ELEMENTAL TELEOLOGY IN ARISTOTLE'S *PHYSICS* 2. 8

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THE role of nature in Aristotle's account of natural teleology has been widely misunderstood, and as a result Aristotle has been interpreted with an excessively biological focus. Scholars have thought that his natural teleology applies exclusively to biological things (plants and animals) and that the elements (earth, air, fire, and water) either are not teleological or are teleological only in so far as they play a role in biological processes.

This general misunderstanding of his natural teleology is well evidenced in interpretations of the winter rain example in *Physics* 2. 8's first argument for natural teleology—one of the most vexing and important passages in Aristotle's corpus. Some interpreters think he cites rainfall as an example of a process that is *not* teleological, while others think he cites winter rainfall as a process that is teleologically directed, and teleologically directed at growing corn.[1] In this paper I show that these interpretations fail to observe the role nature plays in the argument of *Physics* 2. 8. I then offer a new interpretation of that passage which shows winter rain to be teleological on its own, quite independently of biological processes such as corn growth. My new interpretation takes root in a fresh understanding of the elemental teleology at work in *De caelo*, *Physics* 8. 4, and the *Meteorologica*.

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[1] Note that I use the British translation 'corn' for *σῖτος* since the secondary literature on the passage usually speaks of 'corn growth'.

1. The Non-Teleological Rain Interpretation

Martha Nussbaum, W. D. Ross, David Balme, Allan Gotthelf, William Charlton, Lindsay Judson, and Monte Johnson, the main proponents of the Non-Teleological Rain Interpretation (hereafter 'NTRI'), argue that Aristotle agrees with his opponents in the following passage that rain is not for the sake of anything:[2]

ἔχει δ' ἀπορίαν τί κωλύει τὴν φύσιν μὴ ἕνεκά του ποιεῖν μηδ' ὅτι βέλτιον ἀλλ' ὥσπερ ὑει ὁ Ζεύς, οὐχ ὅπως τὸν σῖτον αὐξήσῃ ἀλλ' ἐξ ἀνάγκης—τὸ γὰρ ἀναχθὲν ψυχθῆναι δεῖ καὶ τὸ ψυχθὲν ὕδωρ γενόμενον κατελθεῖν, τὸ δ' αὐξάνεσθαι τούτου γενομένου τὸν σῖτον συμβαίνει—ὁμοίως δὲ καὶ εἴ τῳ ἀπόλλυται ὁ σῖτος ἐν τῇ ἅλῳ, οὐ τούτου ἕνεκα ὑει ὅπως ἀπόληται, ἀλλὰ τοῦτο συμβέβηκεν.

[*The statement of the problem*] There is the difficulty: what prevents nature from acting neither for something nor because it is better, but as Zeus rains—not in order that the corn may grow, but of necessity. (For what was taken up must become cold, and what has become cold, having become water, must come down. When this has happened, it turns out that the corn grows.) Similarly also, if someone's corn on the threshing floor is ruined it does not rain for the sake of this, so that the corn may be ruined, but this simply results. (*Phys*. 2. 8, 198^{b}17–23)

According to NTRI, Aristotle here implicitly concedes to his materialist opponent that rain is not for the sake of *anything*: rain clearly is not for the sake of corn growth—rain comes of necessity and, coincidentally, is followed by corn growth or corn rot—and, this interpretation assumes, there is no better candidate end for rain.

But the passage that follows the statement of the problem offers a challenge to this interpretation:

[2] Proponents of this view include M. C. Nussbaum, *Aristotle's* De Motu Animalium. *Text with Translation, Commentary, and Interpretive Essays* (Princeton, 1978), 94; W. D. Ross, *Aristotle's* Physics (Oxford, 1936), 42; D. Balme, 'Teleology and Necessity' ['Teleology'], in A. Gotthelf and J. G. Lennox (eds.), *Philosophical Issues in Aristotle's Biology* (Cambridge, 1987), 275–86 at 277; A. Gotthelf, 'Aristotle's Conception of Final Causality', *Review of Metaphysics*, 30 (1976–7), 226–54, repr. with additional notes and a Postscript in Gotthelf and Lennox (eds.), *Philosophical Issues in Aristotle's Biology*, 204–42 at 214 n. 19; W. Charlton (*Aristotle's* Physics *Books 1 & 2. Translated from the Greek with Introduction and Notes* [*Notes*] (Oxford, 1992), xvii; M. R. Johnson, *Aristotle on Teleology* [*Teleology*] (Oxford, 2005), 156; L. Judson, 'Aristotelian Teleology' ['Teleology'], *Oxford Studies in Ancient Philosophy*, 29 (2005), 341–66 at 350; and perhaps also T. Irwin, *Aristotle's First Principles* [*Principles*] (Oxford, 1988), and S. Waterlow (Broadie), *Nature, Change, and Agency in Aristotle's* Physics [*Nature*] (Oxford, 1982), 80.

ταῦτα μὲν γὰρ καὶ πάντα τὰ φύσει ἢ αἰεὶ οὕτω γίγνεται ἢ ὡς ἐπὶ τὸ πολύ, τῶν δ' ἀπὸ τύχης καὶ τοῦ αὐτομάτου οὐδέν. οὐ γὰρ ἀπὸ τύχης οὐδ' ἀπὸ συμπτώματος δοκεῖ ὗειν πολλάκις τοῦ χειμῶνος, ἀλλ' ἐὰν ὑπὸ κύνα· οὐδὲ καύματα ὑπὸ κύνα ἀλλ' ἂν χειμῶνος. εἰ οὖν ἢ ἀπὸ συμπτώματος δοκεῖ ἢ ἕνεκά του εἶναι, εἰ μὴ οἷόν τε ταῦτ' εἶναι μήτε ἀπὸ συμπτώματος μήτ' ἀπὸ ταὐτομάτου, ἕνεκά του ἂν εἴη. ἀλλὰ μὴν φύσει γ' ἐστὶ τὰ τοιαῦτα πάντα, ὡς κἂν αὐτοὶ φαῖεν οἱ ταῦτα λέγοντες. ἔστιν ἄρα τὸ ἕνεκά του ἐν τοῖς φύσει γιγνομένοις καὶ οὖσιν.

[*The argument*] For these things [i.e. animals] and all things that are by nature, come to be in this way either always or for the most part, and nothing from luck or chance does. For it does not seem to be from luck or from coincidence that it rains often in winter, but if in the dog-days; nor that there are heat waves in the dog-days, but in winter. If, then, things seem to be either from coincidence or for the sake of something, and if these things are not able to be from coincidence or from chance, they would be for the sake of something. But clearly all such things are by nature, as these speakers themselves would say. The 'for the sake of something', then, is in things which are and come to be by nature. (*Phys*. 2. 8, $198^{b}35$–$199^{a}8$)

David Furley has already offered a definitive argument against NTRI, so let me just briefly review his rebuttal.[3] Since the passage is clear that *winter rain* occurs regularly and thus non-coincidentally, NTRI must show how the disjunction 'either from coincidence or for the sake of something' does not apply to winter rain. Yet the 'all such things' of the penultimate sentence includes the winter rain and summer heat waves as well as the animals referred to in the first sentence.[4] In fact, winter rain and summer heat waves are used as *the* examples of things that occur regularly, thus non-coincidentally, and thus teleologically. The text does not suggest that winter rain should be excluded, and NTRI—in maintaining that rain is not for the sake of anything—requires such exclusion.

Given that Furley's reading of the text is the most straightforward, it may seem surprising that there are so many adherents of NTRI. I think that, in part, scholars have tried to avoid saddling Aristotle with what they take to be an implausible view: water comes down from the sky for the sake of something. Although we can see why he would have thought that plants send down roots for the sake

[3] D. J. Furley, 'The Rainfall Example in *Physics* II 8' ['Rainfall'], in A. Gotthelf (ed.), *Aristotle on Nature and Living Things* (Pittsburgh, 1985), 177–82 at 179–81.

[4] D. Sedley, 'Is Aristotle's Teleology Anthropocentric?' ['Anthropocentric'], *Phronesis*, 36 (1991), 179–97 at 182–3, and R. Wardy, 'Aristotelian Rainfall or the Lore of Averages' ['Rainfall'], *Phronesis*, 38 (1993), 18–30 at 19–21, both agree with Furley on this point.

of obtaining nourishment from the ground—for biological phenomena at least *appear* to us to be teleological—we certainly would baulk at his suggestion that meteorological phenomena are for the sake of something. But in their attempt to fit Aristotle to contemporary sensibilities, I think commentators have run away from some of the most central and important features of his teleology.

On the assumption, then, that Furley has shown that Aristotle thinks winter rain is for *something*, the rest of my discussion will attempt to discern *what* winter rain is for.

2. The Corn Growth Interpretation

Alan Code, John Cooper, David Furley, and David Sedley, the main proponents of the Corn Growth Interpretation, take the argument passage to show that winter rain is for the sake of corn growth—a biological process.[5] As Furley notes, this interpretation 'at first sight at least, seems to imply a much wider application of teleology—perhaps embracing all the workings of the whole natural world'.[6] Although Furley does not pursue this line himself, several commentators have used the Corn Growth Interpretation as evidence of Aristotle's commitment to a cosmic teleology of the natural world—that is, the sort of teleology supposedly endorsed by the *Politics*' claim that plants are for the sake of animals and animals for the sake of humans (1. 8, 1256^{b}10–22). Not only has the Corn Growth Interpretation become the dominant view of *Physics* 2. 8, but it has also renewed interest in the supposed cosmic character of Aristotle's natural teleology.[7]

[5] See Furley, 'Rainfall'; J. M. Cooper, 'Aristotle on Natural Teleology' ['Teleology'], in M. Schofield and M. C. Nussbaum (eds.), *Language and Logos: Studies in Ancient Greek Philosophy Presented to G. E. L. Owen* (Cambridge, 1982), 197–222 at 217–18; and A. Code, 'The Priority of Final Causes over Efficient Causes in Aristotle's *PA*' ['Priority'], in W. Kullmann and S. Follinger (eds.), *Aristotelische Biologie: Intentionen, Methoden, Ergebnisse* (Stuttgart, 1997), 127–43 at 130. Sedley agrees that corn growth must be at issue in *Physics* 2. 8 since Aristotle focuses on *seasonal* rainfall ('Anthropocentric', 184). A. Mansion claims that rain is for a purpose, but does not name the purpose (*Introduction à la Physique Aristotélicienne* (Louvain, 1945), 252 n. 2), while D. Charles lists raining as a '(possible) teleological effect' ('Teleological Causation in the *Physics*', in L. Judson (ed.), *Aristotle's* Physics*: A Collection of Essays* (Oxford, 1991), 101–28 at 103). See also Simpl. *In Phys.* 374. 18–22 Diels.

[6] Furley, 'Rainfall', 177.

[7] See e.g. Sedley, 'Anthropocentric' and '*Metaphysics Λ* 10' ['*Λ* 10'], in M. Frede

The proponents of the Corn Growth Interpretation point to the argument passage as the 'most convincing reason' in favour of their interpretation: 'If Aristotle suggests a teleological explanation of winter rainfall [the argument], we can hardly suppose that he joins the mechanists in denying it in the previous paragraph [in the statement of the problem].'[8] Proponents of the Corn Growth Interpretation tacitly assume that the putative end of rain is the same both in the passage that states the problem and in the argument passage. To some extent this assumption is natural, given that the argument passage does not name the end of winter rain.

However, upon closer inspection, we find textual asymmetries between the two passages. The statement of the problem does not explicitly mention the seasonal rain and summer heat waves found in the argument.[9] And with what are summer heat waves regularly, non-coincidentally, and thus teleologically connected? Some other crop?[10] Moreover, when Aristotle discusses coincidence in the *Metaphysics* he returns to the example of seasonal weather patterns but does not mention corn growth or any other such connected event:

> That which is neither always nor for the most part, we say this is an accident [*συμβεβηκός*]. For example, if in the dog-days winter and cold come to be, we say this is an accident [*συμβῆναι*], but not if stifling heat and warmth come to be, because the latter is always or for the most part, but not the former. (*E* 2, 1026^{b}31–5)[11]

These textual points suggest that we should closely examine the assumption that corn growth is the end at issue in the argument pas-

and D. Charles (eds.), *Aristotle's* Metaphysics *Lambda* (Oxford, 2000), 327–50, and M. Matthen, 'The Holistic Presuppositions of Aristotle's Cosmology', *Oxford Studies in Ancient Philosophy*, 20 (2001), 171–99. For a recent discussion of their views, see I. Bodnár, 'Teleology across Natures' ['Teleology'], *Rhizai*, 2 (2005), 9–29. Sect. 4 below offers my interpretation of the *Politics* 1. 8 passage.

[8] Furley, 'Rainfall', 179.

[9] As Sedley points out, the proponents of the Corn Growth Interpretation would argue that winter rain just *is* the rain that grows corn, while summer rain just *is* the rain that rots corn ('Anthropocentric', 186).

[10] Sedley suggests that the heat of summer ripens olives ('Anthropocentric', 186).

[11] And, as Furley points out, Aristotle uses plain, unadorned indicatives when presenting the opponent's view that rain is not for the sake of corn growth, thereby suggesting that he is sympathetic with their position on the case ('Rainfall', 178). Judson also argues that Aristotle's choice of words in the statement of the problem suggests that he agrees with his opponent that winter rain is not for the sake of growing corn ('Teleology', 346–7).

sage. Both NTRI and the Corn Growth Interpretation are united in assuming that corn growth is the only thing mentioned in the statement of the problem that Aristotle could think rain is for.[12] The former argues that in the statement of the problem Aristotle denies that rain is for the sake of corn growth, while the latter argues that in the argument Aristotle shows that winter rain indeed is for the sake of corn growth. In what follows I offer an interpretation that challenges their common assumption. But first I step back for a moment to consider what Aristotle aims to show in the argument passage (Section 3), and then I return to evaluate the Corn Growth Interpretation in the light of these aims (Section 4).

3. Aristotle's aim in 2. 8

The announced aim of *Physics* 2. 8 is to show that 'nature is among causes which are for the sake of something [*ἕνεκά του*]' ($198^{b}10$–11). And the chapter concludes: 'That nature is a cause, then, and a cause for the sake of something, is clear' ($199^{b}32$–3). In other words, 2. 8 sets out to show that *nature* aims at an end.[13] Let me call this the 'target claim'. Moreover, it is clear that this claim is Aristotle's target not only for the chapter, but also specifically for the argument passage, which directly responds to the following problem: 'What prevents nature from acting [not] . . . for something?' ($198^{b}17$–18).

The conclusion of the argument passage is: 'The "for the sake of something", then, is in things which are and come to be by nature' ($199^{a}7$). Aristotle's very definition of nature in *Physics* 2. 1 ($192^{b}21$–3) claims that *nature* is *in* that which is by nature. So we can understand *nature* to be the thing '*in* things which are and come to be by nature' that the conclusion claims to be for the sake of something. So understood, the conclusion repeats the target claim announced earlier: nature aims at an end.

However, proponents of the Corn Growth Interpretation have not noticed that the argument passage aims to show this connection between ends and *natures*. Now, granted, the argument's conclusion is more loosely stated than the earlier announcements of the target

[12] But, as Sedley notes, winter rain could also be for the sake of other plants and replenishing bodies of water ('Anthropocentric', 185).

[13] Given that nature is in the same genus as potential (*Metaph.* *Θ* 8, $1049^{b}8$–10), the target claim is allied with his claim that actuality is prior to potentiality ($1050^{a}9$–10).

claim. Taken by itself—and without careful attention to the sense in which *nature* is *in* that which is by nature—the conclusion perhaps misleadingly suggests that there are no limits on which things could be taken as the end of natural phenomena such as winter rain. It may appear that Aristotle would be satisfied to have shown that they simply have some end or other. This seems to be how Alan Code interprets the conclusion. He maintains that the aim of the argument passage is to show simply that 'there are things that come to be and exist by nature and for a purpose'.[14] This way of stating the conclusion does not make perspicuous the way in which something's *nature* is connected to the ends it has. For all Code says here, one might think that it would be enough for the argument passage to have shown that the class of things that are *by nature* is coextensive with (or a subset of) the class of things that have an end. However, it cannot be just an accident that something, which is by nature, has an end. Rather, Aristotle's target claim demands that it must be *the nature of* that thing to be for that end. Furley's interpretation likewise fails to show a *connection* between natures and ends. He argues: 'There is no way out [of interpreting the passage to show winter rain aims at growing corn] by denying that the sequence of rainfall followed by growth of crops is regular, or by denying that it is natural, or by denying that it is an end-like result.'[15] On Furley's view, winter rain must have corn growth as its end since we can tick off a list of *independent* and *unconnected* criteria true of the case. Rain? Yes, it is by nature. The connection between rain and growing corn? Yes, it is regular. Corn growth? Yes, it looks like an end. On this reading, rain 'regularly produces a useful outcome; so we must say that the process is for the sake of the outcome'; ends are somehow 'useful' outcomes regularly produced by natural processes.[16]

However, Aristotle's specific purpose in the argument is to un-

[14] Code, 'Priority', 129. Code would probably respond that it is *Aristotle* who fails to make this connection in 2. 8 since the discussion there is only 'partial' ('Priority', 127 and 134). For others who read the target claim in this loose sense, see C. Witt, *Substance and Essence in Aristotle* (Ithaca, NY, 1989), 93, and J. M. Cooper, 'Hypothetical Necessity and Natural Teleology', in A. Gotthelf and J. G. Lennox (eds.), *Philosophical Issues in Aristotle's Biology* (Cambridge, 1987), 243–74 at 253.

[15] Furley, 'Rainfall', 180. He goes on to claim that rainfall 'regularly produces a useful outcome; so we must say the process is for the sake of the outcome' (181). This statement suggests that an end can be identified by its usefulness without making reference to the nature that aims at the end.

[16] Furley, 'Rainfall', 181.

cover the connection between *natures* and ends: that which is *by nature* has the end at which its *nature* aims.[17] In other words, to appreciate the force of the target claim is to see that one cannot point out the end at issue without making reference to the nature at issue; a given end is not just any independently identifiable good, but the good at which a given nature aims. As Simplicius (citing Alexander) puts it, 'In the products of nature there is not only an end in view, but also it is their nature to be for some end' (*In Phys.* 375. 8–10 Diels).[18] For example, Aristotle would not be satisfied to show simply that winter rain has some end-like result. Rather, he wants to show that winter rain has the end at which *its* nature aims.

Since commentators have not paid close attention to the connection *Physics* 2. 8 aims to establish between natures and ends, they (with the single exception of David Sedley) have not paid careful attention to the question of the nature at issue in the case of winter rain.[19] The next section considers the two candidates for the nature expressed in winter rain and concludes that neither of them takes growing corn as its aim.

4. Argument against the Corn Growth Interpretation

Recall that the argument passage of *Physics* 2. 8 maintains that winter rain is *φύσει*, or *by nature*: winter rain is in the scope of the 'all such things' that are 'by nature' ($199^{a}6$). Taking this claim together with the target claim—that nature aims at an end—shows that winter rain's end is the end at which its nature aims. Thus the Corn Growth Interpretation is committed to showing that winter rain's nature aims at growing corn. It turns out that determining *which* nature is at work in winter rain is a complicated matter—as we shall see, on one reading the nature at issue is the nature of water, while on another reading it is the nature of the cosmos. In this section I shall not settle the issue of *which* nature is at work in winter rain. Rather, I shall show that on *either* reading of the nature at issue, growing corn is not its aim.

[17] The end of *Physics* 2. 7 ($198^{b}4$–9) further supports this reading of the target claim.

[18] Trans. B. Fleet, *Simplicius on Aristotle on* Physics *2* (London, 1997).

[19] Sedley's answer ('Anthropocentric') is considered in the next section.

In order to uncover the candidates for the nature of winter rain, we must first get clear on what natures there are:

> Of the things that are, some are by nature, others due to other causes: by nature are animals and their parts, plants and the simple bodies, for example earth, fire, air, and water (for we say these things and such things are by nature). And it is clear that all these differ from the things which have not been put together by nature. For each of these has in itself a source of movement and rest. . . . So a nature is what has been said [i.e. a source of movement and rest in that to which it belongs primarily of itself]. And things that have a source of this sort have a nature. And each of these [i.e. those which have a nature] is a substance. For it is an underlying thing, and nature is always in an underlying thing. And these are in accordance with nature, and things that belong to these of themselves, as being carried upwards [belongs] to fire—for this neither is a nature nor has a nature, but is by nature and in accordance with nature. (*Phys*. 2. 1, $192^{b}8$–14; $^{b}32$–$193^{a}2$)

In this passage Aristotle carefully marks off 'is a nature' from 'has a nature' and 'is by nature': a nature itself *is* an inner source of movement and rest, while that which *has* a nature *has* an inner source of movement and rest. Further, the locution 'by nature' is introduced as a description of that which is *by* an inner source of movement and rest. As we learn in this passage, animals and their parts, plants, and the elements are by nature in the sense of having a nature.[20] Moreover, we can say properly that fire and the activities it undergoes *qua* fire are by nature. However, it is improper to say that the fire's activity is a nature or has a nature, since the fire's activity is *by* a nature fire has.

What is winter rain's nature? Since natures are, by definition, internal to things that have them, by listing things that have a nature, *Physics* 2. 1 offers a list of natures as well. However, this list does not include winter rain explicitly. Corn (and its parts) are on the list, but I doubt that a proponent of the Corn Growth Interpretation would go so far as to argue that winter rain is by corn's nature.[21] Given this list, water's nature seems to be the only candidate nature for winter rain. Winter rain could be taken as a

[20] This claim needs some qualification. $192^{b}8$–11 technically says that the elements are *φύσει*. But he then goes on to say that these things (*ταῦτα*, which refers back to the list at $192^{b}11$) are *φύσει* in the sense of *having* (*ἔχοντα*, $192^{b}14$) a source of motion and rest (i.e. having a *φύσις*) in themselves.

[21] Code cites the nature of seeds, but not as the nature of winter rain ('Priority', 134). He does not see that he needs to show how winter rain is by nature in the sense that *its* nature is for the sake of something.

downward movement of water: so understood, water's falling down as winter rain is *φύσει* in the same sense as fire's movement upwards is *φύσει* in the paradigmatic case at $192^{b}35$–$193^{a}2$.

Certainly Aristotle thinks water is what falls as winter rain (*Meteor.* 1. 11, $347^{b}13$; 2. 4, $360^{a}2$–6; *GC* 2. 11, $338^{b}6$–18; *PA* 2. 7, $653^{a}8$). And if we return to the text of *Physics* 2. 8, the process of condensation and evaporation includes rain as 'water [*ὕδωρ*]' that 'falls down' ($198^{b}20$). Given that water's nature is the only candidate nature for winter rain on the *Physics* 2. 1 list and that Aristotle thinks water is the substance that falls as winter rain, prima facie water's nature is the nature of winter rain.

However, David Sedley, the only proponent of the Corn Growth Interpretation to consider the sense in which winter rain is natural, has proposed that the nature at issue in *Physics* 2. 8 is the nature of the cosmos:

> Whose nature is exhibited in the providential winter rainfall? Surely not the nature of the rain, which as a simple elemental body, cannot possibly have an internal principle of motion beyond its tendency to move towards its natural place. . . . Consequently, the nature which is exhibited by the anthropocentric natural hierarchy must be not so much individual nature as global nature—the nature of the whole ecosystem, so to speak.[22]

Notice that it is only *after* Sedley has settled on the Corn Growth Interpretation that he asks a question about nature, a question he admits to having 'so far avoided'.[23] Sedley's question is tailored to suit the Corn Growth Interpretation: he asks whose nature is exhibited in 'providential winter rainfall' or by the 'anthropocentric hierarchy'.[24] Given the textual points I discussed in Section 2, and given that the argument passage implies that winter rain (without explicit mention of corn growth or providence or hierarchies) is *φύσει*, Sedley's reading is not the only one available, and, as I shall argue, not well supported by the texts he points to as evidence. The only reason Sedley rejects water's nature as the one at work in winter rain is that it does not comport with the Corn Growth Interpretation: it is implausible to claim that water's own nature has corn growth as its end.[25]

Since the cosmos is not among the items on *Physics* 2. 1's list

[22] Sedley, 'Anthropocentric', 192.

[23] Ibid.

[24] See also Code, 'Priority', 130 n. 3, who maintains that it is 'rainfall that grows corn' that is natural.

[25] Sedley, 'Anthropocentric', 192.

of natural things, in order to show winter rain to be by cosmic nature, Sedley must look outside the *Physics* to *Metaphysics Λ* 10, 1075[a]11–25, where Aristotle refers to the 'nature of the whole'. As Sedley admits, 'The context [of *Λ* 10] is theological, and Aristotle's interest is concentrated on the roles of the Prime Mover and the heavenly bodies.'[26] In the light of this fact, Sedley is forced to say that Aristotle defends 'the anthropocentric function of rainfall in passing, as part of his strategy against the mechanists, rather than treating it in its own right. *Physics* ii is another book concerned with individual natures. Aristotle's theology is presupposed there, but not directly addressed in its own right.'[27] Not only does Sedley import the theological discussion of *Metaphysics Λ* into the interpretation of *Physics* 2. 8, but he controversially assumes that *Metaphysics Λ* shows Aristotle committed to there being a cosmic nature.[28] Recently these difficulties for the interpretation have led commentators such as Judson to revert to NTRI, despite its own set of textual intransigencies.[29] But I think commentators have been much too quick to reject Sedley's reading of *Metaphysics Λ* 10. In what follows I concede that *Λ* 10 posits a cosmic nature, but I argue that cosmic nature does not play the role Sedley thinks it plays in *Physics* 2. 8.

Let us begin by examining Sedley's translation of the passage in *Metaphysics Λ* 10 in which Aristotle refers to cosmic nature:

> [1] We must consider also in which way the nature of the whole possesses the good and the best—whether as something separated and by itself, or as its arrangement. [2] Or is it in both ways, like an army? For an army's goodness is in its ordering, and is also in the general. And more the general, since he is not due to the arrangement, but the arrangement is due to him. [3] All things are in some joint-arrangement, but not in the same way—even creatures which swim, creatures which fly, and plants. [4] And the arrangement is not such that one thing has no relation to another. They do have a relation: for all things are jointly arranged in relation to one thing. [5] But it is as in a household, where the free have least licence to act as they chance to, but all or most of what they do is arranged, while the slaves and beasts can do a little towards what is communal, but act mostly as they

[26] Ibid. 193.

[27] Ibid. 195–6. In his later paper, however, Sedley argues that the end of *Physics* 2. 6 cites the nature of 'this universe' ('*Λ* 10', 330). See my discussion of this passage in n. 39.

[28] For the most recent discussion of the controversy, see Bodnár, 'Teleology'.

[29] See Judson, 'Teleology', 346.

chance to. [6] For that is the kind of principle that nature is of each of them. [7] I mean, for example, that at least each of them must necessarily come to be dissolved; and there are likewise other things in which all share towards the whole. ($1075^{a}11$–25)[30]

Although commentators often dismiss Aristotle's reference to 'the nature of the whole' in [1] as a mere periphrasis for 'the whole', I am persuaded by Sedley's philological argument: the previously unnoticed second reference to this nature in [6] is strong evidence that Aristotle posits a cosmic nature.[31] Sedley identifies the nature of the whole with the Prime Mover, the 'one thing' to which everything bears a relation ([4]).[32] What kind of relation does each individual bear to the Prime Mover? Clearly, it is a kind of teleological relation in which the individual is in some sense for the sake of the Prime Mover, which [1] and [2] suggest is 'the good and the best'. Aristotle distinguishes two meanings of the phrase 'for the sake of which' (*οὗ ἕνεκα*): it can mean 'for the sake of which', as an aim or object to be realized (*οὗ ἕνεκά τινος*) or 'for the sake of which', as an object of benefit (*οὗ ἕνεκά τινι*). Three of the five passages throughout the corpus that distinguish these two meanings make the distinction specifically in order to show that individual things—the sphere of the fixed stars (*Metaph*. *Λ* 7, $1072^{b}1$–2), humans (*EE* 8. 3, $1249^{b}15$–16), and animals and plants (*DA* 2. 4, $415^{b}2$–3)—are teleologically directed towards the Prime Mover as their aim, but *not* as an object of benefit. Individuals strive to *be* the Prime Mover, which is eternal, purely noetic activity.[33] But since they can never successfully achieve this aim, the most they can do is *approximate* it through imitation. In taking the best thing as their aim, individuals do not seek to improve or benefit the *end*, but they seek to improve *their own condition*: the more closely they approximate the activity of the best thing, the better they are.[34]

Individuals approximate the activity of the Prime Mover as fol-

[30] I use Sedley's own translation and sentence numbering ('*Λ* 10', 328–9).

[31] My interpretation thereby diverges from that of Bodnár, 'Teleology', who argues that we should read the passage reductively. See the next section for my interpretation of the relationship between individual nature and cosmic nature.

[32] He later amends his position to claim that cosmic nature is simply 'focused' on the Prime Mover (335).

[33] On the impossibility of distinguishing the perfect substance from the perfect activity, see G. Lawrence, 'Snakes in Paradise: Problems in the Ideal Life', *Southern Journal of Philosophy*, 43 (2005), 126–65 at 154.

[34] As Johnson points out (*Teleology*, 69), Themistius, Simplicius, and Philoponus all interpret *DA* 2. 4, $415^{a}25$–$^{b}7$, to show that the individual animal (or the animal's

lows. The heavenly spheres directly imitate the Prime Mover's activity by eternally moving in perfect circles: since each point on a circle is as much an end as any other point (*Phys.* 8. 9, 265^{a}28–^{b}9), circular motion imitates the self-ended activity of the Prime Mover. Plants and animals imitate the eternal actuality of the Prime Mover by reproducing (*DA* 2. 4, 415^{a}25–^{b}7), while humans are the only animals who can imitate the Prime Mover in actually contemplating (*NE* 10. 7, 1177^{b}26–1178^{a}8; 10. 8, 1178^{b}7–32; *EE* 1. 7, 1217^{a}26–9). By imitating the circular movements of the heavenly bodies, the rectilinear movements of sublunary elements indirectly imitate the Prime Mover's activity: 'it is by imitating circular motion that rectilinear motion too is continuous' (*GC* 2. 10, 337^{a}1–7).[35]

But what is the nature of the teleological *joint*-arrangement mentioned in the passage? Although [4] clearly states that everything is, in fact, jointly arranged with everything else, it fails to state what kind of joint-arrangement obtains among individuals. Now, I certainly would agree with Sedley that the joint-arrangement is teleological, and not merely accidental, especially given [1] and [2]'s suggestion that the good is found in the arrangement and not just in that which is separated. But even if we can assume that the joint-arrangement is teleological, what kind of teleology is at stake? Aristotle maintains that the joint-arrangement is *πρὸς ἕν*, found in each thing's relation to one thing, the Prime Mover. As we have seen, the Prime Mover's activity cannot be directly imitated all the way down the hierarchy. For example, the heavenly spheres directly

soul) is the beneficiary of the body's being for the sake of participating in the divine. S. Menn seems to agree ('Aristotle's Definition of Soul and the Programme of the *De anima*', *Oxford Studies in Ancient Philosophy*, 22 (2002), 83–139 at 112). G. Richardson Lear argues, more generally, that it is 'no part' of imitative teleology that the end be a beneficiary (*Happy Lives and the Highest Good* [*Highest*] (Princeton, 2004), 76).

[35] Although there is some question about whether it is the transformation or the rectilinear movement of the elements that imitates the divine, *De generatione et corruptione* 2. 10 explicitly states that rectilinear motion does so. And, as C. H. Kahn argues, *Metaphysics Θ* 8, 1050^{b}28–30, claims that the elemental activity that imitates the imperishables is the activity they have by their own natures, so this activity must be their rectilinear movement ('The Place of the Prime Mover in Aristotle's Teleology' ['Place'], in A. Gotthelf (ed.), *Aristotle on Nature and Living Things: Philosophical and Historical Studies Presented to David M. Balme on his Seventieth Birthday* (Pittsburgh and Bristol, 1985), 183–205 at 189). Bodnár agrees that it is the elemental locomotions at issue in this passage ('Movers and Elemental Motions in Aristotle' ['Movers'], *Oxford Studies in Ancient Philosophy*, 15 (1997), 81–117 at 106).

imitate the Prime Mover's activity by their eternal rotation, while the sublunary elements must imitate the Prime Mover *indirectly*, through their imitation of the circular movement of the heavenly bodies. Now this certainly is *a* sense in which the individuals in the hierarchy are jointly arranged in relation to one thing: in aiming to imitate the Prime Mover, each individual imitates (and/or is imitated by) other individuals in the hierarchy. Given that individuals' teleological direction towards the Prime Mover is the *paradigmatic* example of the sort of teleology in which the individual does not seek to benefit the end, but seeks the end only as an aim, and given that the relationship between individual and Prime Mover is mirrored in the teleology that obtains between lower and higher individuals in the hierarchy, prima facie the teleological relationship between lower and higher individuals is one in which the lower is for the sake of the higher only as an aim. And, importantly, it seems to be no part of *this* relationship for a lower to be for the sake of *benefiting* a higher thing, but, if anything, it is part of this relationship for a lower thing to improve *its own condition* by approximating the activity of a better thing, and thereby approximating the activity of the best thing, the Prime Mover.

A closer look at the *Metaphysics Λ* 10 text suggests that Aristotle has only this imitative joint-arrangement in mind, and not an arrangement in which a lower thing is for the sake of benefiting a higher thing. According to [4], the joint-arrangement is somehow found in the relationship each thing bears to one thing. However, it is not at all clear why in both A and B aiming at some C, A and B would be jointly arranged so that A is for the sake of benefiting B, but it is perfectly clear why, in both A and B aiming at some C, A and B would be jointly arranged such that A is for the sake of B as an aim (where B more closely approximates C than A does). This interpretation also makes sense of [3], in which Aristotle claims that 'even creatures which swim, creatures which fly, and plants' are jointly arranged.[36] These cases are supposed to serve as *examples* of the sort of joint-arrangement Aristotle has in mind. But if Aristotle had in mind the lower benefiting the higher, it is not clear why it would (as Sedley notes) '[suit] Aristotle's purposes to trace this single activity [i.e. locomotion], the fundamental species of change, all the way down from the heavenly spheres, through the characteristic motions of natural species, and down to

[36] For my interpretation of the household analogy in [5], see the end of sect. 5.

the redistribution of the simple elements'.[37] And, again, this kind of joint-arrangement is at work in [7]: each thing is dissolved into its elements, whose rectilinear movements imitate the locomotive cycles of the heavenly bodies.

On this reading, then, *Metaphysics Λ* 10 shows that winter rain and corn are jointly arranged with each other—just to the extent to which their activities approximate that of the Prime Mover by their imitating the circular motion of the heavenly bodies: winter rain imitates the circular motion of the heavenly bodies by moving rectilinearly, while corn imitates it by generating another of its kind (*GC* 2. 10, $336^{b}27$–$337^{a}8$). And even though Aristotle never suggests that sublunary things imitate other sublunary things as intermediaries to imitating the divine, he does maintain that sublunary living things are closer than sublunary elements to approximating the activity of the Prime Mover (*GA* 2. 1, $731^{b}24$–$732^{a}1$).

So even though nothing in *Metaphysics Λ* 10 excludes the possibility that a lower thing is for the sake of benefiting a higher thing, such a relationship is *not* part of the teleology of approximation at work in *Metaphysics Λ* 10.[38] To find explicit reference to (or even just an obvious role for) lower things' being for the sake of benefiting higher things, Sedley's *sole* source is *Politics* 1. 8:[39]

> Even at the moment of childbirth, some animals generate at the same time sufficient nutriment to last until the offspring can supply itself—for example all the animals which produce larvae or lay eggs. And those which bear live young have nutriment within themselves for their offspring for a time, the substance called milk. Hence it is equally clear that we should also suppose that, after birth, plants exist for the sake of animals, and the other animals for the sake of men—domesticated animals for both usefulness and food, and most if not all wild animals for food and other assistance, as a source of clothing and other utilities. If, then, nature makes nothing

[37] Sedley, '*Λ* 10', 336. See also *Phys.* 4. 14, $223^{b}24$–6.

[38] Sedley wants to show that it is in the 'objective workings' of cosmic nature to direct winter rain to grow the corn, and that it is, at a more ultimate remove, 'the world as a whole whose own nature it is to bring men rain at the right times and in the right places' ('Anthropocentric', 184 and 192). However, Sedley admits that *Metaphysics Λ* 10 is 'of neutral evidential value' as to whether Aristotle thinks lower things are for the sake of benefiting higher things ('*Λ* 10', 332 n. 9).

[39] In his most recent work, Sedley points to three additional passages in support of his view of global teleology: *Phys.* 2. 4, $196^{a}24$–35; 2. 6, $198^{a}5$–13; and *PA* 1. 1, $641^{b}10$–23 (*Creationism and its Critics in Antiquity* [*Creationism*] (Berkeley and Los Angeles, 2007), 191–6). However, these arguments seem to invoke the hierarchy at work in *Metaphysics Λ* 10, and not one in which lower benefits higher.

incomplete or pointless, it is necessary that nature has made them all for the sake of men. (1256^{b}10–22)[40]

Notice that the teleology at work in this passage is different from, and does not even refer to, the teleology of approximation discussed in *Metaphysics Λ* 10. Moreover, this passage does not explicitly invoke *Λ* 10's 'nature of the whole'. It is Sedley who must forge the connection:

> Once more, the 'nature' in question can hardly be identified with the natures of the individual plants and animals, or for that matter human nature. For Aristotle certainly does not think it is any part of the nature of the plants and lower animals to serve the interests of their predators, human or other; and although it is part of human nature to exploit them, Aristotle's point is evidently not that here: for example, plants exist for the sake of animals in general, he is telling us, and that aspect of the hierarchy could hardly be part of human nature. Rather it is the complex cosmic nature that is manifested in the world's inter-species ecology.[41]

However, the following alternative interpretation is available, and as I shall show, is well supported by other texts: plants are for the sake of animals in the sense that it is part of animal nature to make use of plants, and animals are for the sake of humans in the sense that it is part of human nature to make use of animals. Sedley is correct to note that it is not part of human nature that plants exist for the sake of animals (except, I might add, in the case of humans feeding plants to domesticated animals), but the scope of 'all' in the final sentence can be understood as limited to the domestic and wild animals invoked in the immediately preceding sentence. So understood, Aristotle is not saying that plants' being for the sake of animals is governed by human nature, but only that human nature is responsible for the fact that the domestic and wild animals are for the sake of humans.[42] Then the claim that plants are for the sake of animals can be understood to have its source in animals' natures.[43]

The biological works confirm that food's being for the sake of its

[40] I use Sedley's translation ('Anthropocentric', 180).

[41] Sedley, *Creationism*, 202.

[42] For a similar proposal see Bodnár, 'Teleology', 25.

[43] Aristotle argues: 'And in general, art perfects some of the things which nature cannot complete, and imitates others. Therefore, if artistic things are purposive, clearly so are natural things' (*Phys*. 2. 8, 199^{a}15–18). From this quotation Sedley concludes that 'the imposition of art does not alter the pre-existing natural aims, but adds new ways of achieving those same aims' ('Anthropocentric', 187). For example, in Sedley's paradigm cases of the arts of agriculture, butchery, and hunting, art

beneficiary's benefit has its source in the beneficiary's nature, and do not suggest that cosmic nature or the nature of the benefiter is

completes the pre-existing aim of feeding humans. So Sedley would argue that it is not enough for his opponent to dismiss anthropocentrism by showing that it is in human nature to make use of plants and animals for humans' own purpose. Rather, the art/nature analogy at work in $199^{a}15$–18 shows that in using plants and animals for human purposes, humans merely aid in the achievement of ends that plants and animals *already have*.

But consider again the case of agriculture: Sedley maintains that the art of agriculture completes the pre-existing aim of feeding humans. The nature that was unsuccessful in achieving this end is *cosmic* nature, not the plant's individual nature (for, on Sedley's view, the plant's own nature has no such aim) ('Anthropocentric', 192). But the context of the argument suggests that Aristotle is interested to show that *individual* natures aim at ends, as Sedley recognizes when he says that the argument seeks 'to show that other natural species [i.e. other than humans] also function teleologically' (187), and that '*Physics* ii is another book concerned with individual natures. Aristotle's theology is presupposed there, but not directly addressed in its own right' (195–6). However, if cosmic nature is the source of plants' and animals' being for the sake of human nutrition, by showing the arts of agriculture, butchery, and hunting to complete the task of *cosmic nature*, Aristotle will not be any closer to concluding that 'other natural species' also function teleologically according to *their own natures*.

Sedley seems to lose track of the fact that he is committed to claiming in these cases that *cosmic* nature is completed by art: Sedley thinks the case of agriculture shows that 'it is no less the *nature of crops* to provide men with food than it is the nature of man himself to seek food' since the '*crops* are too weak to grow without the art of farming' ('Anthropocentric', 189, emphasis added). But in keeping with what he says later in his article, Sedley should have said that it is the nature of the cosmos to provide men with food since the art of agriculture achieves the ends *cosmic* nature was too weak to complete on its own. But this cannot be the point at issue: as I have argued, such a point would not support Aristotle's conclusion, which (according to Sedley's own interpretation) focuses on individual natures.

Sedley also argues: 'Aristotle does not merely assert the anthropocentric teleology, but argues for it: given that the mother's milk exists by nature for the sake of her offspring, there is no ground for denying that same natural function to external food sources, which take over the job of milk exactly where it leaves off' ('Anthropocentric', 181). The question is, however, *which nature* directs mother's milk to be for the sake of the child? Human nature? Milk's own nature? Cosmic nature? And is this the same nature that directs animals to take over where milk left off?

Sedley is clear that cosmic nature directs animals to be for the sake of humans, and although he does not say which nature is at work in the milk example, it would be odd if he thought cosmic nature was responsible in that case as well. It seems more plausible that it is part of human nature to produce milk to supply the child. Notice that in *Politics* 1. 8 the reason why the parent produces milk is because at the time of birth the child cannot 'supply itself'. Presumably, then, when the child can 'supply itself', it is part of its human nature to lay hold of animals for nourishment, just as its parent used milk to accomplish this task. On my reading, the child takes over where the parent left off since the child can now 'supply itself'.

In the examples from *Historia animalium* that I go on to discuss in this section, it is part of the parent fish's nature to migrate into the Pontus, where fresh water will 'complete the nourishment' of their eggs (7. 13, $598^{b}4$–6), but once the offspring

responsible. In *De partibus animalium* Aristotle argues that animals have the morphological features they do because of the type of food they eat. Given that animal behaviour includes eating certain foods, individual animals have the appropriate parts to deal with this food. For example, 3. 1 suggests that birds have the beaks they have based on the type of food they ingest, not that the food they ingest has the consistency it has so that it can be easily picked up by the beaks of birds ($662^{a}34$–$^{b}16$).[44] Aristotle offers this kind of explanation not only for external parts, but also for internal ones (3. 4 $665^{b}2$–5; 3. 14 $675^{b}13$–14). To continue with our example, since birds have beaks instead of teeth, they take their food in without grinding it up. Consequently they must have digestive tracts to deal with such big pieces. Some birds have a broad oesophagus and others have a strong fleshy stomach to hold the food for the long time it takes to digest such big pieces. But since the water-dwelling birds' food is moist and easily ground up all they need is a long crop (3. 14, $674^{b}17$–35).[45] Thus the digestive system is tailored to the type of food ingested, not the other way round.

When Aristotle discusses breeding and migration patterns in the *Historia animalium*, he claims these patterns depend on the seasons

are old enough, it will be part of their nature to migrate (that is, move *themselves*) into the places in which food is plentiful.

[44] The biological works are full of such examples. Birds' wingedness is determined by the type of food they eat: flesh-eating birds as well as migratory birds need wings, but fruit-eating ones and those that live in the water do not (*PA* 4. 12, $694^{a}1$ ff.). Long-legged birds have a long neck which is useful 'for feeding off the ground', and water-dwelling birds have a long neck which is useful 'for getting nourishment from the water'. But flesh-eating birds have a short strong neck instead of a long weak neck, since they must overpower their prey (4. 12, $692^{b}20$–$693^{a}10$). Since crook-taloned birds search for food from above, they have sharp vision (2. 13 $657^{b}26$–7). The camel has several stomachs because its food is thorny and woody and thus hard to concoct (3. 14, $674^{a}29$–31), and since its nourishment is thorny the roof of its mouth is hard ($674^{b}2$–5). Since elephants sometimes get nourishment from the water, they have a long trunk so that they can breathe while in water (2. 16, $659^{a}2$–15). Elephants and insects have odour receptors both for taking in nourishment and for strength (4. 6, $682^{b}35$–$683^{a}3$). Since they obtain their food from below, sea urchins (as well as all the other spiral-shells and limpets) have a head and mouth below, where their food is (*HA* 4. 5, $530^{b}22$–4).

For a recent discussion of some of these passages, see P. Pellegrin, 'Les ruses de la nature et l'éternité du mouvement: encore quelques remarques sur la finalité chez Aristote' ['Ruses'], in M. Canto-Sperber and P. Pellegrin (eds.), *Le Style de la pensée. En Hommage à Jacques Brunschwig* (Paris, 2002), 296–323.

[45] Fish are unable to grind up their nourishment, and thus must have a crop in front of their stomach (4. 5, $679^{a}32$–$^{b}3$).

and not the other way around (8. 12, 596^{b}21–9).[46] The treatise offers several such examples: in the summer, fish migrate into the Pontus in order to take advantage of its plentiful food supply (7. 13, 598^{a}30–^{b}1; 7. 19, 601^{b}16–19), and they lay their eggs there so that the fresh water can complete the nourishment of the embryos (7. 13, 598^{b}4–6).[47] In particular, fish lay their eggs near land since food is more plentiful there (6. 13, 567^{b}14). Just as animal bodies are tailored to the type of food they eat, their bodies are also designed to bring them into the location of their food: for example, since insects range widely in search of food, they have light bodies propelled by four wings (*PA* 4. 6, 682^{a}7–8).[48]

The point that these passages drive home is that for Aristotle animals have the morphological features they do, and they live and breed where and when they do, because of the location and type of food they eat. Given that animals take in nutrients and grow, they have the proper bodily parts and live in a proper location for taking in such nutrients. This is *not* to say that the nutrients are to be located where they are and have the consistency they do so that the animals can take them in as food.[49] *Physics* 2. 8 suggests that this is the case with plants as well: the roots of plants grow down instead of up since their food is located in the ground (199^{a}29–30), *not* that the water is located in the ground in order to be taken in by plant roots.[50] Applying *De generatione et corruptione* 1. 5's discussion of growth to the case of plants shows that plants grow by the growth of their non-uniform parts and these non-uniform parts grow by the growth of the uniform parts. And the uniform parts grow by acting on nourishment in such a way that they assimilate the nourishment to themselves. Growing by taking in water as food is one of the ends corn has by its very nature.

Thus, I have argued that although cosmic nature plays a role in the teleological joint-arrangement among individuals, none the less it does not play the role Sedley thinks it plays in *Physics* 2. 8. On

[46] See also 7. 1, where Aristotle claims that animal lives differ according to nutrition (588^{a}16–17).

[47] And bloodless animals are generated near the mouths of rivers since their food is there (*GA* 3. 11, 761^{b}9).

[48] Cf. J. Lear, *Aristotle: The Desire to Understand* (Cambridge, 1988), 25.

[49] Judson, 'Teleology', 355 and n. 46, and Pellegrin, 'Ruses', also argue along these lines.

[50] Aristotle repeats this point at *PA* 6. 4, 678^{a}11. He also denies that fire is the cause ἁπλῶς of nutrition and growth (*DA* 2. 4, 416^{a}10–19) and that fire and earth produce the parts of animals (*GA* 2. 1, 734^{b}27–735^{a}4).

Sedley's reading of that passage, winter rain is by cosmic nature, which directs winter rain to make the corn grow—that is, to aim at corn's benefit. But this joint-arrangement of winter rain and corn is not the sort of joint-arrangement that cosmic nature directs individuals to bear to one another in *Metaphysics Λ* 10. Instead, *Λ* 10 is interested to show an imitative joint-arrangement among individuals that mirrors (and is an intermediary to) the imitative teleological relationship that each individual bears to the Prime Mover. *Politics* 1. 8 is the *only* text that suggests the sort of joint-arrangement Sedley finds in *Physics* 2. 8. However, taking *Politics* 1. 8 together with the biological works suggests that this joint-arrangement, in which a lower benefits a higher, has its source in the beneficiary's nature, and does not suggest that cosmic nature or the nature of the benefiter is responsible.

Sedley might press, however, that although the biological works show that it is part of a higher thing's nature to make use of lower things in the hierarchy for its own benefit, I have only an argument from silence to support my claim that it is *not* part of cosmic nature or of lower things' individual natures to direct lower things to be for the sake of benefiting higher things. After all, as I admitted, nothing in *Metaphysics Λ* 10 excludes the possibility that cosmic nature directs lower things to be for the sake of benefiting higher things. And neither do the texts that focus on the natures of the sublunary elements exclude the possibility that they have such an aim. In principle, it is possible that the teleology of lower benefiting higher has two sources—that it is *both* in the nature of a higher thing to make use of lower things for its own benefit *and* in the nature of the lower things (or in the nature of the cosmos) for lower things to be for the sake of benefiting higher things.

However, even though this is true *in principle*, it seems to be ruled out by Aristotle's frequent insistence that 'nature does nothing in vain' or 'superfluous'. For example, animals whose teeth serve as offensive and defensive weapons do not, in addition, have tusks. For in such animals tusks would be superfluous—they would serve the purpose that the teeth already serve (*PA* 3. 1, 661^{b}16–33). Just as Aristotle insists that animals do not need two parts to serve the purpose that a single part accomplishes on its own, so too it seems that he would resist the view that there are two natures that serve the purpose a single nature accomplishes on its own: if, as we have seen, it is written into corn's own nature to grow roots into water's

location in order to take in the water as food, why would it *also* need to be part of water's nature or cosmic nature to bring water to that location for the sake of being taken in by plant roots? There need not be two natures that aim at corn's benefiting from its watery nourishment as long as one nature—corn's nature—can explain the phenomenon. Thus, not only is there no textual evidence that the teleology of lower benefiting higher has two sources, but Aristotle has a philosophical reason to resist such a view.[51]

Let us take stock. Although I have not yet answered the question of *which* nature is expressed in winter rain, in this section I have argued that winter rain does not take growing corn as its end. For there is *no* nature that directs winter rain to have such an end: neither water's own nature nor cosmic nature directs winter rain to grow corn, and the nature that does take growing corn as its end—corn's own nature—is not expressed in winter rain.

5. The Natural Place Interpretation

So if, as I argued (*pace* NTRI), *Physics* 2. 8 shows winter rain to be teleological and if, as I argued (*pace* the Corn Growth Interpretation), growing corn is neither the end of water's nature nor the end of cosmic nature (although it is true that growing by taking in water as food is an end of corn's nature), what is the end of winter rain? The *Physics* 2. 8 argument passage itself gives us little guidance—all it says is that winter rain is regular, and thus teleological. But if we return to the introduction of the rain case in the statement of the problem, Aristotle's opponent maintains that rain occurs 'of necessity. (For what was taken up must become cold, and what has become cold, having become water, must come down)' ($198^{b}19$–20). Since the argument passage is a response to the statement of the problem as posed by the opponent, it makes sense to consider, first, whether Aristotle thinks water's generation

[51] The success of this argument rests on my ability to show that there is no non-accidental phenomenon left over for cosmic nature to explain. This section showed that corn's benefiting from winter rain can be explained by corn's nature directing it to make use of winter rain for the sake of corn's own benefit. But it will be crucial for my next section to show how the explanation of its raining *when it does* need not make any reference to biological processes. Without such an account, there would be a remaining phenomenon for cosmic nature to explain. Cf. Sedley's argument that 'rain *per se* may fall in order to return to its natural place; but rain falls *where and when it regularly does* in order to make plants grow' ('Anthropocentric', 191).

and movement downwards are themselves teleological and, second, whether this teleology is the one at work in the winter rain example.

Physics 2 offers at least prima facie evidence that water's own nature aims at an end. As I argued in the previous section, *Physics* 2. 1 claims that each of the elements, as well as plants, animals, and their parts, is by nature in the sense that they have a nature ($192^{b}16$). Aristotle then claims that fire's moving upwards is by nature, thereby suggesting that fire's own nature is the source of the upward motion ($193^{a}1$). Thus *Physics* 2 at least prima facie expresses a commitment to the sublunary elements having a nature and to their natures being the source of their movements.[52] Taking these claims together with the target claim of *Physics* 2. 8—that nature aims at an end—suggests that the elemental natures teleologically direct elemental movements.

Offering a more detailed account of elemental teleology, *De caelo* cites the end to which water's nature directs it—its natural place.[53] *De caelo* 1. 8 maintains that a body moves according to nature to the place in which it rests without force ($276^{a}24$), which for water is on the ground.[54] And 4. 3 describes an element's natural place as the place in which an element has being or 'is [*ἔστιν*]' and has reached its 'actuality [*ἐντελέχειαν*]' ($311^{a}3$–6). The use of *ἐντελέχειαν* strongly suggests that elemental movement into natural place is robustly teleological.[55]

[52] And *Physics* 2 is not alone. For example, *Physics* 8. 4 repeats the claim that the elemental motions are *φύσει* ($255^{a}4$–5; $255^{a}29$–30). 'For indeed fire and earth are moved by something by force whenever contrary to nature, and by nature whenever, being in potential, [they are moved] into their actualities [*ἐνεργείας*]' (*Phys.* 8. 4, $255^{a}29$–30). See also *Phys.* 4. 4, $211^{a}4$–5 and $212^{b}29$–34.

[53] *De caelo* offers further prima facie evidence of Aristotle's commitment to elemental teleology: the four sublunary elements have functions (*ἔργα*: 3. 8, $307^{b}22$), and 'everything which has a function [*ἔργον*] is for the sake of its function [*ἕνεκα τοῦ ἔργου*]' (2. 3, $286^{a}8$–9). And *De caelo* explicitly argues that no natural thing is purposeless (1. 4, $271^{a}35$, and 2. 11, $291^{b}14$). Although his immediate concern in these passages from *De caelo* 1 and 2 is the heavenly bodies, none the less Aristotle phrases his statements as generalizations that seem to warrant the extension to the other natural things (including the four sublunary elements) discussed in the same treatise.

[54] The elements have the potential to be in their natural places, and their natures direct them there (*De caelo* 1. 6, $273^{a}19$–22).

[55] See also *Phys.* 8. 4, $255^{a}29$–31; $255^{b}12$–17; 4. 4, $211^{a}4$–7; 4. 5, $212^{b}30$–1. The actuality is the *τέλος*: see e.g. *Metaph.* *Θ* 8, $1050^{a}9$–10. Note that the centre/periphery is not the *τέλος* of an element without qualification. Place, after all, is not one of the four causes (*Phys.* 4. 1, $209^{a}20$–1). So *De caelo* 1. 6 makes it clear that an element aims not at *being* the centre or periphery but *being at* the centre or the periphery: 'But the body being carried up and down has the potentiality to come to be in this

Given that Aristotle seems to think that water's downward movement is teleological, is this the teleology at work in *Physics* 2. 8? Recall that the initial challenge in the statement of the problem is to show that nature acts for something *and* because it is better. If water's downward movement were for the sake of growing corn, it would be immediately obvious that the end is somehow a 'better', but it is at least initially puzzling how water's movement into natural place would be in any sense better.

Metaphysics Λ 10 suggests a solution. As I showed in the last section, each individual is teleologically directed at the Prime Mover as its aim. Water's movement is so directed via the heavenly bodies: water's rectilinear motions imitate the circular motion of the heavenly bodies, which in turn imitates the activity of the Prime Mover.[56] In moving rectilinearly the sublunary elements cannot become the best (for they cannot become the Prime Mover, and only the Prime Mover is best), but none the less they can *approximate* the circular movement of the heavenly bodies, which approximates the activity of the Prime Mover. The sublunary element thereby can become, as *De caelo* 2. 12 explicitly states, 'better' even though not 'best' ($292^{b}17–25$).[57]

Notice now that the very movement of water that imitates the divine—water's downward rectilinear movement—just is the movement by water's *own* nature—a *καθ' αὑτό* (*Phys.* 2. 1, $192^{b}35–6$) movement essential to water (8. 4, $255^{b}15–17$).[58] *Metaphysics Θ* 8 confirms that the movements by which the sublunary elements imitate the heavenly bodies are movements the sublunary elements have '*of themselves and in themselves*' ($1050^{b}28–30$, emphasis added). Likewise in the case of animals and plants: their 'most natural' activity, generation, and indeed *all* of their natural movements, just

[*δύναται ἐν τούτῳ γενέσθαι*], for it is by nature [*πέφυκε*] to be moved from the centre and to the centre' (1. 6, $273^{a}19–22$). *De caelo* 4. 3, $311^{a}3–6$, describes natural place as that which is *of* a thing's actuality, vs. *being* or constituting its actuality.

[56] Later in this section I offer a more refined interpretation of Aristotle's position such that not just any rectilinear movement imitates circular movement.

[57] *GA* 2. 1 claims that the divine (i.e. the Prime Mover) is the cause of the 'better' in those things that admit of being better or worse. Aristotle is clear that non-living things, although worse than living things, none the less admit of being better or worse ($731^{b}24–732^{a}1$). See also *De generatione et corruptione* 2. 10 and *De generatione animalium* 2. 1, where Aristotle suggests that all natural things aim at what is best.

[58] See Kahn, 'Place', 189, and Richardson Lear, *Highest*, 86. Richardson Lear should be consulted for further exploration of these issues, especially as applied to the interpretation of *Nicomachean Ethics* 10.

are the very movements that approximate the activity of the Prime Mover. Individuals *partake* of the divine in so far as they are able to do so by their own nature (*DA* 2. 4, 415[a]25–[b]7), and the greater and lesser extents to which individuals partake in the divine create a hierarchy of beings stretching from the heavenly bodies—which are 'more divine' (*De caelo* 1. 2, 269[a]32–3) since they have 'a higher nature' due to their distance from the sublunary world (1. 2, 269[b]16–17)—all the way down to even the sublunary elements, which, *De caelo* 2. 12 confirms, 'share in the divine source [*τυχεῖν τῆς θειοτάτης ἀρχῆς*]' (292[b]17–25).[59] In so far as the movements that are by the individual's own nature approximate the Prime Mover's activity, the individual nature shares in the cosmic nature. In this way, the expression of an individual's own nature *just is* an expression of the cosmic nature: for, as *Metaphysics Λ* 10 [6] maintains, the '[cosmic] nature . . . [is a principle] of each of them'. We can understand water's own nature to be cosmic just to the extent to which water's natural downward movement approximates the activity of the Prime Mover.[60]

In the light of *Metaphysics Λ* 10, we can now see how water's movement into natural place is a case not only of water's nature 'acting for something', but also 'because it is better'. However, it remains to be seen whether this is the teleology at work in *Physics* 2. 8's

[59] And, more generally, *Physics* 1. 9 maintains that form is 'divine and good and desirable' (192[a]17).

[60] Both Sedley and Bodnár are committed to the claim that each individual's teleological direction on the Prime Mover has its source *either* in cosmic nature *or* in individual nature. Sedley argues for the former: 'It is much easier to see this inclination towards everlasting recurrence as an aspiration of the overall cosmic nature—if as we have seen confirmed, there is one—than of the individual natures of cabbages, flames, or drops of water' ('*Λ* 10', 334); while Bodnár argues for the latter ('Teleology', 27). My view, as inspired by Richardson Lear's discussion of approximation (*Highest*, 80–5), suggests that individual nature *partakes* of or approximates cosmic nature. Thus, I am immune to Bodnár's argument against Sedley that cosmic nature is not on a par with other natures since it is not an internal principle of movement and rest ('Teleology', 19). On my view, it is such a principle internal to individual things: the natures of individual things are cosmic to the extent to which individuals' natural movements approximate the activity of the Prime Mover. In this sense the 'nature of the whole' (*Λ* 10 [1]) is also a 'principle . . . of each' (*Λ* 10 [6]). And in countenancing a role for the *cosmic* nature of each individual that Sedley reads in [6], I am also immune to Sedley's response to Bodnár's overall argument: 'I argue in particular that the second reference to "nature" [in [6]] . . . enables us to recognize a second reference to global nature. Bodnár 2005 ['Teleology'], pp. 18–19, is right, I think, to reply that the sentence *could* still be read as referring to individual nature. But it becomes much the less natural reading, because "the nature of the whole" is the already announced topic' (*Creationism*, 199 n. 59).

winter rain example. Recall that the argument passage maintains that *winter* rain is teleological and that *summer* rain is infrequent and accidental. So if water's teleology is at issue in the winter rain example, Aristotle's view must be that water moves into its natural place teleologically in the winter but not in the summer. Although many commentators acknowledge Aristotle's commitment to the teleology of elemental motion into natural place, they deny that this is the teleology at issue in *Physics* 2. 8, for how can it make sense to say that water falls to the ground teleologically in the winter but not in the summer?[61] This is the sole reason why Sedley quickly dismisses the Natural Place Interpretation: regardless of the season, Sedley argues, water moves into natural place when it rains.[62]

Although it is true that water moves into its natural place whenever it falls unobstructed (whether as rain or otherwise), I submit that Aristotle's refined view is that water moves into its natural place *naturally and teleologically only upon being generated by the sun* (*i.e. in the winter*). *Physics* 8. 4 reveals the special relationship the elements bear to their generator, the sun. There Aristotle explicitly denies that the elements are self-movers and thereby denies that their nature is an efficient cause of their movements. Unlike self-moving living things, the elements, *qua* things that have a nature, do not have a source of moving (an *ἀρχὴ τοῦ κινεῖν*) but a source of suffering (an *ἀρχὴ τοῦ πάσχειν*, 255^{b}31). Understanding an *ἀρχὴ τοῦ πάσχειν* as a source of being moved (*ἀρχὴ τοῦ κινεῖσθαι*) is in keeping with *Physics* 2. 1's introductory definition of nature as a 'source of movement [*ἀρχὴ κινήσεως*]' since 'movement [*κινήσεως*]' is am-

[61] Sedley suggests, but immediately rejects, a version of a Natural Place Interpretation: 'There is something intrinsically valuable about the downward motion of water from the clouds—namely, its return to its own place' ('Anthropocentric', 184). Philoponus rejects the Corn Growth Interpretation but accepts the fact that rainfall is teleological (*In Phys*. 312. 23–313. 28 Vitelli). Wardy offers a version of a Natural Place Interpretation that attempts to make sense of winter rain as teleological and summer rain as accidental. He claims rain (whether in the winter or in the summer) is always for the sake of being in its natural place and that only the circumstances surrounding summer rain are accidental ('Rainfall', 22). On my view, however, elemental natures are fitted to the movements of the sun so that water's coming down as rain in the summer is accidental, not just that the circumstances surrounding summer rain are accidental.

[62] Sedley, 'Anthropocentric', 184. Sedley goes on to argue: 'Rain *per se* may fall in order to return to its natural place; but rain falls *where and when it regularly does* in order make plants grow' (191).

biguous between the active (*κινεῖν*) and passive (*κινεῖσθαι*) senses.[63] In so far as the elements have as their nature an *ἀρχὴ τοῦ κινεῖσθαι* they are such as to be moved by something else that is their efficient cause. Thus, *Physics* 8. 4 shows that water's movement by nature—that is, its movement by its *ἀρχὴ τοῦ κινεῖσθαι*—requires an external efficient cause.

Physics 8. 4 further maintains that the efficient cause of water's movement into natural place is the efficient cause of its generation, the sun. Aristotle arrives at this claim in the course of arguing for the conclusion that everything that moves is moved by something (256^{a}4):

> And these [i.e. those non-self movers which are moved by nature] are those that may present a difficulty: by what is it moved?—for example, the light things and the heavy things. For these are moved into opposite places by force and into their proper places by nature—the light up [by nature] and the heavy down [by nature]. But it is no longer clear [that they are moved] by something, as when they are being moved contrary to nature [*παρὰ φύσιν*]. (255^{a}1–6)

Aristotle traces the confusion regarding the efficient cause of elemental movement to the failure to recognize that 'potentiality is said in various ways' (255^{a}30). Once we distinguish the two sorts of potentiality—the second potential to move into natural place and the first potential to come to be—we see that movement is the second phase of a single two-phase process (of which coming to be is the first stage).[64] While we had trouble identifying the efficient cause of elemental movement into natural place (the second phase), it is clear that the efficient cause of the first phase is the generator of the elements. So, once we realize that the two phases compose a single process, it is clear that the generator is the efficient cause of elemental movement into natural place; the chapter concludes: 'The light and the heavy . . . [are moved] by the thing that has generated and has made them light or heavy' (256^{a}1–3).[65] Although

[63] For a helpful discussion of this point, see H. Lang, *The Order of Nature in Aristotle's Physics* (Cambridge, 1998), 40 ff.

[64] *De caelo* 4. 3, the companion passage to *Physics* 8. 4, confirms that movement is a stage in the process of generation: 'So whenever air comes into being out of water, light out of heavy, it goes upwards. It is forthwith light: it no longer comes to be, but there it is [*καὶ οὐκέτι γίνεται, ἀλλ' ἐκεῖ ἔστιν*]' (311^{a}2–3). The fact that an element no longer comes to be after it is in its natural place suggests that movement is part of the process of generation.

[65] The passage also mentions the hindrance-remover as a cause (256^{a}3), but Aris-

Aristotle does not mention what this generator is (since all that matters for his purposes here is that there is one), it is clear from what he says elsewhere that it is the sun moving along the ecliptic (*Meteor.* 1. 9, 346^{b}22; *GC* 2. 10, 336^{b}6–7).

Thus, *Physics* 8. 4 shows that water's movement by nature—that is, its movement by its ἀρχὴ τοῦ κινεῖσθαι—requires an external efficient cause. And given that water's movement into natural place is part of the process of water's coming to be, the external efficient cause of water's movement into natural place is the sun, the efficient cause of water's generation. Since water's nature makes essential reference to the sun—water's nature is a source of being moved by the sun—we can now see that Aristotle's refined position is that water falls naturally and teleologically when it is moved by the sun, which is *in the winter*. Although when water comes to be in the summer it reaches its natural place, none the less its movement there is not due to its nature, which makes essential reference to its proper mover, the sun. Aristotle stresses that that which happens

totle clearly thinks it is an *accidental* efficient cause (255^{b}27). The reason many commentators claim that the generator should also be considered an *accidental* efficient cause of elemental motion is that they think (mistakenly, on my view) Aristotle's conception of natural change requires it, not that the text of *Physics* 8. 4 demands it. See e.g. S. Sauvé Meyer, 'Self-Movement and External Causation', in M. L. Gill and J. G. Lennox (eds.), *Self-Motion: From Aristotle to Newton* (Princeton, 1994), 65–80 at 77 n. 20. However, if nature can be understood as a source of *being moved*, then movements into natural place can be understood as natural changes even if their efficient cause is external. On my view, the elements are formally responsible for their own movements, while the sun is the non-accidental efficient cause of these movements. *Physics* 8. 4 highlights the contribution an element makes to its own natural movement. As Bodnár notes, *Physics* 8. 4 sharply distinguishes two questions regarding elemental movement: 'By what [ὑπὸ τίνος] is it [i.e. an element] moved?' (255^{a}2), and 'Why [διὰ τί] are the light and the heavy ever moved into their place?' (255^{b}14) ('Movers', 89). While the answer to the first question cites the efficient cause of elemental movement—the generator (ὑπὸ τοῦ γεννήσαντος, 256^{a}2)—the answer to the second question cites the formal cause—'the cause is that it is by nature somewhere and this is what it is to be [εἶναι] light and heavy' (255^{b}15–17). Even though the elements have an external efficient cause, they have an internal formal cause, their nature, which determines their manner of movement. Consequently, the elements are themselves formally responsible for their movements, and their natural movements are not at the whim of their mover.

For other commentators who maintain that the generator is an accidental cause of movement, see B. Morison, *On Location: Aristotle's Concept of Place* (Oxford, 2002), 27 and 27 n. 78, and M. L. Gill, *Aristotle on Substance: The Paradox of Unity* (Princeton, 1989), 31. Furley finds the issue perplexing ('Self-Movers', in M. L. Gill and J. G. Lennox (eds.), *Self-Motion: From Aristotle to Newton* (Princeton, 1994), 3–14 at 4). See also F. Solmsen, *Aristotle's System of the Physical World* [*System*] (Ithaca, NY, 1960), 384.

by chance is that which might have come to be (ἂν γένοιτο) for the sake of something (*Phys.* 2. 5, 197[a]35; see also 2. 6, 198[a]7). Water's falling in the summer might have been for the sake of something if it were due to the sun's recession in the winter; water moves naturally and teleologically into its natural place only when the sun serves as its efficient cause in the winter.

Given this refined view of water's teleology found in the *Physics* and in *De caelo*, and given that Aristotle thinks it is water that falls as rain, we would expect the *Meteorologica* to show that water's falling to the ground as *winter rain* is teleological, while water's falling to the ground as *summer rain* is not.[66] The Arab commentary tradition on the *Meteorologica* claims that this is indeed Aristotle's view: both Avicenna's *Kitāb aš-Šifā'* and Averroes' *Short Commentary* agree with Pseudo-Olympiodorus, who claims that condensation by recoil (i.e. summer rain and hail) occurs accidentally (*bi-tarīq al-'arad*), whereas condensation in the cold of winter occurs essentially (*bi-ḏātihī*) or teleologically.[67] In what follows I fill out this view found in the Arab commentary tradition by reading the *Meteorologica* in the light of water's teleology as described in *De caelo* and *Physics* 8. 4.[68]

[66] Notice that *Physics* 8. 4 shows water's natural downward movement to be the second phase of the two-phase process caused by the sun (of which coming-to-be is the first stage). Thus, the sun must generate water above the ground, and so when water falls naturally, it falls as *rain* (or as another form of precipitation that composes one of the three cycles caused by the sun—see n. 68).

[67] See P. Lettinck, *Aristotle's* Meteorology *and its Reception in the Arab World* (Leiden, 1999), 97–119.

[68] Aristotle clearly thinks that water, by its very nature, aims to move into its natural place by the efficient causal power of the sun. Although I focus on winter rain as one such teleological, natural movement, the *Meteorologica* claims that the sun causes *three* cycles of evaporation and condensation. First, there is the yearly cycle of summer evaporation and winter rain. As we have seen, the sun's annual movement along the ecliptic accounts for this regularity. Second, there is the daily cycle of evaporation and condensation into dew/hoar frost (into dew in summer and into hoar frost in winter), which is linked to the sun's daily movement (347[a]13 ff.). And last, Aristotle describes the cycle of floods and drought, a cycle that returns on itself only after 'a great period of time' (352[a]31; see also 2. 3, 357[a]2), and thus escapes our notice (1. 14, 351[b]8). This cycle is regular (1. 14, 351[a]26; 352[a]31; 352[b]16; 2. 2, 355[a]28) and due to the sun's movement (1. 14, 352[a]27–35).

On my interpretation, water moves naturally into its natural place *only* when it is moved by the sun as part of one of these three cycles. However, this is not to say that it is the goal of all the water in the world to come down as precipitation. For the water found in lakes and rivers has already reached its natural place. And once water has reached its natural place it could only come down again either by (*a*) being destroyed into air, and then regenerated above the ground, or (*b*) moving upwards by force and then getting released. But neither of these processes would be due to

According to Aristotle's own introduction, the *Meteorologica* should be read in the light of these treatises. For meteorology is a continuation of the study of nature that commenced in the *Physics* and that has been carried through *De caelo* and *De generatione et corruptione*:[69]

> We have discussed before the first causes of nature,[70] and all natural motion,[71] and also the stars which have been ordered according to the upper movement,[72] and the number, kinds, and mutual transformation of the elemental bodies, and coming to be and passing away in general.[73] The remaining thing that must be considered is the part of this investigation which all our predecessors called meteorology. These are the things that happen according to nature [*κατὰ φύσιν*], but with a regularity less [*ἀτακτοτέραν*] than that of the first element of bodies, and around the place that most borders the movement of the stars. (1. 1, 338^{a}20–^{b}4)

Thus the *Meteorologica* sets out to account for elemental movements that are according to nature (*κατὰ φύσιν*) and regular (albeit less regular than the motions of the heavenly bodies). And with such an aim, the *Meteorologica* claims to belong alongside a parallel study of animals and plants:

> After we have gone through these things in detail let us consider if we can give some account, according to the method [*τρόπον*] laid down, concerning animals and plants, both in general and separately; for when these things have been specified perhaps the end of the whole plan we had from the beginning [*τῆς ἐξ ἀρχῆς ἡμῖν προαιρέσεως πάσης*] may have come to be. (339^{a}6–9)

water's nature. Rather, once water has reached its natural place, it rests there due to nature (*De caelo* 1. 8, 276^{a}24) and has reached its actuality (4. 3, 311^{a}3–6). Just as earth's resting in its natural place is a way in which earth imitates the divine (2. 12, 292^{b}17–25), so does water imitate the divine by resting in its natural place. Thus, water imitates the divine not only in its movement into natural place upon the sun's recession, but also in resting there once it arrives. Notice that it is only because water is generated by the sun *away from* its natural place that it has a natural downward movement that imitates the motion of the heavenly bodies; if it were generated in its natural place, it would have no natural movement, but only a natural rest.

[69] Throughout the *Meteorologica* Aristotle claims to use the initial assumptions and definitions as given in *De caelo* and *De generatione et corruptione* to account for meteorological phenomena. See e.g. *Meteor.* 1. 3, 339^{a}33–^{b}3; 339^{b}17–19; 340^{b}4–6.

[70] i.e. *Physics* (H. D. P. Lee, *Aristotle's* Meteorologica [*Meteorologica*] (Cambridge, 1952), 4 note a).

[71] i.e. *Physics*, especially books 5–8 (Lee, *Meteorologica*, 4 note b).

[72] i.e. *De caelo* 1 and 2 (Lee, *Meteorologica*, 4 note c).

[73] i.e. *De caelo* 3 and 4 and *De generatione et corruptione* (Lee, *Meteorologica*, 4 note d).

Just as the *Physics* 2. 8 argument passage offers parallel explanations of winter rain and the growth of teeth in animals, here Aristotle maintains, more generally, that meteorology belongs alongside the study of biological things: both sorts of phenomenon are part of the science of nature commenced in the *Physics*. By arguing that the *Meteorologica* is part of the *Physics*' natural science, which obviously offers teleological explanations of natural phenomena, and that the *Meteorologica* belongs alongside his biological works, which highlight the particular ways in which the natures of organisms aim at their ends, Aristotle suggests that the kinds of explanation found here will be teleological. Moreover, as Furley has noted, the biological works (*De somno* 1. 3, $457^{b}31$ ff., and *PA* 2. 7, $653^{a}2$ ff.) actually draw on the *Meteorologica*'s account of rain to illustrate a brain function that Aristotle considers teleological.[74] As part of the 'whole plan' laid out in the *Physics*, the *Meteorologica* can be read as a treatise that offers teleological explanations.[75]

When we turn to the passages in which Aristotle discusses winter rain and summer rain, he offers just the kind of explanation we would expect given the refined view of water's teleology expressed in *De caelo* and *Physics* 8. 4. He maintains that winter rain in particular, as part of the cycle of evaporation and condensation, is an expression of nature—*φύσις* (2. 2, $354^{b}34$) and is regular—*κατὰ . . . τὴν τάξιν* (1. 9, $347^{a}6$), *κατά τινα τάξιν, ὡς ἐνδέχεται μετέχειν τὰ ἐνταῦθα τάξεως* (2. 3, $358^{a}26$–7), *περιόδου* (1. 14, $352^{a}31$), and *τεταγμένως* (2. 3, $358^{a}3$). The sun's annual movement along the ecliptic is the efficient cause responsible for this regularity:

> Now the sun is carried in a circle, and when it approaches it lifts up by heat the moist evaporation; when the sun is at a distance the vapour that had been lifted up is condensed back into water by the cold. For this reason there is more rain in winter. (2. 4, $359^{b}34$–$360^{a}3$)[76]

[74] Furley, 'Rainfall', 181.

[75] Granted, much of the study focuses on accidental occurrences such as shooting stars (1. 4), comets (1. 6–7), coast erosion (1. 14), earthquakes (2. 7–8), thunder, lightning (2. 9), hurricanes, and typhoons (3. 1). But in so far as the *Meteorologica* offers what we might call a 'science of the accidental', there must be a science of the teleological on which it is parasitic: 'Chance and luck are posterior [*ὕστερον*] to both mind and nature' (*Phys.* 2. 6, $198^{a}10$–11). It should not be surprising to find in the *Meteorologica* less discussion of the 'prior' teleological accounts of the elements and more lengthy discussions of a wide variety of accidental phenomena, since accidental phenomena are more numerous (*De caelo* 3. 2, $300^{a}24$–7). On this point, see also my discussion of *Metaphysics Λ* 10's household analogy at the end of sect. 5.

[76] Since the *Meteorologica*'s theory of exhalations introduces unnecessary com-

Now, at first glance one might think that Aristotle here offers no more teleological an explanation than the one we get from his *Physics* 2. 8 opponent, who claims that rain is not for the sake of corn growth, but rather that it occurs 'of necessity. (For what was taken up must become cold, and what has become cold, having become water, must come down' ($198^{b}19$–20). Indeed, the few commentators who have discussed *Meteorologica* 1–3 maintain that explanations offered in passages such as this one from 2. 4 are all mechanistic.[77] But notice that unlike his materialist predecessors, Aristotle attempts to explain why there is more rain *in winter*—that is, why it rains regularly in the winter. Interpreted in the light of Aristotle's refined view of water's teleology, we can see that this is the kind of regularity that, according to *Physics* 2. 8, calls for teleological explanation. Just as the *Meteorologica* explains winter rain by linking the seasonal evaporation and condensation cycle to the yearly movement of the sun along the ecliptic, *Physics* 8. 4 suggests that elemental natures, as sources of *being moved*, make essential reference to their efficient cause, the sun. Water is the kind of thing that moves into its natural place due to the sun's recession in the winter, and air is the kind of thing that moves into its natural place due to the sun's approach in the summer. *Meteorologica* 2. 2 confirms *De caelo*'s relevance: Aristotle explicitly draws on *De caelo*'s teleology of natural places to argue that the water generated by the sun in its circular course, i.e. water which rains down in the winter due to nature (*φύσις*, $354^{b}34$), reaches its natural place ($355^{b}2$).

In the summer, however, the hot air sometimes concentrates the cold in such a way as to cause air to condense back into water and fall to the ground out of season. An extreme form of this 'recoil' (*ἀντιπερίστασις*) of hot and cold results in hail, while a weaker form of recoil results in summer rain (1. 12, $348^{b}8$–10; $349^{a}5$–9). As *De generatione et corruptione* 2. 10 observes, 'We see that coming to be is when the sun approaches, and passing away [is when the sun] recedes, and each of the two in equal time [*ἐν ἴσῳ χρόνῳ*]' ($336^{b}16$–18), but sometimes 'comings to be are irregular [*ἀνωμάλους*]—either

plications, I discuss the cycle of evaporation and condensation simply in terms of water and air instead of water and the moist exhalation vapour.

[77] Although Furley more moderately suggests that Aristotle 'accepts the mechanistic interpretation as at least part of the truth' ('Rainfall', 181), other interpreters claim that the *Meteorologica* contains only mechanistic explanations. See Cooper, 'Teleology', 218; Lee, *Meteorologica*, xvi; Charlton, *Notes*, xvii; Johnson, *Teleology*, 150.

quicker [*θάττους*] or slower [*βραδυτέρας*]' (336^{b}23–4). Although here the immediate context seems to be that of animal generation, extending the point to the case of the elements would explain the *Meteorologica*'s emphasis on the speed with which recoil generates rain: recoil conditions force air to transform into water quickly (*ταχύ* at 348^{b}8 and *τάχος* at 348^{b}12). Arabian and Ethiopian summer rains also occur because clouds are 'cooled quickly [*ταχύ*] by recoil' (349^{a}5–9).[78] Consequently, summer rain is called 'violent rain' (*ὕδατα λαβρότερα*, 348^{b}11, 348^{b}23, or *ῥαγδαῖα* 349^{a}7).[79]

We are now in a position to see not only that water rains down into its natural place teleologically in the winter and not in the summer, but also that moving there in the winter is *better*. As I have argued, Aristotle maintains that water's movement is teleologically directed towards the Prime Mover via the heavenly bodies: water's rectilinear motions imitate the circular motion of the heavenly bodies, which in turn imitates the activity of the Prime Mover. But given the refined view of water's teleology as found in *De caelo*, *Physics* 8. 4, and now in the *Meteorologica*, it turns out that not just *any* of water's downward rectilinear movements is an imitation of

[78] Aristotle gives hail a similar treatment at 1. 12, 348^{b}16–349^{a}4. Note his emphasis on the speed with which water freezes. See also *Physics* 5. 6, 230^{a}29–^{b}4, where Aristotle maintains that some comings to be are forced and unnatural and that sometimes growth is forced and thereby too quick (*ταχύ* repeated at 230^{b}2 and 230^{b}3).

[79] *De generatione et corruptione* 2. 4 also suggests that improper timing is a symptom of improper transformation: the transformation from fire to water, for example, *can* take place, but is 'slower [*βραδύτερον*]' and 'more difficult [*χαλεπώτερον*]' (331^{b}5–7; 331^{a}23–4). As Broadie points out, *χαλεπώτερον* here can also be translated 'more harsh', which suggests that nature is 'stepmotherly' (synonymous with 'harsh', e.g. Hes. *WD* 825). Given this reading, Broadie thinks the passage 'threatens to rock the boat of Aristotle's metaphysical optimism. A natural cycle forever repeated must not involve struggle against the grain (cf. *Cael*. II 1)' ('*GC* I.4: Distinguishing Alteration', in F. A. J. de Haas and J. Mansfeld (eds.), *Proceedings of the XVth Symposium Aristotelicum* (Oxford, 2004), 123–50 at 144 n. 75). But just as we can understand the quick generation of summer rain to 'go against the grain' of natural movement, so too can we understand the slow transformation from fire to water. Even though the elements are able to transform into one another under various conditions and due to various influences, the *proper* transformations are those that are part of the regular cycles caused by the sun. Slower or quicker transformations must take place, but these transformations are not at the appropriate speed and timing since they are not properly caused by the sun in its circular course. Elemental transformation and movement into natural place have their proper timing and proper season from which these accidental transformations and movements diverge. Perhaps Broadie does not think it is possible for elemental motions to go against the grain because she fails to distinguish between what an element teleologically aims to do and what an element must do (see Waterlow (Broadie), *Nature*, 89).

the circular motion of the heavenly bodies—that is, not just any is an instance of water's moving there because it is *better*—but only its downward movement that occurs due to the sun's recession in the winter. Water's falling to the ground in the summer should not count as an imitative rectilinear movement that occurs because it is *better*.

The reason why summer rain should not count as imitative is clear from the *De generatione et corruptione* 2. 10 passage in which Aristotle claims rectilinear movement imitates circular movement: there he says that it does so *because* (expressed by ὥστε $337^{a}7$) it occurs on the heels of another rectilinear movement with which it composes a cycle.[80] And only water's natural movement due to the sun comprises part of such a cycle. The very fact that water's natural movement is efficiently caused by the sun ensures that water's natural movement will occur on the heels of air's upward rectilinear movement, which takes the opposite position of the sun as its efficient cause. Only in this way does water's movement imitate circular movement, which imitates the Prime Mover. *Meteorologica* 1. 9 confirms that, in particular, rain caused by the sun's movement—*winter* rain—comprises part of such an imitative cycle ($346^{b}35$–$347^{a}1$).[81] Given that the water that comes down as winter rain, and not summer rain, is part of this cycle caused by the sun, it is the rectilinear movement of water as winter rain, and not summer rain, that imitates the circular motion of the heavenly bodies. Thus, it is winter rain, and not summer rain, that falls to the ground *because it is better*.

A return to the household analogy in *Metaphysics Λ* 10 confirms that we should have expected only some of water's movements to imitate the activity of the Prime Mover:

> [A]ll things are jointly arranged in relation to one thing. But it is as in a

[80] In showing that teleological cycles can involve only two elements, I highlight a feature of the *Meteorologica*'s account that commentators find problematic. See e.g. Solmsen (*System*, 426 n. 135), who cites Joachim. However, the fact that the *Meteorologica* does not describe a single cycle that includes all four elements is a problem only if one assumes that a 'complete cycle' must include all four. Aristotle maintains that 'we say coming to be has gone round in a circle because it has been made to return again [διὰ τὸ πάλιν ἀνακάμπτειν]' (*GC* 2. 10, $337^{a}6$–7) or when one member 'will be again [πάλιν ἔσται]' (*Meteor.* 2. 3, $356^{b}35$–$357^{a}1$). Thus, for Aristotle, a cycle is 'complete' not because it has gone through a certain number of elements, but because it has returned to its starting-point, and this can be true of a cycle that includes only two elements.

[81] This is not the only cycle for which the sun is the efficient cause. See n. 68.

household, where the free have least licence to act as they chance to, but all or most of what they do is arranged, while the slaves and beasts can do a little towards what is communal, but act mostly as they chance to. (1075^{a}19–22)

If the heavenly bodies are to the sublunary elements as the freemen are to the slaves and beasts, we should expect that the heavenly bodies 'have least licence to act as they chance to, but all or most of what they do is arranged', while the sublunary elements 'can do a little towards what is communal, but act mostly as they chance to'. My interpretation makes sense of this suggestion: although the circular motion of the heavenly bodies always imitates the activity of the Prime Mover, not all sublunary elemental movements imitate the activity of the Prime Mover, but only those movements, such as winter rain, that take the sun as their efficient cause.

Thus, I have argued that Aristotle's refined view of water's teleology, as described in *De caelo* and *Physics* 8. 4, shows that water is by its very nature such as to be moved into its natural place by the sun (i.e. *in the winter*). And it is only this rectilinear movement that occurs because it is better, for only this movement imitates the circular movement of the heavenly bodies, and thereby indirectly imitates the Prime Mover. This refined view of water's teleology appears to be at work in the *Meteorologica*'s discussion of winter rain and summer rain, and thus we should interpret the winter rain example in *Physics* 2. 8 to show that winter rain, but not summer rain, is teleologically directed to reach its natural place on the ground.

6. Conclusion

The winter rain example of *Physics* 2. 8 has exercised so many scholars because on its interpretation seems to hang our understanding of the extent and character of Aristotle's natural teleology as a whole. If I am correct in my interpretation of the argument passage, and, more generally, in my account of the metaphysical commitments underlying my interpretation, we get some interesting results for the interpretation of Aristotle's natural teleology as a whole. Let me briefly mention just two.

First, we find that each individual is teleologically directed towards the Prime Mover, and as a result, individuals are teleologically arranged with one another: individuals lower in the hierarchy

imitate individuals higher in the hierarchy. Although it is true, in addition, that lower entities benefit higher entities, it is no part of their imitative teleological relationship that they do so. Rather, the fact that lower things are for the sake of benefiting higher things has its source in the *beneficiary*'s nature: it is part of the nature of a higher thing to make use of lower things for its own benefit.

Second, we find that the elements are in and of themselves natural teleological subjects, *independently* of the role they play in biological processes. Contemporary commentators have focused almost exclusively on Aristotle's biological works in order to understand his natural teleology better. As a result of this exclusive focus they have thought that natural teleology is grounded in characteristics exclusive to biological natural things—being a whole of parts or a self-mover. But if the elements are teleological independently of biological things, this fact can work as a constraint on the proper account of the ontological basis of Aristotle's ascriptions of teleological causation to natural things and show that these recent interpretations of its basis are mistaken.[82]

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[82] For example, Balme, 'Teleology', and M. Bradie and F. Miller, 'Teleology and Natural Necessity in Aristotle', *History of Philosophy Quarterly*, 1 (1984), 133–45, argue that natural teleology is based on the claim that natural explanations must make reference to a program in the seed that controls and regulates development, while Irwin, *Principles*, and S. Sauvé Meyer, 'Aristotle, Teleology, and Reduction', *Philosophical Review*, 101 (1992), 791–825, repr. in T. Irwin (ed.), *Classical Philosophy: Collected Papers* (New York and London, 1995), 81–116, argue that his natural teleology is based on ineliminativism—on the claim that natural things have an intrinsic efficient cause of their coming to be. Of course, in the case of elemental teleology, there are no seeds or intrinsic efficient causes at work.

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