Empedocles and the Other Physiologists in Aristotle's *Physics* II 8

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1. Empedocles's theory of generation as model for the mechanistic argument in Aristotle's *Phys.* II 8

At the beginning of *Phys.* II 8 Aristotle announces the subject of the last two chapters of the second book as follows:

> We must explain then first why nature belongs to the class of causes which act for the sake of something; and then about the necessary and its place in nature, for all writers ascribe things to this cause, arguing that since the hot and the cold and the like are of such and such a kind, therefore certain things necessarily are and come to be – and if they mention any other cause (one friendship and strife, another mind), it is only to touch on it, and then good-bye to it.[1]

[1] All translations of the *Physics*, unless otherwise noted, are by Hardie and Gaye in Barnes (1991).

In this passage, after distinguishing nature as final cause from necessity, Aristotle explains that all philosophers consider necessity a cause by taking as examples the hot and cold and other things of a similar sort. The example makes it quite clear that Aristotle is referring to the material causes of which physiologists speak. Soon afterwards he notes that, although some philosophers have "touched upon" (ἁψάμενοι) another cause – for Love and Strife on the one hand and the Intellect, on the other, are moving causes for Aristotle – they immediately discarded them. This means that the philosophers in question believed that the material cause was sufficient to explain the fact that natural beings come about of necessity. In this regard, for example, Simplius (*In Phys*. 369.21–22) argues that physiologists lead back beings to matter inasmuch as this coincides with necessity by stating precisely: ἀνάγουσι δὲ εἰς τὴν ὕλην ὡς ταύτην οὖσαν τὴν ἀνάγκην [...].

From this passage of Aristotle it is also clear that the philosopher is thinking of Empedocles – to whom he implicitly refers when speaking of hot and cold[2] and Love and Strife – and Anaxagoras, whose notion of Intellect he mentions. This passage seems to have its counterpart in *Metaph*. I 7, 988a25 *ff*., where Aristotle mentions philosophers who took matter as the primary cause and explicitly refers to Anaxagoras and Empedocles. The two philosophers are once again mentioned together,[3] in relation both to their material causes and to the fact that they also "touched upon" (ἥψαντο) the moving cause. According to Philoponus, *in Phys*. 312,10 *ff*., Aristotle stated that some philosophers just "touched upon" the moving cause without believing that Love and Strife or Intellect are responsible for the generation of particular beings, in order to make it clear that these philosophers only posited a material cause: Anaxagoras posited the homeomeries and Empedocles hot and cold. Philoponus further adds that Plato had already raised this objection against his predecessors, since in *Phd*. 97b *ff*. he shows that Anaxagoras did not actually resort to Intellect, but simply explained the phenomenon of becoming on the basis of homeomeries, *i.e.* of matter.[4]

To sum up, in the passage just quoted, and which introduces *Phys*. II 8, Aristotle makes the point that the two claims that naturalists have posited necessity as cause and that they have posited matter as cause are perfectly equivalent. Even the Neoplatonic commentators, in the passages mentioned above, illustrate this equivalence by referring to Aristotle's passage. Philoponus' commentary on *Phys*. II 4, 196a24–26 is possibly even more explicit about this equivalence between the material cause and necessity. In these lines Aristotle says that there are some philosophers, usually identified as the Atomists,[5] who argue that chance, τὸ αὐτόματον, is the cause of our universe, as well as of all possible worlds, on the grounds that the cosmos derives from an original whirling movement generated by chance. In *In Phys* 265.15 *ff*. Philoponus comments that it would be very

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[2] See also Aristot. *GC* II 3, 330 b 19 *ff*.

[3] On this coupling of Anaxagoras with Empedocles in Aristotle see Mansfeld (2011: 361–366).

[4] The same quotation from Plato's *Phaedo* is to be found in Simpl. *In phys*. 369.28 *ff*.

[5] See Simpl. *In phys*. 331.16.

stupid to consider chance as the cause of those things that are always in the same way, unless we wish to justify this senseless statement by saying that the ancient philosophers called the material cause chance – like when we find weeds among the plants we are cultivating and say that they were born by chance, even though we know that they were generated by a material cause. Philoponus' argument is very modern, because it identifies material necessity as the cause of chance becoming, and it is perfectly consistent with Aristotle's theory – as should soon be clear.

In addition, to return to *Phys*. II 8, 198b10–17, the philosophers to whom Aristotle implicitly refers are, as we have seen, Empedocles and Anaxagoras. But whereas the reference to Empedocles here is only implicit, Aristotle explicitly mentions the philosopher a few lines later: at line 198b32, at the end of the argument in support of natural mechanism by which Aristotle begins his exposition in favour of natural teleology. Here is the entire passage:

> A difficulty presents itself: why should not nature work, not for the sake of something, nor because it is better so, but just as the sky rains, not in order to make the corn grow, but of necessity? (What is drawn up must cool, and what has been cooled must become water and descend, the result of this being that the corn grows.) Similarly if a man's crop is spoiled on the threshing-floor, the rain did not fall for the sake of this – in order that the crop might be spoiled – but that result just followed. Why then should it not 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 coincident result; and so with all other parts in which we suppose that 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 spontaneously in a fitting way; whereas those which grew otherwise perished and continue to perish, as Empedocles says his 'man-faced oxprogeny' did.

In this passage Aristotle makes two similar arguments, which differ only by the fact that one regards the general physical order and the other the particular physical order. Both arguments – that of rain and that of the parts of the living being – rest on the idea of a necessary cause and a casual effect: the moisture of the earth necessarily rises when it warms up because of higher temperatures and then precipitates once it has risen and cooled down; on the other hand, whether wheat grows or rots is a matter of chance. In the same way, it is out of necessity that front teeth are pointed and back teeth flat, but it is only by chance that the former are suitable for tearing and the latter for chewing. In other words, we tend to attribute a purpose to chance processes that have necessity as their cause, believing for instance that the rain is falling to make the wheat grow or rot and that front teeth are sharp in order to tear and back teeth flat in order to chew. Speaking as a mechanistic philosopher would, Aristotle suggests that all this actually occurs by chance through necessity and that what was designed for survival survived, while

what was improperly formed was destroyed, as in the case of the human-faced cattle mentioned by Empedocles.[6]

First of all, as has just been noted, Aristotle is proposing arguments as a mechanistic philosopher would. Having proven the equivalence between materialism and mechanism, Aristotle was free to take as an example the mechanistic arguments of any materialist philosopher. Of all the materialists, however, Empedocles was the one who had formulated the most complete mechanistic argument; therefore it is quite understandable that Aristotle would want to take Empedocles as the philosopher whose arguments must be refuted in order to build a theory that affirms natural teleology, although Empedocles only provides one paradigmatic case of a widespread theory endorsed by all materialists.

With regard to this explicit reference to Empedocles, Philoponus, *in Phys*. 314.26–315.6 clearly shows that the mechanistic theory just formulated by Aristotle is supported by all materialist philosophers, who take (λαμβάνουσι, 315.5) the examples of monsters given by Empedocles.[7] Empedocles, then, would simply be the materialist philosopher who most clearly sets out the theory according to which the cause of natural beings is necessity, which is why they are generated randomly in different ways. Even Simplicius, *in Phys*. 371.4 *ff*., speaks of philosophers who, not believing in finality, say that beings come into being out of natural or material necessity (ἐξ ἀνάγκης φυσικῆς ἢ ὑλικῆς λέγουσι τὰ γινόμενα). After quoting Empedocles as regards the parts of a living being, the commentator states that both the early philosophers – who argued that material necessity is the cause of things that come into being – and the later Epicureans are of the same opinion (ταύτης δοκοῦσι τῆς δόξης τῶν μὲν ἀρχαίων φυσικῶν ὅσοι τὴν ὑλικὴν ἀνάγκην αἰτίαν εἶναι τῶν γινο μένων φασί, τῶν δὲ ὑστέρων οἱ Ἐπικούρειοι – 372.9–11).

Now, the interesting thing for the sake of our discussion is that the two mechanistic arguments formulated by Aristotle correspond precisely to Empedocles' doctrine, to which Aristotle had already referred when discussing chance in *Phys*. II 4. Here the Stagirite criticizes those philosophers who invoked fortune as a cause yet never discussed its existence nor what it is. After specifying that they did not identify fortune or chance with any of the causes which they put forward to explain the universe, Aristotle mentions Empedocles, who drew upon chance both in his cosmogony and in relation to specific things such as the parts of animals (196a20–24). In other words, already in *Phys*. II 4 Empedocles is, according to Aristotle, the philosopher who has spoken out in favour of mechanism both in the general physical field and in the particular physical one. In *Phys*. II 4, 196a22–23, Aristotle quotes fragment DK 31 B 53.9–10 of Empedocles with reference to the casual distribution of the elements in the cosmos. The same fragment, however, is also present in *GC* II 6, 334a3, within an argument very similar to that of the *Physics*. Other Empedocles' fragments, then, may be cited in support of the theory that the parts of the living being are generated randomly by necessity, for example, DK 31 B 72 or 35 or

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[6] DK 31 B 61.

[7] See also οἱ λέγοντες in Philop. *In Phys*. 314.28.

60. Philoponus, who well understood the fact that Empedocles allows Aristotle to fight mechanism both in the general physical field and in the particular physical one, in the *theôria* which he devotes to *Phys*. II 4 also cites fragment DK 31 B 53.9–10. He explains that Empedocles believed that the roots of all things, originally confused in the Sphere, once separated by Strife, are randomly assigned to different places in the universe: so while water is above the ground now, in another cyclical phase of cosmic generation it could take a different place, according to a different order.[8] A little further on, to explain the casual generation of the parts of the living being, Philoponus instead anticipates the example of the teeth which is the second argument in favour of mechanism formulated by Aristotle in *Phys*. II 8 (cf. Philop. *In Phys*. 261.17–28).[9]

This evidence makes it clear that in *Phys*. II 8, 198b10–17 Aristotle takes Empedocles as a paradigm of a theoretical position common to all philosophers who preceded him. It remains to be shown how Aristotle builds his arguments in favour of finality in order to refute Empedocles, in the belief that once he has refuted Empedocles' arguments in favour of mechanism, he will have refuted mechanism as a whole. To do this, I will set out again from *Phys*. II 8, 198b10–17.

2. Aristotle and the refutation of Empedocles' arguments in favour of mechanism

The first thing to be explained is why, when formulating the argument against finality in *Phys*. II 8, 198b10–17, Aristotle presents the case of rain, which has necessity as a cause and the growing or rotting of wheat as effects. Aristotle believed in natural finality, so this argument, when accepted as evidence in favour of finality, should indicate that according to the philosopher rain falls in order to make grain grow or rot! Or rather, given that it would be absurd to identify the growing or rotting of grain as the purpose of rain, the problem is to determine, in more general terms, whether Aristotle believed that a meteorological phenomenon such as rain occurs for a specific natural purpose – something he rules out in *Meteorologica* – or whether he is simply formulating an argument in the manner of materialistic physiologists.[10] Aristotle's interpreters were well aware of this problem: I will simply refer here to a 1986 paper by D. Furley and to a 1993 paper by R. Wardy.[11] What was said before with regard to the passage from *Phys*. II 8, 198b10–17 allows us to effectively answer this question: if Aristotle is adopting the position of mate-

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[8] See also DK 21 A 35.

[9] I have discussed this passage of Philoponus in Giardina (2015: 154-156).

[10] For this uncertainty in the interpretation of the aristotelian example of rain see Pellegrin (2000: p. 149 n. 3).

[11] Furley (1986: 177–182), reprinted in Furley (1989: 115–120); on Aristot. *Mete*. III 4, see Sayili (1939: 65–83). See also Wardy (1993: 18–30).

rialistic philosophers, as illustrated by Empedocles, the formulation of two arguments in favour of mechanism precisely on the basis of Empedocles' own theory is perfectly consistent with his approach. In other words, Aristotle constructs the argument of rain on the basis of Empedocles' cosmogonic argument, according to which the elements are randomly distributed in the cosmos in different cosmic cycles. The case of rain concerns a cosmic and seasonal element, water, whose distribution in the cosmos occurs by chance according to the mechanistic philosophers, just as Aristotle shows in his example. This does not mean that Aristotle believed that rain falls in order to make grain grow or rot, nor that he is here simply formulating an argument typical of materialist philosophers. I believe that neither of these two options taken in a strict sense offers a solution to the problem raised. I believe that Aristotle is correctly presenting Empedocles' argument, also adopted by the other materialists, with a specific purpose, which is to show that the parts of nature, *i.e*. the elements, are all ordered in a finalistic way, even though this does not authorize us to apply to specific phenomena, such as the fact that it is now raining, purposes other than their proper ends, such as the growing or rotting of grain. The Aristotelian example seems to ridicule the theoretical position of the materialists, because Aristotle sets out from their assumption that the elements are randomly distributed in different ways in cosmic cycles (see Empedocles, DK 31 B 53), to say that rain falls in order to make grain grow or rot. Given this conscious juxtaposition between the distribution of cosmic elements, which is part of a finalistic order, and the idea that the growth or destruction of grain is a purpose – which, if true, would make a mockery of the same purposeful order – it is not incorrect to assert that, although Aristotle did not believe that the specific weather phenomenon exists in view of an end, the distribution of cosmic elements is part of a finalistic natural order. For Aristotle the elements of the universe and their seasonal cycles are governed by a cosmic order and general law. And this is precisely the meaning of the first argument in favour of finality,[12] whereas in *Phys*. II 198b36 8 *ff*. Aristotle notes that it is often rainy in winter and warm in summer and not *vice versa*; on the other hand we find the same argument also in *Cael*. II 3, 286b3–4 and in *GC* II 10. We can therefore say that for Aristotle rain falls within the purposeful order of the universe, but in a very general sense: water is distributed in the various parts of the cosmos, ensuring its survival and that of all living beings. However we can assert at the same time that as an individual weather phenomenon rain has no specific purpose for Aristotle, especially if this purpose is identified with the growing or rotting of grain. It is possible

[12] I believe that in *Phys*. II 8 Aristotle proposes four arguments in favour of natural finality, as Philoponus too believes in the first *theôria* that he devotes to this chapter. Other interpreters disagree with this view, as well as with one another: Carteron (1926) distinguishes five arguments against mechanism in 198b34–199a32 and three arguments founded on mechanicism in 199a 33–b33; Charlton (1970) maintains that after setting out the opinion contrary to his, Aristotle proposes two or three arguments; Pellegrin (2000), thinks that Aristotle opposes eight arguments and two objections to the argument in favour of mechanism; Thomas Aquinas, *De physico auditu sive Physicorum Aristotelis*, *Lib*. II, *Lectio* XIII 497, thinks that Aristotle formulates five arguments in which he expresses his own views and then adds to these three other arguments presenting the perspective of mechanist philosophers.

therefore that Aristotle formulated the example of rain in this way not in order to ridicule his predecessors, but to avoid the risk that it be taken literally. Aristotle does not believe that chance is the cause of the distribution of cosmic elements and wishes to avoid the risk that someone may interpret the finality he opposes to chance to mean that rain falls with the purpose of making grain grow or rot. On the other hand, with regard to weather phenomena Plato himself, *Tht*. 153d1–3, had taught that, as long as the rotation of the stars and sun continues, all things will continue to exist and will be preserved. Interpreting Aristotle's text in the same terms, Philoponus, *in Phys*. 312.30 *ff*., states that the circular motion of the elements in the cosmos, that is their seasonal cycles, endures thanks to the circular and eternal movement of heaven and has cosmic well-being as its purpose.

The connection between the Aristotelian argument of the parts of a living being (especially the argument of the teeth) and Empedocles' zoogony (explicitly cited by Aristotle with the example of the human-faced oxen) is immediately evident. Empedocle's view will be refuted by Aristotle through his fourth argument on the natural finality, the one that, from line 199a30, deals with the errors of nature.[13] Here Aristotle refutes Empedocles's view through his own arguments, by stating that monsters are not generated by chance, but because of corrupt seed. Why do I say that to state, as Aristotle does, that corrupt seed is the cause of monsters is to refute Empedocles – and with him the other materialists – through his own arguments? The obvious reason is that the corrupt seed is nothing but matter, which is precisely the principle that all materialists take as a necessary cause of the random becoming of natural beings. Once again, Empedocles expressed himself more clearly than other materialists, because he spoke of an "initial natural indistinctness" (DK 31 B 62) that, as Aristotle rightly stresses, is nothing but the seed. Aristotle goes further by pointing to finality in plants, something which Empedocles did not consider; however, this is an argument similar to the one related to the animals, a simple extension to plants of the argument that demonstrates the finality in animals against Empedocles.[14]

A brief reference remains to be made to the other two arguments used by Aristotle. The second argument is formulated in 199a8–9, where Aristotle says that «in things in which there is a purpose, in view of this what comes before and what comes after are done». The use of the verb πράττω is instrumental to Aristotle, because it allows him to argue on the basis of the τέχνη-φύσις analogy, which is an important methodological tool for the development of the entire book II of the *Physics*.[15] What concerns us, however, is the fact that, according to this argument, in generation there are antecedents

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[13] See Yartz (1997: 67–72). Philoponus in his Commentary on *Physics* largely discusses this Aristotelian problem of the errors of nature, see Wilberding (2014: 1021–1042), but also Giardina (2015: 158 *ff*.).

[14] This argument provided an opportunity for commentators to develop a series of critical arguments against Empedocles and other materialists, who were accused of inconsistency. See Philop. *In phys*. 319.17 *ff*. A discussion of this passages may be found in Giardina (2014: 216 *ff*.).

[15] On the τέχνη-φύσις analogy in Aristotle, see Timpanaro Cardini (1950: 279–305); Theiler (19652); Bartels (1965: 275–287); Owens (1968: 159–173); Cardullo (2005: 51–109).

and consequences.[16] Whereas in Empedocles we find no arguments regarding τέχνη, it is important to note that in several sections of his works Aristotle argues about what the antecedents and consequences might be in Empedocles' cosmological theory and zoogonic one. In relation to Empedoclean cosmogony, Aristotle wonders whether Empedocles established the one or the many first, *i.e.* whether the roots derive from the Sphere or the latter results from the roots. What is also unclear is the role of Love and Strife: the former should have an aggregating role and the latter a disintegrating role, but it is in fact Strife which operates to separate the original mixture constituting the unity of the Sphere and which is therefore responsible for the subsequent aggregation of the various elements: in other words, the principle that leads to the identification and determination of the Empedoclean roots would be Strife.[17] In *Cael*. III 2, 301a14 *ff*. Aristotle explicitly raises the issue of antecedents and consequences in Empedocles' cosmogony: after he has established that it is not reasonable to assume that the generation of the universe starts from separate and moved things (because before the existence of a well-ordered world one can only posit a chaotic movement – as the Atomists did – which does not account for the specific distinction of things) and after he has expressed his approval of Anaxagoras' choice to begin his cosmogony from immovable things, Aristotle emphasizes that Empedocles ruled out generation under the rule of Love, because he could not build the sky from separate components aggregated by Love. On the contrary, according to Aristotle, the cosmos is made up of separate components and this entails that it was generated out of a single whole.

Even in the case of living beings Empedocles distinguished between antecedents and consequences, as we read in DK 31 B 62, taken from Simplicius, *in Phys*. 381.29 *ff*. The commentator rightly points out that according to Aristotle the seed is generated first and the living being only later. Now, it is worth bearing in mind that fragment DK 31 A 48 was transmitted by Plato, who in the *Laws* (10, 889b) states that according to the materialist philosophers – Empedocles once again serving as a paradigm – fire, water, earth and air exist by nature and by chance and not by art. In other words, Plato had already drawn a distinction between that existence of which τέχνη is the cause, and which is therefore well-ordered, and that existence which has nature understood as chance as its cause, namely disorderly existence. Plato had shown implicitly that Empedocles attributes to this casual mixture of elements the existence of the sky, of the celestial bodies and also of animals and plants. One could assume that, once he had formulated the argument of antecedents and consequences according to a perspective that was very clear to him in relation to Empedocles, Aristotle was induced to discuss it under the influence of Plato's text. Certainly, this is only a supposition, but it is a plausible one.

Finally, the priority of nature over art inspired the last argument, related to animals that act neither by art nor by decision, such as spiders, ants and swallows, whose

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[16] See Giannantoni (1998: 361–411).

[17] See Aristot. *Phys*. I 4, 187a20 *ff*.; *Metaph*. A 4, 985a21 *ff*.

behaviours Aristotle is familiar with and describes in various sections of the *Historia Animalium*. But it is now time to briefly summarise the results of this analysis.

3. Conclusion

In conclusion, I hope to have effectively shown that in order to prove natural finality against mechanism, Aristotle, in *Phys*. II 8, borrows the arguments of the philosopher who was the clearest thinker among all those who believed that both the cosmos and the parts of living beings were generated by chance, having material necessity as their cause, *i.e.* Empedocles. Aristotle develops his arguments in favour of natural teleology largely as a response to Empedocles' arguments, because he is probably – and rightly, I might add – convinced that to disprove Empedocles' cosmological and zoogonic arguments in support of mechanism is to disprove mechanism as a whole. Hence, Aristotle deals at some length with the problem of teratology, explicitly treated by Empedocles, who admitted that originally living beings of all kinds were formed, such as the human-faced oxen. He also formulates the curious argument of rain, which is absurd in its literal meaning, but makes sense if it is regarded as Aristotle's attempt to formulate – perhaps not without a hint of ridicule – Empedocles and other materialists' argument, according to which the elements are distributed randomly in the cosmos. So, the argument of rain is instrumental to Aristotle's first argument in favour of finality, according to which the elements have a regular and orderly place in the cosmos. If my reading is correct, Empedocles embodies the philosophical paradigm which Aristotle takes as his theoretical opposite when discussing natural teleology as well as chance in book II of the *Physics*.

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Empedocles and the Other Physiologists in Aristotle's *Physics* II 8

In this paper I propose to show: 1) that in *Phys.* II 8 Aristotle takes Empedocles as a paradigm for a theoretical position common to all philosophers who preceded him: the view that materialism implies a mechanistic explanation of natural becoming; and 2) that, since Empedocles is regarded as a philosopher who clearly expresses the position of all mechanistic materialists, Aristotle builds his teleological arguments precisely to refute him. Indeed, Aristotle believes that refuting the arguments of Empedocles – the champion of mechanism – means refut-

ing the mechanistic theory itself. In order to illustrate this point, I will discuss some passages from *Phys*. II 8, while also turning to consider the Neoplatonic commentators on Aristotle's *Physics*. I will then endeavour to explain why in 198b19 *ff*. Aristotle formulates the argument of rain, which has attracted so much attention from scholars of the *Physics*: I will consider whether Aristotle believes that rain serves a purpose, contrary to what he claims with regard to meteorological phenomena in Meteorologica.

KEYWORDS Presocratics, mechanism, physics, teleology, rainfall, Aristotle