

# THE HOLISTIC PRESUPPOSITIONS OF ARISTOTLE'S COSMOLOGY

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IN the *De caelo* Aristotle posits an unchanging intelligent being that exists beyond the heavens, enjoying there 'the best and most self-sufficient life' (1. 9, 279<sup>a</sup>21-2). In *Physics* 8 and *Metaphysics A* this entity becomes the Prime Unmoved Mover, ultimately responsible for all movement, change, and generation in the universe. What exactly is the relationship between the Prime Mover and the corporeal universe? It is perhaps natural to think of it as a cause of change that is distinct from and stands outside the various corporeal substances in which change occurs. It is my thesis, however, that we gain a better understanding of some of the things Aristotle says about nature, causation, and the universe if we adopt the following propositions:

*first*, that the corporeal cosmos is a single substance with a motion proprietary to itself, directed towards an end which is good;

*second*, that this corporeal substance constitutes, together with its Prime Mover, a composite whole that can be regarded as a self-mover.

Aristotle's universe is appropriately considered to be a composite

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substance, I contend—an individual thing that has a nature or form of its own but comprehends other substances which have their own natures and forms. In this respect it is like the entities of the *Politics*; there are interesting commonalities in the ways Aristotle treats of all such composites, and I shall allude to some of these as I go along.

### 1. The universe as natural substance

#### (a) *The form of the totality*

Let us begin by recalling that in the *De caelo* Aristotle treats of the universe as a single individual substance with form and matter.<sup>1</sup> At the start of 1. 9 he begins by comparing it with a product of nature or art (277<sup>b</sup>31). The form of such things is distinguishable from their matter, he says, and then he continues as follows: 'Since the universe is perceptible, it is an individual thing; for every perceptible thing exists in matter. And by reason of its being an individual thing, there is a difference between being *this* universe and being [a] universe: the one is as form or matter, the other is as mixed with matter' (278<sup>a</sup>10–15). And later: 'The universe<sup>2</sup> is one of the things that are individual and made out of matter' (278<sup>b</sup>3–4). The inference is an odd one. From the fact that something is perceptible it does not follow that it is *one*. Romeo and Juliet were perceptible, but they were two individual things, both existing in matter. Why should the universe not be, similarly, an agglomeration of perceptible things? The non sequitur underscores the intuitive character of Aristotle's commitment to the unity of the cosmos. He is not trying to *establish*, above, that the universe is one—he more or less assumes it in the very form of the premiss, 'The universe is perceptible.' What he is arguing for is a hylomorphic analysis of this entity, one which assigns formal as well as material causes to the universe as a whole. How seriously does he mean this invocation of form to be taken? I shall argue that hylomorphism is an essential part of Aristotle's

<sup>1</sup> In this section I draw on and develop the argument of Mohan Matthen and R. J. Hankinson, 'Aristotle's Universe: Its Form and Matter', *Synthese*, 96 (1993), 417–35.

<sup>2</sup> The word is *οὐρανός*, which has several meanings in Aristotle, including 'universe' and 'heaven', but here the word refers to that which is 'composed of the totality of natural perceptible body' (ibid. 278<sup>b</sup>8–9). This marks *οὐρανός* as taking in 'the whole which is enclosed by the last circumference' (278<sup>b</sup>21–4), i.e. the bodily universe.

cosmological thinking: his universe is an individual substance with *both* form and matter.

The opening chapter of the *De caelo* identifies and characterizes the matter of Aristotle's universe. Here, *body* is defined as continuous extension in three dimensions. Thus understood, body is undifferentiated mass: taken by itself, it possesses neither boundaries nor individuality. (To put this in the formal mode: 'body' is a mass term, defined as 'extension'.) Discrete individuals have to be made out of body by the imposition of spatial or other boundaries. Such boundaries make *bodies* out of body.

The last five lines of the chapter deal with two types of such discrete bodies, i.e. with two applications of 'body' understood as a count term.<sup>3</sup> First, he says, there are 'bodies in the form of a part' (*ἐν μορίῳ εἶδει σώματα*)—the plural, which occurs here for the first time, makes it clear that these 'partial bodies' are individual. They are '*determined*' by contact with what is close (268<sup>b</sup>5–7): just as body-as-extension is 'determined by three [dimensions]', partial bodies are determined by contact. That is, they are what they are because of what they touch. Such determinateness as partial bodies possess comes from outside themselves—for this reason they lack *intrinsic* unity. Partial bodies are divisible simply by interposing new boundaries within their own extensions. Pointing at a partial body, then, one might as well be pointing at the many smaller bodies that could arise from such a division. So, Aristotle says: 'In a sense, they are many' (268<sup>b</sup>7–8), and he means this to imply that partial bodies are not unequivocally individual.

Aristotle turns now to the universe—'the totality', as he calls it. Although each partial body is many, '... the totality of which these [partial bodies] are parts is necessarily complete, and, as the name indicates, it is complete in every way, not complete in one way, incomplete in another' (268<sup>b</sup>8–10). Understood as *all the body there is*, the universe excludes no body, and so it cannot be determined by contact with something outside itself. But it does not need to be so determined: it is 'necessarily complete'.<sup>4</sup> The reason partial

<sup>3</sup> This is clear from the *μέν...δέ* construction ranging from 268<sup>b</sup>6 to <sup>b</sup>8, where partial bodies and the 'totality of which these are parts' are contrasted as a pair with body-as-extension. The latter is an undifferentiated mass, whereas both partial bodies and the totality are individuals. As I shall now argue, partial bodies are not intrinsically individual, whereas the totality is.

<sup>4</sup> Cf. *Metaph. Z* 2, 1028<sup>b</sup>12, where Aristotle says that anything made out of the entirety of the elements (of each one or of all of them?—the phrase is ambiguous) is

bodies are, in a sense, 'many' is that they are determined by contact with what is close by. The material universe is not subject to this limitation. We may surmise that it is not many but one. It is an individual precisely because it is the *totality*. Eighteen lines earlier Aristotle had suggested that wholeness and completeness are predicated of an underlying subject as form is of matter.<sup>5</sup> It now emerges that when it is predicated of all of body, the resulting complex, *the totality*, is *necessarily* complete, and is an individual thing in virtue of being so. This wholeness, or inclusiveness, already identified as form, emerges as that which makes the material universe into an individual thing. So far, it is acting just like a formal cause.

This conclusion is reinforced by probing the logical force of the description of the universe as all the body there is. The definition sounds purely 'analytic': it is part of the meaning of the term that Aristotle uses to designate the universe—'the totality' (*τὸ πᾶν*). So, one might concede that it sanctions such conclusions as that there is no body outside the universe, since by verbal definition the universe includes all body. However, it seems to imply nothing about how much matter there is or how it is structured. It comes as a surprise, therefore, when Aristotle uses the material all-inclusiveness of the universe to sanction substantive conclusions concerning its structure. In such deductions the definition of the universe as all-inclusive plays a role incongruent with that of a merely verbal definition.

In *De caelo* 1. 9 Aristotle uses the above characterization in an argument against the atomists' thesis of many worlds. The ancients distinguished between the universe and the worlds in it.<sup>6</sup> In the atomistic philosophy, *this world* (*ὁδε ὁ κόσμος*) is the spatially limited, structured system bounded by the stars, i.e. the stars we see. The atomists proposed that this structured system was brought into existence and maintained by a vortex, which was responsible

an (individual) body. I think he means that the whole of fire is an individual body. The universe is, of course, made out of the entirety of body; thus it has the same form as the totality of fire, but in different matter (cf. *De caelo* 1. 1, 268<sup>a</sup>10–12). See also *Metaph.* Δ 16, 1021<sup>b</sup>12–13, on completeness.

<sup>5</sup> "All", "whole", and "complete" differ from one another not in idea [*κατὰ τὴν ἰδέαν*]), but, if indeed they do, only in their matter, that of which they are said' (268<sup>a</sup>20–2).

<sup>6</sup> This is best and most fully discussed by D. J. Furley, 'The Greek Theory of the Infinite Universe', *Journal of the History of Ideas*, 42 (1981), 571–85, repr. as ch. 1 of his *Cosmic Problems* (Cambridge, 1989), 1–13.

for the rotatory motion of the heavenly bodies.<sup>7</sup> They argued that such a world could not be unique. There must be, in other parts of the universe, other vortices causing other agglomerations of matter to cohere into other worlds bounded by other starry spheres. There must, indeed, be indefinitely many such worlds included in the universe as a whole: for why should there be worlds only in one restricted region rather than scattered throughout the infinite void?

Aristotle's assertion, in *De caelo* 1. 9, that the universe is individual occurs in the context of his rejecting the atomists' many-worlds thesis: 'Such a plurality is impossible if this world is made from the entirety of matter, as it is' (278<sup>a</sup>27–8). In general, form admits of plural instantiations, he concedes. However, when a form is instantiated in *all* matter, it can be instantiated only once. Aquilinity, for example, is curvature in the nose, and, in general, there is nothing to prevent it from being instantiated in many noses. Suppose, however, that aquilinity were instantiated in *all* flesh. Then there could be only one aquiline nose. This, says Aristotle, is what happens in the case of the universe. Its form is (by its very definition) instantiated in the totality of matter. So there can be only one world.

As an *argument* against the atomists, this line of reasoning is misplaced. Since the atomists do not contend that *this world* is identical with the universe, they may well be prepared to concede that the *totality* comprehends all matter, by definition.<sup>8</sup> By conflating the atomists' 'this world' with his own 'totality', Aristotle seems to miss the point and beg the question. However this may be, his attitude reveals something about his own requirements concerning cosmological explanation. As we have seen, the atomists thought that the cosmic structure we see around us is accounted for by a vortex, the kind of cause that we might term 'mechanical'. By contrast, Aristotle does not think that a vortex is the sort of thing that could in principle be used to explain cosmic structure. A vortex is a contingent occurrence, and as such, its effects are the products of 'spontaneity'.

Aristotle strongly rejects the notion that the world could be spontaneous. 'There are some who explain these heavens and all the worlds by spontaneity. They say that the vortex arose spon-

<sup>7</sup> Furley, *Cosmic Problems*, ch. 8, is an excellent discussion.

<sup>8</sup> Of course, this concession would embroil them in the logical difficulties of positing an infinite entity, and Aristotle would object to their position on these grounds.

taneously . . . This statement might well cause surprise . . . that the heavenly sphere, the most divine of the visible things, arose spontaneously . . .' (*Phys.* 2. 4, 196<sup>b</sup>25–b4). And again: 'If nothing that happens by chance or spontaneously could be eternal, and the universe and the circular motion are eternal, by what cause is this motion in one direction rather than the other? Necessarily, either this is a principle or there is a principle for it' (*De caelo* 2. 5, 287<sup>b</sup>25–7). This is the heart of the disagreement. The atomists insist on a kind of explanation that makes the world a product of contingency. (Indeed, this is why they think that there are many, or even an infinite number, of worlds: since there is nothing unique about an accident, it is repeatable, possibly *ad infinitum*.) For Aristotle it is an absurdity for an eternal thing, a thing which is for this very reason considered divine, to be treated in this way. It is in order to replace the atomists' explanation with one more appropriate to an eternal entity that he seeks to explain this world in terms that make it clear that its various properties belong to it necessarily.<sup>9</sup>

A complementary argument leading to the same conclusion is to be found in the first part of *De motu animalium* 4. It cannot be force that makes the earth heavy, and keeps it at the centre of the universe. Since the earth is not infinite in weight (and remembering that the centripetal force manifests itself as weight),<sup>10</sup> we may infer that the force would not be infinite. So it could be overcome: 'it is both natural and possible that there be a motion greater than that by which earth stays still, or that by which fire and the body above are moved'. But 'we believe that the heaven is imperishable and indestructible from necessity'. The Earth must be at the centre by necessity, not force.

One might think that this is an impossible demand. What sort of explanation could one give of the observed structure of the world if not in terms of forces, like that of the vortex, which create that structure and ensure that it is maintained? The surprising answer, presupposed by the argument of the *De caelo*, is that one must

<sup>9</sup> See *Phys.* 2. 8, 198<sup>b</sup>35–199<sup>a</sup>3, for the requirement that things that happen regularly cannot be accidents, and so must be teleologically explained (sect. 1(c) below), and 2. 9, 199<sup>b</sup>36–200<sup>a</sup>14, for the general principle that material causes cannot fully explain things to which teleology is applicable. *De caelo* 2. 5, 287<sup>b</sup>25–7, and 8, 289<sup>b</sup>25–9, are applications of this principle to the eternal universe.

<sup>10</sup> Cf. *De caelo* 2. 13, 295<sup>b</sup>3: 'The vortex determines the heavy and the light', which shows how, for the atomists, 'earth's movement to the centre is constrained and its rest at the centre is constrained also' (295<sup>a</sup>22).

explain the structure of the universe in the way that one explains universal truths. Aristotle's theory of demonstration posits that for each knowable domain, there is a set of necessary first principles, from which one can deduce the universal properties of this domain by syllogistic inference. At *De caelo* 2. 5, 287<sup>b</sup>25–7 (above), a demand is made for some such procedure to ground not just the important properties of eternal things, but even properties that one might have considered inessential or contingent, such as the direction in which the stars rotate. Because such properties are eternal, even they must be traced to a first principle, Aristotle says, though it might at best be uncertain what that principle is.<sup>11</sup> In *De caelo* 1. 9 we find that the definition of *universe* plays the role of this type of explanatory first principle. All-inclusiveness is part of that definition, and it implies that the universe is 'one, unique, and complete' (279<sup>a</sup>10–11).

Examined in this context, Aristotle's argument against the atomists takes on new significance. He is not *simply* begging the question against them—though surely he is doing that. He is proposing, as a first principle of the science that studies the totality, that the universe contains all the matter there is. In Aristotle such first principles are not merely verbal: they define the essence, or form, of the thing in question. We have seen that Aristotle defines the universe by its completeness, and stipulates that completeness is form predicated of matter. We see now that 'form' is intended here to carry the weight that it does in the hylomorphic analysis of substance, and in the theory of knowledge.

#### (b) *The proper parts of the whole*

The definition of the totality in *De caelo* 1. 1 is followed almost immediately (1. 2, 268<sup>b</sup>13) by a characterization of the elements as its formal parts. At the beginning of chapter 2 Aristotle says that he will set aside the nature of the totality until later, in order to discourse immediately about its parts in virtue of form (*περὶ τῶν κατ' εἶδος αὐτοῦ μορίων*). It is obvious from what follows that the *κατ' εἶδος μόρια* of the totality, its parts in virtue of form, must be the elements. But by what meaning does the phrase denote the elements? Simplicius says:

<sup>11</sup> *De caelo* 2. 5 is one of the few places where Aristotle owns up to the epistemic limitations of teleology, thus anticipating Descartes's view that God's purposes are inscrutable.

By 'parts in virtue of form' he means the parts differing from one another in virtue of their form: heaven, fire, air, water, earth; for these are the principal parts of the totality. Since the parts of earth and of each of the others are homogeneous, they too are parts of the totality, not principally but rather as parts of parts. And these are not just any parts [μέρη], but natural parts [μόρια]. So these are the *principal* parts of the totality and are the ones which differ [i.e. from one another] in virtue of form. (*In De caelo* 1.1. 27–30 Heiberg)<sup>12</sup>

The idea is that the universe divides into five bodies (i.e. the whole of fire, of earth, etc.).<sup>13</sup> Because these are parts of the universe that differ from one another in form, he argues, they are parts in a more robust sense than the mere 'partial bodies' just discussed (which might not be distinguishable from one another in form or function). This makes the five bodies 'parts in virtue of form'. The translators follow him.<sup>14</sup>

Now, it is possible to understand the phrase in another way. For one might feel a certain infelicity in the fact that although μόρια is plural in the above phrase, κατ' εἶδος is singular. Since the five μόρια have five εἶδη, should he not have pluralized the εἶδος? Grammar does not dictate such a pluralization by itself, but a survey of Aristotle's usage suggests that where he wants to emphasize the distinct forms of a number of different things, he tends to use the plural, whereas the singular form is used when he is referring to a single principle that governs the making of distinctions.<sup>15</sup> For example, he says: 'Movement is motion from here to there, and it has differences of kinds [διαφοραὶ κατ' εἶδη]: flying, walking, leaping, and the like' (*NE* 10. 4, 1174<sup>a</sup>30–1). Here the emphasis is on the plurality of forms that fall under a single category. Where there is no such emphasis, he tends to say something like: 'Swiftness and slowness are

<sup>12</sup> The translation is slightly modified from R. J. Hankinson (unpublished).

<sup>13</sup> See n. 4 for a reference that supports the idea that the whole of fire is indeed an individual for Aristotle.

<sup>14</sup> Guthrie, Stocks, Longo, Moraux, and now Legatt, render the phrase as something like 'formally distinct parts', and it is hard to explain this homogeneity without reference to Simplicius, since the notion of *distinctness* is absent from the Greek.

<sup>15</sup> However, one should exercise due caution here: a search of the *Thesaurus Linguae Graecae* reveals only 3 occurrences of κατ' εἶδη in Aristotle: *NE* 1174<sup>a</sup>31 and *Top.* 109<sup>b</sup>14, 120<sup>a</sup>35, the second of which (σκοπεῖν κατ' εἶδη) is not relevant to the present usage, as opposed to 31 occurrences of κατ' εἶδος. This might suggest that no particular importance should be attached to any occurrence of the latter: if κατ' εἶδος sounded more standard, it could have been thoughtlessly used in contexts where the plural would have emphasized the point better.

not differentiae of motion, because this differentiation comes after all the differentiations of kind [πάσαις ἀκολουθεῖ ταῖς διαφοραῖς κατ' εἶδος] (*Phys.* 5. 4, 228<sup>b</sup>28–30). If Simplicius is right about our passage in *De caelo* 1. 2, the emphasis is surely on the several forms of the simple bodies. So if Aristotle had meant to say what Simplicius has him saying, one might have thought that he would have used some such construction as μόρια κατ' εἶδη αὐτῶν along the lines of the first example quoted above: 'We shall now speak of the things that are parts because of their forms.' The wording that he in fact chooses suggests that there was a *single* form in Aristotle's mind, and that the parts are so in virtue of that form. The parts are parts of the totality, and so the form in question would be *the form of the totality*; this reading is somewhat encouraged by the positioning of the possessive pronoun αὐτοῦ, which gives it a certain bivalence, allowing it to be read with both εἶδος and μορίων.<sup>16</sup>

I would suggest, therefore, that it is attractive to read the phrase thus: 'its parts in virtue of [its] form'. We saw in the last section that Aristotle's universe has formal causes. He might be suggesting here that these formal causes make it the case that its parts are the elements, just as (later in the treatise) he argues that given its form, the universe can comprise only one world. (His methodology would, on this understanding, be comparable with that in *Politics* 7, where he argues that since the polis is a self-sufficient entity which facilitates the best life in some of its citizens, it must have certain parts and prerequisites by way of population, territory, and division of political responsibility.<sup>17</sup>) On this reading, the phrase 'parts in virtue of form' strongly suggests the kinds of parts which (in *Metaph.* Z 10, for example) depend for their existence on the whole. Aristotle holds, famously, that organic parts such as a hand are defined in terms of the whole—a hand is an organ that grasps, but it is really the *animal* that grasps, and so the character of the hand is dependent on the nature of the animal. Such parts lose their essential character when severed from that whole.

Independently of how the phrase is to be read, it is clear that in the *De caelo* the elements *are*, in exactly the way sketched in

<sup>16</sup> Nick Denyer, Christos Panayides, and David Sedley pushed me to clarify my ideas about this phrase. I am painfully aware that I have not addressed all of their objections.

<sup>17</sup> In *Pol.* 7. 8 Aristotle is explicit about deducing the conditions necessary for the existence of a whole from the nature of that whole, in the case of the polis and 'other things that are put together according to nature' (1328<sup>b</sup>22).

*Metaph. Z 10*, defined in terms of the whole. This follows from two subsidiary propositions:

- (1) The elements would not be able to perform the activities in terms of which they are defined if their natural places did not exist.
- (2) The natural places of the elements are defined by reference to the whole.

Let us see why (1) and (2) are true.

(1) There is a tendency to think that Aristotle's elements possess a nature that can be characterized non-relationally. It is thought, for example, that the upward movement of fire is a fact about fire alone, involving no other entity. Consider the following statement, from one of the most acute recent readers of the *Physics*:<sup>18</sup> 'Fire is not programmed to stop at the periphery—it would proceed upward indefinitely if it were not confined by the sphere of the moon.' The suggestion appears to be that fire stops at the periphery of the sublunary universe not because its definition requires it to do so, but because it bumps against the sphere of the moon. This is not correct: for when fire is at the uppermost point of the sublunary sphere, it has no tendency to move further away from the centre. In Aristotle's cosmology, each element is defined with respect to its natural place and what it does there. The sublunary elements, fire, air, water, and earth, rest in their natural place if they happen to occupy it, and move towards it if they do not. Fire, then, does not stop because it is prevented from continuing by the lunar sphere: it stops at the uppermost place because it has reached the place in which it rests. In other words, it is precisely 'programmed to stop at the periphery'. The natural motion of fire has to be defined relative to this natural place. If (*per impossibile*) there were no periphery, fire would possess no characteristic activity. It would have nowhere to go and nowhere to rest.

(2) Fire is defined, then, in terms which make reference to the periphery. Yes—but the periphery of what? This is the crucial point. *The cosmic natural places are defined with respect to the universe*: the centre of the universe, the sphere of the moon, the outer periphery. The identity of these places cannot be understood without reference to the structure of the whole. And since these places are defined with

<sup>18</sup> Mary Louise Gill, 'Aristotle on Self-motion,' in L. Judson (ed.), *Aristotle's Physics: A Collection of Essays* (Oxford, 1991), 243–65 at 261.

respect to the totality, they do not exist without it. Since the nature of fire is defined with respect to these places, it too depends on the whole.

In the same sense as a hand, then, the characteristic functional activity of the elements is defined in terms of the whole of which they are parts.<sup>19</sup> This is the sense in which they are parts in virtue of the form of the totality.

### (c) *Teleology and the parts*

The *De caelo* definitions reflect the ontological subordination of the elements to the totality, but only in an incomplete way. In other works we begin to appreciate a further dimension of this dependence—not only is the essence of each element *formally* defined by reference to the whole, but in addition the elements are *teleologically* subordinated to the ends of the whole. Here we find that the cosmos is so organized as to achieve an end proprietary to its own essence. The 'principal parts' of the cosmos are defined in terms of the role they play in achieving this end.

In a well-known passage in *Generation and Corruption* 2. 10 we are told that if each of the elements were to travel to its natural place and stay there, they would have separated out 'in infinite time' (337<sup>a</sup>9). But, as we know, the universe is so constructed as to imitate the eternity of God and the stars: 'Of the things that are, some are eternal and divine, and others admit alike of being and not being . . . [for] by its very nature, the beautiful and divine produces what is better in the things which admit of it' (*GA* 2. 1, 731<sup>b</sup>25–6). In order that it might imitate the eternity of the divine, the sublunary sphere must be capable of eternal activity. To achieve this, the elements must be disturbed from their natural place when they get there. The everlasting stirring-up of the elements is achieved by means of their cyclical intertransformation:

God . . . fulfilled the perfection of the whole by making coming-to-be

<sup>19</sup> The citizen is this type of part of a polis: the character of the *πολιτής* depends on the *πολιτεία* (*Pol.* 3. 1, 1275<sup>a</sup>2–3). The same holds true of the parts of the polis mentioned in 7. 9, 1329<sup>a</sup>37–8, the hoplites and legislators. Fred D. Miller, Jr., *Nature, Justice, and Rights in Aristotle's Politics* (Oxford, 1995), ch. 1, argues persuasively that *men* do not depend in this way on the polis—they can exist outside it. But this should not be taken to imply that the polis lacks the kind of ontologically dependent parts that we are discussing here. Men are political animals because they naturally have the capacity to play these roles.

uninterrupted . . . because that coming-to-be should itself come-to-be perpetually is the closest approximation to eternal being. The cause of this perpetuity of coming-to-be . . . is circular motion, for it alone is continuous. That is why all the other things—the things, I mean, which change into one another . . . e.g. the simple bodies—imitate circular motion. For when air comes-to-be from water, fire from air, and water again from fire, we say the coming-to-be has completed the cycle . . . It is by imitating circular motion that rectilinear motion too is continuous. (336<sup>b</sup>31–337<sup>a</sup>7)

The mechanism by which circular motion achieves this cyclical transformation is the exhalation and rain cycle described in *Metemorphology* 1, and alluded to in various other places. The details of this process are neither particularly clear in Aristotle's description, nor particularly relevant to my present purposes. Very broadly, water and earth are heated by the sun, giving rise to 'exhalations', namely fire and air. When fire and air rise, they cool off and come down again, getting converted into water and earth in the process. The dual motion of the sun along the ecliptic, alternately approaching and receding from any given spot on the earth, results in greater or lesser evaporation at different times of the year. (The sun is subject not only to diurnal motion, as the stars are, but also to an annual rotation along the ecliptic, which takes it north in summer and south in winter.) This cyclical variation is responsible for endless annual cycles of generation and perishing, at the level both of the elements and of organisms. Only this duality of motion can account for the bidirectionality of generation and perishing: thus, the simple circularity of the fixed stars would not suffice to maintain the sublunary sphere in constant motion.<sup>20</sup> The heavens and the planets serve as divine instruments for maintaining 'the cycle' in the sublunary world; they are described in *Physics* 8. 10 (267<sup>a</sup>21–<sup>b</sup>9) and *Metaphysics A* 7 (1072<sup>a</sup>20–5) as intermediate between God (or the Prime Mover) and sublunary entities.

The kind of teleology that we have just encountered both parallels and diverges from that ascribed to Aristotle by David Sedley in his important article 'Is Aristotle's Teleology Anthropocentric?'<sup>21</sup> Sedley argues, just as I do, that Aristotle's universe is a single teleologically structured entity. He claims, however, that Aristotle's

<sup>20</sup> *GC* 2. 10, 336<sup>a</sup>15–<sup>b</sup>25. See also *De caelo* 2. 3, 286<sup>a</sup>31–<sup>b</sup>9. Analogous points concerning animal coming-to-be and passing-away are made in *GC* 2. 11, 337<sup>b</sup>30–338<sup>b</sup>19, and *GA* 4. 10, 777<sup>b</sup>16–778<sup>a</sup>3, i.e. that their continuation too is dependent on heavenly rotations.

<sup>21</sup> *Phronesis*, 36 (1991), 141–59.

universe (or the sublunary part thereof) is so constructed as to serve the ends of humankind—this is what he means when he says that the teleology is 'anthropocentric'. In effect, he treats Aristotle's sublunary sphere as an *instrument* in that it serves the ends of something distinct both from itself and the entity of which it is essentially a part. When we ask what end a human eye or hand serves, we *may* specify a social end or the interest of the human's employer—this would be to treat the eye in terms of instrumental teleology. When thinking *biologically* about the human eye or hand, however, we refer not to the needs of such external entities, but to the ends of the biological entity of which it is itself a part. That is, we seek to understand the ways in which the activities of these organs fit together with those of others to produce something that the whole organism naturally strives for for its own sake.

This is the kind of *internal* teleology that I find in Aristotle's doctrines concerning the parts and whole of the universe: the elements are serving the ends of the entity of which they are parts. But this is no reason to exclude Sedley's instrumentalism with respect to the elements. In *Politics* 1 Aristotle posits an entity—the household—of which the slave is an intrinsic part. The slave's activities serve this entity. This relation is internal: that is, the ends of the more inclusive entity govern the teleological understanding of all of its parts, master and slave alike. However, having said this, one has immediately to recognize that it is, of course, the master's personal interests that determine a good number of the ends of the household—his use of the wealth of the household to further his personal virtues of generosity is a good example of this (*Pol.* 2. 5, 1263<sup>a</sup>40–<sup>b</sup>14). And so the slave's activities also serve the ends of another, a fact that Aristotle recognizes in characterizing the rule of the master over the slave as 'despotic'.<sup>22</sup> So while the slave's role is understood in one way as determined by the same kind of teleological subordination as we find of organs to organism, it is simultaneously subject to instrumental teleology.

It might well be that the same sort of consideration applies to the elements. Though they serve the end of the entity of which they are a part, the universe, they also serve the interests of humans—axiologically the most valuable things in the sublunary sphere—e.g. by providing water for their crops through the rain cycle. The latter

<sup>22</sup> *Pol.* 1. 5, 1254<sup>b</sup>4–10. The despot rules in his own interest, not in the interest of his subjects (3. 6, 1278<sup>b</sup>32–7, 1279<sup>a</sup>17–21; *NE* 8. 10, 1160<sup>b</sup>29–31).

might be part of what Aristotle intends when he insists that 'we do not ascribe to chance or mere coincidence the frequency of rain in winter', while at the same time maintaining that 'things are either the result of coincidence or for the sake of something' (*Phys.* 2. 8, 198<sup>b</sup>36–199<sup>a</sup>4). That is, he may be saying, as Sedley argues, that the rain cycle is for the sake of the crops that humans depend on to live. But he might also have it in mind that the rain cycle is part of how the sublunary sphere maintains itself in eternal motion.

## 2. Explaining the motion of the totality

Having considered how Aristotle defines the totality, and the role that the elements play in it, we now pass to another aspect of Aristotle's cosmic hylomorphism, the explanation of cosmic motion.

### (a) Nature and the elements

In *Physics* 8. 4 Aristotle is trying to prove that everything that is moved is moved by something. In the course of this argument, he considers 'the heavy and the light', and propounds what seems to be an inconsistent set of propositions.

- (1) Things that move themselves, i.e. those that have the origin of their motion within themselves, we say are natural. (254<sup>b</sup>14–17)
- (2) The upward motion of fire is natural. (255<sup>a</sup>4)

From these propositions it seems to follow that fire moves itself. But then we have:

- (3) To say that fire moves itself is impossible: it is not alive, it cannot stop itself, and, being continuous and homogeneous, it cannot be divided into mover and moved. (255<sup>a</sup>5–15)
- (4) So none of these things (including fire) moves itself. (255<sup>a</sup>15)
- (5) Fire contains within itself a source not of causing motion, but of suffering it. (255<sup>b</sup>29–30)
- (6) Light things are moved (a) by what brought them into existence, and (b) by what removed any hindrance to their natural motion. (256<sup>a</sup>1–3)

Proposition 4 seems to contradict 2.

David Furley is the author of one attempt to resolve this apparent inconsistency.<sup>23</sup> He points out that in *Physics* 2 nature is said to be a cause of *being moved* rather than of motion.<sup>24</sup> This is the idea that is expressed again above. We may surmise that self-movers, as envisaged in 3, contain within themselves the *active* source of their own motion, whereas the class of natural things is broader, and includes passive entities like the elements, which merely possess within themselves the principles of suffering to be moved. The elements are natural entities, but they are not self-movers. This is an important point. The ultimate active cause of any motion has to be an unmoved mover. Thus, self-movers need to contain within themselves an unmoved mover. In *GC* 1. 7 Aristotle says that unmoved movers do not share the same matter as the things they move, and that this is how they remain themselves unaffected (324<sup>a</sup>32–5). In proposition 3 above he tells us that fire is homogeneous. Because it is so, no part of it can be separate from the rest in the way that an unmoved mover would have to be: if one part of fire were to act upon another, the material continuity of the two parts would ensure that each was affected by the other (324<sup>b</sup>18–22). Fire lacks the kind of articulation of psychic and material parts—the former not sharing in the matter as the latter—that self-movers must have.

Furley's way of resolving the above contradiction is undoubtedly correct, but it raises a number of difficult questions. One is this. As an instrument that is used to split wood, an axe too contains an innate principle of being moved by another: it is movable in such a way as to split wood. This is the result of its form, not merely its matter—it is essential to the axe that it be so movable, not an accidental characteristic that it has by virtue of its matter or history. Yet, an axe is not natural; it is an artefact, and needs *another* thing to move it. If an artefact is one that lacks an innate principle of movement (or rest), and if the elements too are moved by another, why are the elements natural?<sup>25</sup>

To get an adequate answer to this question we need to take on

<sup>23</sup> 'Self-movers,' in G. E. R. Lloyd and G. E. L. Owen (eds.), *Aristotle on Mind and the Senses* (Proceedings of Seventh Symposium Aristotelicum; Cambridge, 1978), 165–79.

<sup>24</sup> 'Nature is a kind of origin or cause of being moved or being at rest in that to which it belongs primarily' (192<sup>b</sup>20–3).

<sup>25</sup> Furley seems to acknowledge a problem when he says that Aristotle 'should at least stress that they have an internal source of being acted on in a fully determinate



board Aristotle's account of self-motion in *Physics* 8. 5. For here he comes, by a complicated dialectical process which I shall not attempt to analyse here, to the conclusion that self-movers consist of two parts, one of which moves the other without itself being moved, that other being a spatially continuous substance (as every moved thing must be). If considered by itself, neither of these parts is a self-mover: the active part is the cause of motion in something else, and the passive part is caused to move by something else. This implies that the problem concerning fire *generalizes to any part of a self-mover that is in motion*. The limbs of an animal are moved by something else. What makes them natural?

The glimmerings of an answer emerge at the start of *De caelo* 3. 1:

The things called natural are either substances or their activities and affections. By substances I mean the simple bodies, such as fire and earth and the other things in that series, and the things that are made from them: the whole universe and its proper parts, and again, the animals and the plants and their proper parts . . . [all of which] are causes of movement by some power of their own. (298<sup>a</sup>26–31)<sup>26</sup>

Here Aristotle states a composition principle (the principle underlined above)—anything composed (by a natural process)<sup>27</sup> from natural things is itself a natural thing—and also a decomposition principle (italicized): the proper parts of a natural thing are natural. The decomposition principle tells us why a limb is a natural thing: i.e. not merely because it contains a passive source of motion within itself, but because it is a proper part of something which is a self-mover. The picture is this. The unmoved mover within a man moves his arm, the arm moves an axe. The axe is not natural, for it is moved by another. Why, then, is the arm natural? Because though it is moved by something outside itself—an unmoved mover—this mover is a part of the same animal as the arm itself. In the case of the axe, the mover is not only distinct, but not a part of the same natural entity.

to say'. It is not clear to me how this resolves the difficulty. In any case, I shall pursue a different line of thought.

<sup>26</sup> There is a parallel passage near the beginning of *Physics* 2, where Aristotle says 'The natural things are: the animals and their parts, plants, and the simple bodies . . .' (192<sup>b</sup>9–10).

<sup>27</sup> This qualification is needed, for otherwise, as David Sedley has pointed out to me, the composition principle will entail that an axe is natural.

Now in the above passage from *De caelo* 3. 1 the elements occur in both contexts, both as the apparent ground level for applying the composition principle, and as proper parts of the universe, parallel to the proper parts of animals. Looking at the composition principle by itself, as stated above, one might suppose that the elements are independently natural, and the things made from them are so derivatively. We have seen that this view faces major obstacles: given that the elements contain only passive potentialities, it is not clear how they are different from an axe. I want to suggest here that it is the decomposition principle that gives us the key to solving this difficulty. Could it be that, like the parts of animals and plants, the elements too are natural only because they are organic parts of a thing that contains the active principle of their own motion? This would sit nicely with the conclusion of Section 1(b) above, that the elements are defined in terms that presuppose the nature of the totality. This is the thesis that I shall pursue in the remainder of this section.

#### (b) Cosmic self-motion

We have seen that Aristotle asserts that the mover of the elements is that which brought them into existence—proposition 6(a) above.<sup>28</sup> And we have just surmised that since it contains the active potentiality responsible for the motion of the elements, this mover must be a part of a larger entity of which the elements are also parts. This surmise throws some light on a puzzlingly inconclusive train of thought that we find in Aristotle's discussion of elementary motion. In the *De motu animalium*, and in *Physics* 8, Aristotle repeatedly makes statements along the following lines: 'The cause of all the other movements is something that moves itself', 'In the case of fire, earth, and any of the inanimate things, the cause of movement is something that moves itself', 'Either a thing is moved directly by something that moves itself, or else we come ultimately to such a cause of its motion', and so on. These statements indicate that when we look for the cause of activity of an inanimate element, we must go outside the inanimate things themselves. Ultimately, we

<sup>28</sup> According to proposition 6(b) it is also moved by whatever removes any hindrance to their natural motion. 6(b) does not diminish the role of the maker, as some have thought. For in the first place, it may well be the case sometimes that there is no hindrance. What, aside from the maker, is left to play the role of the mover on these occasions? More importantly, the thing that removes the hindrance is always merely an accidental cause of motion.

are told, a self-mover is responsible for any such event. There is no place where Aristotle shows that he has abandoned this principle.

In *Physics* 8. 5 Aristotle begins by stating this principle, but then suddenly switches to discussing quite a different one, namely that all motion must be traced back to an *unmoved* mover. From the latter principle he famously draws the conclusion that the motion of the sublunary elements is ultimately to be traced back to a mover outside themselves. Commentators have devoted a lot of space to discussing why this must be so, but here I shall sidestep this question. I am interested in a different matter: what is the *self-mover* ultimately responsible for the motion of the sublunary elements? It cannot be the Prime Mover: since this does not move at all, it is not any kind of mover, let alone a self-mover. The Prime Mover is an unmoved mover, but it is not a self-mover. Can the self-mover responsible for elementary motion be the aether? It is certainly true that the heavens are responsible for the motion of the sublunary elements (in particular the Sun). And since Aristotle is committed to the heavenly bodies being alive, it might be thought that they must be self-movers. But this cannot be so: like fire, the aether is homogeneous, and cannot be divided into psychic and somatic parts in the way that self-movers must be. And in *Physics* 8 the aether is a moved mover, an instrument intermediate between the first mover and things that are moved without moving anything else.

Now, in the middle of *Physics* 8. 5, having argued that the first in any series of movers must either be an unmoved mover or a self-mover, Aristotle abruptly returns to the question of what self-movers are like (257<sup>a</sup>31 ff.). He concludes (as we have seen) that they must have a moved part as well as an unmoved part. The Prime Mover is the unmoved mover of the sublunary elements. So it seems natural to assume that the self-mover responsible for the motion of fire and earth has the Prime Mover as its unmoved part. The Prime Mover moves the aether, and as we have seen, the aether moves the sublunary elements. So with respect to the question we are considering, the only answer we can reasonably come to is this: the self-mover responsible for the motion of the sublunary elements must be a composite entity consisting *at least* of the Prime Mover and the aether taken together. This entity has an unmoved part and a moved bodily part. It is a self-mover.

However, the self-mover responsible for the motion of the sublunary elements cannot consist of *just* the Prime Mover and the

aether. For we cannot suppose that the sublunary elements are outside this entity, moved by it as an axe is moved by a man, for then the sublunary elements would not be natural. We saw in Section 2(a) that the elements were natural because they are proper parts of a larger natural entity. So we ought to conclude that the entity that includes the Prime Mover and the aether as parts also includes the sublunary elements. The corporeal universe we discussed earlier is a part of a self-mover, and its motion is traced to a psychic entity that is a part of a greater whole of which it is itself a part.<sup>29</sup> In other words, the entity consisting of the Prime Mover *plus* the corporeal universe is a self-mover.

(c) *The motion of the parts*

The same conclusion is urged on us also by a set of different considerations. Consider what Aristotle says about animal motion towards the beginning of *Physics* 8. 4. 'It is the *whole animal* that moves itself naturally, although the *body* may be moved either naturally or against nature, depending on the kind of motion it may undergo, and the kind of element of which it is composed' (*Phys* 8. 4, 254<sup>b</sup>17–20). Here we find a contrast between the motion of the whole animal and that of its body. Though the movement of the latter could be regarded at times as against nature, the motion of the whole animal is still natural.

A complementary conclusion is reached in *De anima* 1. 4, 415<sup>b</sup>30–416<sup>a</sup>18. Some think that the elements are the cause of various changes in biological organisms, Aristotle tells us there, but in fact they are only 'concurrent causes', while 'soul' is the principal cause. These are not incompatible accounts: Aristotle tells us that where movement originates from the soul, it is better to ascribe that movement not to the soul itself—for that would imply that the soul is a thing in motion—but to the man (408<sup>b</sup>11–15). This line of thought

<sup>29</sup> There are strong parallels between my conclusion and that of Aryeh Kosman in 'Aristotle's Prime Mover', in Mary Louise Gill and James Lennox (eds.), *Self Motion from Aristotle to Newton* (Princeton, 1994), 135–53. However, the argument I am offering here is quite different from Kosman's, and consequently there are a number of divergences. (1) I include the sublunary elements in the composite entity. (2) I am not moved by any developmental thesis. (3) I do not think that the Prime Mover is the soul of the heavens. Fundamentally, I think that Aristotle is driven by a methodology that makes him look to entities larger than the sublunary elements, but I have doubts about how strong the ontological consequences of this methodology are.

is confirmed in *Phys.* 8. 4: 'It would seem that in animals, just as in ships and things not naturally constituted, that which causes motion is separate from that which suffers motion, and that in this way *the animal as a whole* causes its own motion' (254<sup>b</sup>29–32). The claim is that regardless of whether the body of an animal or its constituent elements is moving naturally or by force, the *animal's* motion is controlled by the whole. In making a heavy part of itself ascend, an animal may need to exert force. In allowing the same part to descend, it relaxes that force. The negative character of the latter action does not make the 'whole animal' any less the cause of descent: even if the heavy part is simply realizing its own nature by descending, the whole animal is still letting it do so for its own purposes. When they are contributing to the motion or activity of the whole, all organic parts are thus under the control of a higher cause: a leg falling over the side of a bed in sleep may simply be realizing its own material nature, but when it descends as part of the animal's gait, it is not simply doing that.

We need to apply this idea to the case of the elements. Aristotle says that when fire ascends, it exercises its own nature, but when it descends it does so against nature. But, as we have seen, both motions are also a part of a larger motion, namely the everlasting cyclical transmutation of the elements. We can now see that when we ask about the naturalness of this larger motion it is irrelevant whether fire is ascending or descending; the agent of the larger motion has responsibility for both. This is why Aristotle can think that, even when it is ascending, fire is intrinsically moved by something else, namely that which made it light. I am suggesting that this reference to the genesis of fire is an allusion to the cycle of the elements. This cycle is traced back to the first unmoved mover, which works through the intermediate activity of the starry substance. What we need in order for this larger motion to be natural is the additional hypothesis, broached at the end of the last section, that there is a single entity of which fire, the starry substance, and the first unmoved mover are parts. The action of the first unmoved mover is not just that of one thing upon another. It is the action of one part of a natural thing upon another part of the same.<sup>30</sup>

<sup>30</sup> In *Aristotle's Physics and its Medieval Varieties* (Albany, NY, 1992), ch. 3, Helen Lang proposes that natural place is the mover referred to in *Physics* 8. 4. She is talking about the passage from first to second actuality here, the process by which water, already created, moves to the place it properly occupies. Lang proposes that

(d) *The motion of the whole*

This suggests a somewhat non-standard reading of *Physics* 8. Aristotle argues that within each animal there is an unmoved mover which is the ultimate cause of motion proper to that animal. I contend that there is motion proper to the cosmos too, and I read *Physics* 8 as arguing that it is caused by an unmoved mover proper to the cosmos.

The argument of the book is standardly taken to be a version of the so-called cosmological argument, along the following lines.

- (7) Every motion is caused by something other than the moving thing.
- (8) On pain of receding to infinity, any chain of movers must have a first member.
- (9) This first member cannot be in motion, for otherwise it would stand in need of a mover too.
- (10) So, the first member of any chain of movers must be an unmoved mover.
- (11) This is the Prime Mover.

But there is a problem with this reading noticed by Aquinas:<sup>31</sup> given that Aristotle acknowledges the existence of an unmoved mover within *each* animal, why should he insist on a Prime Unmoved Mover in addition? What is the motion for which this additional entity is required?

A complete solution must take into account that in *Physics* 8 Aristotle is talking not about the myriad motions that belong to

it is the place which water properly occupies that causes water to move there. I suspect that Lang's analysis is based on the idea that the actuality of each element is its natural place. But the actuality of fire is *not* a place such as the periphery of the sublunary sphere, but rather *being-in-that-place* (τὸ ποῦ εἶναι, 255<sup>b</sup>11). This is an important distinction. A thing is actual when a certain predicable belongs to it actually. Places are not predicables. In *Categories* 4 the things that fall into the so-called category of place (actually the category of where) are called in-the-*agora*, in-the-*Lyceum*, etc. It is not these things that are places but things like the *agora*, the *Lyceum*. The importance of this distinction becomes clear when we consider the starry substance. Its actuality is not a place, but exercising a certain activity (rotating) in that place. (*Being* in a place takes more than merely being there!) Similarly, the actuality of fire is not the periphery but being at rest there. So if Lang wants to make the actuality the cause, then it is resting at the periphery that she must make the cause of fire moving there. I can make no sense of this suggestion.

<sup>31</sup> *Summa contra Gentiles* 1. 13. 24.

discrete things within the cosmos, but about the eternal cosmic cycle that belongs to the cosmos itself. He says:

That some things come-to-be and others perish, and that this is so continually, cannot be caused by anything that is unmoved but does not exist for ever, nor again can some be caused by some, others by others. *None of these things can be the cause of the eternity and continuity [of motion] nor can they be so altogether . . .* (258<sup>b</sup>26–30)

He is concerned not with the many causal chains that culminate in the multitude of motions in the universe, but with the one causal structure that accounts for eternal cosmic motion.<sup>32</sup> The proper analysis of the argument, then, is this. The motion proprietary to the universe has a special character: it is eternal and unremitting. Consequently, it requires a mover whose activity is also eternal and unremitting. Just as an animal requires an unmoved mover to explain the motion proprietary to itself, so does the whole universe.

(e) *The Prime Mover as object of emulation*

We must now consider an objection to the idea just articulated. It has been said that the Prime Mover is not an efficient cause of motion. Rather, it causes motion in the material world by being a kind of final cause, i.e. by being 'loved' or emulated.<sup>33</sup> Thus the hypothetical composite entity that consists of the Prime Mover together with the corporeal universe is less like a self-mover than has appeared thus far. In this section I argue that the objection is beside the point. Although it is right to say that the Prime Mover is a final cause in the way suggested, it is also an efficient cause.

Charles Kahn is responsible for one authoritative statement of the view that the Prime Mover is a final, not an efficient, cause. He deprecates a 'very literal reading' of the passage from *Generation*

<sup>32</sup> In *Physics* 5. 4 Aristotle stipulates that a motion is one if it is in one subject and continuous. The cosmic cycle certainly satisfies the first criterion, since its subject is the corporeal universe, which, according to sect. 1 above, is one substance. However, it would seem that a serial process consisting of distinct rectilinear motions would not count as continuous by this criterion because it is discontinuous where it reverses direction. But Aristotle says at *GC* 2. 10, 337<sup>a</sup>7, that 'it is by imitating circular motion that rectilinear motion too is continuous'.

<sup>33</sup> *Metaph.* A 8, 1072<sup>b</sup>1–5. In this passage there is a distinction made between final causes in the sense of the beneficiaries of instrumental action and final causes that are the objects of emulation. Clearly the Prime Mover, being completely self-sufficient, is not a final cause in the first sense.

and *Corruption* 2. 10 discussed in Section 1(c) above, on the grounds that

Every contemporary student of Aristotle would recognize such language simply as Aristotle's use of popular or Platonic ways of talking about the divine, no more to be taken literally than his occasional personification of Mother Nature who does nothing in vain. There is no place in Aristotle's system for a transcendent artisan or potentate. The [Prime Mover] is not properly an agent at all . . .<sup>34</sup>

Kahn is certainly correct to say that we cannot take Aristotle literally when he says that the Prime Mover 'fulfilled the perfection of the whole by making coming-to-be uninterrupted'. Since Aristotle's universe has no beginning in time, no such temporally punctual 'making' can be ascribed to the Prime Mover.<sup>35</sup> Further, though the Prime Mover causes sublunary activity by thinking, the thinking is causally efficacious in a way very different from the goal-directed thinking of a human agent. The latter consists of practical syllogisms which result in action. The Prime Mover does not participate in this sort of linear step-by-step ratiocination, it simply 'contemplates'. So Kahn is right: the Prime Mover does not exercise agency, at least according to Aristotle's own analysis of agency. But does it follow that 'its direct causal relation to the world can only be that of final causation'?

Aristotle's language does need to be discounted, as Kahn says, but by how much? We need to subtract the implication of a moment of creation, and also that of agent-deliberation. But can we discount the language of efficient causation? In *Physics* 8, Aristotle constantly uses verbs of transitive activity to describe the Prime Mover—look, for example, at the last 21 lines of *Physics* 8. 6. In this book Aristotle likens an unmoved mover to the first term in a series of causes—the man moves a thing by moving a stick which is in contact with the thing. He indicates no difference between the kind of influence exerted by the man on the stick and that by the stick on the moved thing. Both are links of efficient causation. The Prime Mover is the first term in just such a causal series, and the heavens are the

<sup>34</sup> 'The Prime Mover and Teleology', in Allan Gotthelf (ed.), *Aristotle on Nature and Living Things: Philosophical and Historical Studies* (Pittsburgh, 1985), 183–205 at 185.

<sup>35</sup> The use of the aorist ποιήσας at 336<sup>b</sup>32 does definitely suggest this sort of action; similarly the δημιουργήσας at *PA* 1. 5, 645<sup>a</sup>9. However, there are clear counter-indications. We learn at *NE* 10. 1–6, for example, that God's activity is homogeneous, an ἐνεργεία as opposed to an end-directed κίνησις.

second term. The Prime Mover corresponds to the man, and the heavens to the stick. This implies again that the Prime Mover acts by efficient causation. True, there is a difference between the man and the Prime Mover: the man moves when he moves the stick, and the Prime Mover is always unmoved. But what this shows is not that the Prime Mover is not an efficient cause, but rather that it is the kind of efficient cause that is unmoved. The terminology is continued in the *Metaphysics*. In  $\Theta$  8 the Deity is characterized in terms of activity: *ἐνεργεῖν* and *ἐνέργεια*. Similarly in book *A*, where Aristotle is most explicit about God acting as a final cause, we again find indications of the active intervention of Aristotle's God: it is a 'mover and maker' (1071<sup>b</sup>12) and possesses an innate principle of change (ibid. 15–16).

The argument of *Physics* 8 leads us to the same conclusion. Here Aristotle is concerned with motion in the cosmos taken as a whole and with the nature of the entity responsible for this motion. Having argued in the early chapters for the eternity of cosmic motion, he asks what sort of cause could be responsible for temporally unbounded motion. Only completely homogeneous activity, without beginning or end, can account for the eternity of cosmic motion. This line of thought makes no reference to final causation. The point is that only homogeneous activity can cause eternal motion in the sublunary sphere.

The evidence for the final causation model is primarily to be found in *Metaphysics A* 7. Here we are told that God moves the heavens by being an object of desire and of thought, and 'produces movement by being loved'.<sup>36</sup> The idea is that the heavens do certain things because they desire to be like God, whom they love. Is this sort of connection really a case of God exercising efficient causation? We are reminded of the passage at the end of *GC* 1. 6, where Aristotle speaks of being touched by somebody's grief. It is clear that he means to say that the griever is the efficient cause of our being affected in this way. But is this a coherent idea?

Here we have recourse to an idea derived from Lindsay Judson,<sup>37</sup> who suggests that an unmoved mover might, in a 'non-energetic' sense, be an efficient cause of a desire in *S* if

<sup>36</sup> Cf. *MA* 6, 700<sup>b</sup>23–5.

<sup>37</sup> Judson, 'Heavenly Motion and the Unmoved Mover', in Gill and Lennox (eds.), *Self Motion*, 155–71.

*S* has a desire for the final cause, and the goodness of the final cause does explain why *S* has it.

Consider a young sports fan who patterns his behaviour on that of some football star, without the latter knowing it. It is true that in some sense the star is the cause of the fan's behaviour even though he does not do anything to influence it: for instance, he does not *tell* the boy to wear his hair long—his behaviour has this result without any effort. Thus, he is an efficient cause in a way that does not require him actually to do anything directed at influencing his young admirer. This is the kind of causation that Judson seems to have in mind.

Now, I think that this is a little weaker than what we need: in other words, it seems that the influence of the Prime Mover has to be a little more 'energetic' than this. The instrumental terminology of *Physics* 8 implies that the first mover in a series of movers possesses an active potential that is specifically directed to the things that it moves. Consider a mother who teaches her daughter certain virtues simply by practising them *with the intention of being imitated*. Here one might think of the virtuous activity of the mother as possessing instrumental status. In other words, the behaviour of the daughter is caused by the mother not just in the minimal way that Judson lays out, but more directly. Since the mother intends the effect, a verb of agency, 'teaches', can be used of the mother. This is not true of the football star discussed above: his wearing his hair long is not instrumental. We cannot say that the star *taught* the boy to wear his hair long.

It is this more direct involvement that is implied by the passage in *Metaph. A* 10, 1075<sup>a</sup>11–24, in which the Prime Mover is said to be the source of the good in the universe, *in the way that a general is of order in his army*. Let us concede, even though Aristotle does not say so here, that the general is emulated, and is in this way a final cause for the ordering of his army. That is, let us concede that the general does not have to shout out his orders. Even conceding this, can Aristotle really be taken to be implying that the general is not *actively* responsible for the activities of his army? He compares the role of the general to that of a free man in a household with slaves and animals. In Aristotle's theory of the household, the free man, being the only member in possession of a fully developed rational faculty, acts on behalf of the whole by commanding the bodily

assistance of the others. It may be that all the other members of the household love the master, and that this explains their activity. But this does not imply, evidently, that the master does not act—for Aristotle explicitly says that he acts for the good of the whole.<sup>38</sup> This tells us something about how the general acts: true, he is loved and emulated, but it is also true that his activity is responsible for the actions that constitute this emulation. So also the Prime Mover.

It is not accidental that the corporeal universe imitates the everlasting homogeneous activity of the Prime Mover. Rather, it is a part of the form of the composite entity consisting of Prime Mover and corporeal universe that it should imitate the activity of the Prime Mover. Imitation is typical of a kind of derivative intention that occurs more than once in Aristotelian political and ethical works. In political entities such as the city, the army, and the household the intentions of the subordinate members derive from those of the rulers or leaders. In the *Ethics* it is part of the nature of man to imitate the contemplative activity of God. The universe in its turn is a composite entity so put together that the values of its best and ruling members are reflected in the activity of the other members. This supplements Judson's condition: it shows *why* the goodness of the Prime Mover brings it about that the corporeal universe imitates its homogeneous activity.

### 3. Conclusion: is Aristotle's universe an animal?

The argument I have presented might encourage one to think that like many other Greek cosmologists Aristotle was committed to the idea that the universe is just like an organism. After all, Aristotle thinks of organisms as composite wholes comprising a corporeal part and an unmoved mover. If I am right, the corporeal universe together with the Prime Mover is an entity of just this kind. And Aristotle uses characteristically biological ways of thinking in connection with the universe—for example, he subordinates the natural movement of the elements to that of the whole. What else but the inclusion of a thing in the biological domain could justify thinking of it in ways that are characteristic of biology? I do not

<sup>38</sup> In this passage Aristotle uses the odious term ἀνδράποδος—man-footed—for 'slave' (1075<sup>a</sup>21), emphasizing his lack of reason or volition despite his bodily similarity to free men.

think that such a conclusion is warranted (though for a long time I did). Aristotle's universe is a hylomorphic substance, but it is not an animal.

In his 'psychology' Aristotle makes the radical and interesting move of integrating the soul and body of an organism into a single entity, the former constituting a set of capacities that belong to the whole. As a consequence, there are many ways in which it makes no sense, within Aristotle's system, to talk of the soul independently of the body. 'It seems that in most cases, it neither suffers nor does anything independently of the body', he says (*De anima* 1. 1, 403<sup>a</sup>5–7). This is why he says that 'all the affections of the soul [with the possible exception of thinking] involve the body—passion, gentleness, fear, pity, courage, joy, loving, and hating; in all of these there is a concurrent affection of the body' (403<sup>a</sup>16–19). And when the soul acts it is not the soul to which most of these actions are attributed, but rather the whole animal.

Aristotle thinks that this sort of integrative account runs into difficulties when it is applied to other kinds of composite entity. In *Politics* 2. 2–3, for example, he criticizes Plato for exaggerating the kind of unity that it is possible to find in an entity like the polis. Both Plato and Aristotle emphasize the ways in which the polis is a natural unity with aims and structure that do not arise in any merely aggregative way from those of its citizens.<sup>39</sup> Plato, however, believes that this unity should be strengthened by making the attachment of the citizen to the polis more like that of an individual to himself and to his own family and possessions. Aristotle derides this move as a misunderstanding of the essential internal diversity of the polis.

Is it not obvious that a polis may at length attain such a degree of unity as to be no longer a polis? For the nature of a polis is to be a plurality, and in tending to greater unity, from being a polis, it becomes a family, and from being a family, an individual; for the family may be said to be more one than the polis, and the individual than the family. (*Pol.* 2. 2, 1261<sup>a</sup>16–21)

Just because an entity is a natural entity, it does not follow that

<sup>39</sup> There are weaker and stronger ways of understanding this condition. Minimally, humans are able within a polis to pursue, or even to attain, a natural end, political participation, which it is logically impossible for them to pursue outside it. Aristotle holds that the right pursuit of this communal good is the virtue of justice, and that the polis must seek to promote this virtue (among others). If it were to promote only individual ends, it would be no more than an alliance. (*Pol.* 3. 9, 1280<sup>b</sup>6–9). Consequently, the good that the polis exists to promote is not one that humans pursue in isolation.

it ought to be, or even that it can be, as strongly integrated as an individual human.<sup>40</sup> We just noted that 'psychic' activities located in an organism's bodily parts are attributed to the whole. The same is not true in the realm of political wholes: there are capacities and attributes of the citizens that are in no way capacities or attributes of the polis; and the converse is true as well.

Aristotle's argument in the *Politics* shows that he recognized the existence of natural unities with different degrees of functional integration amongst their parts. His individual animal is more strongly integrated than Plato's, as it is more of a unity than simply a soul inhabiting a body. His polis, on the other hand, is *less* integrated than Plato's ideal polis, since its *τέλος* coexists with a variety of individual goals and attachments in its constituent members. Such a fractionation of *τέλη* would be impossible in the case of an individual organism. In the case of an animal it is inconceivable that the limbs should have a function independent of the functioning of the whole, but in the case of the polis the individual men who are its members may pursue activities, such as contemplation, or goals, such as the care of their children, independently of the corporate entity. This, presumably, is the reason why the constitution is not the soul of the polis: the constitution has an influence on the action of citizens, but it is not the very capacity by means of which the citizens perform those actions.

Aristotle must, I believe, have brought this conception of different degrees of unity to bear on the question of the universe. His cosmos falls short of the stronger conditions of unity that characterize an animal: for it would not be right to say that the activity of the Prime Mover is in any way to be attributed to the universe as a whole. The reason is very simple. Even when considering the human soul, Aristotle thinks that there is some difficulty in understanding how pure thinking can be a capacity of the body. Since pure thinking is all that the Prime Mover does, the capacities of the Prime Mover cannot be bodily capacities, and specifically they cannot be associated with affections of the corporeal universe, or of the aether.

Aristotle does not fit into the Greek cosmological tradition that

<sup>40</sup> Cf. Miller, *Nature, Justice, and Rights*, 55: 'A polis does not possess the innate unity which is characteristic of an Aristotelian substance.' I would agree if 'organism' were to be substituted for 'substance.' The context shows that Miller would be likely to consent to such a substitution; for his position is in fact very similar to the one that I recommend.

thinks of the universe as an animal. At the same time, he did not move as far away from this tradition as is sometimes thought. Discussing the surprising treatment of cosmic and animal motion in a single treatise, the *De motu animalium*, Martha Nussbaum suggests that Aristotle departs from the dictum found in the *Analytics* that a science must operate within a single genus. In using 'biological data and principles' in cosmology, she suggests, Aristotle was moving 'towards a less departmentalized and more flexible picture of scientific study', thus providing us with 'a fine example of his capacity for self-criticism'.<sup>41</sup> I would suggest that the true explanation is more prosaic. In treating of the cosmos in biological terms, Aristotle is not making use of the 'forbidden "transition to another genus"'. The cosmos is a bodily substance, though it is subject to weaker unity constraints than animals are. It is a self-moving hylomorphic whole, as animals paradigmatically are. This accounts for the holistic presuppositions in Aristotle's cosmology.

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<sup>41</sup> Martha Craven Nussbaum, *Aristotle's De Motu Animalium* (Princeton, 1978), 113.