

## CHAPTER 5

*Man from man but not bed from bed:  
Nature, art and chance in Physics II*

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The first argument in *Physics* 11.8 serves as the foundational text for understanding the domain, extent, and character of Aristotle's natural teleology. On the basis of this text, most scholars think that Aristotle's 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. In addition, some scholars think this text shows natural teleology to operate not only within an individual living thing, but also to extend throughout the *scala naturae*, with lower things (like elements) existing for the sake of higher things (like animals and plants, and ultimately humans). With what they take to be the domain and extent of natural teleology confirmed by this text, scholars look outside the *Physics* to deepen their understanding of the character of natural teleology (as well as related concepts such as cause, end, nature, chance, and necessity) through careful consideration of its application in particular explanatory contexts. Those convinced of the restriction of natural teleology to individual biological things seek clarification predominantly in the biological works, such as *Generation of Animals* and *Parts of Animals*, while those seeking, in addition, better understanding of a supposed commitment to an overarching teleology across the *scala naturae* turn also to such works as *Metaphysics* XII and even the *Politics*.<sup>1</sup>

In a previous paper I argued that the role of nature in *Physics* 11.8's first argument for natural teleology has been widely misunderstood, and as a

I thank Sean Kelsey and Devin Henry for written comments on an early draft of the chapter, and Mariska Leunissen for her comments on the penultimate draft. I also thank Kellyn Bardeen for her excellent editorial assistance and philosophical insight.

<sup>1</sup> Gotthelf and Lennox 1987 and Lennox 2001a are paradigmatic examples of the former approach, while Sedley 1991 is such of the latter. Notable exceptions include M. R. Johnson 2005, Leunissen 2010, and Quarantotto 2005.

result Aristotle has been interpreted with an overly biological focus.<sup>2</sup> I suggested a new reading of the winter-rain example that appears in the argument and argued that water is teleological *on its own*, independent of biological processes. If I am correct in my interpretation of the text, we should be looking not only at the biological works, but also at the elemental works such as the *Meteorology*, *On Generation and Corruption*, and *On the Heavens* to understand the character of natural teleology and related concepts.

In general, there are two desiderata for a proper interpretation of the first argument in *Physics* 11.8: First, the interpretation must show that the premises and conclusion are ones Aristotle himself would accept; and second, since the argument is meant to engage an opponent, its interpretation must offer a satisfying account of the dialectic in the passage.<sup>3</sup> In my previous work, I showed my new interpretation to best satisfy the first desideratum, but did not speak to the second. In this chapter, I argue that my interpretation best satisfies the second desideratum as well and, more importantly, suggests a unified interpretation of the dialectic across the whole of *Physics* 11.

### I The argument of *Physics* 11.8

In *Physics* 11.8, Aristotle considers a puzzle from an opponent to his natural teleology. The challenge makes use of some of Empedocles' views, yet, as Alan Code points out, the problem is not posed by Empedocles and may not be one that he would have endorsed.<sup>4</sup> I follow Code in referring to the opponent of *Physics* 11.8 as the "Empedoclean" opponent, who presents what I call 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. Why then should it not

<sup>2</sup> Scharle 2008.

<sup>3</sup> In arguing for the importance of the dialectic in *Physics* 11.8, I do not mean to suggest that Aristotle's method in the *Physics* is dialectical as opposed to scientific. I see the *Physics*' use of dialectical and scientific methods as complementary and integrated, but I will not pursue the complex issue here. For the purposes of my interpretation, "dialectic" need not be understood in any more technical a sense than engaging an interlocutor, as opposed to talking past him.

<sup>4</sup> Code 1997: 127.

be the same with the parts in nature, e.g. that our teeth should come up of necessity – the front teeth sharp, fitted for tearing, the molars broad and useful for grinding down the food – since they did not arise for this end, but it was merely a coincidental result; and so with all other parts in which we suppose there is purpose? Wherever then all the parts came about just what they would have been if they had come to be for an end, such things survived, being organized by chance in a fitting way; whereas those which grow otherwise perished and continue to perish, as Empedocles says his “man-faced ox-progeny” did. (*Phys.* 11.8, 198b17–34)<sup>5</sup>

In the course of the chapter I will discuss what this challenge amounts to. But first I will focus on Aristotle’s response to this challenge with the passage I call “the winter-rain argument”:

Such are the arguments (and others of the kind) which may cause difficulty on this point. Yet it is impossible that things are this way. For these things [e.g. 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 heatwaves 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.* 11.8, 198b35–199a8)

Many commentators suggest that Aristotle presents nothing in the winter-rain argument that does anything more than baldly beg the question – asserting, more than arguing, the position of natural teleology against his Empedoclean opponent. I believe a more compelling argument can be constructed from this passage by bringing in texts from outside the *Physics* to sharpen our understanding of the shared ground between Aristotle and his Empedoclean opponent. The structure of the argument, I suggest, is as follows:

1. (Accepted Premise): “Things [e.g. animals] seem to [come to] be either from coincidence or for the sake of something.”
2. (Disputed Premise): “These things [e.g. animals] are not able to [come to] be from coincidence or from chance.”
3. (Sub-Conclusion): “These things [e.g. animals] would [come to] be for the sake of something.” (1, 2)

<sup>5</sup> Trans. Barnes 1984; modified. All translations are from Barnes 1984, unless otherwise noted.

4. (Accepted Premise): “All such things are by nature, as these speakers themselves would say.”
5. (Conclusion): “The ‘for the sake of something,’ then, is in things which are and come to be by nature.” (3, 4)

As presented, the argument is valid. In order to establish his conclusion, however, Aristotle must be able to convince the Empedoclean opponent to accept each of the premises, so that the conclusion will follow. After considering Premises (1) and (4), I will focus on what is, perhaps, the most problematic premise, Premise (2).

As Leunissen notes, Premise (1)’s use of *δοκεῖ* suggests mutual agreement.<sup>6</sup> There is a trivial reading of the agreement, argued by Code and Charles, in which the disjunction is trivially true because the opponent agrees to one of the two disjuncts.<sup>7</sup> On my view, Aristotle positively moves his opponent to accept Sub-Conclusion (3), that “these things [e.g. animals] come to be for the sake of something,” by asserting the disjunction in the strong sense required for the entailment of (3) (that the rejection of one disjunct entails the acceptance of the one remaining). If this were the case, he would not be simply arguing against the disjunct that the opponent accepts and asserting his own: He would be using the rejection of the opponent’s position to drive the acceptance of his own. By moving the Empedoclean opponent to accept Sub-Conclusion (3), Aristotle can make use of Accepted Premise (4) to reach the final Conclusion (5). If Charles and Code are correct that all Aristotle can do is show one of the disjuncts to be false, then the fanfare that Aristotle makes over Premise (4) as shared ground – “as these speakers themselves would say” – would be for naught; without the opponent’s acceptance of Sub-Conclusion (3), the mutual agreement on Premise (4) would serve no purpose in the dialectic.

On my view, the Empedoclean opponent maintains that tooth growth and the generation of whole animals *appear* to be teleological: We suppose that there is purpose in these cases (*ἐν ὅσοις δοκεῖ ὑπάρχειν τὸ ἐνεκά του; Phys. 11.8, 198b28–29*).<sup>8</sup> The opponent suggests that things might not be as they appear and offers his own alternative: Maybe they just came to be that way by chance, in a similar way to things that are not, in fact, teleological (like rain resulting in corn growth or rain resulting in corn rot). The opponent thereby concedes that phenomena like tooth development in animals and the generation of whole animals *might* be teleological, and the

<sup>6</sup> Leunissen 2010: 29.    <sup>7</sup> Charles 1991: 113; Code 1997: 129.

<sup>8</sup> I acknowledge Sean Kelsey for suggesting this view to me.

question on the table is whether they, in fact, are – either they are teleological (as they appear to be) or they are not (because the opponent has presented a successful alternative). This is what Premise (1) formalizes. In admitting that the phenomena appear teleological, the opponent accepts that the onus is on him to unseat the presumption in favor of teleology.

So interpreted, Premise (1) does not claim that *for any occurrence whatsoever*, it happens either by chance or for the sake of something. Not even Aristotle thinks that.<sup>9</sup> Rather, Premise (1) states that *the phenomena in question* happen either for the sake of something (as they appear to) or by chance (because the opponent has offered a successful counter).<sup>10</sup>

Let us now consider Premise (4). Aristotle directly states that the Empedoclean opponent would accept the truth of this premise, that all such things that are at issue in the dialectic are “by nature” (φύσει). This is important because Aristotle and his Empedoclean opponent disagree as to which types of natures exist, so the meaning of the term “by nature” must be interpreted in a way that is neutral to this philosophical disagreement. The Empedoclean opponent denies the existence of natures above the level of the four elements: earth, air, fire, and water. Homogenizing the views of Aristotle’s materialist predecessors – including Empedocles – *Physics* II.1 attributes to them the view that the four elements are “the whole of substance, all else being its affections, states, or dispositions” (193a25).<sup>11</sup> Aristotle’s own view, by contrast, is that each natural thing – each animal, in this case – has a nature of its own, where nature is an inner source of movement and rest that belongs to the thing “primarily in virtue of itself” (πρώτως καθ’ αὐτὸ) (*Phys.* II.1, 192b22), and that animal generation (propagation of the species) comes about caused by the source of movement and rest that is the animal nature.

<sup>9</sup> The production of bile is a case in point: Bile is produced neither for the sake of something nor coincidentally, but simply as a necessary byproduct of the teleological operations of the liver (*PA* IV.2, 677a12–18). The nature of the animal does not aim to produce bile: In fact, the healthier the liver and the more pure the blood, the less bile is produced.

<sup>10</sup> This premise is suggested by the Empedoclean opponent himself in the statement of the problem: When it comes to the phenomena under consideration, the two options are “either from coincidence or for the sake of something.” Sauvé Meyer 1992: 796–797 points out that although the initial disjunction is misleadingly stated as “not in order that . . . but of necessity” (198b18–19), the gloss of that disjunction (198b19–23) does not mention necessity. The reason the opponent gives for denying that the phenomena are teleological in the restatement of the position at 198b27 is that they are coincidental (198b27), even though necessity is mentioned in this passage. Ultimately, the final statement of the opponent’s position (198b27–32) does not mention necessity at all, thereby suggesting that the opponent agrees to the disjunction for the phenomena in question.

<sup>11</sup> See also *Metaph.* v.4, 1014b35–1015a3.

Without begging the question, Aristotle cannot build into (4) the assumption that animal generation is *by the nature of the animal*, because in the Empedoclean opponent's view animal generation is *by the nature of the elements*. However, in *Physics* II.1, Aristotle carefully marks off the distinctions between something that "has a nature" and something that is "by nature" (φύσει). The locution "by nature" is introduced as a description of that which is *by* an inner source of movement and rest, which has a much wider scope than "has a nature," for it includes not only things that *have* a nature, but, more generally, that which is the result of nature (e.g. the natural activities of things that have nature), whether the nature of an animal or the nature of the elements.

Premise (4) therefore remains neutral between Aristotle's own view and that of the Empedoclean opponent, who denies that animals "have" a nature (for they do not have a nature that belongs to it primarily in virtue of itself), yet admits that animals are "by" nature in the sense that they are by the nature of the elements. In order to reach his conclusion, Aristotle needs nothing stronger than the neutrally stated Premise (4).

The greatest difficulty in interpreting Aristotle's argument lies in showing why he thinks the Empedoclean opponent could be moved to accept the truth of (2) – so I will spend the bulk of the chapter explaining and defending this premise. The text seems to offer the following claims in support of (2):

- A. (Accepted Premise): "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 heatwaves in the dog-days, but in winter." (*There is a regularity in winter rain, and in summer heatwaves, which cannot be due to coincidence.*)
  - B. (Disputed Premise): "These things [e.g. animals] and all things that are by nature come to be in this way either always or for the most part." (*Animals and things that are "by nature" come to be with the same type of regularity as winter rain and summer heatwaves.*)
  - C. (Disputed Premise): "Nothing from luck or chance does [i.e. nothing from luck or chance comes to be in this way either always or for the most part]." (*Nothing that comes by chance comes to be with the same type of regularity as winter rain and summer heatwaves.*)
- Premise (2) (Conclusion): "These things [e.g. animals] are not able to [come to] be from coincidence or from chance." (*Therefore, animals and things that happen "by nature" cannot come to be from chance.*) (A, B, C)

The question of how A, B, and C are meant to support Premise (2) is not obvious, although the gloss after each quotation offers a preview of the interpretation I will argue. To begin, I want to consider whether the Empedoclean opponent would accept the truth of these claims. Let us consider Premise (A). Most scholars now think Aristotle means that while summer rain produces corn growth coincidentally, winter rain produces corn growth teleologically.<sup>12</sup> In my previous paper, I offered a detailed argument against this interpretation by showing that it would lead to a conclusion Aristotle himself would not accept.<sup>13</sup> Importantly, this interpretation also fails to be dialectically satisfying. Again, Aristotle's use of  $\delta\omicron\kappa\epsilon\acute{\iota}$  here, as in his statement of Premise (1), suggests mutual agreement.<sup>14</sup> But the case of rain's production of corn growth was originally intended by the Empedoclean opponent as an obvious example of chance, and it is not at all clear why pointing out this *seasonal* connection would move the opponent to change his mind. After all, the opponent has *already* said that "cold" is responsible for the rain (*Phys.* 11.8, 198b14), which is close to acknowledging its seasonality.

On my reading, Premise (A) presents winter rain, taken on its own, as an example of a non-coincidental phenomenon, and this is simply a restatement of the opponent's assertion: "For what was taken up must become cold, and what has become cold, having become water, must come down" (*Phys.* 11.8, 198b19–20). Premise (A) simply makes this mutual agreement precise by clarifying that the process takes place when it is cold, and that it is typically cold in the winter, and not in the summer.<sup>15</sup> Premise (A) additionally notes that we would not say that winter rain happens by coincidence, but only summer rain.

Let us now consider Premises (B) and (C). The statement of the problem shows the Empedoclean opponent to reject either or both: Although nowadays species reproduce true to type, and thus nowadays come to be, for instance, with a set of teeth with molars in back and sharp teeth in front (either always or for the most part), nonetheless it was not always so, the Empedoclean opponent would say. The species we see now were once less

<sup>12</sup> I argue against the full range of alternative interpretations in Scharle 2008: 148–167. Most recently, Leunissen 2012: 10–48 has suggested that Premise (A) refers to the fact that farmers use winter rain to grow their crops. Although I do not have the space to pursue the point, I think her otherwise persuasive interpretation strains the text in requiring that winter rain not be among the things whose nature is for the sake of something.

<sup>13</sup> Scharle 2008: 151–167. <sup>14</sup> Leunissen 2010: 29.

<sup>15</sup> *Pace* Leunissen, who argues, "If the argument is to be rhetorically effective, it seems that there must be some non-accidental way in which Aristotle thinks winter rain (even if not itself caused teleologically) serves the growth of crops" (2010: 30; my emphasis).



common and only became common because the arrangement of their parts was conducive to survival. So, if (B) is interpreted as a claim about what has always or for the most part happened *throughout all time*, the Empedoclean opponent will simply deny its truth: One would only think (B) is true if one were focused myopically on the current era and ignored the fact that things did not always or for the most part come to be as they do nowadays. However, if (B) is interpreted as a claim about what nowadays comes to be always or for the most part, (B) will be true, but (C) will be false. For the Empedoclean opponent claims that what nowadays happens always or for the most part nonetheless comes to be by coincidence. In putting forward B and C in support of (2), it is hard to see how Aristotle does not just baldly beg the very question at issue.

Some commentators simply concede that he does so. For example, Cooper holds that Aristotle's argument relies on his view that the species of organisms are eternal and thus did not come to be as Empedocles hypothesizes.<sup>16</sup> Other commentators push Aristotle's question-begging back a step. For example, Judson holds that Aristotle's argument relies on the claim that the proper account of the generation of animals must make reference to the fact that the arrangement of teeth, for example, "serves the life of the organism."<sup>17</sup> Thus, Aristotle shows that the Empedoclean opponent's account of the arrangement of teeth is impoverished because it maintains that the arrangement of teeth is merely coincidentally beneficial. But, again, this issue lies squarely within the disputed ground. Similarly pushing the question-begging back one step, Code maintains that "all the opponent must admit is that it is always or for the most part the case that if in *human* development a front tooth is formed, then it is suitable for biting."<sup>18</sup> But, as we have seen when examining Premise (4), the Empedoclean opponent denies the existence of natures above the level of the four elements, and thus thinks that an animal is simply a coincidental arrangement of earth, air, fire, and water, and there is no robust, non-arbitrary kind "Human" by which to distinguish certain occurrences of tooth formation from others. Further, the Empedoclean opponent might press that even if the designation of a kind is not wholly arbitrary, the designation is completely *ad hoc*: If you can designate the kind "Human" in part *by reference to the fact* that things in this category have teeth suitable for biting and chewing, then it will be true, in a trivial sense, that tooth formation in a human regularly leads to teeth suitable for

<sup>16</sup> Cooper 1982: 246–253. See also Charlton 1970: 123, who claims the argument is "inconclusive."

<sup>17</sup> Judson 2005: 352. <sup>18</sup> Code 1997: 131.



biting and chewing. But the kind of regularity within the “kind” designated in this *ad hoc* fashion is not the kind of regularity that (C) claims is not the result of coincidence.

In what follows, I will suggest that Aristotle uses the uncontroversial shared ground of (A) as the fulcrum of his argument against the Empedoclean opponent: Because the Empedoclean opponent will uncontroversially agree to (A), he will have to concede (C) and (B), and thus (2). In order to appreciate the impact of this strategy, we first have to understand the origin of the challenge posed in the statement of the problem.

## II The origin of the problem

In *Physics* 11.4–6, Aristotle argues that both *thought* and *nature* enjoy a priority over chance: “spontaneity and chance . . . are posterior (ὕστερον) to intelligence and nature” (*Phys.* 11.6, 198a9–10), in the sense that movements brought about by either thought or by nature are teleological, while those that might have been brought about by either, but in fact were not, are coincidental (*Phys.* 11.5, 196b22–23). For example, “the stone that struck the man did not fall for the sake of striking him; therefore it fell spontaneously, because it might have fallen by the action of an agent and for the sake of striking” (*Phys.* 11.6, 197b29–32). Here the fall is coincidental, because it might have fallen by thought – for the sake of striking the man – but in fact did not.

It is just this priority of nature and thought over chance that misleads the Empedoclean opponent in the statement-of-the-problem passage. The opponent’s case of rain accidentally resulting in corn growth – “Zeus rains, not in order to make the corn grow” (*Phys.* 11.8, 198b18–19) – is perfectly analogous to the 11.6 stone case: replacing “striking the man” with “corn growth,” Aristotle can give the same description: “it did not fall for the sake of [growing corn]; therefore it fell spontaneously, because it might have fallen by the action of an agent [i.e. Zeus] and for the sake of [growing corn].” Coincidence for Aristotle is the lack of either *thought* or *nature*, and in the case of both the stone and the rain, the coincidence is because of the lack of *thought*, emphasized by the opponent’s appeal to “Ζεὺς” in stating the problem. The opponent seizes on what we might call the “lack-of-agency” model of coincidence (that is, coincidence by lack of thought) to formulate his understanding of the “lack-of-nature” coincidence supposedly exhibited in the case of animals. The opponent asks: “Why then should it not be the same with the parts in nature?” (*Phys.* 11.8, 199b24), and ultimately with the generation of whole animals (*Phys.* 11.8,

198b29–32)? On my reading, the winter-rain argument responds to this question by claiming that the “lack-of-agency” model is the wrong model of coincidence.<sup>19</sup> In the winter-rain argument, Aristotle re-orientes the Empedoclean opponent by offering a “lack-of-nature” case of coincidence (summer rain) and a *natural* case of teleology (winter rain) to serve as the exemplars of the model on which to reconsider the opponent’s case of animal generation. Given that the case of animal generation fits the model exemplified by winter rain, not summer rain, the opponent should conclude that animal generation (and thus the development of functional teeth as part of that generative process) is similarly teleological.

This reading demands a distinction between what I am calling the “natural” model of teleology and what I am calling the “agency” model of teleology. *Physics* II.4–6 claims that regularity is a hallmark of both models: Both things that come to be by nature and things that come to be by thought come to be regularly, while things that come to be by coincidence do not (*Phys.* II.5, 196b10–11, 20–21; 197a3–4, 20, 31–32; 197a33–35). Agents, by the teleological direction of their thought, and natural things, by the teleological direction of their natures, both reliably produce their respective ends, unless something impedes: The builder regularly builds houses, and the plant regularly grows roots. But there is something distinctive about the type of regularity exhibited by natural things at the level of generated wholes, a distinction Aristotle makes in his argument in *Physics* II.1 against his materialist predecessors (including Empedocles): “man is born from man but not bed from bed” (193b9–10). The type of regularity exhibited by natural things is that of continuous generation, for nature is an internal principle of “production (*Phys.* II.1, 192b30: ποιήσεως).” And this is the type of regularity with which winter rain comes to be.

### III Regularity on the natural model of teleology

Aristotle’s refined view, as my previous paper argues in depth, is that water moves into its natural place *naturally and teleologically only upon being generated by the sun*.<sup>20</sup> Although it is true that water moves into its natural

<sup>19</sup> Pace Cooper 1987: 245n.5, who maintains that the art–nature analogy plays no role in the winter-rain argument, and therefore claims, given the fundamental importance of the winter-rain argument, that one must “reject the suggestion” that the analogy is “central and fundamental to Aristotelian natural teleology.”

<sup>20</sup> For the full argument for this view, see Scharle 2008: 150–181. As I mention there (n.70), the sun is the efficient cause of three teleological cycles of evaporation and condensation, and water’s coming to be and movement as part of these cycles is imitative of the divine and teleological.

place whenever it falls unobstructed (whether as rain or otherwise), winter rain is the *only* rainfall that forms a cycle that imitates the divine. *Metaphysics* XII.10 (1075a19–22) suggests that elemental movements are teleologically directed towards the prime mover via their imitation of the heavenly bodies: Water’s rectilinear motions can imitate the circular motion of the heavenly bodies, which in turn imitates the activity of the prime mover. The only way for a rectilinear motion to imitate circular motion is for it to be part of a cycle that “reverts again to the beginning . . . Hence it is by imitating circular motion that rectilinear motion too is continuous” (*Cael.* II.10, 337a7). The rectilinear movement of water in winter rain, then, is imitative *because* (expressed by ὥστε) it occurs on the heels of another rectilinear movement (of air) with which it composes a cycle. *Meteorology* I.9 confirms that winter rain composes part of an imitative cycle of generation: “[W]e get a circular process that follows the course of the sun . . . When the sun is near [i.e. in the summer] the stream of vapor flows upwards; when it recedes [i.e. in the winter], the stream of water flows down [as winter rain]” (346b35–347a1; see also *Meteor.* II.4, 359b34–360a3).<sup>21</sup> The fact that water’s natural movement is efficiently caused by the sun ensures that the natural movement of water will occur on the heels of air’s upward rectilinear movement. Only in this way does water’s movement imitate circular movement, which imitates the prime mover. In contrast, whereas winter rain is properly caused by the recession of the sun, which ensures its coordination with air to form an imitative cycle, summer rain is caused by the “recoil” (ἀντιπερίστασις) of hot and cold (*Meteor.* I.12, 348b8–10, 349a5–9) and is thus “violent” (ὑδατα λαβρότερα, *Meteor.* I.12, 348b11, 348b23, or ῥαγδαῖα, 349a7). Summer rain is therefore neither imitative nor teleological – a rectilinear dead-end.<sup>22</sup>

In general, *Metaphysics* XII.10 shows that things are in “joint-arrangement” (συντέτακται) (*Metaph.* XII.10, 1075a15) with one another 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

<sup>21</sup> See also *Metaph.* IX.8, 1050b28ff.

<sup>22</sup> Most recently, Leunissen 2010: 30n.57 has resisted my interpretation of winter rain in *Physics* II.8 because she “take[s] it that the crux for Aristotle in *Ph* II.8 is to show that regular natural phenomena have regular beneficial outcomes due to the fact that *nature is an efficient cause that acts for the sake of something*. Under Scharle’s interpretation, however, it is the retraction of the sun in the winter that is the efficient cause that makes the water return to its natural place, but this efficient cause itself never – neither in the winter, nor in the summer – acts for the sake of this outcome.” My response is to deny that natures are always efficient causes (see Scharle 2008: 171–173) and to maintain that the stated conclusion of *Physics* II.8 is that nature is for the sake of an end (198b17–18, 198b10–11, 199a7, 199b32–33), not that nature is an *efficient* cause for the sake of an end.

imitates the circular motion of the heavenly bodies by moving rectilinearly on the heels of air's upward movement in the summer (thereby forming the generative cycle of water and air), while animals and plants do so by generating another of their kind (*GC* 11.10, 336b27–337a8).<sup>23</sup> Aristotle argues, “coming-to-be and passing-away will, as we have said, always be continuous (συνεχής)” (*GC* 11.10, 336b25), for God “fulfilled the perfection of the universe by making coming-to-be uninterrupted; for the greatest possible coherence would thus be secured to existence, because that coming-to-be should itself come-to-be perpetually is the closest approximation to eternal being” (*GC* 11.10, 336b32–337a1). We have now arrived at a precise articulation of the type of regularity exhibited on the natural model of teleology: that coming-to-be itself comes-to-be regularly. This regularity is initiated by the sun – the sun's circular motion ensures not only that sublunary elemental transformation and locomotion will come to be in an imitative pattern, but also that animals generate another individual of their own kind in an imitative pattern: “since the upper movement is cyclical, the sun moves in this determinate manner; and since the sun moves thus, the seasons (ᾠροί) in consequence come-to-be in a cycle, i.e. return upon themselves; and since they come-to-be cyclically, so in their turn do the things whose coming-to-be the seasons initiate [e.g. plants and animals]” (*GC* 11.11, 338b3–5; see also *Cael.* 11.3, 286a13–286b2).<sup>24</sup> And it is important for my interpretation that Aristotle has this relationship between the sun and generable things clearly in mind in *Physics* 11 itself when he says, “man is begotten by man and by the sun as well” (*Phys.* 11.2, 194b13).

So far I have argued that the same type of regularity is exhibited in both elemental and animal generation. I now want to show that this regularity comes in degrees according to an entity's rank on the *scala naturae*. *Generation of Animals* 11.1 lays out the ranking as follows: Beginning at the top of the *scala naturae*, Aristotle places the heavenly bodies (both living and eternal), then living things (living but not eternal), and finally the sublunary elements (neither living nor eternal) (731b24–732a1). This passage understands rank according to goodness, while the texts I consider next suggest that ranking is alternatively calibrated according to the *degree of regularity* exhibited in the entity's imitative activity. These two descriptions of ranking ultimately come to the same thing: Since the prime mover

<sup>23</sup> In fact, *On the Soul* 11.4 maintains that, for living things, generating another of their own kind is “the most natural” (φυσικώτατον; 415a26) act to which all other natural activities are subordinate (415b1–2).

<sup>24</sup> On my view, the seasons initiate coming-to-be in the sense that animals make use of the seasons for the sake of growth. See Scharle 2008: 161–165.

is the best thing in the cosmos, the more closely something approximates its activity, the better it is; and the more closely it approximates the prime mover, the more regular and uninterrupted its activity.

The introduction to the *Meteorology* confirms that the sublunary elements exhibit a “regularity less (ἄτακτοτέρων) than” the heavenly bodies moving in a circle (*Meteor.* I.1, 338a20–b4). This contrast in degree of regularity is also at work in *Metaphysics* XII.10’s household analogy: Taken together with the introduction to the *Meteorology*, the analogy suggests that the heavenly bodies are to the sublunary elements as the freemen are to the slaves and beasts. Thus, we should expect that the heavenly bodies “have least license to act as they chance to, but all or most of what they do is arranged (τέτακται),” while the sublunary elements “can do a little towards what is communal, but act mostly as they chance to” (1075a19–22).<sup>25</sup> 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.

*On the Soul* confirms that this regularity varies in degree even within the stratum of living things: “since then no living thing is able to partake in what is eternal and divine by uninterrupted continuance (for nothing perishable can forever remain one and the same), it tries to achieve that end in the only way possible to it, and success is possible by the more and the less (τὸ μὲν μᾶλλον τὸ δ’ ἥττον)” (II.4, 415b4–6). Thus, Aristotle seems to think that the heavenly bodies exhibit the highest degree of the type of regularity at issue, followed by animals and plants, which exhibit a lower degree of regularity (and greater and lesser degrees within this stratum), and, at the lowest level, sublunary elements exhibit the lowest degree of regularity.

*Physics* II offers two anti-materialist arguments that clearly capitalize on the degrees of regularity Aristotle articulates. First, *Physics* II.4 (196a25–b4) argues against Democritus’ view that animals and plants come to be by mind or nature and not by chance, but that the heavenly spheres did come to be by chance. Aristotle argues that the movements of the heavenly spheres are much more regular than the generation of plants and animals, so if Democritus agrees that the regularity with which plants and animals come to be cannot be due to mere chance, *a fortiori* it is so in the case of the heavenly spheres.<sup>26</sup> Democritus cannot consistently maintain that the

<sup>25</sup> Trans. Sedley 2000: 328. <sup>26</sup> See also *PA* I.1, 641b10–23.

generation of animals is not due to chance while arguing that the movements of the heavenly spheres are.

*Physics* 11.8 itself offers an analogous argument, which I will call the “olive-headed-vines argument,” found just thirty lines down from the winter-rain argument and levied against the same Empedoclean opponent:

Again, in plants too we find that for the sake of which, though the degree of organization (διήρθρωται) is less. Were there then in plants also olive-headed vine-progeny, like the “man-headed ox-progeny,” or not? An absurd suggestion; yet there must have been, if there were such things among animals. (199b10–13)

Once again, Aristotle takes as a premise a claim about the degrees of regularity exhibited in the generation of things at different levels of the *scala naturae*: The generation of animals is more regular than the generation of plants, so that if the generation of animals is due to chance, as Empedocles suggests, *a fortiori* the generation of plants is, in which case plant generation should exhibit the botanical analogue of man-faced ox-progeny (e.g. olive-headed vines).<sup>27</sup> But Empedocles never mentions anything like olive-headed vines, which shows his inconsistent application of the notion of chance.

#### IV Reconsidering the winter-rain argument

I now submit that *Physics* 11.8’s argument for Premise (2) is yet another instance of the *a fortiori* argument pattern exhibited in both *Physics* 11.4’s argument against Democritus and the 11.8 olive-headed-vines argument against the Empedoclean opponent. In fact, Aristotle suggests this in the introductory passage directly preceding the statement of the problem: Here Aristotle complains that his predecessors posit the existence of causes like love or *nous* that could operate teleologically, but fail to use them in the proper explanatory contexts. As we have seen in the *a fortiori* arguments, they “touch on it” to explain some phenomena, but fail to use it to explain the phenomena that require it even more (καὶ γὰρ ἔαν ἄλλην αἰτίαν εἴπωσιν, ὅσον ἀψάμενοι χάρειν ἔωσιν; *Phys.* 11.8, 198b13–16). The origins of this complaint can be found in Plato’s *Phaedo* (97b–99d), where Socrates expresses disappointment in Anaxagoras’ positing *nous*, but failing to make use of it as a teleological cause of phenomena that require one.

Recall the sub-argument at issue in the first argument of 11.8:

<sup>27</sup> Simplicius’ commentary on *Physics* 11 agrees with Alexander that this is another *a fortiori* argument.

- A. (Accepted Premise): “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 heatwaves in the dog-days, but in winter.” (*There is a regularity in winter rain, and in summer heat waves, which cannot be due to coincidence.*)
- B. (Disputed Premise): “These things [e.g. animals] and all things that are by nature, come to be in this way either always or for the most part.” (*Animals and things that are “by nature” come to be with the same type of regularity as winter rain and summer heatwaves.*)
- C. (Disputed Premise): “Nothing from luck or chance does [i.e. nothing from luck or chance comes to be in this way either always or for the most part].” (*Nothing that comes to be by chance comes to be with the same type of regularity as winter rain and summer heatwaves.*)
2. (Conclusion): “These things [e.g. animals] are not able to [come to] be from coincidence or from chance.” (*Therefore, animals and things that happen “by nature” cannot be from chance.*) (A, B, C)

While the *Physics* 11.4 argument against Democritus relied on the claim that the heavens display a greater degree of regularity than animal- and plant-generation, and the 11.8 olive-headed-vines argument relied on the claim that there is a greater degree of regularity exhibited in animal generation than in plant generation, here in the 11.8 winter-rain argument Aristotle suggests that animal generations exhibit the same type of regularity as elemental generations in the form of winter rain. And just as the *Physics* 11.4 argument showed Democritus mistakenly to attribute to chance the heavenly motions, even though they are more regular than the generations he does not attribute to chance, and just as the olive-headed-vines argument shows the Empedoclean opponent mistakenly to attribute to chance animal generations, even though they are more regular than the plant generations, he does not attribute to chance (at least in so far as he does not posit the existence of anything like olive-headed vines), so too this winter-rain argument shows the Empedoclean opponent mistakenly attributes animal generations to chance even though they exhibit the same type of regularity whose degree is the same as (if not more than) the elemental generations exhibited in winter rain, which the opponent does not attribute to chance. Not only does my interpretation make better sense of the dialectic between Aristotle and his Empedoclean opponent, it reveals that Aristotle thought two of his formidable materialist opponents – Democritus and Empedocles – fell prey to the same kind of error, simply from different ends of the *scala naturae*.



So understood, Premise (A) supports (C) directly by showing that the type of regularity exhibited in winter rain – a kind of continuity of generation – is the kind of regularity that cannot be chalked up to chance. And if the regularity in (B) is this same type of regularity that (C) claims cannot be due to chance, then neither can the regularity by which animals are generated be chalked up to chance. By accepting (A), then (C), then (B), the Empedoclean opponent reaches conclusion (2).

But why would the Empedoclean opponent admit that there is any continuity at all in animal generation such that it displays the same type of regularity as winter rain? Even though Aristotle thinks the species are eternal, and thereby disagrees with the Empedoclean opponent's version of "natural selection," they both share the view that animal generation is itself continuous: Even the Empedoclean opponent thinks that *the animals that generate* do so continuously, for he claims that the ones whose parts were unsuitably arranged die and continue to die (*Phys.* 11.8, 198b29–33). As Aristotle highlights in the next set of arguments, Empedocles thought that animals are generated from seeds: Aristotle even quotes Empedocles' poem that "what was 'undifferentiated first' was seed (σπέρμα)" (*Phys.* 11.8, 199b8–9). As they do for Aristotle, Empedocles' seeds serve as the link between one generation and the next, and can thereby suggest that he is committed to a kind of continuity of generation, even if it is not eternal. Aristotle wants to point out that in so far as the Empedoclean opponent thinks this, there is, after all, a regularity found in animal generation that cannot be simply coincidental, for this regularity is *the same type of regularity* – a kind of continuity in generation – that the Empedoclean opponent agreed could not be due to mere coincidence in the case of winter rain. Water's falling in winter (when the sun recedes) ensures (for the most part) its subsequent evaporation (when the sun returns); in so doing, winter rain metaphorically "sows the seeds" of the next winter's rainfall. For although it may rain in the summer, this kind of rain does not form a generative cycle with air that will lead to another iteration of rain the following winter. Likewise, although men may give birth to ox-faced progeny, those are not the ones that will, in turn, generate. And even if there are plenty of episodes of coincidental rain that randomly come to be here and there out of season, and even if there are plenty of random ox-faced monstrosities that come to be, nonetheless *the rain that forms part of the generative cycle with air* will (for the most part) come to be again, and *the animals that give birth to animals that survive and generate* will (for the most part) generate again. This is the distinctive regularity found on the natural model.

At this point one might worry that my interpretation pushes Aristotle's question-begging back just one step, in a way that is similar to Code's interpretation. It is worth returning to Code's interpretation in order to distinguish mine. As I note above, Code's interpretation requires that "the opponent must admit that it is always or for the most part the case that if in *human* development a front tooth is formed, then it is suitable for biting," and more generally, "for any given natural kind K, tooth formation of a K" regularly results in functional teeth.<sup>28</sup> I argued that this assumption would violate Premise (4), understood as neutral between Aristotle's own position in which there are robust kinds above the level of the elements, and the Empedoclean opponent's view in which there are not. By contrast, my interpretation of the argument does not violate Premise (4), interpreted neutrally. I argue that Aristotle first sets out the example of winter rain as the natural model of teleology to which the Empedoclean opponent's own version of animal generation conforms. The opponent admits that the *animals that generate* do so continuously and thus must be explained teleologically, just as winter rain must be. Once Aristotle has identified this set of animals – the ones that generate according to the natural model exemplified in winter rain – he can then say that *in those things* tooth formation regularly leads to functional teeth, while remaining neutral as to whether it is the elemental natures or the natures of the animals that are responsible for the continuity. That is to say, Aristotle thinks he must first establish the need for teleological explanation at the level of the generation of whole animals – for this is the level that exhibits the distinctively natural pattern of teleology – and then consider the teleology of the formation of their parts as part of the generative pattern.

In my reading, all the Empedoclean opponent needs to accept is that winter rain exhibits a regularity that cannot be due to coincidence, and that animal generation exhibits the same type of regularity. Thus, animal generation, like winter rain, requires a teleological explanation, and given that these phenomena are by nature (as opposed to by thought), nature will be the teleological cause. To accept this, the Empedoclean opponent need not accept (i) Aristotle's particular teleological explanation for the regularity, although *Metaphysics* XII.10 later makes an argument to this end, nor must the opponent accept (ii) Aristotle's appeal to natures above the level of the elements. If the Empedoclean opponent thinks he can show that elemental natures are robust enough to explain the continuity of animal generation, so be it (as far as this argument is concerned).<sup>29</sup>

<sup>28</sup> Code 1997: 131.      <sup>29</sup> Pace Judson 2005: 349.

That said, Aristotle may think that he also has given the Empedoclean opponent reason to doubt his ability to explain the continuity of animal generation by appeal solely to the four elemental natures. Although Aristotle does not spell this out in the winter-rain argument, if he can convince the Empedoclean opponent that winter rain displays not only the same type of regularity, but that winter rain is *less regular* than animal generation (as Aristotle himself thinks), then he would have given the Empedoclean opponent reason to doubt that elemental natures could explain the continuity of animal generation. In other words, if elemental processes (exhibited in winter rain) are less regular than biological generative processes, the former could not explain the latter. But, again, Aristotle need not argue this in order to reach his conclusion.

### V Reconsidering *Physics* II.8's place in *Physics* II

With my interpretation that winter rain is teleological in its own right, I am in the unusual position of claiming that Aristotle extends natural teleology even to the level of the elements. This novel approach allows me to construct an argument I believe to be more interpretatively satisfying and more dialectically satisfying than other existing readings. In addition to this, my interpretation suggests a unity for the set of arguments in *Physics* II.8 and for the whole of *Physics* II. Let me conclude with a brief sketch of this unified picture.

Aristotle's conception of nature in *Physics* II is presented as opposed to both a Platonic tradition, in which nature *is* art, and a pre-Socratic one, in which nature is not properly distinguished from chance. Rejecting the pre-Socratic tradition, both Plato and Aristotle insist that the world's order and structure are explained teleologically and are not due to chance; however, Aristotle disagrees with Plato, who holds that nature would have to be art in order to explain such order. Overall, *Physics* II insists that art and nature are analogous in being the source ( $\alpha\rho\chi\eta$ ) of order, yet distinct in that nature is an internal source of this order, while art is an external one (*Phys.* II.1, 192b9–34). In arguing against his pre-Socratic predecessors' conception of the natural world as operating by chance, however, Aristotle's nuanced conception of the relationship between art and nature is at once a help and a hindrance.

Consider Aristotle's response to the pre-Socratic predecessors' argument in *Physics* II.1 for the claim that nature is matter (193a13–25). Aristotle depicts the pre-Socratics as taking lessons about nature from artificial examples: Just as matter is the nature of the bed, so too, they think, is

matter the nature in the natural cases of bronze, bone, and wood. In modeling nature after art, the predecessors relegate much of nature to chance, for if *solely matter* (earth, air, fire, and water) is nature, then everything else is “its affections, states, and dispositions” (*Phys.* II.1, 193a24–25). But in response to this materialist challenge, Aristotle argues that form “is more ( $\mu\acute{\alpha}\lambda\lambda\omicron\nu$ ) nature” than matter (*Phys.* II.1, 193b6) by sharply distinguishing art from nature: “man is born from man but not bed from bed” (*Phys.* II.1, 193b9–10). This statement reiterates Aristotle’s introductory claim that nature is an *internal principle* of production ( $\pi\omicron\iota\iota\eta\sigma\epsilon\omega\varsigma$ ; *Phys.* II.1, 192b29).

This sharp distinction between nature and art gets blunted by *Physics* II.4–6’s insistence, against his pre-Socratic predecessors, on nature and thought’s allied priority over chance (*Phys.* II.6, 198a9–10). I have argued that it is this shared priority of nature and thought that led the Empedoclean opponent of *Physics* II.8, once again, to mistakenly model nature after the agency we find in art. Here we find the opponent erroneously attempts to model a “coincidental” development of animals (which Aristotle goes on to argue against) on the lack-of-agency coincidence between rain and corn growth. Through the winter-rain argument, Aristotle restores nature’s priority over chance by returning to *Physics* II.1’s sharp distinction between art and nature: “man is born from man, but not bed from bed.” The distinctive regularity by which natural things generate could not be found in the case of Zeus’s raining for the sake of growing crops, and the example of winter rain is meant to highlight the distinctive feature of natural generation in terms that are mutually acceptable to both Aristotle and his opponent. Aristotle is then in a position to move the opponent, through an *a fortiori* argument, to see that animals generate in this distinctively natural way as well.

This unified reading of *Physics* II makes sense of *Physics* II.8’s second argument to the conclusion that nature is prior to art (199a9–33) as an attempt to block, once and for all, the opponent’s tendency to take lessons about nature from artificial examples, and to be misled, thereby, into thinking that nature operates by chance. In so doing, Aristotle brings together the arguments of *Physics* II.1 (that form is more nature than matter) with the first argument of *Physics* II.8 (that nature is for the sake of something) to conclude that “form must be the cause in the sense of that for the sake of which ( $\eta\ \omicron\upsilon\ \epsilon\nu\epsilon\kappa\alpha$ )” (*Phys.* II.8, 199a33); in other words, that form is for the sake of form, or “man is born from man.”