HYLOMORPHISM AND FUNCTIONALISM[1]

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Was Aristotle's theory of the soul a prototype of contemporary functionalism? A growing number of scholars, including both philosophers of mind and historians of philosophy, would like to think so. To the former, the functionalist interpretation of Aristotle offers the security of a classical heritage. To the latter, its appeal is two-fold; it promises both to illuminate and to revitalize Aristotle's thought. His contemporary students will be pleased to discover that although Aristotle's physiology of psychology may be antiquated, his philosophy of psychology is quite up to date.

Other scholars remain unconvinced by the functionalist interpretation. According to one influential line of criticism, functionalism is a live option in the philosophy of mind, while Aristotle's theory is too riddled with outmoded assumptions to be taken seriously any more. The spearhead of this critique, surprisingly, is not a functionalist philosopher of mind, but Myles Burnyeat, Laurence Professor of Ancient Philosophy at Cambridge University.

In a provocative paper,[2] Burnyeat has developed a powerful line of criticism of the views of Hilary Putnam[3] and Martha Nussbaum,[4] two of the leading functionalist interpreters of Aristotle. Although directed against their particular interpretation, his argument is quite general. If Burnyeat is right, not only Putnam and Nussbaum, but also Richard Sorabji (1974), Edwin Hartman (1977), and Kathleen Wilkes (1978) are all misguided in their more or less explicitly functionalist interpretations of Aristotle.

Burnyeat does more than dispute functionalist interpretations of Aristotle; he argues that when we correctly understand Aristotle's philosophy of mind, we will realize that the only thing to do with it is to junk it. So anyone who finds contemporary relevance in Aristotle's theory will have to come to terms with Burnyeat's argument. That is what I propose to do. I will try to show that Burnyeat has not succeeded in refuting either Aristotle or his functionalist interpreters. I will not, however, attempt to provide additional positive reasons for embracing a functionalist interpretation.

Functionalism is the theory that mental states are defined in terms of their relations to causal inputs, behavioral outputs, and other mental states.[5] It holds that the same mental state may be *realized* by

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[1] An earlier version of this essay was presented at a conference at the University of Alberta in Edmonton in March 1986 and was published (under the title 'The Credibility of Aristotle's Philosophy of Mind') in Matthen, 1987. The results reached in the present essay are not significantly different from those of the earlier one, but there have been numerous alterations and improvements in both style and substance. Thanks are due to Paul Opperman and Christopher Shields for their help in eliminating various mistakes and confusions in the earlier version, and to Opperman (again) and David Keyt for similar assistance with the present version.

[2] Above, Ch. 2.

[3] Cf. his 'Philosophy and our Mental Life', in Putnam (1975).

[4] Cf. Essay 1, 'Aristotle and Teleological Explanation', in Nussbaum (1978), 59-106.

[5] See Block, 'What is Functionalism?', in N. Block (1980) 171-84.

several different physical states or processes. Mental states cannot, therefore, be reduced to physical states. They are, rather, functional states of the physical systems that realize them.

Aristotle had little to say about how mental states in general should be defined. His concern was to define the soul (*psuchê*). His theory—hylomorphism—holds that the relation of soul to body is that of form to matter. What are these two theories thought to have in common? We will begin with hylomorphism.

Aristotle's conception of the soul is biological: *psuchê* is that in virtue of which a body is a *living* body. As Aristotle puts it (*DA* 2. 1, 412ª20):

> soul is the substance, in the sense of *form*, of a natural body potentially having life.

By 'substance' (*ousia*) he does not mean a *Cartesian* substance—an independently existing thing. In some sense *psuchê* for Aristotle is not a *thing* at all. He calls it a substance 'in the sense of form'. What sense is that?

Aristotle typically uses artifacts as examples to illustrate the distinction between form and matter.[6] A statue is some bronze with a certain shape; this house consists of these bricks and boards arranged and assembled in such-and-such a way; an axe is some iron that has the capacity to chop. In the simplest case, form is just shape; in more complex cases, it is more like functional organization. In each case, matter is compounded with form. Bronze, bricks, and iron are matter; shape, arrangement, and capacity are form. The matter and the form are *contingently* related: the matter might have had a different form, and the form might have been found in different matter.

Human *psuchê* is evidently a form of considerable complexity. Put simply, it comprises the capacities to be nourished, to take in sensory information about the environment, to move voluntarily, and to think. It is in terms of *psuchê* and its actions or movements that we explain these characteristic human activities and account for the bodily parts and systems on which they depend. These explanations and accounts are *teleological*. We explain movements in terms of the goals they are aimed at rather than in terms of the mechanical workings of the body which carries them out. We account for the eye or the heart not in terms of what it is made of but in terms of its function—what it *does*, what it is *for*.

Aristotle also applies the matter/form distinction to the 'actions' and 'passions' of the soul—what we would call mental (or emotional) states or psychological processes. In trying to say what *anger* is, for example (403ª29ff), a natural scientist and a philosopher will give different answers. The scientist will say that anger is the boiling of the blood in the vicinity of the heart. The philosopher will define anger as a desire for retaliation. One cites the matter; the other cites the form.

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[6] Relying on the artifact model in explicating the form-matter distinction, as both Aristotle and most of his commentators do, makes for trouble in understanding his hylomorphic theory of mind. Critics such as Burnyeat and Ackrill (see below, pp. 68-69) see this as a flaw in the theory; but it might equally well be taken to be a shortcoming in the model. The problem with the artifact model is that it oversimplifies hylomorphism and ultimately misrepresents it in the cases that are most important to Aristotle. The crucial point of misrepresentation is the contingent connection between matter and form. In all but the simplest cases, matter already contains a great deal of form, and form carries with it many material requirements. (I am grateful to Montgomery Furth for his illuminating presentation of this point in discussion at the conference mentioned in n. 1. See Matthen (1987), 124.)

The form in this case is inseparable from matter: it must be realized in matter, Aristotle tells us, if it is to exist at all (403^{b}3, ^{b}18). So anger cannot exist in a disembodied state. But neither can it be reduced to the boiling of the blood around the heart, for that is just its *matter*. Therefore, if we are correct in assuming that *this* form and *this* matter are only contingently related, then there is no essential connection between anger and the boiling of the blood around the heart. And in general, there will be no essential connection between a psychological state and any particular material realization of it.

Some psychic states are intimately associated with specific bodily parts, of course; sensation and the sense-organs are an obvious example. Aristotle discusses these in detail in *De Partibus Animalium*. His remarks strongly suggest a conviction that the same psychic state may have different material realizations. In animals made of flesh, for example, the organ of touch is the flesh; in other animals it is the part 'analogous to flesh' (*PA* 2. 1, 647^{a}21). Sensations of touch occur in the flesh of humans, but in different (although analogous) organs of other species. Such observations, which abound throughout the work, suggest a sympathy for the *compositional plasticity* that is characteristic of functionalism.

In a famous passage in *Metaph*. Z11, Aristotle considers whether there should be reference to matter in a definition: whether matter is, as he puts it, ever 'part of the form'. He points out that it is obvious that 'neither bronze nor stone belongs at all to the substance [i.e. form] of the circle' (1036^{a}33), for *circle* is a form that supervenes on different kinds of matter. He goes on to say that bronze would be no part of the form 'even if all the circles that had ever been seen were of bronze' (1036^{b}1). In that case, he concedes, it would be hard—but correct—to abstract the bronze from the circle in thought. He then considers the case of the form *man*, which is always found in flesh and bones. 'Are these', he asks, 'parts of the form?' His answer (although clouded by a vexatious text) seems to be 'no'.[7] Here, too, he suggests, we simply fail to make the necessary abstraction.

Aristotle surely did not believe that the human form was likely to supervene on anything other than flesh-and-bones. At some abstract level, however, the possibility is at least conceivable to him. The reason it is conceivable is that he maintains that definitions must always be in terms of function, not matter. What makes something human is not what it is made of but what it *does*. Here again he seems sympathetic to compositional plasticity.

So the key elements of a materialistic variety of functionalism appear to be present in Aristotle's account. Psychical faculties and states require some material embodiment,[8] but not any particular kind of embodiment. Their definitions are always to be given in terms of form and function, never in terms of material composition. They are multiply realizable, in that the same faculty or state may be found in different kinds of creatures with significantly different physiological makeups.

Burnyeat concedes that Aristotle's hylomorphism has the appearance of functionalism. But the appearance, he claims, is misleading. For contemporary functionalism was devised as a response to Descartes' mind-body problem. The problem arises because Descartes posits two fundamentally different kinds of substance: *matter*, whose nature is to be extended, and *mind*, whose nature is to think. The subject matter of Cartesian psychology is entirely distinct from that of Cartesian physics. How, then, do we explain the interaction of mind and matter? Under what science could the laws of such interaction fall? That is Descartes' problem. For Aristotle, on the other hand, psychology is a part of physics, that is,

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[7] See the appendix for a discussion of some problems in the interpretation of this passage.

[8] With the notorious exception of *thought*. The difficulty of reconciling Aristotle's treatment of *noûs* with the rest of his psychology is widely recognized.

of the general theory of nature; psychology therefore has an *Aristolelian* conception of matter built in. This conception of matter, Burnyeat argues, is not consistent with functionalism, or, indeed, with any plausible contemporary theory. It is thus Aristotle's physics that makes his philosophy of mind no longer credible.

In order to establish this mismatch between contemporary functionalism and the Aristotelian conception of matter, Burnyeat turns to Aristotle's theory of perception. His examination focuses on the mysterious Aristotelian doctrine that a 'sense is what is receptive of sensible forms without matter' (*aisthêsis esti to dektikon tôn aisthêtôn eidôn aneu tês hulês*, 424ª17 ff). The received interpretation of this doctrine, as ably articulated by Richard Sorabji,[9] is one that a functionalist interpreter would find congenial. According to Sorabji, Aristotle means that sense-organs take on (come to be characterized by) the perceptible qualities of perceived objects. When one sees a tomato, for example, the transparent jelly composing the eyes goes red. In general, when one perceives a sensible object to be *F*, some part of one's sensory apparatus literally becomes *F*. (Aristotle describes the process as *without matter* in order to contrast his own theory with that of Empedocles and Democritus, who thought that in vision material particles emanate from the object seen and into the eye of the beholder.)

This account of the physiology of perception may strike us as embarrassingly naïve. Jonathan Barnes, for one, finds it 'open to devastatingly obvious empirical refutation'.[10] (He doubtless thought that anyone who looks into another's eyes can see that they do not turn red at the sight of a tomato.) Its naïveté need not disturb the functionalist interpreter, however. For Aristotle does not *identify* seeing red with the reddening of the eye-jelly (just as a contemporary functionalist would not identify pain with C-fiber stimulation). Rather, Aristotle maintains that the reddening of the eye-jelly is only the *matter* of which the perception of red is constituted (as a contemporary functionalist might concede that C-fiber stimulation is the material realization of pain in humans but would insist that other realizations are at least possible). A functionalist's philosophy need not be impugned because his physiology is unsound. If we discard the antiquated theory of the reddening eye-jelly and replace it with a more up-to-date physiology, we may still, it would seem, claim to be advancing an Aristotelian theory of perception.

Against the Sorabji interpretation of Aristotle's notion of a sense-organ's taking on form without matter, Burnyeat proposes an alternative that he credits to Philoponus, Aquinas, and Brentano. According to this rival interpretation, a sense-organ's taking on a sensible form is nothing more nor less than an *awareness* of that form. Taking *on* a form is to be thought of as taking *in* that form; the sense-organ's becoming *F* is to be thought of as the sense-faculty's becoming *aware* of *F*-ness.

If this account of Aristotle is correct, he cannot plausibly be interpreted to hold that perception *supervenes* on an underlying physiological process. The supervenience of the mental on the physical—the idea that in any two worlds where the physical facts are the same, the mental facts are the same—is a modern invention, and is alien to Aristotle, Burnyeat maintains. Of course Aristotle does believe that physiological states are psychologically relevant. But like Plato's Socrates in the *Phaedo*, Burnyeat's Aristotle regards these as necessary conditions only.

Burnyeat concludes that Aristotle's account of the physiology of perception is different from what the Sorabji interpretation supposes. A sense-organ's reception of sensible form, which is both necessary

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[9] Sorabji (1974/1979), 49; see esp. n. 22.

[10] Barnes (1971-2, p), 109.

and sufficient for perception, is not a physiological process at all. Burnyeat even goes so far as to say that Aristotle's account allows there to be perceptual awareness without any corresponding physiological change. (The physiologically necessary conditions on his account are only *states* of receptivity, not *processes* or alterations.) This clinches his case against the functionalist interpretation, Burnyeat thinks. For it shows that Aristotle would have to hold that an organism's perceptual capacities are fundamental, not supervenient. They simply *are* the way they are, and do not require explanation in physiological terms. According to Burnyeat, Aristotle does not regard the emergence of the life-functions as a mysterious fact standing in need of explanation. Rather, Aristotle has the explanations going the other way around: we explain the physical properties of animals in terms of their contribution to the existence of animal life.

The linchpin of Burnyeat's argument is his understanding of the notion of receiving form without matter; it therefore demands careful scrutiny. He argues that receiving form *with* matter is not correctly construed as merely absorbing some matter which carries a form. If it were, then receiving form *without* matter would be receiving a form which is not carried by any material vehicle. But this, he rightly points out, is an absurd way to view the relation between form and matter. Form is not something that can leave one material vehicle (or exist without a material vehicle at all) and be taken on by another material vehicle. Rather, *x* receives the form of *y* just in case *y* causes *x* to become like *y* in form. Therefore, Burnyeat concludes, to receive the form of something *with* its matter is to become like it in both form and matter; and to receive the form of something *without* its matter is to become like it in form without becoming like it in matter.

When something is warmed by proximity to a hot stove, for example, its matter becomes like the matter of the stove: it gets hot. That is, its matter takes on the same form (viz., heat) that the iron of the stove already has. It becomes like the stove in both form and matter. But when someone notices the warmth of the stove without being heated by it, he does not become like the stove in matter; for, unlike the iron of the stove, his flesh does not become hot. Rather, he becomes like the stove in form only. Or, as Burnyeat seems equally happy to put the point, he becomes warm without *really* becoming warm.

Burnyeat admits that one recalcitrant passage appears to favor Sorabji's interpretation over his own. In *DA* 2. 12, Aristotle raises the question whether sensible objects, such as colors or odors, can effect things that do not perceive; he offers arguments on both sides of the issue. On the one hand, he reasons, since the only effect an odor can produce is *smelling*, it follows that things which cannot smell cannot be affected by odors (424^b8). On the other hand, non-sentient bodies (like air) do seem to be affected by odors. He concludes his discussion with the following question (424^b17): what more (*para*) is smelling than being affected by something? The question is ambiguous. Is he asking what smelling is *over and above* a physiological process in which the sensible object, odor, affects the nose? Or is he asking what smelling is *as opposed to* what goes on when a non-sentient body is affected by an odor? The first reading has Aristotle explicitly drawing the distinction between physiological and psychological processes that is crucial to the functionalist interpretation. Burnyeat, of course, would prefer to adopt the second reading. The question, he says, is not what more there is to smelling an odor than having it affect the nose, but what more there is to odor's effect on the nose than there is to its effect on the air.

There is only one hitch for Burnyeat: Aristotle's answer, according to one influential edition of the text (Torstrik's), appears to block his reading of the question. Torstrik emended the text by adding the word *kai* ('also'), making the answer read: 'perhaps smelling is *also* perceiving' (*osmasthai kai aisthanesthai*). This response makes sense only on the first reading of the question: smelling, *in addition to* (*kai*) being affected, involves awareness (*aisthanesthai*). Without the *kai*, Burnyeat's reading is quite plausible. Why did Torstrik find it necessary to insert the *kai*?

The answer, along with a devastating refutation, is supplied by Kosman (1975), whom Burnyeat cites with approval. Kosman points out that Torstrik was following manuscript E (Parisinus graecus 1853), the one manuscript in which the *kai* occurs. E itself is written in two different hands; book 2 was written by the later of the two. Some fragments of the older recension of book 2 have survived, however, including a corrupt version of our passage. The older hand had written *osmasthai ai aisthanesthai*, which is meaningless. The later scribe presumably took the *ai* to be the remnant of an original *kai*, and corrected his text accordingly. (Torstrik also had philosophical motives, since he took Aristotle to be asking what perceiving is in addition to being affected, and preferred a text making that clear.) Kosman makes the much more plausible conjecture that the meaningless *ai* was the product of dittography. (*Ai ai ai*! The scribe should have written *osmasthai aisthanesthai*). Once the *kai* is rejected, there is no reason to favor the first reading. Far from supporting the functionalist interpretation, Burnyeat concludes, this passage provides evidence against it.[11]

The idea that the effect of sensible form on a sense-organ is nothing *less* than a state of awareness has the consequence, Burnyeat notes, that the matter of which sense-organs are composed is *essentially* capable of awareness. For there is, according to Burnyeat's Aristotle, no physiological state of a sense-organ on which a state of awareness can supervene. Sensible form produces awareness in the sense organ directly; there is no intervening or supervening involved.

What kind of matter is this that is essentially capable of awareness? It is nothing like Cartesian matter, whose essence is simply to be extended, and whose connection to mind and the mental is as tenuous and contingent as a connection can be. It is in terms of inanimate Cartesian matter that the mind-body problem is framed. But how can there be a mind-body problem if the 'animal matter' that composes the bodies of sentient beings has awareness built in at the ground level? And how can a theory be considered a version of functionalism if it denies the contingency of the connection between a psychological state and its physical realization?

According to Burnyeat, Aristotle's theory of perception is committed to both of the following claims:

(i) A sense-organ's taking on a sensible form is an act of awareness rather than a physiological change.

(ii) It is possible for perception to occur without any associated physiological change.

Burnyeat uses (i) as the leading premise in his argument against the functionalist interpretation. It has solid (albeit disputed) textual credentials. (ii)'s credentials, however, are less clear, as is the relation Burnyeat supposes it bears to (i). He nowhere argues that (ii) follows from (i). His arguments are devoted to proving (i); then (ii) puts in a sudden appearance. This suggests that Burnyeat may have the following sort of argument in mind: perception is *nothing more nor less* than a sense-organ's reception of sensible form, and the reception of form is not a physiological process. So since there is nothing *more* to perception than the reception of form, it is possible for perception to occur without any corresponding physiological change.

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[11] The fate of the *kai* in recent texts of *DA* has been curious. Hicks includes it, citing Torstrik, but Ross has vacillated. His OCT edition (1956) includes the *kai* (albeit with no mention of Torstrik in the apparatus) but his text with commentary (1961) omits it. Nevertheless, he glosses the passage as if the *kai* were there: 'What, then, is smelling, over and above a being affected? It is, besides a being affected, a *perceiving* …' (p. 297).

This is not a convincing line of argument. The reception of sensible form may still require a physiological process, even if it cannot be identified with such a process. If the eye's taking on the sensible form of an object is not a physiological process, vision cannot be identified with a physiological process. It does not follow that there is *no* physiological process that is essential to vision.

(ii) is certainly incompatible with token-physicalistic functionalism. But since (ii) does not follow from (i), Burnyeat has not shown that functionalists are obligated to deny (i). Still, they are not likely to be convinced by his argument for it. Nussbaum and Putnam,[12] for example, complain about the emphasis Burnyeat places on Sorabji's account of a sense-organ's taking on sensible form. They reply that even if he is right in his criticism of Sorabji (which they seem happy to grant), he will not have established that the reception of form is not a physiological process, but at most that it is not the particular physiological process Sorabji claimed it to be. There is no evidence, however, that Aristotle had some other physiological process in mind. I suggest, therefore, that functionalists should not be so quick to distance themselves from Sorabji's interpretation.

I shall argue that Burnyeat has not succeeded in refuting Sorabji. Nor, I contend, has he made a compelling case for his rival interpretation. My argument will consist primarily of a detailed examination of the passages in which Aristotle uses the enigmatic notion of a sense-organ's taking on sensible form without matter. A few preliminary observations will help to focus that examination.

Burnyeat makes a point of reminding us that it is absurd to suppose that receiving form without matter consists in receiving a form that is not carried by any material vehicle. But Sorabji would surely agree; on his account, 'without matter' is elliptical for 'without *receiving* matter'. And 'receiving matter' means: incorporating matter from the object. What is at issue is not whether the form existed somehow in an immaterial state during the process of transmission (of course it did not), but whether any of the object's matter was incorporated by the recipient of the form.

What may be bothering Burnyeat is a striking disanalogy in Sorabji's understanding of the notions of receiving matter and receiving form. Receiving (some of) an object's matter, on Sorabji's understanding, deprives the object of that matter; receiving its form deprives it not at all. Burnyeat's interpretation may at first appear to fare better in this respect: 'taking on the form of *x*' means 'becoming like *x* in form'; 'taking on the matter of *x*' means 'becoming like *x* in matter'. The analogy, however, is only superficial. For Burnyeat takes 'being like *x* in matter' to mean 'having matter that is like *x*'s matter', and 'being like *x* in form' to mean (not, as we would expect, 'having a form that is like *x*'s form') but 'being aware of *x*'. Neither interpretation succeeds in preserving the analogy suggested by the labels 'receiving matter' and 'receiving form'. Sorabji's at least has the advantage of being more literal. The disanalogy in his reading is due to the metaphysical difference between matter and form; the disanalogy in Burnyeat's seems strictly *ad hoc*.

Burnyeat's understanding of these two notions, if correct, would devastate the Sorabji interpretation. For my matter becomes like your matter when my matter changes *qualitatively* and takes on the form that your matter already has. Taking on matter (or, perhaps, taking on form *with matter*) turns out to be a kind of qualitative change. So when Aristotle asserts that in perception a sense-organ receives form *without* matter, he is doing little more than denying that perception involves a qualitative change in

[12] Martha Nussbaum and Hilary Putnam, 'Changing Aristotle's Mind' (this volume, pp. 27-56).

the sense-organ. That is, he is doing little more than denying precisely what Sorabji interprets him to be asserting.

At this point Burnyeat seems to declare his own interpretation the winner by default. Sorabji's idea that 'receiving form without matter' describes a kind of qualitative change cannot be right, Burnyeat thinks, since Aristotle ought to describe qualitative change as taking on form *with* matter. Therefore, 'taking on form without matter' must mean something else: taking on the form of an object without one's matter being affected by it.

Note that on Burnyeat's theory, it is the *recipient's* matter that is at issue: the perceiver takes on the form of the object but the perceiver's matter is not affected. This creates two problems for Burnyeat, one philosophical, one textual. The first problem is that it seems incoherent to make the matter referred to in 'without matter' be that of the *perceiver*, and at the same time construe 'without matter' to be elliptical for 'without taking on matter', that is, without taking on any of the matter of the *object*. The second problem is that Aristotle's examples show that when he says 'without matter' he is thinking of the matter of the (donor) object, not the (recipient) perceiver.

The best place to begin is with Aristotle's wax analogy in *DA* 2. 12. A sense receives form without matter, he tells us, 'as wax receives the imprint of a signet ring without the iron or gold; it takes the imprint of gold or of bronze, but not *qua* gold or bronze' (424^{a}19-22). In illustrating 'without matter' Aristotle says 'without the gold'. It is clearly the matter of the *donor* that is at issue rather than that of the recipient. The analogy would be a poor illustration of the theory Burnyeat attributes to Aristotle.[13]

In Aristotle's analogy, when the wax takes the imprint of gold (*to chrusoun sêmeion*) its shape is altered; it takes on the shape of the gold. It is clearly affected by the gold. But not, Aristotle says, *quâ* gold. What is he ruling out? What would it have been like if the wax had received the imprint of the gold *quâ* gold? It is hard to escape the conclusion that the wax would have received not just the extrinsic, accidental features of the gold (its shape) but its intrinsic, essential ones as well (being gold). The wax would (at least in part) have come to *be* of gold (*chrusoun*). It would have done this, presumably, by incorporating some matter that carries the form of gold.

Other passages create similar difficulties for Burnyeat's interpretation. At 424^{a}1, Aristotle says that in perception the sense-organ is potentially such as the object of perception is actually. On the Sorabji interpretation, his point is quite clear, for in perception the sense-organ literally takes on the sensible form of the object: in perceiving the *F*-ness of something, the sense-organ itself literally becomes *F*. And of course the sense-organ cannot become *F* unless it is (*a*) already potentially *F* and (*b*) not yet actually *F*. One cannot feel warmth unless one's organ of touch is capable of becoming warm; and one cannot feel the warmth of something one's organ of touch is already as warm as. At 424^{a}7 Aristotle goes on to say that the organ which will perceive white and black must itself actually be neither white nor black, but potentially both. Again, his point seems quite straightforward: something which is already actually white cannot *become* white. To perceive is to take on sensible form, and a sense-organ cannot *take on* a form it has already assumed.

[13] Burnyeat sees in the analogy a polemical reference to the *Theaetetus*, where Plato used it as the model for a theory of judgment. He might therefore maintain that Aristotle had a good reason for using it here in spite of its failure to fit his own theory.

What is Aristotle's point on Burnyeat's interpretation? Why can't eye-jelly which is about to perceive white already actually *be* white? According to Burnyeat, for the eye-jelly to be (actually) white is just for the perceiver to be *noticing* whiteness. But why should Aristotle think that one who *will* be noticing whiteness cannot *already* be noticing whiteness? Whereas Sorabji takes perception to be, at least in part, a genuine process in which the sense-organ undergoes an alteration, Burnyeat understands it to be not a genuine alteration at all. In perception, according to Burnyeat's Aristotle, the sense-organ is merely brought into activity; perception is nothing more than the exercise of a capacity. This means that the simple logical point about genuine changes—that a thing which is already *F* cannot become *F*—is inapplicable. A thing which is already red cannot be about to *turn* red; but one who is already playing tennis may be about to play more tennis.

A crucial passage for Sorabji is 425^{b}22-26, where Aristotle argues that 'what sees' (*to horôn*) is itself 'in a way colored' (*estin hôs kechrômatistai*). This remark makes perfectly good sense on his interpretation. Aristotle is discussing the question of how, or whether, we perceive that we perceive. How can we see that we see, when all that we can see, properly speaking, is the proper object of sight, namely, color? Aristotle's answer is that what sees is in a way colored, 'for the sense-organ receives the sensible object without its matter'.

Aristotle goes on to say that this coloration of *to horôn* explains why perception and images (*phantasia*) linger on after the object of perception has been removed. Since Sorabji understands this to be the literal coloration of the eye-jelly, the explanation is simple and plausible: we look at a tomato, and the eye-jelly goes red. Remove the tomato and the impression of redness persists. This is because the eye-jelly really *is* still red.

On Burnyeat's interpretation, however, Aristotle's explanation would beg the question. The reason the *impression* of redness persists can hardly be that the eye-jelly remains red. For the reddening of the eye-jelly, Burnyeat tells us, is nothing more nor less than an *awareness* of redness, and that is precisely what Aristotle is supposed to be explaining. To ask why the impression of redness persists is just to ask why we continue to be aware of redness. On Sorabji's interpretation Aristotle has a genuine explanation (albeit physiologically naïve); on Burnyeat's he has no explanation at all.

The only truly recalcitrant passage for the Sorabji interpretation now appears to be the discussion in *DA* 2. 12 of the fact that plants do not perceive. Clearly Aristotle is interested in the case of plants because they are apparent counter-examples to his theory of perception. A plant has a soul and it can take on sensible form—it can get warm, for example. So why, according to Aristotle's theory, does it not perceive warmth? In his answer, Aristotle must make clear that his theory can distinguish between the effect a sensible object has on a sense-organ and its effect on a non-sentient subject, such as air, or a plant. And Burnyeat's account takes Aristotle to be making just this distinction.

Sorabji agrees that Aristotle means to be drawing this distinction. He and Burnyeat also agree that Aristotle's reason for denying that plants perceive is that they take on sensible form only 'with matter'. Where they disagree is over the interpretation of this crucial phrase. Sorabji takes Aristotle to be asserting that plants can get warm only by (literally) taking in warm matter; Burnyeat takes him to mean that the only way plants can take in warmth is in a *material* way, by having their *matter* become warm.

One may be inclined to agree with Burnyeat here, if only because Sorabji attributes to Aristotle such an implausible theory of plant-warming. Surely Aristotle would have noticed that a plant can get warm by just sitting in the sun, without ingesting any material at all? But Sorabji and Burnyeat may both be wrong on this point. Aristotle says that the reason plants do not perceive warmth is that they do not have a mean (424^{b}2); that is, they do not have the right initial temperature, poised between warm and

cold, to perceive these two qualities. Their matter can get warm, but that material change does not constitute the perception of warmth. The reason it does not constitute perception is not that it is only a material change, nor that it is only achieved by taking on external matter, but that it is the wrong kind of material change.

Burnyeat concedes that the requirement that the organ of touch be in a mean or intermediate state appears to support Sorabji's interpretation. His counter-proposal is that the intermediate state of the sense-organ is merely an initial condition required for perception to take place, and that Aristotle does not suppose there to be an actual physical change away from the mean—a warming or cooling, for example—in the sense-organ. Rather, the departure from the mean is what Aquinas called a 'spiritual' change, a becoming aware of warmth or cold. However, this proposal faces the same problem we encountered earlier at 425^{b}22-6. For Aristotle's explanation of our failure to perceive when our sense-organ is not in the right initial state becomes circular on Burnyeat's reading: an already warm sense-organ cannot perceive warmth because it cannot become warm, in other words because it cannot perceive warmth.

Burnyeat is surely right that a plant's inability to perceive warmth is bound up with the fact that its matter is not sensitive to warmth. But Sorabji is right on the larger issue. For it is still a physical difference between a plant's matter and ours that explains its insensitivity. Perceiving warmth does not involve getting warm in an immaterial way; it occurs when the right kind of matter—the kind that composes a sense-organ—gets warm in a straightforwardly material way.

But this talk of the right *kind* of matter, Burnyeat would surely say, smuggles in a notion that is antithetical to functionalism. For the right matter is matter that is *essentially* alive, *essentially* capable of awareness. And matter that is essentially alive cannot be only contingently related to the form—the soul—in virtue of which it is alive.

Burnyeat derives the conclusion that animal matter is essentially alive from two sources. One, which we have already examined, lies in the details of the theory of perception. The other is Aristotle's frequently enunciated *homonymy principle*, according to which a body that is not actually alive is a body in name only—is not really a body at all, just as an eye which cannot see is not really an eye. It is tempting to treat this principle as a mere linguistic ruling—that, for example, it is inappropriate or misleading to use the term 'body' for what is no longer alive—but Burnyeat understands it as a physical thesis that is incompatible with Aristotle's hylomorphic theory of mind. He refers us to John Ackrill's brilliant articulation of this tension in Aristotle's thought.

Aristotle's problem, as Ackrill presents it, emerges when he tries to specify the *matter* component of a living body, that is, of a hylomorphic compound whose form is its soul. On the one hand, the matter of any compound must *potentially* have that form; on the other hand, it must not have it *necessarily*. It might seem that there is no problem: the matter of an animal is its *body*. But this solution is blocked by the homonymy principle; if we try to pick out the matter without the form, the body without the soul that animates it, we must fail, for if what we pick out is not alive, then what we pick out is not a body. The homonymy principle prevents the fulfillment of the contingent specification requirement. As Ackrill (1972-73, 126) says:

> The body we are told to pick out as the material 'constituent' of the animal depends for its very identity on its being alive, in-formed by *psuchê*.

Nor can we retreat to such candidates as flesh and bones, or other such bodily parts and organs, for the homonymy principle applies to them, as well. Here is the way Aristotle puts it (*GA* 734^{b}24):

> There is no such thing as face or flesh without soul in it; it is only homonymously that they will be called face or flesh if the life has gone out of them, just as if they had been made of stone or wood.

Yet if we descend to the level of the inanimate elements of which living things are ultimately composed—earth, air, fire, and water—we have gone too far. Although they satisfy the contingent specification requirement, since they are what they are independent of composing a living body, they fail in a different way. For the elements are too remote to be the matter of a living hylomorphic compound; they are not even *potentially* alive (cf. *Metaph*. Θ7). Ackrill (1972-3, 132) concludes:

> Until there is a living thing … there is no 'body potentially alive'; and once there is, its body is necessarily actually alive.

This temporal language—'until', 'once'—distorts the homonymy principle. Ackrill makes it seem as if its point is to rule out a 'Frankensteinian' account of the generation of life: new animals do not come into being by having life installed in previously inanimate bodies. While I agree that Aristotle would find such an account incomprehensible, I do not take that to be the point of the homonymy principle. The point, rather, is to remind us of the crucial importance of function in the definition of a living creature or an organic system. The question is not whether there is a time before life begins at which what we have on our hands is a nonliving body that is potentially alive; it is, rather, whether we can, in the case of a presently living animal, pick out something that now functions in certain characteristic ways although it will eventually cease to do so, which will continue to exist (at least for a while) after this happens, and whose functioning in those ways is definitive of the life and existence of that animal. What the homonymy principle tells us is that what we pick out for this role cannot be the body.

Yet there is something that looks, acts, and functions very much like the body, although it cannot, strictly speaking, be the body, since it will continue to exist after death, when the body no longer exists. Nor is this something the corpse, which only *begins* to exist at death. It is to this continuing something (which non-Aristotelians are inclined to call the 'body') that Aristotle needs to refer. Well, then, let him refer to it in some other way—say, as the BODY. The BODY has accidentally those properties the body has essentially, and in virtue of which the animal is alive. When the BODY functions, the body is alive; when the BODY ceases to function, the body, but not the BODY, ceases to exist.

The hylomorphist's appeal to the BODY does not just pay lip service to the homonymy principle or treat it as a mere linguistic ruling. But it does, as Bernard Williams[14] has pointed out, leave the hylomorphist with a pair of entities on his hands—the body and the BODY—which are the subjects of psychological and physiological investigation respectively. And so it seems that the hylomorphist has neatly sidestepped the mind-body problem only to be confronted with the perhaps equally intractable body-BODY problem. So the hylomorphist is by no means out of the woods.

Still, he is safe from Burnyeat's argument. For certainly the BODY is composed of ordinary matter, and there is no reason to think that the matter composing the body is any different. The difference between the body and the BODY, that is to say, need not be a difference in their matter. The homonymy principle need not be construed as the physical thesis that there is a kind of matter whose life and sensitivity are independent of and not explicable in terms of its physical properties. The principle tells us, for

[14] Williams (1986). I am indebted on several points to Williams' insightful discussion of Aristotle's hylomorphic theory; in particular, I have borrowed from him the distinction between the body and the BODY. I should point out, however, that Williams himself is less sanguine than I about the tenability of a hylomorphic theory.

example, that a sightless EYE is not properly called an eye any more, and that this is because it has ceased to *be* an eye. This is not to say that the only difference between a functioning eye and a sightless EYE is that one can see and the other cannot. There is still room for a physical difference between the two to account for their functional difference.

Burnyeat has the idea that this is ruled out by the homonymy principle, which he sees as entailing an unbridgeable gap between the physiological and the psychological—between the nonliving and the living. If this is how Aristotle intended the principle, we should expect to find him restricting its application to living things. Such a restriction would confirm Burnyeat's interpretation of homonymy and strengthen his conclusion that there is a kind of Aristotelian matter whose life and awareness are built in and are irreducible to anything physical.

On the contrary, Aristotle does not restrict the homonymy principle in this way. For one thing, he seems willing to apply it even to artifacts. Thus, at 412^{b}14-15 he says that an axe no longer capable of performing its function 'would not be an axe, except homonymously'.[15] *Mete*. 4. 12 reiterates this point (the example is changed to a saw) and extends it even further into the inanimate realm. What we find is a systematic downward applicability of the homonymy principle, and, along with it, a systematically pervasive appeal to functional definitions. For the homonymy principle is now extended to natural bodies well below the threshold of life and consciousness—viz., all the way down to the elements themselves (390^{a}7-19):

> [E]ach of the elements has an end and is not water or fire in any and every condition of itself, just as flesh is not flesh …. What a thing is is always determined by its function: a thing really is itself when it can perform its function; an eye, for instance, when it can see. When a thing cannot do so it is that thing only in name, like a dead eye or one made of stone, just as a wooden saw is no more a saw than one in a picture. The same then is true of flesh, except that its function is less clear than that of the tongue. So, too, with fire; but its function is perhaps even harder to specify by physical inquiry than that of flesh. The parts of plants, and inanimate bodies like copper and silver, are in the same case. They all are what they are in virtue of a certain power of action or passion—just like flesh and sinew.

Aristotle thus insists on functional definitions even of copper and silver, of water and fire. His doctrine concerning inorganic compounds and their component elements, then, is not in principle different from that concerning animals and their parts. They are all given functional definitions; they all fit into a single hierarchical structure. All sublunary matter, even that of living things, is composed of the same four elements.

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[15] The passage, unfortunately, is vexed. Aristotle suggests this analogy: as a living body is to its soul, so is an axe to its capacity to chop. If an axe were a living body, this capacity would be its soul, whose removal would render it no longer an axe, except homonymously. 'But in fact', Aristotle goes on, 'it is an axe' (*nun d'esti pelekus*). The most common reading of the quoted sentence takes it to withdraw the counterfactual assumption: an axe is not a living body, so it doesn't have a soul—it's just an axe. But on another reading, it refers back to the consequence derived from that assumption: since an axe is not a living body, it remains an axe even when it can't chop. On the second reading (but not the first), Aristotle refuses to apply the homonymy principle to the axe. The first reading is preferable, however, as becomes clear from Aristotle's justification: 'for it is not of this kind of body that the essence or formula is the soul, but of a certain kind of natural body having within itself a source of movement and rest' (*ou gar toioutou sômatos to ti ên einai kai ho logos hê psuchê, alla phusikou toioudi ekhontos arkhên kinêseôs kai staseôs en heautôi*). Cf. Hicks in *Aristotle* (1907), 316-17. I wish to thank David Keyt for a helpful discussion of this passage and for convincing me that the favorable reading is in fact the right one.

The fact that the proximate matter of a hylomorphic compound is itself ultimately composed of elemental matter does not, of course, entail that the properties of the compound, or even of its proximate matter, are reducible to properties of elemental matter. For matter at every level above the lowest (that of the elements or of prime matter) is itself a compound of matter and form, and its essential properties will be those of its form. What makes matter matter-of-a-certain-kind, such as animal-matter, is *form*.

Burnyeat's critique stresses differences between Aristotle's concept of matter and ours, and I have argued that the functionalist interpretation can survive it. The problem for the functionalist interpreter, as I see it, comes rather from the other side. It concerns the causal role of form in Aristotle's psychology.

The functionalist interpretation holds that *psuchê* is the form of a living body in the sense of an arrangement or functional organization of bodily components—a *formal* cause. Explanations that appeal to such a cause will explain the properties and behavior of an organism in terms of functional properties of its material components. But Aristotle (perhaps unwisely) was working with a richer conception of form. For him, form or essence can also be an agent, an *efficient* cause. We know from *Ph*. 2. 7 ($198^{a}25$ ff.) that formal, efficient, and final causes often coincide, and *DA* 2. 4 leaves no doubt that *psuchê* is supposed to be a cause in all three senses. The passages in *De Anima* in which Aristotle uses the language of agency in speaking of *psuchê* are too numerous to mention.

It may well be replied that Aristotle's attribution of efficient causal efficacy to *psuchê* (and to form in general) should not be taken literally. His talk of *psuchê* as an agent may be just a manner of speaking. (A parallel case: you may know perfectly well that a computer program is a set of rules, an abstract characterization of behavior in terms of inputs and outputs, and still say that the program 'runs' the computer, 'tells' it what to do, and 'causes' it to behave as it does. It is simply easier to talk that way.) As for his explicit identification of formal and efficient causes, Aristotle may mean no more than that the efficient cause must itself manifest the form it generates in another: a tiger begets a tiger, the source of life must itself be alive.

The success of the functionalist interpretation seems to me to depend on whether the apparent role of *psuchê* as efficient cause can be satisfactorily explained away. I am not convinced that it can be. Since the controversy over the interpretation shows no signs of abating, we may at least hope that its proponents will next turn their attention to this problem.

Appendix: Matter and Definitons in *Metaph*. Z11

Although Aristotle makes it clear (1036b1) that there can be no reference to bronze in the definition of *circle*, his treatment of the important biological case of flesh and bones and the form of *man* is obscure. He begins (1036b5) with a question about the relation between matter and form in this case, but is not clear where the question ends and the answer begins. Ross takes Aristotle to be answering his own question immediately: '… are [flesh and bones] then also parts of the form and the formula? No, they are matter; but because man is not found also in other matters we are unable to effect the severance'. Furth in *Aristotle* (1985), on the other hand, takes the mention of matter to be part of the question: '… are these then parts of the form and the formula? Or not, but *matter* …?' It would therefore be hasty to conclude on the basis of these lines that Aristotle disallows any reference to a specific kind of matter in the definition of a biological species.

Aristotle goes on to say ($1036^{b}7$) that although it 'seems to be possible' for a definition to contain reference to matter, it is 'unclear *when*' a definition is of this sort. That is why, he goes on, some people raise doubts about the received definitions of *circle* and *triangle* in terms of *lines* and *continuous space* ($1036^{b}8$-9). (Their objection is presumably that lines and space are matter.) These people, Aristotle tells us, think that the relation of lines to circle is like that of flesh-and-bones to man and bronze to statue ($1036^{b}10$-12).

Flesh and bronze are lumped together here as examples of the kind of matter that is inadmissible in definitions. The question is: who lumps them together? Not the objectors; they would have relied on the clear case of bronze, which is definitely not part of the definition of *statue*, rather than appeal to the problematic case of flesh. The assimilation here, I think, is due to Aristotle.

A subsequent passage raises problems for this interpretation, however. At $1036^{b}24$ Aristotle says that 'the comparison which Socrates the younger used to make in the case of animal is not good; for it leads away from the truth and makes one suppose that man can exist without the parts, in the way that circle can without the bronze'. The comparison objected to is presumably the one mentioned at $1036^{b}11$; Aristotle seems to be saying that man cannot exist without flesh-and-bones, and that Socrates' comparison of flesh to bronze (even if technically correct) is misleading in just this respect.

I am not convinced that this is what Aristotle is saying. His objection may simply be that whereas circles can be immaterial, *man* must be realized in matter (see Nussbaum (1984) 201). It will be instructive to examine his other reasons for objecting. *Animal*, he says, 'cannot be defined without reference to change' ($1036^{b}29$). In *Metaph*. E1 ($1026^{a}3$) he says that things that cannot be defined without reference to change 'always have matter', contrasting them with *concavity*, which can be defined, and presumably can exist, 'without perceptible matter' ($1025^{b}33$). He does not say merely that concavity can exist independently of any particular *kind* of matter. I take his point in Z11 to be the same: things which cannot be defined without reference to change must have *material* parts. Such a part, he says ($1036^{b}30$) must be 'in a certain state'. Does this mean 'made of a certain kind of matter'? Aristotle does not say so. Rather he continues: 'It is not a hand in *any* state that is a part of man, but the hand which can fulfill its work … .' This remark, with its functionalist overtones, must seem slightly off target to those who think that Aristotle requires a specific kind of matter. On their showing, shouldn't he have said: 'It is not a hand no matter what it is made of, but only if it is made of flesh-and-bones'?