

GENUS/DIFFERENTIA, MATTER/FORM, AND LEVELS OF COMPLEXITY

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At various points in the *Metaphysics* Aristotle wrestles by turns or simultaneously with two problems.

First, what is the nature of definition? What sort of predication is it that links the elements of a definition to one another and to the term defined?

Second, what is the nature of substance? What are the various aspects of substance and how are they related?

Each of these two discussions features its own vocabulary. The problem concerning definition is that of ascertaining the nature of the relation between *genera* and speciating *differentiae*, while the problem concerning οὐσία is that of determining the relation between *matter* and *form*. I shall argue that Aristotle has an understanding of genus and differentia, on the one hand, and of matter and form, on the other, that enables him both to assert the identity of these two problems and to solve them; viz. an understanding imported from the biological works, in terms of relative levels of organic complexity.

In chapter 10 of *Metaphysics Z* Aristotle discusses form and matter and argues that form alone, not matter and not the concrete whole composed of form and matter, constitutes essential nature (εἶδος δὲ λέγω τὸ τί ἦν εἶναι—1035b32) and substance (1035b21). Similarly, he appears to say that in definitions only form (εἶδος) can be mentioned; for example parts are counted as parts of a definition only if they are “parts of the formula of the form” (1035a10),¹ and not parts in the sense that matter is a part.

¹ H. Tredennick, trans. (Cambridge 1933).

But in *Metaphysics Z* 11 Aristotle picks up some threads left loose at the end of *Z* 10, and he begins to wonder just what this matter is which is to be excluded from the essence of things, and left unmentioned in their definitions. It had emerged in *Z* 10 that some types of matter are immaterial – that is, not sensible but merely intelligible: for example, the arcs into which a circle may be divided (1036a1ff.),² and it had emerged that in addition to the matter which concretizes particular individuals and makes them *this* horse, *this* circle, etc., there are *types* of matter —*this* particular matter ὡς καθόλου (1035b31)— which in part constitute types of concrete wholes. Aristotle mulls over the Pythagorean claim that just as the matter bronze is to the form triangle in the composition of a bronze triangle, so the matter “linear” is to the form “three” in the composition of a mathematical triangle (1036b7ff.).

Finally at 1036b21 in *Z* 11 Aristotle retreats from his *Z* 10 conclusion. After apparently alluding to the difficulties which arose in *Z* 5 when he attempted to define snubness, he says that “to reduce everything in this way and to dispose of matter is going too far, for some things are presumably a particular form in a particular matter.” His first example of a case in which matter must be included in a definition is that of a biological entity, a human being. Whereas a sphere can be conceived without its particular material component (bronze, for example), a human being can’t be a human being, can’t perform the function which is characteristic of and essential to it, without having material parts capable of that sort of motion.

The difficulties (concerning notions like snubness) which arose in *Z* 4 and 5 were not expressed as difficulties concerning the relation of form and matter but rather as difficulties concerning the relation of the elements of a definition, and their unity. Aristotle suggested there that a definition consists in a description of a thing’s essence. “Essence belongs to all things the account of which is a definition . . . essence will belong to nothing except species of a genus, but to these only; for in these the predicate is not considered to be related to the subject by participation or affection, nor as an accident” (1030a7-14). But essence in the primary sense belongs to undivided individuals: “essence is an individual type; . . . when a subject has something distinct from it predicated of it [as for example in the case of “white man”], it is not an individual type”

² See also *Metaphysics B*, 1043a35.

(1030a2-5). It is therefore important to one engaged in composing definitions to be able to discriminate between predications which are of something distinct and those which are not, and to know in particular how a two-term definition of one simple essence can *not* contain at least one predicate distinct from the essence.

Aristotle's attempt to define "snub nose" was intended to highlight this difficulty. If "snub nose" is defined as *concave nose* then, since concavity does not seem to be peculiar to noses, one is left with a definition by addition, in which each element is distinct from the whole. If, however, one defines "snub nose" as nose having that sort of concavity proper to a nose one is left with a circular, redundant formula.³

Well, snub nose may or may not actually have a simple essence.⁴ But the same paradox arises in the case of every term which *is* thought to have such an essence. If, for example, the genus-species definition of "human being" as two-legged animal is not to be uninformatively glossed as "animal having the two-leggedness *proper to human beings*," then the composite "two-legged animal" will not seem to define something which is in essence one thing. Human being will dis-integrate—its formula will include abstract, formal, general two-leggedness on the one hand and generic animality on the other. Neither genus nor differentia will be *per se* predicated of the other or of the whole. The "definition" will be of a sort with that of "white surface" or "cultured Socrates."

Aristotle's solution to this problem in Z 12—that proper differentia and genus are in some sense one—follows immediately upon his aforementioned Z 11 decision that the essential nature of some things includes both form and matter. The two discussions are said to be connected: "now let us deal . . . with definition . . . for the problem . . . [of unity of definition] has a bearing upon our discussion of substance" (*Metaphysics* Z 12 1037b8-10). The connection appears more clearly in *Metaphysics* H 6 (1045a15ff.) where one finds one of many hints that Aristotle regarded the two problems as identical.⁵

What is it, then, that makes 'man' one thing, and why does it make him one thing and not many, e.g. 'animal' and 'two-footed' . . . ? Evidently if

³ Cf. J. E. Hare, "Aristotle and the Definition of Natural Things," *Phronesis* 24 (1979).

⁴ Cf. *Metaphysics* E, 1025b32.

⁵ See also *Metaphysics* Δ, 1024b9; Z, 1038a6-10; I, 1058a24.

we proceed in this way, as it is usual to define and explain, it will be impossible to answer and solve the difficulty. But if, as we maintain, man is part matter and part form —the matter being potentially, and the form actually man— the point which we are investigating will no longer seem to be a difficulty. For this difficulty is just the same as we should have if the definition of *X* were 'round bronze'; for this name would give a clue to the formula, so that the question becomes 'what is the cause of the unification of 'round' and 'bronze'?

Here Aristotle intends to answer a question concerning the unity of *genus* and *differentia* in a definition of human being by pointing out that human beings comprise both *matter* and *form*. "This difficulty," he says, "is just the same."

So: in the *Metaphysics* Aristotle implies that the elements of a definition (genus/species) and the elements of essential nature (matter/form) are each possessed of a kind of unity. And he repeatedly suggests that these are not in the final analysis two kinds of unity but one.

Unfortunately, under their initial descriptions both sorts of unity remain somewhat unaccounted for. Unity of definition which contains both genus and speciating differentia is said to be possible because certain differentiations are somehow proper to a given genus, while unity of an essence which contains both matter and form is apparently held to be possible because some actualities are somehow proper to a given potentiality. But what "proper to" means, and what sort of things matter and form, genus and differentia must be in order to be subject to "proper to" relationships, remain in need of explanation.

The nature of such an explanation is suggested by the fact that Aristotle's *Metaphysics Z* conclusion concerning the cohesion of the various elements of a definition is repeated in a treatise on organic creatures.

If . . . a new differential character be introduced at any stage into the division, the necessary result is that the continuity of the division becomes merely a unity and continuity of agglomeration, like the unity and continuity of a series of sentences coupled together by conjunctive particles. For instance, suppose we have the bifurcation Feathered and Featherless, and then divide Feathered into Wild and Tame, or into White and Black. Tame and White are not a differentiation of feathered,

but are the commencement of an independent bifurcation, and are foreign to the series at the end of which they are introduced.

[*De Partibus Animalium* 643b17-24]⁶

This argument appears at the end of a passage in which Aristotle considers the requirements of a taxonomic scheme for animals. "The method . . . that we must adopt," he says, "is to attempt to recognize the natural groups" (643b10). Not every criterion which happens to create a distinction within a given class will do; "the differentiae must be elements of the essence" (643a27). For *every* multi-member class can be divided by *some* criterion. Unless one chooses natural differentiae, "the disruption of a species into different groups" (643b4) will occur. In the final analysis there will in fact be as many new "species" as individuals, and a taxonomic scheme employing such non-essential differentiae will lose its value as an orderer or systematizer of thought, both because any grouping function can be destroyed with the reappearance of a given differentia in another branch of the schema, and because which differentiations occur first and which occur last will be left an arbitrary matter; none will be more "central." At least here in the study of animals, then, it is of great importance to know which differentiae are somehow naturally associated with —proper to— the genus they differentiate, and which are not. And here again there appears an (ambiguous) hint that in the solution of this problem the form/matter and differentia/genus distinctions will be found to coincide: Aristotle asserts that "a species is constituted by the combination of differentia and matter" (643a24).

What light does their relevance to the understanding of organic creatures shed upon the questions of the unity of essential nature and the unity of the elements of a definition, and how is the asserted coincidence of the two just-mentioned distinctions to be accounted for? I shall argue that by understanding both differentia and form as representing —at least in discussions of living things— a certain level of organic or systematic complexity, and by understanding both genus and matter as representing —at least in discussions of living things— a certain lower level of such complexity, the problems concerning the two sorts of unity mentioned above can be solved, and Aristotle's scattered suggestions concerning the coincidence of the matter/form and genus/differentia distinctions can be understood.

⁶ W. Ogle, trans. (Oxford: Clarendon Press 1912).

Aristotle believed that embryos develop and assume whatever identity they have as a result of certain motions in semen which work on original matter from the menses or some analog (καταμήνια) to produce increasing degrees of organization (*De Generatione Animalium* 734b20ff.). At every stage what is worked upon has already some degree of organization, some λόγος, and some *function* (“flesh . . . too has a function”—*GA* 734b31).⁷ These characteristics apply even to what is worked upon at the very first stage: “nobody would put down the unfertilized embryo as soulless” (*GA* 736a33). What apparently counts as form relative to one metamorphosis counts as matter for the next. Cf. *DPA* 646a20: “The second degree of composition [of three] is that by which the homogenous parts of animals, such as bone, flesh, and the like, are constituted out of primary [though already once informed] substances.” (Cf. also *Metaphysics* H 4, 1044a19ff.)⁸

Exactly coinciding with this emergence of progressively more complex *forms* is, according to Aristotle, the development of the sorts of soul characteristic of the members of each of the successively less inclusive *genera* (mediate and finally immediate) to which a given organism belongs. The passage which begins with the just-quoted excerpt from *GA* runs as follows:

Nobody would put down the unfertilized embryo as soulless or in every sense bereft of life (since both the semen and the embryo have every bit as much life as a plant), and it is productive up to a certain point. That they then possess the nutritive soul is plain . . . As they develop they also acquire the sensitive soul in virtue of which an animal is an animal. For e.g. an animal does not become at the same time an animal and a man or a horse or any other particular animal. For the end is de-

⁷ A. Pratt, trans. (Oxford: Clarendon Press 1912).

⁸ Cf. M. Grene: “*Eidos* and *hyle* were for [Aristotle] a pair of analytical tools, to be applied in the study of nature relatively to one another and relatively to the particular inquiry.” (“Aristotle and Modern Biology” in *Boston Readings in the Philosophy of Science* Boston 1974, pp. 18-19.).

Martha Nussbaum argues that form alone gives humans their character: “if we found tomorrow a creature made of string and wood who performed all the functions mentioned in our formal account of what it is to be a human being, we could not rule him out simply on material grounds.” But a consequence of my argument is that the assertion Nussbaum resists -- that human beings are necessarily enmattered -- amounts just to the assertion that the uniquely human form is invariably embedded in a broader, less detailed but more inclusive form. “Aristotle on Teleological Explanations” in *Aristotle’s De Motu Animalium* (Princeton: Princeton University Press, 1978), pp. 70-73.

veloped last, and the particular character of the species is the end of the generation in each individual.

[736a33-b5]

Possessing a nutritive soul, a thing is marked by the differentia which distinguishes living things from among things in general. With the acquisition of a sensitive soul, a thing moves definitely to one side of the division which splits the class of living things—it becomes animal, not plant. Finally, with the development of the rational soul, a thing is specified as being that within the genus animal which is *human*.

Having a certain *genus*, like having a certain *matter*, thus apparently amounts to having been moulded to at least a certain extent, in a certain determinate way. Possessing a certain *differentia*, like possessing a certain *form*, apparently amounts to having received a certain more particular mould.⁹

It is tempting here to pull back and object that while having the matter flesh, say, and belonging to the genus animal, may be two properties which a thing acquires at the very same point in its development, they cannot literally be the same property. It is one thing to be composed of a certain kind of *stuff*, another to have certain characteristic functions and types of organization. But if flesh and other organic matter truly is to be regarded as having both certain kinds of organization (*DPA* 646a20) and certain kinds of function (*GA* 731b1), and if on the other hand the animal soul is to be regarded as being a certain kind of *essentially* enmattered function or organization (*De Anima* I 1, 403a1ff.), then matter and genus do begin to merge, and to lose not just their temporal but also their logical separateness.

⁹ "When used technically [εἶδος] seems to represent a single concept, although it is already rendered in Latin (as in modern European languages) by two separate terms: *forma* and *species*. I have not found, however, any indication that Aristotle took the term *eidos* to be in any formal sense equivocal." [Grene, "Aristotle and Modern Biology," p. 17].

The account I'm presenting suggests Aristotle's response to Ackrill's "Contingency Condition"—"the contrast of form and matter in a composite makes ready sense only where the matter can be picked out in such a way that it could be conceived as existing without that form." [J. L. Ackrill, "Aristotle's Definitions of *Psuche*," *Aristotelian Society Proceedings* 73 (1972-73), 126.] It is not clear that Aristotle would regard meeting it as necessary—the condition seems equivalent to the requirement that it be conceivable that genera exist independent of species.

I will review briefly some of the attractions the account presented here has for Aristotle, and mention some of the difficulties to which it may be subject.

(1) If Aristotle did in fact hold that the sort of predication which links one level of organic complexity (of a given type) to another is of especial importance, at least in the study of natural things, he thus equipped himself with a criterion on the basis of which to distinguish between useful and unuseful scientific generalizations. An Aristotelian scientist is not reduced to creating a new category for every conjunction of characteristics, or at least not to giving all such categories equal status—that is, the scientist need not regard every quality possessed by only certain members of a class as a speciating differentia.

(2) Differentiation by virtue of alternative types of organization constitutes a *positive* criterion, such as Aristotle argues is requisite, for speciation¹⁰—privatives will not do as differentiae he says (*DPA* 647b20ff.), because on the one hand they do not admit of further subdivision, thus disqualifying them as differentiae at intermediate levels, while on the other hand within the class delimited by a privative there are contained specifically distinct creatures, thus disqualifying privatives as *ultimate* differentiae. These characterizations of privatives—as admitting no subdivision and as containing specifically distinct creatures—appear contradictory, unless one grants that a particular sort of subdivision or a particular sort of containment of species is being required by Aristotle; viz., one somehow proper.

(3) Equipped with this understanding of proper qualities as those which further extend the type and degree of organic complexity the thing qualified exhibits, the scientist will not be reduced to merely observing the actual distributions of alternative possible outcomes in order to determine which sorts of change are proper to a thing and which are not.

Matter (and therefore genus, according to Aristotle's occasional assertions) may be understood as that which is capable of further *specification*—apparently, specification by receiving either of a pair of contraries. Now it might seem that an individual thing which possesses one contrary has that contrary actually and the other contrary potentially, and so it is with contraries such as white and black, hot and cold, etc. Potentiality

¹⁰ Cf. Montgomery Furth, "Transtemporal Stability in Aristotelian Substances" *Journal of Philosophy* 75 (1978): pp. 634-5.

here moves in two directions. This is to say that in these cases, the form in virtue of which a thing belongs to a particular genus does not automatically stamp a thing as having —or not having— a certain one of the contraries. The contraries are not essential predicates.

Matter, and genus, may in fact be regarded as a substrate for change of this sort. But in addition to the sort of change represented by the change from white to black, and the notion of potentiality/actuality which parallels this sort of change, there is a different sort of change suggesting a different sort of potentiality/actuality. (Cf. *De Anima* II 5, 417b17.) This is the sort of change whereby a thing, in particular an organic thing, moves through the successive stages in its development, the sort of change whereby a thing moves from a less detailed and organized state to a more detailed and organized state. This sort of movement from potentiality to actuality cannot be reversed and does not imply an opposite potentiality. An acorn may decompose or become an oak tree; an unhealthy person may die or become well; (a child —I think Aristotle regards this case as analogous— may become vicious or virtuous) but only becoming an oak tree and becoming well, respectively, count as proper potentials (cf. *Metaphysics* H 1044b30-1045a7). Death and decomposition, on the other hand, require a decrease in the organization and orderedness of the thing said to have a potential. They require, this account suggests, some abandonment of the level of organization which made the thing with a potential the sort of thing it was.

(4) Vice may be regarded as in this respect resembling death and decomposition; there is no contrary potential to the potential that each human has to become virtuous. The notion that proper *human* development consists in the attainment of increasing levels of organic complexity makes sense of a great many passages in Aristotle's ethical writings,¹¹ and dovetails nicely with work currently being done by commentators on those writings.¹²

¹¹ The *Nicomachean Ethics* presents the reader with the following puzzles. (1) What is the ontological status of a *ἕξις*, or disposition; how, in particular, can a *disposition* be said to conflict with a creature's *nature*? (2) Given that Aristotle generally bases evaluation of actions and dispositions on the extent to which they conform to a creature's nature, by what standard does Aristotle evaluate *natures* as good or bad?

The account I have presented here suggests the following solutions. (1) Dispositions are the same sort of things as natures ("second natures," as Aristotle sometimes remarks) [*EN* 1152a28-33, 1154a33-34, *EE* 1220b1-3, *Mem.&Rem.* 452a28-30, and *Rb* 1370a6-8]. But dispositions stand in relation to original nature as detail to schema,

In sum, Aristotle offers a notion of positive organization as a basis for predication of certain types of change as proper. Proper predications occur when a more detailed, more fully nuanced pattern is predicated of a sketchier, less detailed pattern. As long as the rudimentary pattern, so far as it goes, remains, there are restrictions on further development. The alternative paths for further development are in some sense peculiar and proper to the rudimentary outline; they may be regarded as proper potentials, and proper differentiations of the more general schema.¹³

Few of the difficulties confronting the preceding interpretation of Aristotle have been mentioned above. It is unclear, for example, to what extent the sort of increase in complexity which suffices to mark off a new type must be a sort which in fact occurs at some point in the actual maturing process of an organism. If any increase in order and complexity will do then it would seem that "cultured man" might after all name a new species, or at any rate that participants in different cultures are members of different species. But if one is prepared to grant the existence of processes of maturation or development other than biological processes then this conclusion need not be resisted, and it can, for example, make room, when goods and bads are linked to species-determining patterns of activity, for the perceived extent to which goods and bads are relative to specific cultures and situations.

On the other hand, if only those increases in complexity which actually occur in the course of the development of particular kinds of organism are relied upon in creating distinctions in a classificatory scheme, then Aristotle must seek a different basis for the sorting out of things

and it is in this way that dispositions and nature either conflict or conform. (2) One nature is superior to another by virtue of exhibiting or allowing development of greater organic unity and complexity [EN 1170a20-25, 1106b29-32]. For a more extensive treatment of these issues see "The *Nicomachean Ethics* and Aristotle's Biological Metaphysics," forthcoming.

¹² For example, Martha Nussbaum, Nancy Sherman, David Wiggins, and John McDowell. Cf. Sherman: "At issue [in the matter of acquisition of the virtues] is how we make determinate more indeterminate capacities and actions" ["Aristotle's Theory of Moral Habituation," unpublished manuscript].

¹³ If characteristics which tend to develop in the course of an organism's development can be *per se* predicated of the organism, then there is room for the sort of ἐπὶ τὸ πολὺ scientific generalization, otherwise hard to account for, which Aristotle mentions in the *Posterior Analytics* (73b10ff., 96a8-11). The account outlined here dovetails with Aristotle's account of practical reasoning at DA 434a4-9: "Making two images into a unity."

which do not undergo organic processes of maturation. But perhaps there is no alternative, now or at the time of Aristotle, to allowing a certain flexibility in the types of order, actual or hypothetical, one employs as the basis for one's actual or provisional conceptual superstructures. If there is *some objective formal understanding of what counts and what does not count as an extension of a given type and amount of organic complexity* then this flexibility does not entail a return to arbitrariness in the construction of taxonomic schemes.¹⁴

A final difficulty: Aristotle says (*De Anima* II 4, 416a16-17) that "in the case of all complex wholes formed in the course of nature there is a limit or ratio which determines their size and increase,"¹⁵ and that this limit and ratio indicate the soul and *λόγος* of these things. But semen, according to Aristotle, has motion which contains the pattern, limit, or ratio of whatever development the organism undergoes. Why should the semen and therefore also the embryo at each stage of its development not be considered in full possession of the soul and *λόγος* of a human being? In what sense are the semen and the embryo merely potentially human beings? If to be a certain specific thing simply *is* to contain the amount and kind of information which some type of organism possesses at maturity, then since seeds and fertilized embryos contain, encoded, all the information a mature organism contains, seeds and fertilized embryos already fully are what they are commonly thought to be in need of becoming. Rephrased, the question is, what sort of potential does a seed have?¹⁶

Some of these difficulties may be telling; others may be more troubling to Aristotle than to twentieth-century writers who wish to borrow Aristotle's conceptual schema. Those writers can profitably adopt Aristotle's view that living things, and in particular human beings, are to be regarded as essentially certain types and degrees of organic comple-

¹⁴ Acknowledgement of the possibility of such an understanding might constitute a step forward in the personal identity debate. It would particularly illuminate, and render more flexible, the accounts of those who link the identities of persons to participation in the natural kind "human being;" cf. D. W. Wiggins' *Sameness and Substance*.

¹⁵ J. A. Smith, trans. (New York: Random House, 1941).

¹⁶ The response here cannot be "The potential to develop specific phenotypic excellences," because Aristotle asserts that the potential in question is a potential to become, e. g., simply animal, mammal, human. What one seems, paradoxically, to have in the case of fertilized seeds and embryos is form without matter; the potential these things have is the potential to be embedded within a broader form.

xity. They can adopt this view *without* accepting an account that makes what human beings are something static or uniform, because as the view has just been described these are not essential features of Aristotelian essentialism.

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