The *paschein* and *pathê* of the Earth and Living Beings in Aristotle and Alexander of Aphrodisias (*Meteorologica* 1.14)

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CHIARA MILITELLO / *Università degli Studi di Catania* /

In his 2013 monograph on *Structure and Method in Aristotle's Meteorologica*, Malcolm Wilson showed that Aristotle conceived of meteorological phenomena as analogous to the bodily processes of animals.[1] Wilson also showed that for the Stagirite, the sublunar world should not be seen as a single body, being rather composed of many different indi-

[1] Wilson (2013: 281).

viduals.[2] However, Wilson did not articulate the relationship between these two theories—that is, he did not answer the following question: how is it possible for the Earth to behave like an animal if it is not a single body? In this paper, I argue that the answer to this question lies in the different ways in which the Earth and animals undergo *pathê*; this can be deduced from what Aristotle says, and is stated more explicitly by Alexander of Aphrodisia.

In fact, in chapter 1.14 of *Meteorology*,[3] devoted to climatic changes,[4] Aristotle, after comparing such changes to the maturation and ageing of living organisms, states that:

> Just, it does not happen to those [i.e., the bodies of animals and plants] to suffer these things [i.e., maturation and old age] in each part separately, but it is necessary for the being to mature and decay all at once, whereas in the case of the earth this happens in each part separately, due to cooling and warming.[5]

It is good to analyse what the similarities and differences are between the transformations of the Earth and those of living beings, paying particular attention to the vocabulary used by Aristotle. To understand exactly how climate change is similar to the life cycle of a living being, it is first necessary to understand what types of change Aristotle is referring to. We can start with the sentence that opens the chapter, because in it Aristotle emphasises the existence of two different types of change in the environment in the long term: on the one hand, the same region is wet in one era, but dry in another; on the other hand, what is now land was once sea, and vice versa.[6]

Both of these changes are linked to the emergence and drying up of rivers. In fact, Aristotle states shortly afterwards that the presence or absence of the sea from a certain region is caused by the rivers. The details of this causal link are actually not very clear in the Aristotelian text.[7] However, following the interpretation of Webster, Lee and Wilson, one can assume that Aristotle conceives of the relationship between river and sea in the following way. When a new river is created, it deposits sediment at its mouth, which, accumulating, creates new land;[8] the sea, being moved away from that place, must necessarily inundate another. When, after a long period, the river dries up, the sea returns to

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[2] Wilson (2013: 281).

[3] The literature on Aristotle's *Meteorology* is not extensive. Apart from the commented translations (Webster 1923; Tricot 1941; Lee 1952; Strohm 1970; Louis 1982; Pepe 1982; Groisard 2008; Thillet 2008), the mentioned monography written by Wilson is the main study on the work. One can also cite Freeland (1999).

[4] This chapter belongs with the previos ones and the next three (i.e., the first three chapters of the second book). Together, these chapters form a section on the rivers and the sea, with the account of winds introduced just before this section and continued after it. This section is considered by Strohm as an insertion (Strohm 1970: 155–156). Wilson introduces it as a part of a more general discussion of emanations, which also include winds (Wilson 2009: 67, n. 9).

[5] Arist. *Mete.* 1.14, 351a28–31.

[6] Arist. *Mete.* 1.14, 351a19–25.

[7] Arist. *Mete.* 1.14, 351b3–8.

[8] To historically contextualize Aristotle's account of siltation, see Irby (2016: 187–189; 2021: 66–68).

cover the region it originally occupied, leaving behind that which it had occupied in the meantime.[9] The birth of a river thus causes both the transformation from sea to land of one area and the reverse process in another; and the same is true of the drying up of a river. The difference is that the birth of the river transforms the mouth into dry land and another coast into the sea, while, on the contrary, the drying up of the river causes the sea to return to the former mouth and the dry land to the other coast.

The relationship between the moisture content of a piece of land and the presence or absence of a river might also seem similar; that is, one might get the impression that the state of the river is the cause of the moisture content. Indeed, when presenting the phenomenon of moisture variations, Aristotle states that:

> The same places on Earth are neither always wet nor always dry, but change according to (κατά) the rising and falling of the rivers.[10]

The use of κατά might suggest that rivers are the cause and moisture is the effect, i.e. that the birth of a river makes the earth wetter and its disappearance makes it drier. In reality, however, Aristotle has a causality of the opposite direction in mind, as is evident from what he says a little further on: springs—and, consequently, rivers—disappear when the earth becomes drier.[11] Therefore, it is the moisture content of the earth that causes the existence or non-existence of rivers, and not vice versa.

Rivers thus constitute the link between the two types of environmental change mentioned by Aristotle at the beginning of chapter 1.14: as Wilson points out, rivers are the effect of changes in humidity and the cause of the retreat and advance of the sea.[12] In other words, the climatic changes mentioned by Aristotle are changes in the moisture content, which cause rivers to appear or disappear, which in turn influence the coastal profile. Therefore, the cause of the changes in the landscape is the changing degree of dryness/humidity of the land.[13] Aristotle himself says that the 'cause and principle' (ἀρχή [...] καὶ αἴτιον) of environmental changes are the changes in the state of the inner parts of the earth.[14]

The evolution of the moisture content of the soil in a given region is not a random process, but follows a precise pattern. The soil, which is too wet at the beginning of the

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[9] Webster (1923: *ad locum*). Lee (1952: 108–109 n. a). Wilson (2013: 172). Solmsen seems to imply a different interpretation, as he portrays the action of the rivers as just reducing the volume of the sea, and he states that this action is counterbalanced by floods; that is to say, he does think that the birth of a river 'pushes' the sea in an area previously occupied by land, nor he refers to the effects of rivers drying up. In any case, Solmsen is right when he stresses that Aristotle wants to introduce, against the Presocratic idea of the sea progressively drying up, the image of a balanced sublunary world, where the proportions between the different parts never changes, as this is crucial to ensure that the world is eternal (Solmsen 1958: 273–275).

[10] Arist. *Mete.* 1.14, 351a19–21.

[11] Arist. *Mete.* 1.14, 351a36–351b3.

[12] Wilson (2013: 172).

[13] On dry and wet in Aristotle, see Dimas, Falcon, Kelsey (2022).

[14] Arist. *Mete.* 1.14, 351a26–28.

cycle, gradually loses the water with which it is impregnated, reaching an optimum moisture content; at this stage it flourishes. When, however, the drying process continues, and the proportion between wet and dry becomes unbalanced in favour of the latter, the soil dries out.[15]

This process is described by Aristotle using biological terms. Indeed, he states that the inner parts of the earth 'have maturation and old age' (ἀκμὴν ἔχει καὶ γῆρας).[16] The philosopher explicitly says that, in this respect, the internal parts of the earth are 'like the bodies of plants and animals' (ὥσπερ τὰ σώματα τῶν φυτῶν καὶ ζῴων):[17] indeed, the body of a living being 'matures and decays' (ἀκμάζειν καὶ φθίνειν), and the same happens to the earth.[18] Biological terms are used again to denote changes in the earth's moisture content later in the chapter. Aristotle states that the regions of the earth first 'are brought to life' (βιώσκονται),[19] then 'grow old' (γηράσκει).[20] Similarly, he says that a newly formed earth such as that produced by the deposits of the Nile, after a certain time, 'prospers' ('εὐθενεῖ', a verb normally used for living beings).[21] The earth has, therefore, a life cycle, just like plants and animals.[22]

There are, however, various differences between the development and decay of the earth on the one hand and the life of a plant or animal on the other. One of these differences is not presented as such by Aristotle, but it is no less obvious. In fact, the philoso-

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[15] That the two extremes of the cycle are characterised by two opposing excesses (too much moisture and too much dryness, respectively) while maturity coincides with the balance between the two extremes, is perhaps stated most clearly when Aristotle gives examples of environmental changes in different regions. The philosopher says that initially the lands created by the Nile were marshy, waterlogged. As time progresses, however, there is a gradual drying up. This is at first positive, because it turns the swamps into fertile land, but then becomes negative, because it makes the land increasingly arid (Arist. *Mete.* 1.14, 352a2–8). Actually, this is not really an example of the life cycle of the earth, because we are talking about the deposits from the river, and the existence (or, at any rate, the capacity) of the river depends on the moisture of the soil from which it flows. The real beginning of the cycle is therefore when the mountain becomes impregnated with water, not when the river deposits sediment creating a swamp. But the basic point holds true in any case: we go from excessive moisture to a fertile balance of wetness and dryness to excessive dryness. In fact, this same cycle (the similarity is explicit) can be found in the comparative history of Argos and Mycenae, which for Aristotle provide an excellent example of the environmental changes that also occur in larger regions (Arist. *Mete.* 1.14, 352a8–17).

[16] Arist. *Mete.* 1.14, 351a28. I have translated ἀκμή and ἀκμάζω as 'maturing' and 'ripening', rather than as 'maturity' and 'being ripe', because Aristotle contrasts ἀκμάζω with φθίω, which indicates the process of decay; ἀκμή, moreover, is contrasted with γῆρας, which is the age at which one grows old rather than the single moment of maximum old age. Scholars who have translated *Meteorology* also tend to interpret the two terms in this sense: 'the interior of the earth grows', 'each of them necessarily grows' (Webster 1923); 'the whole creature must grow to maturity' (but 'the interior parts of the earth, like the bodies of plants and animals, have their maturity', Lee 1952: 107); 'le parti interne della terra hanno un ciclo di sviluppo', ' tutto il corpo insieme necessariamente si sviluppa' (Pepe 1982: 72). Moreover, as will be seen, Alexander of Aphrodisia also interprets and uses ἀκμή and ἀκμάζω in a sense that is not static, but dynamic (see footnote 83).

[17] Arist. *Mete.* 1.14, 351a27–28.

[18] Arist. *Mete.* 1.14, 351a29–30.

[19] More precisely, βιώσκομαι means being brought *back* to life; as we shall see, these changes are cyclical.

[20] Arist. *Mete.* 1.14, 351a32–36.

[21] Arist. *Mete.* 1.14, 352a6.

[22] Moreover, this life cycle involves a change from wetness to dryness in both cases. We have already seen that the earth is very wet at the beginning of the cycle and progressively dries up, until it reaches its final, 'dead', state. As Lloyd has pointed out, Aristotle associates the life of animals with wetness and their old age and death with dryness (Lloyd 1964: 104). Therefore, for animals, too, a life cycle is a change from being wet to being dry.

pher states that the earth at some point becomes wet again, and its 'life cycle' begins anew.[23] Hence, Aristotle says that changes in the environment occur 'according to a cycle' (κατά [...] τινα [...] περίοδον)[24] and that the drying up of the soil continues 'until at last the beginning of the same cycle (τῆς περιόδου τῆς αὐτῆς) returns'.[25] It is, then, evident that the condition of the earth is different from that of living beings proper, for whom old age is followed by death. Aristotle states that the world changes, but is neither begotten nor perishes, because it is eternal.[26] While in the case of plants and animals flowering and growing old occurs only once, the earth, eternal, repeats this cycle countless times.

The cause of the 'zeroing' of the cycle is the 'great winter': in fact, Aristotle believes that, just as within a year there is a season (winter) in which it rains more than during the rest of the year, so too within a much longer period there is a phase with more rain.[27] Naturally, the length of this phase is proportional to the length of the period this rainy phase is part of. One can imagine that if within a year the rainy season lasts a few months, in a multi-century period such as the one we are talking about, this season must extend over decades and even centuries. In any case, longer than normal periods of frequent rainfall have the effect of impregnating the soil with a great deal of moisture, with the effect precisely that the earth 'becomes young again' and the cycle of maturing and ageing repeats itself once more.[28]

Another difference between earth and living beings proper, as far as the process of maturation and senescence is concerned, is that in the case of the earth this process lasts much longer, even when considering a single cycle of development and decay. For Aristotle, it is crucial to emphasise this difference between earth and animals, and in particular human beings, since it explains why no people have any memory of environmental changes of the kind described in this chapter. In fact, the philosopher states that the life cycle of the earth is of such long duration that, before it is complete, not only do the individual human beings who witnessed its beginning die, but the entire civilisation to which they belonged also perishes.[29]

From the perspective of this paper, however, the most important difference between the life cycle of a living being proper and that of the Earth is another. In the case of the living being, the transition from generation to maturity to death occurs for the organism as a whole, i.e. for all its parts together. The various regions of the Earth, on the other hand, experience these transitions each at a different time. It is not the Earth as a whole that passes from a state of wetness to a state of dryness, but each of its parts separately,

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[23] Arist. *Mete.* 1.14, 351a35–36; 352b11–19.

[24] Arist. *Mete.* 1.14, 351a25–26.

[25] Arist. *Mete.* 1.14, 352b15–16; transl. Webster.

[26] Arist. *Mete.* 1.14, 352b16–17.

[27] Arist. *Mete.* 1.14, 352a28–31.

[28] According to Chroust, Aristotle assumes such cyclic catastrophes (here and in the first book of *On Philosophy*, which, again according to Chroust, is the source of this chapter of *Meteorology*) to explain why civilisations end, and generally why mankind does not remember its infinite past (Chroust 1973).

[29] Arist. *Mete.* 1.14, 351b8–13.

so that at any given time in the history of the world some regions of the planet will be flourishing and others will be arid. Aristotle expounds this difference between the Earth and living beings in the passage, which I have already quoted, in which he states that the process of development and decay affects plants and animals in their entirety, but the Earth in each of its parts separately.[30] Immediately afterwards, Aristotle reiterates that while some parts wither, in turn (κατὰ μέρος) other regions (ἕτεροι [...] τόποι) flourish.[31] Indeed, the entire chapter is based on the idea that environmental changes affect different regions of the Earth rather than the planet as a whole. This is clear right from the incipit of the chapter:

> The same regions of the earth (οἱ αὐτοὶ τόποι τῆς γῆς) are neither always wet nor always dry...[32]

This sentence is repeated almost literally a few pages later: it is necessary that

> the same places (αὐτοὺς [...] τόπους) are not for ever moist through the presence of sea and rivers, nor for ever dry.[33]

And again, at the end of the chapter:

> the same places of the earth (οἱ αὐτοὶ τόποι τῆς γῆς) do not always remain moist.[34]

But even when citing examples of environmental changes by humans, Aristotle refers to individual regions: Egypt,[35] the lands around Argos and Mycenae,[36] the region of Ammon in Libya,[37] the lake Maeotis,[38] the area around the Bosporus.[39] Indeed, in the case

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[30] Arist. *Mete.* 1.14, 351a28–31.

[31] Arist. *Mete.* 1.14, 351a32–36.

[32] Arist. *Mete.* 1.14, 351a19–20.

[33] Arist. *Mete.* 1.14, 352b18–19; transl. Webster. In this passage, Aristotle seems to be saying that the fact that the earth's life cycle begins in different places necessarily follows from the premise that the world as a whole was not generated, and will never become corrupt. However, the philosopher seems to have no reason to rule out the possibility that the Earth may experience a cyclical transition from moisture to dryness and then back to moisture globally (although this is not what happens in practice). So perhaps in this passage Aristotle only means: (1) that the Earth is subject to perpetual change, not a single 'life' from generation to final corruption; (2) that we therefore experience cyclical change, in which wetness and dryness alternate; and (3) that, more precisely, this change affects different regions of the Earth separately.

[34] Arist. *Mete.* 1.14, 353a20–21.

[35] Arist. *Mete.* 1.14, 351b27–352a2; 352b20–31. In the latter passage, Aristotle states that 'the facts about the Red Sea are a sufficient proof (τεκμήριον)' that the Egyptian land was produced by the Nile. On the use of τεκμήριον in *Meteorology*, see Freeland (1990: 85–94). Even though Freeland does not mentions the passage on the Red Sea, it seems to me that it confirms Freeland's hypothesis that Aristotle uses τεκμήρια for abduction, that is to say, to confirm his own description of phenomena.

[36] Arist. *Mete.* 1.14, 352a8–14.

[37] Arist. *Mete.* 1.14, 352b31–353a1.

[38] Arist. *Mete.* 1.14, 353a1–7.

[39] Arist. *Mete.* 1.14, 353a7–14.

of the districts of Argos and Mycenae, the temporal displacement of the cycles of prosperity and aridity is explicit, as Aristotle states that when Argos was at the beginning of the cycle (marshy land), Mycenae was at the middle (fertile land); this stage was reached by Argos at the time Aristotle teaches, but in the meantime Mycenae had reached the final stage (arid land).[40] Just after mentioning the cases of these two districts, Aristotle clarifies what scale of change he is talking about:

> It must therefore be assumed that exactly what occurred in this small place (ἐπὶ τούτου τοῦ τόπου [...] ὄντος μικροῦ), also occurs for vast areas and entire regions (περὶ μεγάλους τόπους καὶ χώρας ὅλας).[41]

Even as he broadens the scope of the earth's maturing and ageing cycle, Aristotle reiterates that these are τόποι and χῶραι, regions, not the planet as a whole. Furthermore, Aristotle responds to those who claim that the Earth is drying out not by denying that many places (τόποι) where there was sea are now dry land, but rather by pointing out that in many other places the opposite has happened;[42] once again, the cornerstone of Aristotle's argument is that, in a given moment, different regions are at different stages of the cycle of progressive drying out (which, as we have seen, has an effect on the position of the sea). Finally, when Aristotle summarises his conclusions at the end of the chapter, he says that the region (ὁ τόπος) from which each of today's rivers flows has not always been wet.[43] Aristotle thus reiterates until the end that the change in the moisture content of the soil affects each part of the Earth separately. The whole Earth is subject to wetting and drying, but in each of its parts this cycle begins at a different time.

One can note that the difference between the different regions consists not only in the fact that the cycle of maturing and ageing begins at a different time in each place, but also in the different rhythm that this cycle has depending on the type of soil. In fact, after saying that the different regions change separately from one another, Aristotle adds that

> the parts of the Earth also assume a different potentiality (καὶ τὴν δύναμιν τὰ μέρη τῆς γῆς λαμβάνει διαφέρουσαν), so that they can (δύναται) remain moist until a certain moment.[44]

Different regions have a different capacity to retain the moisture they acquire at the beginning of the cycle, so for some the drying process is slower than for others. Aristotle makes this consequence explicit later, when he also explains the cause of this difference in potential between different places. Certain characteristics of the mountains from which

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[40] On this temporal difference between the climatic cycles of Argos and Mycenae as an explanation of the history of the two cities since Homer's time, see Huxley (1973: 274–276).

[41] Arist. *Mete.* 1.14, 352a14–17.

[42] Arist. *Mete.* 1.14, 352a17–25.

[43] Arist. *Mete.* 1.14, 353a16–17.

[44] Arist. *Mete.* 1.14, 351a32–34.

rivers flow determine the ability of the soil to remain moist;[45] these are in particular size, density and temperature.[46] If a mountain is large, it retains more water; the same is true if its soil is compact or if the region is cold (of course, the effect of these factors is additive, so a mountain that is simultaneously large, dense and cold ensures maximum water retention). Conversely, a small mountain may hold less water; a soil that is not dense because it is porous, composed of stones or clay will hold less moisture; and – although Aristotle does not explicitly say so – a river will have a shorter life in a warmer climate.[47] The effect of these differences in moisture-holding capacity is that rivers flowing from large, dense, cold mountains manage to survive until the beginning of the next cycle, while the others die out at some point. This is why some rivers are perennial, but others are not.[48]

Aristotle also explains why the life cycle of the earth does not begin everywhere at the same time. In fact, he emphasises the fact that the great winter does not occur throughout the Earth, but in a different region each time. When there is an excess of precipitation, it does not affect the entire planet, but only a part of it.

> It [i.e., the overabundance of rainfall] does not always occur in the same places (κατὰ τοὺς αὐτοὺς τόπους).[49]

The presence of the expression οἱ αὐτοὶ τόποι, mentioned so many times to state that different regions are at different stages of development, is not accidental: Aristotle wants precisely to emphasise how the differences between places with regard to the date of the great winter are the cause of the differences with regard to the stage of the cycle in which each region is found. The great winter constitutes the beginning of the earth's life cycle, so if it occurs at different times in each region, the 'calendar' of the different parts of the earth will be out of phase. The example used by Aristotle to prove that the exceptionally heavy rainfall that starts a new life cycle of the earth occurs in limited territories is the flood of Deucalion. This event in fact mainly affected the ancient Hellas, i.e. the region of Dodona and the Achelous.[50]

Aristotle uses several different terms to designate the transformations of the earth during the cycle from one great winter to the next. We have already mentioned the biological terms used by Aristotle to indicate the different phases of the cycle: a region first βιώσκεται, then ἀκμάζει (i.e. experiences a process of ἀκμή), until it reaches a state

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[45] On the relationship between rivers and mountains in Aristotle, see Irby (2016: 191 = Irby 2021: 71).

[46] Aristotle had already said that the ability to retain water depended on heat and cold.

[47] Arist. *Mete.* 1.14, 352b4–16.

[48] Arist. *Mete.* 1.14, 352b3–8; 353a27–28.

[49] Arist. *Mete.* 1.14, 352a31–32.

[50] Arist. *Mete.* 1.14, 352a32–352b3. Given the central role the rivers and the mountains from which they flow play in the life cycle of the Earth, it is natural for Aristotle to divide the Earth on the basis of mountain ranges and streams. Indeed, the symmetry of geography is ensured by the existence of corresponding mountains and rivers in opposite parts of the planets. On this, see Pajón Leyra, Bartoš (2021: 107).

in which it εὐθενεῖ, and finally φθίνει and γηράσκει (i.e. is in the γῆρας).[51] The beginning of the cycle is referred to by Aristotle as ἡ καταβολὴ τῆς περιόδου τῆς αὐτῆς.[52] The becoming wet of a soil is designated using the expression ἔνυδρος γίγνεσθαι,[53] and the maintaining of this state by the expression ἔνυδρος διαμένειν;[54] for the becoming dry both the expression ξηρός/ξερότερος γίγνεσθαι[55] and the verb ξηραίνεσθαι[56] are used. Aristotle then makes use of various adjectives and expressions to indicate the state in which a particular soil is: for a condition of excessive humidity, he uses the expression ἑλώδης εἶναι;[57] for an optimal condition, καλῶς ἔχειν;[58] being unproductive, due to excessive humidity or aridity, is denoted with ἀργός.[59] The same lexicon, enriched by some other adjective, is found when Aristotle speaks of the soil reaching a certain condition: in fact, to indicate that a land has reached the optimal state of moisture he uses the expressions ἔρχεσθαι εἰς τὸ καλῶς ἔχειν[60] and χρήσιμος γίγνεσθαι ('becoming usable'),[61] while the subsequent process, in which the land becomes less and less fertile, is described as a ἀργὸς γίγνεσθαι[62] or a χείρων γίγνεσθαι ('becoming worse').[63] In general, the fact that the moisture content changes over time is indicated with the verbs γίγννομαι (in this context, 'to happen'),[64] μεταβάλλω (to change)[65] and συμβαίνω (to happen)[66] and with the nouns associated with the first two of these verbs, i.e. γένεσις and μεταβολή.[67] Γένεσις is used in the expression φυσικὴ περὶ τὴν γῆν γένεσις, 'the whole natural process

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[51] Aristotle speaks of ἀκμάζειν καὶ φθίνειν with regard to the bodies of plants and animals, but adds that 'this happens' (τοῦτο γίγνεται, Arist. *Mete.* 1.14, 351a30) to the earth as well, although not simultaneously in all its parts.

[52] Arist. *Mete.* 1.14, 352b15.

[53] Arist. *Mete.* 1.14, 351a35–36.

[54] Arist. *Mete.* 1.14, 351a34.

[55] Arist. *Mete.* 1.14, 351a35–351b1; 351b24; 351b28–29; 352a13.

[56] Arist. *Mete.* 1.14, 351a34; 351b30–31; 352a5; 352b14. The prefix ὑπερ is added to ξηραίνεσθαι to indicate the process that leads to excessive dryness (*Mete.* 352a7–8).

[57] Arist. *Mete.* 1.14, 352a10.

[58] Arist. *Mete.* 1.14, 352a11.

[59] Arist. *Mete.* 1.14, 352a14. Actually, in this passage Aristotle only speaks of a land that does not bear fruit because it is too impregnated with water. But from the use of ἀργὸς γίγνεσθαι we see that an excessively dry soil is also ἀργός.

[60] Arist. *Mete.* 1.14, 352a6–7.

[61] Arist. *Mete.* 1.14, 352a14.

[62] Arist. *Mete.* 1.14, 352a13.

[63] Arist. *Mete.* 1.14, 352a8.

[64] Arist. *Mete.* 1.14, 351a30 ('to the earth this [i.e. developing and decaying] *happens* separately for each part'); 351b10–11 ('these *events* escape observation').

[65] Arist. *Mete.* 1.14, 351a19–20 ('the same parts of the earth [...] *change*'); 351b22–24 ('it first settled in a land *that was changing*', transl. Webster); 352a5–6 ('in time this land *changes its character*', transl. Webster).

[66] Arist. *Mete.* 1.14, 352a8–9 ('this *happened* in Greece'); 352a14–17 ('Now the same process that *has taken place* in this small district must be supposed *to be going on* over whole countries and on a large scale ', transl. Webster).

[67] Arist. *Mete.* 1.14, 351b12 ('before we are reminded of the *change* in these things'); 351b35–36 ('Homer, who is modern, so to speak, with respect to such *changes*'). At 352b, l. 16 Aristotle speaks of the change of the world as a whole; however, this change is reduced to the changes, occurring at different times, of its parts (*Mete.* 352b16–19).

of the becoming of the earth';[68] The noun, therefore, is here linked to the meaning of 'becoming' of γίγννομαι, which we have found in expressions in which the verb has a predicative complement, rather than to that of 'happening', which Aristotle refers to when he uses the verb without a complement in this chapter.[69] Another noun used to designate the progress of the earth through its various stages is ἐπίδοσις (progress).[70] But when Aristotle emphasises the main difference between the earth and living beings, he uses the verb πάσχω:

> to those [i.e., the bodies of animals and plants] it does not happen that they *suffer* these things [i.e., maturation and old age] in each part separately.[71]

Moreover, πάθημα, one of the nouns derived from πάσχω, is used in the plural to indicate the changes to which the earth in general is subjected: in fact, after having spoken of the transformations, which can also be universalised, of Argolis from excessively humid to fruitful and of the region of Mycenae from productive to too dry, Aristotle speaks of the 'cause of such *affections*'.[72] To sum up, it can be said that Aristotle uses two types of words to indicate changes in the earth's moisture content. The first type, comprising γίγννομαι in the sense of 'becoming', μεταβάλλω and their derivatives, emphasises the fact that the phenomena spoken of are *changes*. The second type, which includes γίγννομαι in the sense of 'happening', συμβαίνω and πάσχω/πάθημα, indicates instead that these phenomena are something that the earth passively *undergoes*. The earth, like *the body* of a plant or an animal, suffers the cyclical change of its conditions.

It should be noted, however, that Aristotle makes no explicit reference to the πάθη of the earth. He assimilates the life cycle of the earth to that of the bodies of living beings, which happen to suffer (πάσχειν) maturation and old age. One can easily deduce that the earth also happens to suffer the same phenomena, but this is not explicitly stated. Similarly, Aristotle speaks of the cause of the affections (παθημάτων) of the regions of Argos and Mycenae. These affections are certainly of the same type as those that occur elsewhere, but this is not made explicit by the philosopher.[73]

It is Alexander of Aphrodisias who speaks explicitly of affections of the earth.[74] In his commentary on chapter 1.14, Alexander explains more explicitly than Aristotle that

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[68] Arist. *Mete.* I, 14, 351b, ll. 8-9. Compare Pepe's translation: 'l'intero processo naturale del divenire della terra' (Pepe 1982: 72).

[69] Aristotle certainly does not mean γένεσις in the sense of 'generation', since he denies – even in this same chapter (Arist. *Mete.* 1.14, 352b16-17) – that the world as a whole is subject to generation and corruption. If the world is not generated, neither are its regions (although a region can be generated in the sense that where there was formerly sea there is now land, *Mete.* 352b20–22).

[70] Arist. *Mete.* 1.14, 351b25–26 ('the *change* is gradual and lasts a long time', transl. Webster).

[71] Arist. *Mete.* 1.14, 351a28–29.

[72] Arist. *Mete.* 1.14, 352a17–18.

[73] On the metaphysical concept of *pathos* in Aristotle, see Rorty (1984). Cohen (2012).

[74] Alexander's commentary on *Meteorology* is still understudied. The commentary on the fourth book has been translated by Lewis (1996). Kupreeva (2022) is a study on a specific passage.

the difference between the changes of the earth and those of living organisms concerns the way in which these different subjects undergo affections (*pathê*).[75] Alexander states that what the internal parts of the earth have in common with the bodies of living beings is that they undergo changes and affections, and that the cause and principle of these changes and affections (αἰτία δὲ καὶ ἀρχὴ τῶν τοιούτων μεταβολῶν τε καὶ παθῶν) is the succession of a phase of maturation and one of ageing. In fact, these affections of the earth (τὰ τοιαῦτα [...] περὶ τὴν γῆν πάθη) occur according to an ordered succession. What these affections are, Alexander said immediately before, paraphrasing the first lines of the Aristotelian chapter: the wet parts of the earth become dry and vice versa, some rivers come to be and others cease to be, the land becomes sea and the sea land.[76] Since Alexander then repeats with Aristotle that the difference between the earth and living beings is that maturation and ageing occur at different times in the different parts in the case of the former but not the latter,[77] it can be said that Alexander is more explicit than Aristotle in stating that the similarities and differences between the earth and living beings concern the πάθη and their cause, i.e. the life cycle.

In general, in his commentary on this chapter of *Meteorology*, and in particular its first part, Alexander, while essentially repeating what Aristotle said, proposes some personal notes. For instance, while (at least in Wilson and my interpretation) Aristotle proposes a causal chain from changes in the earth's moisture content to the appearance or disappearance of rivers to changes in the coastline, Alexander considers that it is the generation and destruction of rivers that causes not only the sea to move, but also the moistening and drying up of the earth.[78] The commentator, moreover, develops the Aristotelian reference to the Sun's action on the life cycle of the Earth's parts through warming and cooling,[79] proposing a complete theory of how the Sun's approach to the Earth, repeating itself every year for many years, causes regions to mature, while its receding, which obviously also occurs annually, is the cause of ageing.[80] This explanation of the succession of the Earth's ages is placed in parallel with the description of the causes of the life processes of living beings, because they too grow and perish as a result of the Sun's approaching and receding.[81] Alexander thus extends the Aristotelian similarity between earth and living beings: earth, plants and animals are united not only by having a life

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[75] Alex.Aphr. *in Mete.* 59, 11–21.

[76] Alex. Aphr. *in Mete.* 58, 31–59, 15. Alexander also mentions the πάθη of the earth (*in Mete.* 60, 28), regarding the oblivion of such affections by human civilisations. Furthermore (*in Mete.* 60, 1–2) he uses the verb πάσχω to indicate the fact that rivers undergo changes; in particular, in lands that become dry, they see their flow decrease until they disappear altogether.

[77] Alex.Aphr. *in Mete.* 59, 15–21.

[78] Alex.Aphr. *in Mete.* 58, 31–59, 10.

[79] Arist. *Mete.* 1.14, 351a30–32.

[80] Alex.Aphr. *in Mete.* 59, 29–60, 4. Aristotle states that the approach and receding of the Sun causes generation and corruption elsewhere in the first book of *Meteorology* (Arist. *Mete.* 1.9, 346b21–23) and in *On Generation and Corruption* (Arist. *GC* 2.10). On the general meaning of this Aristotelian theory, see Wildberg (2004: 240–242). Horn (2016: 276–280).

[81] Alex.Aphr. *in Mete.* 59, 21–31.

cycle, but also by the fact that this cycle is caused by the Sun's revolution. Finally, Alexander interprets differently from modern commentators the passage in which Aristotle explains how rivers cause the sea to turn into land. According to Alexander, this can happen in two different ways: either because the river pushes the sea away, or because it covers it with debris.[82]

Alexander's commentary thus shows that the concept of *pathos* is fundamental to understanding how Aristotle conceives of biological analogies, which play a key role in his meteorology: parallels with the afflictions of organisms can be found in meteorological phenomena, but at the level of individual parts of the Earth, not for it as a whole. Although the sublunar world can be understood in organic terms, this world is not a 'cosmic animal', but rather a multiplicity of 'regional animals'.

Appendix: Translation of Alexander of Aphrodisias, *Commentary on Aristotle's Meteorology*, 1.14, 58, 31–60, 13

[p. 58, l. 31] It seems to him that the parts of the earth do not always remain the same, so that the wet parts of it always remain wet and the dry parts always dry, but that they change and that **[p. 59]** those that were previously wet become dry, and conversely the dry parts are moistened, and that this happens through the work of the rivers. For, among the rivers, some are generated not existing before, while others come to an end and cease to be, no longer existing, and this is also followed by the transformations of the wet and dry earth, since the parts of the earth **[l. 5]** that were dry before are moistened by the rivers born in them, while those that were wet before are dried up because the rivers in them cease to exist. He says that, for the same reason that among the rivers **[l. 10]** some are generated not existing before and others cease to exist, the land and the sea also change state.

It must be supposed—he says—that such affections of the earth occur not in a disorderly manner, but according to an order and a cycle. The cause and principle of these changes and affections is, he says, that, just as the bodies of animals and plants have by nature maturation[83] and old age, so do **[l. 15]** the internal parts of the earth. But they

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[82] Alex.Aphr. *in Mete.* 60, 5–13.

[83] It seems to me that, in some passages of Alexander's argumentation, ἀκμή clearly means 'maturation' rather than 'maturity', and ἀκμάζω 'maturing' rather than 'being mature'. In fact, Alexander contrasts ἀκμή and ἀκμάζω with: (1) παρακμή and παρακμάζω, which have not only the static sense of having passed maturity but also the dynamic sense of declining; (2) γηράσκω, which (when, as in this case, it is used in the present tense) means 'to grow old'; (3) φθίω, which indicates the process of decay. Here, moreover, Alexander is explicitly referring to a 'change' (*in Mete.* 59, 15–21). On p. 60, 2, moreover, Alexander states that rivers are born in regions ἀκμάζοντα, and watercourses come to be when the region is wetter, i.e. when it is maturing, and not when the moisture content is optimal and thus lower, i.e. when that part of the earth has reached maturity; therefore, in this passage, too, ἀκμάζω seems to have the dynamic meaning of moving towards maturity rather than the static one of having reached it. Since the other occurrences of ἀκμή and ἀκμάζω are compatible with the dynamic sense, which is probably what Aristotle also gave to these terms (see footnote 16), I have translated these words as 'maturation' and 'maturing' respectively.

differ because in the case of the former, maturation and decline occur not with each part maturing and declining at a different time, but simultaneously in all parts; for both their maturation and, conversely, their ageing and decay occur simultaneously in all parts.[84] In contrast, to the earth this happens part by part; for to it this change occurs because of cooling **[l. 20]** and heating, and different parts of it are cooled and heated at different times.

For beings endowed with life and for those endowed with souls, the Sun's revolution is a cause of growth and shrinkage. For when it approaches, it is a cause of preservation and growth, and when it recedes, of shrinkage and corruption, as is evident from the annual plants, which grow when the Sun approaches them, and **[l. 25]** decay and corrupt when it recedes. And as in the case of these, so it is also in the case of long-living beings, whose growth and decay last longer: for they grow[85] for a certain number of approaches of the Sun, and shrink and decay[86] for the same number of recedings.

Therefore, just as these beings grow and decay because of the Sun's revolution, so too the parts of the earth receive both maturation and old age from the approaching and **[l. 30]** receding of the Sun, and in general from its revolution, so that they may mature and remain moist for a time, and then become dry and grow old again. He called dryness the 'old age of the earth', transferring the term from animals. It follows that the springs that are found in the regions and parts of the earth that become dry **[l. 35]** also at first become smaller and then also cease to be; since this happens, the rivers that flow from these springs also at first become smaller **[p. 60]** and then also cease to exist altogether; and since the rivers undergo this and change their course (because they are born in the parts of the earth that mature, and depart from those that decline), the sea also leaves some of the regions of the earth, and occupies others.

[l. 5] Next, Aristotle adds the phenomena relating to the sea that occur when rivers recede and when they continue to flow. In fact, parts of the sea dry up for two reasons.[87] Where, due to the rising of the rivers, the sea has spread out, pushed away by their inflow, it happens that, as the sea recedes, these lands become arid; when the rivers no longer flow, the sea is no longer pushed away and spreads out **[l. 10]** over these same lands. On the other hand, in those regions where the flowing of the rivers has increased the sea and filled it with land, it happens that, because of the alluvial deposit, the sea becomes marshy, little by little it dries up and becomes land, yet it spreads out towards other regions and occupies them.

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[84] Literally, 'both mature simultaneously in all parts and, conversely, age and decay simultaneously in all parts'.

[85] Literally, 'their growth <occurs>'.

[86] Literally, 'their shrinkage and decay <occur>'.

[87] Alexander does not seem to mean that some parts of the sea dry up because the rivers move away from them, while others dry up because the rivers flow to them. The two drying-up processes described next are in fact both due to the presence of the rivers, which either push the sea away or fill it with alluvial deposits (this is how Lee (1952: 109) also interprets Alexander's passage).

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CHIARA MILITELLO
/ The University of Catania, Italy /
chiara.militello@unict.it

The *paschein* and *pathê* of the Earth and Living Beings in Aristotle and Alexander of Aphrodisias (*Meteorologica* 1.14)

In his 2013 monograph on *Structure and Method in Aristotle's Meteorologica*, Malcolm Wilson has shown both that Aristotle conceived of meteorological phenomena as analogous to the bodily processes of animals, and that for the Stagirite the sublunar world should not be seen as a single body, but rather as composed of many different individuals. However, Wilson did not articulate the relationship between these two theories—that is, he did not answer the following question: how is it possible for the Earth to behave like an animal if it is not a single body? This paper argues that the answer to this question lies in the Aristotelian statement about the different *paschein* of the Earth and animals. In fact, in the chapter of *Meteorology* dedicated to climatic changes (1.14), Aristotle, after comparing such changes to the maturing and ageing of living organisms, states that 'only, in the case of the bodies of plants and animals being affected does not occur in each part separately, but it is necessary for the being to mature and decay all at once, whereas in the case of the Earth this occurs in each part separately, due to cooling and warming' (351a.28-31). In his commentary, Alexander of Aphrodisias reiterates that the difference between the changes of the Earth and those of living organisms concern the way in which these different subjects undergo affections (*pathê*). The concept of *paschein*/*pathos* is thus fundamental to understanding how Aristotle conceives of biological analogies, which play a key role in his meteorology: as the affections of maturing and corruption show, parallels with organic processes can be found in meteorological phenomena, but always at the level of the individual parts of the Earth. Although the sublunary world can be understood in organic terms, this world is not a 'cosmic animal', but rather a multiplicity of 'regional animals'. To corroborate this thesis, this paper addresses several related questions, including: the mechanics of environmental changes according to Aristotle; the differences between the regions of the Earth; the lexicon used in *Meteorology* to refer to the transformations of the Earth; the personal notes that Alexander adds to Aristotle's discussion. Finally, the first modern translation of the relevant section of Alexander's commentary is also provided here.

KEYWORDS

Pathos, *scala naturae*, Aristotle, Alexander of Aphrodisias, climate change, great winter