷον ὕδωρ οἴνω ἀεὶ πλεῖον μινύμενον τέλος ὕδαρῆ ποιεῖ καὶ ὕδωρ, τότε φθίσειν ποιήσει τοῦ ποσοῦ· τὸ δ' εἶδος μένει.

Now the word that Joachim here translates as 'duct' is *aulos*. But there has been a longstanding uncertainty as to whether this word is to be understood as the noun *aulós* (pipe) or the adjective *á-ūilos* (immaterial). The manuscripts all have the latter; both Prantl and Bekker follow suit; Philoponus reads it that way too. But the 16th century Latin translation of Franciscus Vatablus translates the word as *tibia*, and so takes it in the former sense: a duct or channel. Joachim argued that *aulós* is to be preferred, because *á-ūilos* is not otherwise in Aristotle's vocabulary;¹ all more recent editors and translators known to me have followed suit. So we do not have to confront the presence of immaterial powers, or unenmattered forms, in our understanding of the text. But what does the text say?

i) I take it that its interest in ducts or tubes arises from the concern that, if growth is to be managed, acceding flesh must not block up a bodily duct – an artery, a nerve, an esophagus, an intestine, a windpipe, a Fallopian tube or a nasal passage, etc. – but must rather add itself to the flesh already there in such a way as to preserve the duct-like shape of the organ.

¹ Joachim also slightly emends the text in line with this reading of *aulos*; I will not go into that here.

ii) “The form of which we have spoken”. The Greek is merely *touto de to eidos*. Joachim in his notes interprets this to be a reference to the basal soul, the vegetative soul: the vegetative soul is the power that manages these goings on. I would regret it if that is correct, for then Aristotle would be using ‘soul’ as a refuge of ignorance: “how does growth get managed? well, soul does it”. But in any case it would very odd to say that the vegetative soul is a duct! I think the form here is the form of an organic part – in the example, of a duct.

iii) ‘a matter which is potentially a duct’ picks up the theory of the *GA*, according to which the acceding matter is already destined to become a duct, and has been so destined by the earlier activity of the digestive system. There are (roughly) two kinds of potentiality in Aristotle, entelechy and plasticity. Some things have only one potentiality, their entelechy: the only potentiality of an acorn is to become an oak – though it may fail to achieve its potential. But a blob of potter’s clay has many different potentialities: it can become many different things – a statue, a jug, a platter, a lamp, a tablet.... Although matter is generally plastic in Aristotle², in this case the matter has been so-to-speak predestined to become a duct; its plasticity has been narrowed by the digestive process. Of course it is still only *potentially* a duct; something is needed to actualize that potentiality.

iv) What then is this power immersed in matter (the Greek just says “a certain power in matter”)? What is the “it” that may no longer be able to act? I suggest that it is, in this case, precisely the duct or tube of the example. But what does such a duct *do* in this process of growth or nourishment? I answer: it *ductifies*.

If we look at other examples of change in this chapter, we see that when you add water (in small quantity) to wine, the water is understood to become wine; when the moist accedes to the dry, it is dried; when fire lays hold of fuel, the fuel becomes fire. Ancient and mediaeval science in general makes far greater room than does our own science for a causal principle that might be called *homeopoesis*, or contagion. Think of the primary example that is so often found in these discussions: heating something by bringing a hot thing into contact with it. Or think of pollution: if you come into contact with something that is ritually impure, you yourself become ritually impure. This causal principle was broadly present in ancient thought about causation.

Aristotle goes to some length to insist, in this chapter of the *GC*, that for genuine growth – as opposed to substantial coming-to-be – there must be contact between the acceding food and the tissue-to-be-grown: the food must be ‘together with’ (*hama*) the growing thing. And he gives his examples of mixing water into wine, and of fire taking hold of fuel. Without the touching, the contagion (*contingere, tangere*), the homeopoesis cannot occur.

Now homeopoesis would be a form of efficient causality, of course. So if Aristotle’s idea is that the acceding matter, undifferentiated flesh, is ductified when it reaches the duct and is touched by it, he would be offering us a straightforward efficient-

² I think of Heinz Happ’s book on *Hyle*, which, after pursuing the subject for several hundred pages, concluded simply that matter, in Aristotle, is *reine Möglichkeit*: Heinz Happ, *Hyle – Studien zum aristotelischen Materie-Begriff*, Berlin & New York, De Gruyter, 1971.

causal explanation of growth. There would be no mystery here; he could be absolved of the suspicion of having recourse to an *asylum*. It is just that the matter is informed by contact with the duct.

A duct's 'power immersed in matter' is precisely the power to ductify.

v) What, then, is the distinction between growth and mere nutrition that this paragraph is seeking to elaborate? Aristotle is clear that there can be nutrition without growth: so long as a body is alive it can be nourished, although it may not be growing, and may even be diminishing. On the other hand, though, nutrition and growth are the same, but different in being, in definition (*einai, logos*) (322a24).

The difference, says Aristotle, is that the acceding matter is either potentially flesh, or potentially so-much-flesh; in the former case we have mere nutrition; in the latter we have growth. This suggests that whether we have growth or mere nutrition occurring depends upon the potentiality that was imposed upon the nutrient blood in the digestive process. And so we have the mysterious picture of the vegetative soul telling this or that portion of blood that it is to go off to the knee and be such and such a quantity of flesh, or that it is to go off to the knee and just be flesh (though of course it can't help being some or other quantity of flesh!). The vegetative soul has a plan, and whether *quantity* of flesh is or is not part of that plan determines whether we will have growth or mere nourishment. This implies the existence of a complex process, but it is one about whose mechanics Aristotle ventures nothing whatever.

And it would appear to be troubled by the final sentence of the chapter, which says that if the duct (I take it) is no longer able to make flesh, it will diminish its quantity, even though the form remains. The trouble is this: what determines whether we have nutrition or growth? is it the vegetative soul, through some unimagined mechanism, running the digestive process and assigning potentialities to different portions of nutrient blood? Or is it the ducts and other organs located throughout the body? Is it a matter of the blueprint imposed on the blood, or is it the efficient causality of the homeopoetic organs? Or do the two things, perhaps, come to the same in the end? That is, does a duct, when it is first created in embryological development, acquire only a limited power to build itself up, so that in due course it will build no more, but settle back into merely repairing itself to keep its quantity stable, and eventually even into quantitative decrease?

The thing about homeopoesis is that it cuts both ways. If you touch a hot thing to a cold one, the cold thing will heat up. If you do this again and again, however, eventually the cold things will wear down the hot thing, and the homeopoesis will go in the opposite direction. Aristotle is clearly aware of this as he thinks about mixing water into the wine; for a while you have wine, and wine that is increased in quantity. But eventually what you have becomes watery, and then ultimately is really water. In the same way, the duct can keep ductifying flesh, but eventually the flesh overcomes the duct, and it begins to grow no more, and eventually to diminish. And isn't this just the story of animal life?

Concluding observations

We have tracked Aristotle's theory of nutrition and growth through two treatises, hoping to find that he satisfactorily fills out his formal claim in *DA* II,5 that soul imposes

a limit or ratio on growth. It is an impressive accomplishment that he can tie the mechanism of reproduction so closely to that of nutrition, for both are functions of the vegetative soul. But the mechanism seems to involve a mysterious operation that is part of digestion, namely, making each portion of nutrient blood potentially specific to the nourishment, or the growth, of a particular body part, endowing each portion of nutrient blood with a blueprint or code. It is hard even to imagine how that might work; indeed it is hard even to imagine how Aristotle might have imagined that it might work.

It is frustrating of course, that Aristotle gives us so little in the way of picturing the physical realization of the blueprint. This lack of specificity can at times make his science here seem like little more than a fairy tale, a castle in the air. One pleads, in his defence, such facts as that human dissection (let alone vivisection) were unavailable to him, or that the truths of these matters are so microscopic that even if he had been able to dissect he could not have detected the physical realization of the blueprint or code. But something stronger can be said in his support. Science often postulates hypothetical entities: the entities that must be there if a certain function is to be performed, even if we cannot say much more than that about the entities in question. Thus the 'gene' was understood as the unit of heredity, long before any clear idea of its chemical nature was available. Or again, the 'language of thought' has been hypothesized as a theoretic necessity, even in the absence of a clear notion of just what the physical realization of its strings might be. It is perfectly *bona fide* science to postulate entities that are theoretic necessities, in advance of filling in any other details about them. And this, I think is what Aristotle is up to in his roughly postulated blueprinting of nutritive matter. There are certain theoretic necessities to be acknowledged, even if their possible physical realization is hard to descry.

If we are willing to allow Aristotle the postulation of the theoretic necessity of some sort of blueprinting mechanism in digestion, and if we recognize homeopoesis as part and parcel of ancient conceptions of efficient causality, then rest of this story falls fairly tidily into place.