

Aristotle's Parva naturalia and the Study of Animals and Everything That Has Life

1 Introduction

In Chapter 1 I argued that it is not an interest in this or that form of life but rather an interest in life in all its forms and manifestations that prompted Aristotle to engage in his research into the soul understood as the ultimate source of life. I also argued that Aristotle's *De anima* plays a foundational role for any systematic study of perishable life. It is the serial approach adopted for the study of the powers of the souls that makes it possible for Aristotle to restrict the scope of his investigation from life in all its forms and manifestations to life as it is encountered here on earth. This restriction is too often taken for granted or even overlooked. And yet, it plays an architectonic role in Aristotle's natural philosophy.¹

The close connection that exists between having a soul and being alive is lost when we approach Aristotle's *De anima* as a psychological work concerned with the mind via a study of perception and thought. This exegetical approach has its roots in post-Aristotelian philosophy. Both Hellenistic and post-Hellenistic philosophers did not share Aristotle's ambition to engage in a systematic study of the natural world. Stoics and Epicureans did not trace the powers related to self-nutrition, growth, and reproduction back to the soul.² It was, therefore, quite natural for them to focus on the cognitive powers of the soul. A similar point can be made in connection with the Platonists of late antiquity. While these philosophers were eager to adopt the conceptual resources Aristotle developed for the discourse on and around the soul, they no longer felt the need to engage in any sustained investigation of the phenomenon of perishable life. In fact, they found a complete explanation of the natural world in Plato's *Timaeus*. By their lights, this work was the culmination of the ancient study of

¹ The epistemological implications of this restriction for the study of imperishable life are explored in FALCON 2005: 85–112.

² See the doxographical report going back to Aëtius discussed in Chapter 1, Section 1.

nature. It also set the limits of their interest in the natural world, controlling the selection of what was relevant in Aristotle's writings on natural philosophy. As a result, a full immersion in the study of the natural world in all its aspects became an unnecessary and unwanted distraction.³ To make a long story short, the study of animals and plants remained at the margins of the ancient philosophical reflection after Aristotle. The latter stood out in antiquity as a remarkable exception for his unwavering commitment to a systematic, and philosophically motivated, study of perishable life.⁴

Aristotle conceived of his study of perishable living beings as an investigation into animals and plants. This is arguably one of the most important results we can take away from Aristotle's *De anima*. But nothing Aristotle says in this work rules out that there might be room for a common study of animals and plants in addition to separate studies of animals and plants. On the contrary, Aristotle is expected to remain open to the possibility that salient features of perishable life can be explained in common for both animals and plants *qua* perishable living beings. More to the point: this is a possibility that Aristotle is required to entertain since the procedures of scientific explanation outlined in the *Posterior Analytics* require him to give explanations that are as general as possible while at the same time remaining as specific as necessary to deliver scientific knowledge.

In light of the above, the questions I will try to answer in this chapter are:

- (1) Are there explanations that apply in common to animals and plants *qua* perishable living beings in Aristotle's extant writings on natural philosophy?
 - (2) If there are such explanations, where are they located in his overall project?
 - (3) How does Aristotle go about studying animals and plants in common?
- Last but not least,
- (4) How far is Aristotle able to pursue a common study of animals and plants?

³ In the *Timaeus* Plato makes it very clear that his goal is to account for the emergence of the cosmos down to the creation of the human beings (*Tim.* 27 A combined with *Tim.* 90 E). Accordingly, he deals with the emergence of animals in a couple of pages at the very end of the dialogue. It is difficult to resist the conclusion that the emergence of animals is an expendable coda to the project attempted in the *Timaeus*. A similar point can be made with respect to the emergence of plants whose discussion is compressed in a very short, elliptical passage (*Tim.* 77 A–C).

⁴ I discuss the reasons for this systematic marginalization of the study of perishable life after Aristotle in FALCON 2021C: 246–260.

2 The Project of the *Parva naturalia*

The opening lines of *Sens.* 1 mark the transition from Aristotle's research into the soul to the explanatory project conducted in the short essays collectively known as *Parva naturalia*. In a couple of carefully crafted sentences, Aristotle gives us an idea of how he envisions the relation between his research into the soul and these short works on natural philosophy. For this reason, this transitional passage has been the object of a close examination by scholars interested in the architectonic question of how the different Aristotelian investigations fit together into a coherent project.⁵ Here is my own translation of this important passage:

Since we earlier completed a study of the soul as such and each of its powers taken part by part, it is next to be investigated about *animals and everything that has life* [περὶ τῶν ζώων καὶ τῶν ζῶν ἐχόντων ἅπαντων], [with a focus on] what are their specific and common activities. So, then, let us assume what was said about the soul and let us speak about the rest – and *first about what is first* [πρῶτον περὶ τῶν πρώτων].⁶

I begin my discussion of this text from what is obvious before turning to what is not so obvious and potentially controversial. The study of the soul comes before the study of animals and everything that has life in the order of inquiry. This is a direct consequence of the foundational role that the research into the soul plays for the project that Aristotle announces in this passage – namely, a study of animals and everything that has life. Recall that the soul is the source or provider of life. In other words, the soul is the most general and fundamental principle of living beings. This point is clearly made at the outset of Aristotle's *De anima*, where the relevance of the research into the soul for the study of living beings is also stressed. In the second part of the above passage Aristotle tells us, explicitly and unequivocally, that he now plans to build on the main results he has reached in his research into the soul.

This research supplies him with the explanatory starting points for another investigation, which he describes as the “*study of animals and everything that has life*.” Moreover, the research into the soul and the study of animals and everything that has life are to be integrated into a single explanatory project. But it remains to be seen how Aristotle conceives of their integration. To be sure, the integration envisioned in this transitional passage need not be a case of straightforward assimilation.

⁵ Here I single out RASHED 2004: 185–202; MOREL 2006: 121–139; and JOHANSEN 2006: 140–164.

⁶ Aristotle, *Sens.* 1, 436a1–6.

When Aristotle says that he has completed his research into the soul and is ready to turn his attention to another investigation, he may be saying that he has moved away from the study of the soul and is about to engage in another kind of investigation.⁷ On this reading, Aristotle not only announces the transition from the research into the soul to a study of animals and everything that has life but also indicates a shift in research focus. While the previous investigation was concerned with the powers of the soul, the upcoming inquiry will deal with the activities of animals and everything that has life.

None of the claims made so far is especially controversial. Let us now look more closely at how Aristotle describes his shift of focus. While Aristotle's *De anima* is concerned with the *soul as such* and with its fundamental powers taken as *parts of the soul*, his new project is about *animals and everything that has life*. The way Aristotle describes the contents, and even the argument, of his *De anima* calls for a few words of elaboration. To begin with, the soul is no abstract entity over and above its powers, so we should refrain from thinking that Aristotle is referring to an investigation of the soul followed by one that is concerned with its powers. Aristotle's view is that the study of the powers of the soul amounts to a study of the soul. To his mind, the only way to engage in a fruitful study of the soul is by engaging in a serial study of its relevant powers. But Aristotle does not simply speak of powers of the soul; he pointedly speaks of *powers taken as parts of the soul*. We can infer this from the fact that Aristotle tells us that they have been studied "*part by part*." I submit that Aristotle has in mind a specific subset of powers. We can refer to them as the basic powers of the soul. These powers are parts of the soul because they are separate (or separable) in account. "Separate (separable) in account" means independent in definition: each of these powers can be defined independently from the other basic powers of the soul.⁸ Insofar as they are basic, these powers are also constitutive of the soul.⁹

The beginning of *Sens. I* is a carefully worded description of how Aristotle proceeds in his research into the soul. The positive (i.e., constructive) part of this research begins in earnest at the outset of the second

⁷ I owe this point to Klaus Corcilius (CORCILIUS 2008: 25).

⁸ The conceptual distinction between being a part of the soul and being a power (or a capacity) of the soul, and the relation between being separable in account and being a part of the soul, is discussed in CORCILIUS-GREGORIC 2010: 81–119 and JOHANSEN 2012: 53–62. There is some important disagreement among these scholars on how the distinction between basic and non-basic parts of the soul is to be secured. This disagreement can be traced by looking at the footnotes in JOHANSEN 2012: 53–62.

⁹ For an introduction to how Aristotle thinks about powers of the soul, see JOHANSEN 2012: 1–8.

book with what Aristotle himself calls the most common account of the soul.¹⁰ According to this account, the soul is the first actuality of a natural, organic body that has life potentially.¹¹ This account is not contingent upon the subsequent study of the basic powers of the soul. Rather, it gives us a theoretical framework for the investigation to come. The theoretical framework in question is nothing less than Aristotle's general hylomorphism. But this account accomplishes at least another important result. It provides us with a much-needed picture of unity before embarking on a serial account of the basic powers of the soul. In the previous chapter I argued that the most common account of the soul establishes the scope and boundaries of the research into the soul; from here onward, Aristotle concentrates on the soul of *perishable living beings*.¹² It is possible to restate this point by saying that this account orients, and indeed shapes, the research into the soul offered in *DA* II–III.¹³ Once this account is in place, Aristotle continues his research via an inquiry into the basic powers of the soul. These powers are taken one by one in a certain order. Aristotle tells us, forcefully and unequivocally, that a serial study of these powers is the only way to move forward. In other words, there is no other way to secure the definitional goal announced at the outset of Aristotle's *De anima* than a serial study of the powers of the soul.¹⁴ There is, however, no textual evidence that the most common account of the soul becomes superfluous once the basic powers of the soul are serially defined. We can safely say the most common account of *the soul as such* combined with a definition of each of its *powers taken part by part* is for Aristotle the optimal way to fulfill his promise made at the outset of his research into the soul.¹⁵

Before turning to the second part of our passage taken from *Sens.* 1, I would like to firm up the results achieved so far by elaborating on the distinction between basic and non-basic powers of the soul. I will do so by looking at Aristotle's treatment of memory. Memory is a power that both human and nonhuman animals have in virtue of having a soul. At least in this respect, the power of storing perceptual information and retrieving it

¹⁰ Aristotle, *DA* II 1, 412b5–6. ¹¹ Aristotle, *DA* II 1, 412b27–28. ¹² Chapter 1, Section 2.

¹³ For an attempt to elaborate on the overall function of the most common account in the context of Aristotle's research into the soul, see JOHANSEN 2012: 9–33.

¹⁴ Aristotle, *DA* II 3, 415a12–13: "it is therefore clear that the account of each of them [*sc.* the basic powers or parts of the soul] is also the most appropriate account of the soul."

¹⁵ Aristotle, *DA* I 1, 402a7–8: "we seek to have knowledge about the nature and being of the soul." Contrary to what this passage may suggest, the soul does not have a nature or essence, but it is a nature or an essence of living beings. By promising knowledge about the nature and being of the soul, Aristotle announces an answer to the question "what is the soul?"

whenever needed is not different from the power of sense-perception. Like sense-perception, memory too is a power that both human and nonhuman animals have in virtue of having a soul. There is, however, one important difference: while sense-perception is a basic power of the soul, memory is not. This explains why Aristotle does not deal with memory in the context of his research into the soul but in the *Parva naturalia*. He launches his investigation into memory with the uncontroversial but important observation that we first perceive (or think) something and then remember having perceived (or having thought) it.¹⁶ This observation shows that, at least for Aristotle, memory cannot be adequately explained without reference to sense-perception and thought. Both sense-perception and thought are regarded as basic powers of the soul, so they are defined in the context of the research into the soul.¹⁷

When we reflect on how Aristotle divides his explanatory work between *De anima* and *De memoria*, we see that his account of memory is offered within the theoretical framework provided by his research into the soul. But this theoretical continuity does not mean that the treatment of memory is a supplement to the project attempted in *De anima*. No such supplement is needed given that Aristotle takes his account of the basic powers of the soul to be complete at the end of *De anima*. In other words, his discussion of memory does not perfect the account of the soul.¹⁸ It is best described as an application of the main results reached in the research into the basic powers of the soul. One methodological insight carried forward from the research into the soul and self-consciously applied to the study of memory is that the study of any power of the soul, whether basic or not, is to be conducted via a study of its manifestation (or manifestations). This means that we should study memory via a study of the activity of remembering. This is an activity that has *zoological* significance since both human and nonhuman animals are capable of storing information and retrieving it.

¹⁶ Aristotle, *Mem.* I, 449b15–20.

¹⁷ Aristotle's explanation of memory requires reference not only to sense-perception and thought but also to another power that human and nonhuman animals share in virtue of having a soul: *phantasia*. Aristotle seems to consider *phantasia* a non-basic capacity of the soul. In this respect *phantasia* is not on a par with perception and thought. But this does not prevent him from dealing with this capacity in the context of his own research into the soul (most notably in *DA* III 3).

¹⁸ *Contra* BOLOTIN 2021: VII. Here we read that “the treatises in the *Parva naturalia* are not mere appendages to the *De anima*” but rather “they help to perfect the account of the soul and of its relation to the world as a whole.” But from the fact that the short essays collected in the *Parva naturalia* are no appendages to *De anima*, it does not follow that they perfect it. The way out of this false alternative is to see that they contribute to *another* project altogether.

From an architectonic point of view, the study of memory contributes, directly and immediately, to the study of animals. We tend to obfuscate this point when we describe the study of memory and the other treatises transmitted in the context of the *Parva naturalia* as “psychological works,” or when we say that they contribute to “Aristotle’s psychology.”¹⁹ But Aristotle neither adopts these expressions nor encourages us to adopt them on his behalf. For his own description of the project attempted in the short essays on natural philosophy, we need to return to the transitional passage at the outset of *Sens.* 1, where Aristotle tells us that the works collectively known by us as *Parva naturalia* are concerned with “*animals and everything that has life*.” Based on this description we can safely say that we make the equivalent of a categorical mistake when we lump together Aristotle’s *De anima* and the short essays collectively known as *Parva naturalia*. They do not contribute to the same project: while the former is about the soul as the ultimate principle of living beings, the latter are concerned with animals and everything that has life.

In *Sens.* 1 Aristotle offers another description of the explanatory project attempted in the context of his *Parva naturalia*. He tells us that these short treatises on natural philosophy are concerned with “*what is common to the body and the soul*.”²⁰ This second description complements the first by offering a precise idea of how the investigation attempted in the *Parva naturalia* relates to the one conducted in *De anima*. Among other things, this description confirms that Aristotle is no longer concerned with the soul as such. In fact, he uses the same expression, namely “common to the body and the soul,” in his own research into the soul to point forward to *another kind of investigation*.²¹ This is most likely a reference to the investigation conducted in *De motu animalium*, which is to be regarded as a contribution to the *Parva naturalia*.²² The *Parva naturalia*, augmented by *De motu animalium*, are collectively concerned with psycho-physical phenomena whose significance is either zoological or extends beyond the narrow case of animals. In other words, the study of what is common to the body and the soul contributes either to a study of “*animals*” or to a study of “*everything that has life*.”

¹⁹ This is the title chosen for the new Penguin translation of Aristotle’s *De anima* and *Parva naturalia* (MILLER 2018).

²⁰ Aristotle, *Sens.* 1, 436a7–8. This description has drawn considerable attention lately. For a discussion of what Aristotle may mean by “common to the body and the soul,” see MOREL 2000: 10–24; MOREL 2006: 121–139; JOHANSEN 2006: 140–164.

²¹ Aristotle, *DA* III 10, 433b20.

²² For a full discussion of the relation between *De motu animalium* and *Parva naturalia*, see CORCILIUS-PRIMAVESI 2018: clxx–clxxvi.

A great deal is packed into the phrase “*animals and everything that has life*.” It is now time to take a closer look at the message Aristotle wants to convey with this careful choice of words. First, since Aristotle tells us that he is going to build on the results achieved in his research into the soul, it is not open to us to assume that the distinction between animals and plants is not available to him. But this observation only makes the task of understanding the peculiar expression he adopts more pressing. To be sure, the phrase “*everything that has life*” entails an implicit reference to plants. But it would be a mistake to rush to the conclusion that in *Sens.* 1 Aristotle is announcing a study of animals and plants based on the results reached in the investigation of the soul. If this were what Aristotle had in mind, he would have spoken of a study that is concerned with *animals and plants* (περὶ ζώων καὶ φυτῶν). Instead, he speaks of a study that is concerned with *animals and everything that has life* (περὶ τῶν ζώων καὶ τῶν ζῶην ἔχόντων).²³

To study everything that has life is not equivalent to studying everything that is alive without qualification. Recall that in *De anima* Aristotle has successfully isolated perishable life from imperishable life. Since he is building his entire theoretical edifice upon the results achieved there, he must be tacitly assuming this restriction to perishable life at the beginning of the *Parva naturalia*. If so, in *Sens.* 1, Aristotle is announcing a study of *everything that has a share in perishable life*. But, again, this is emphatically not equivalent to announcing a study of animals and plants. To see why, we must return to the theory of scientific explanation outlined in Aristotle’s *Posterior Analytics*. We have seen that this theory requires Aristotle to give explanations at the right level of generality. The investigator is expected to produce explanations that apply as broadly as possible while at the same time remaining sufficiently specific to capture the salient features of the phenomena under discussion. In some cases, this entails seeking explanations that are common to most, or even all, animals; in other cases, it means going beyond the case of animals to look for explanations that apply to everything that has life, including plants. This is exactly what Aristotle has in mind. In fact, he may be referring to the explanatory

²³ Alternative, acceptable translations are “*animals and all living things*” (MILLER 2018: 70) and “*animals and all the beings that have life*” (BOLOTIN 2021: 3). The living beings in question are *perishable* living beings, and the life in question is *perishable* life. David Ross obfuscates this point, as well as the existence of two distinct explanatory levels at the outset of the *Parva naturalia*, when he paraphrases our passage by saying: “now that we have discussed soul and its faculties, we must consider the activities peculiar to some animals and those common to all, beginning with the most important” (Ross 1955: 183).

requirement outlined in his *Posterior Analytics* when he distinguishes between *specific* and *common activities*. By “specific activities” Aristotle need not mean species-specific activities; he may mean activities that are specific to all animals. When our text is read in this way, Aristotle is elaborating on what he has just told us. He has announced “*a study of animals and everything that has life*”; he now goes on to say that such a study ought to be conducted first by focusing on what is *specific to animals* and then by turning to what is *common to everything that has a share in perishable life*.

This reading becomes even more appealing when we realize that, in addition to introducing the investigation conducted in this work, the opening lines of *Sens.* 1 are meant to inform the reader about the explanatory project conducted in the other short essays traditionally transmitted in the context of the *Parva naturalia*. It turns out that these essays are clearly divided into two distinct groups, reflecting two different explanatory levels. While the first group deals with activities that occur along with sense-perception or through sense-perception,²⁴ and so with activities pertaining to some, most, or even all animals (*On Sense-perception and Sense-perceptibles*, *On Memory and Recollection*, *On Sleep and Waking*, *On Dreams*, *On Divination in Sleep*, *On the Motion of Animals*), the second group is concerned with aspects of perishable life that are not restricted to animals (*On Length and Shortness of Life*, *On Youth and Old Age*, *Life and Death*, and *Respiration*). Aristotle's treatment of respiration may be taken to be *prima facie* evidence against this division. But it does not take long to see that this treatment is embedded within his larger study of life and death. Aristotle himself makes this connection at the outset of *Juv.* when he says that life is contingent upon respiration for some animals.²⁵ In light of the above, it is far from surprising that the Aristotelian tradition in antiquity and beyond has considered the writings collected in the second (smaller) group, to the extent that they are concerned with activities that are common to all perishable living beings, plants included – a sort of bridge between the study of animals and that of plants.

Let us return to the programmatic passage offered at the outset of Aristotle's *Meteorology*, where Aristotle announces a study of “*animals and plants, both in common and separately*.” We have seen that, at least at the outset of this work, we cannot rule out that Aristotle promises, in

²⁴ Aristotle, *Sens.* 1, 436b2–3.

²⁵ Aristotle, *Juv.* 1, 467b12–13. The qualification “for some animals” is important since Aristotle does not consider respiration an activity shared by all animals. More on this in due course.

addition to separate studies of animals and plants, a study that captures salient features pertaining in common to both animals and plants. Recall the geometrical example Aristotle uses in his *Posterior Analytics*: we do not achieve proper knowledge of equilateral, isosceles, and scalene triangles unless we study them both in common and separately. We study these triangles separately when we study the properties that belong to them insofar as they are equilateral, isosceles, and scalene triangles. We study these triangles in common (or in general) when we study them insofar as they are triangles. Likewise, we do not reach proper scientific knowledge of animals and plants unless we study them both separately and in common. To study animals and plants in common is equivalent to studying them insofar as they are *perishable living beings*.

If Aristotle ever fulfills the promise made at the beginning of the *Meteorology*, he is likely to do so in the context of the *Parva naturalia*. This is the place where he announces not only a study of animals but also a study of everything that has a share in perishable life. On closer inspection, however, what is studied in common for animals and plants is surprisingly little. The essay *On Length and Shortness of Life* is by far the most promising case study, so I would like to turn to this short work to see what decisions or moves Aristotle makes in this essay and what they teach us about how Aristotle goes about implementing a common study of animals and plants.

3 Longevity As a Case Study

In the essay *On Length and Shortness of Life* Aristotle is centrally concerned with explaining the phenomenon of longevity.²⁶ Right at the outset of the work Aristotle indicates that animals are the primary, but emphatically not exclusive, focus of his causal investigation:

Concerning the fact that some animals are long-lived while others are short-lived *and concerning the length and shortness of life in general* [καὶ περὶ ζωῆς ὅλως μήκους καὶ βραχύτητος], we have now to search for the causes.²⁷

There are two explanatory goals on Aristotle's agenda right from the start, and they are clearly related, although we are not told how to move from the first (length and shortness of life in animals) to the second (length and shortness of life in general). Before embarking on his causal investigation, Aristotle takes the time to go through a couple of *aporiai*. The first *aporia* is

²⁶ In this section I rely on results published in FALCON 2021d. ²⁷ Aristotle, *Long.* I, 464b19–21.

immediately relevant to the question of whether a common study of longevity in both animals and plants is possible.²⁸ It is not clear, Aristotle says, whether it is the same cause or a different one in animals and plants that makes some of them long-lived and others short-lived.²⁹ Stating a difficulty is not the same as solving it. Aristotle does not offer a solution to this difficulty. His solution must be inferred from his subsequent discussion.

3.1 *The Scope of the Investigation*

The discussion of longevity in animals and plants begins in earnest only in *Long.* 4. In this stretch of text, Aristotle registers a few correlations that fail to occur in nature. For instance, there is no clear correlation between the relative size of the different kinds of animals and their lifespan. We cannot say, for instance, that larger animals live longer than smaller ones, or that smaller animals live longer than larger ones. Nor can we say that all plants live longer than animals. As a matter of fact, some plants live only for a year, or even only for a season. Furthermore, there is no obvious correlation between the presence or absence of blood and longevity. We cannot say that blooded animals live longer than bloodless animals, or that bloodless animals live longer than blooded animals. Finally, the habitat surely has an impact on the duration of life, but we cannot correlate longevity with living on land or in water. There are land animals and plants that live only for a year or for a season. Likewise, there are marine animals that live only for a year or a season.³⁰

What is especially interesting about the discussion offered in the first part of *Long.* 4 is that Aristotle is at least in principle willing to make transgeneric comparisons. By “transgeneric comparisons” I mean comparisons across genera of living beings.³¹ They are comparisons involving blooded and bloodless animals, or land and marine animals, or even animals and plants. The fact that certain general correlations fail to occur in nature does not take anything away from what is interesting about the exercise offered in this stretch of text. It is telling that, in *Long.* 4, Aristotle

²⁸ The second *aporia* is concerned with the relation between longevity and health. It is not clear whether long life and healthiness go together or whether they are independent from one another. This second *aporia* points toward a large question that remains at the margins of the present discussion, namely the question of the disciplinary boundaries and systematic connections between natural philosophy and medicine.

²⁹ Aristotle, *Long.* 1, 464b22–26. ³⁰ Aristotle, *Long.* 4, 466a1–9.

³¹ I borrow this expression from Klaus Corcilius (CORCILIUS 2021a: 142).

goes on to register a few *transgeneric facts* that hold in nature and call for a scientific explanation:

In general, the longest-lived creatures are found among plants (for instance the date-palm). Then, they are found among blooded rather than bloodless animals, and among those [animals] that live on land rather than in water. Hence, combining the two features, the longest-lived animals are found among the blooded animals that live on land, like the human being and the elephant. And, indeed, the largest [animals] live for the most part longer than the smaller [animals], for the other longest-lived [creatures] too happen to be of large size as in the case of those mentioned.³²

Aristotle opens his *transgeneric investigation* with the claim that the longest-lived creatures are found among plants rather than animals. He ends it by returning to the case of plants when he says that the other longest-lived creatures (i.e., other than animals) are also characterized by their large size.³³ In between, Aristotle compares not only the expected duration of life in blooded and bloodless animals but also the expected duration of life in animals that live on land and in water, and finally the expected duration of life in animals and plants. We find this sort of transgeneric investigation elsewhere in the Aristotelian corpus. For instance, the scientific account of animal locomotion requires Aristotle to engage in a causal investigation that operates at a very high level of zoological abstraction.³⁴ The comparison of flying and swimming animals is a good case in point: any account of animal locomotion that treats flying and swimming in common is expected to proceed at a very high level of zoological abstraction to capture the salient features shared by both modes of locomotion. And yet, the account of longevity is almost unique in the Aristotelian corpus since here Aristotle makes transgeneric claims that involve comparing two very large genera such as animals with plants.

To be sure, Aristotle occasionally makes comparisons that involve plants and animals. For instance, Aristotle compares the morphology of animals and plants right at the outset of his study of the non-uniform parts of animals.³⁵ In this case, however, his conclusion is largely negative,

³² Aristotle, *Long.* 4, 466a9–16.

³³ I find support for this reading in *Long.* 5, 466a26–27, where Aristotle says that “*large creatures, animals and also plants* [τὰ μεγάλα καὶ ζῷα καὶ φυτὰ], generally speaking, live longer, *as was said before*.” I take this second passage from *Long.* 5 to refer to our passage from *Long.* 4. Admittedly, this is not the only possible reading. On an alternative reading, the other longest-lived creatures mentioned in *Long.* 4 would be animals to the exclusion of plants. On this reading, Aristotle would be reminding his reader that there are other long-lived large animals besides the human being and the elephant mentioned at 466a13.

³⁴ More on this topic in Chapter 3, Section 3.4. ³⁵ Aristotle, *PA* II 10, 655b28–656a3.

confirming that his focus is on the bodily parts of animals, to the exclusion of plants. I will return to this interesting stretch of text toward the end of this chapter. For the time being, let me say why the case of longevity in animals and plants is different and potentially more interesting. To begin with, the comparison involving plants and animals follows directly from the stated goal of the work on longevity. We have seen that Aristotle is interested in the phenomenon of longevity in general – that is, longevity not only in animals but also in plants. He wonders *ore operto* whether the causes of longevity are the same in plants and animals. Moreover, his conclusion is not negative. Quite the opposite: Aristotle explains why some plants live longer than all animals.

3.2 *The Explanation of Longevity in Animals and Plants*

In *Long.* 4 Aristotle establishes a few scientific facts. By “scientific facts” I mean facts that call for an explanation in the context of Aristotle’s science of nature. The following one is among them: some plants (mostly trees) live longer than all animals. This is a remarkably complex fact to the extent that it entails a comparison between the lifespans of plants and animals. When he tries to explain this fact, Aristotle goes beyond the domains of animals and plants since he offers an explanation that holds in common for animals and plants. But how does Aristotle achieve this explanatory feat? To answer this question, we must look at the argumentative strategy adopted in the rest of the essay, which is traditionally divided into two chapters: *Long.* 5 and *Long.* 6.

A notable feature of the ensuing discussion is that Aristotle engages in a search for the relevant causes by focusing on the case of animals. This is done in *Long.* 5. The focus on animals suggests that the order in which the two main explanatory goals are given in *Long.* 1 is also the order in which the investigation is conducted in the rest of the work. Aristotle looks *first* for the causes by which some animals are long-lived while others are short-lived, and *then* for the causes of length and shortness of life in general. This strategy explains why Aristotle begins the search for the causes of longevity by narrowing down his discussion to the case of animals. His first move consists in assuming that *the animal* (τὸ ζῷον) is naturally wet and hot, and assuming that to be alive *for an animal* is to be of such a constitution.³⁶ With this assumption in place, Aristotle goes on to state that *for animals* (τοῖς ζῴοις) the matter of their body consists in the hot and the cold, the

³⁶ Aristotle, *Long.* 5, 466a18–19.

dry and the wet.³⁷ From this point on, his overall explanatory strategy consists in showing that not only the relative quantity but also the quality of the material constituents present in the body of the animal are relevant to the explanation of its expected lifespan:

the causes [of longevity] are two: the quantity and also the quality [δύο γὰρ τὰ αἴτια, τὸ τε ποσὸν καὶ τὸ ποιόν], so there must be not only a large amount of moisture, but this moisture must also be warm.³⁸

This combination of quantity and quality is optimal in the case of the human animal:

This is the reason why the human being lives longer than some larger animals: animals that fall short in quantity of moisture live longer whenever they excel more in the quality of their moisture than they fall short in its quantity.³⁹

According to Aristotle, the explanation of why a human being lives longer than a horse, even if a horse is larger in size than the human being and so the horse has a larger quantity of moisture (i.e., blood) in its body, is that the moisture in the human body is of a better quality. While deficient in quantity, the human blood is more resistant to the physical changes related to aging and decay because it is hotter. To appreciate this point, we need to keep in mind that aging and decaying are regarded as processes involving not only a loss of moisture but also a loss of vital heat. For Aristotle, aging is becoming dry and cold.

A full discussion of how Aristotle deals with the explanation of longevity in animals is not required for my argument.⁴⁰ Let me only say that Aristotle argues that land animals generally live longer than marine animals,⁴¹ and that blooded animals generally live longer than bloodless animals. In both cases, the explanation has to do with the quality of the moisture present in their body. According to Aristotle, marine animals possess an inner moisture that is water-like and so is more liable to destruction because it is easy to congeal.⁴² A similar point is made in connection with bloodless animals.

³⁷ Aristotle, *Long.* 5, 466a20–22. I follow the text printed in Ross 1955. His apparatus shows that the manuscript tradition is divided between ζῴοις (animals) and οὐσι (beings). The full force of the alternative reading will become apparent shortly.

³⁸ Aristotle, *Long.* 5, 466a29–31. ³⁹ Aristotle, *Long.* 4, 466a9–16.

⁴⁰ A fuller discussion of longevity in animals can be found in WOODCOX 2018: 65–78.

⁴¹ This claim is false if cetaceans are included among the marine animals. Either Aristotle was not well informed about the lifespan of cetaceans, or else this is only a claim about fishes, not about all marine animals. I owe this point to James G. Lennox.

⁴² Aristotle, *Long.* 5, 466b33–467a2.

Their moisture, which is not blood but rather something analogous to blood, does not contain fatty material and so is less impervious to the physical changes related to aging and decay.⁴³

However, the following aspect of Aristotle's explanatory strategy in *Long.* 5 is important: *even if his focus is squarely on animals, Aristotle does not hesitate to extend his findings to plants.* Consider the following two passages:

that is why, generally speaking, *large living beings, animals and also plants* [τὰ μέγιστα καὶ ζῷα καὶ φυτὰ] live longer, as we said before. The reason is that it is reasonable to suppose that that which is large contains more moisture. (Aristotle, *Long.* 5, 466a16–28)

if they do not obtain nourishment, *plants and also animals perish* [τὰ φυτὰ καὶ τὰ ζῷα φθείρεται], for they waste themselves away. (Aristotle, *Long.* 5, 466b28–30)

In both passages, Aristotle does not confine himself to animals.⁴⁴ But this does not mean that he is oblivious to his original focus on animals; it only means that *Aristotle is willing to extend his findings to plants whenever he is confident that he can do so.* I will return to this interesting aspect of his overall explanatory strategy shortly.⁴⁵

In the meantime, I would like to turn to Aristotle's extended discussion of plants. This discussion is traditionally marked out as a separate chapter (*Long.* 6). We should resist the initial impression that this chapter is an expendable coda. To begin with, it is in this stretch of text that Aristotle most obviously fulfills his promise (made at the outset of the essay) to advance an explanation of longevity that is not restricted to the case of animals. Furthermore, his treatment of longevity in this chapter is expected to help us see not only why a human being or an elephant lives longer than a horse or a dog but also why some plants (mostly trees) live longer than any animal. There are three reasons (or, better, causes) that jointly explain why some plants live longer than any animal. To understand them, we need to keep in mind, once more, that aging and decaying are processes

⁴³ Aristotle, *Long.* 5, 467a2–5. Both passages may explain why the manuscript tradition at 466a21 is divided between ζῷοις (animals) and οὐσι (beings).

⁴⁴ Many thanks to Wei Cheng who made me aware of the importance of these two passages for Aristotle's overall strategy in *Long.* 5.

⁴⁵ See next section.

that involve loss of moisture and loss of vital heat.⁴⁶ The first cause is that plants have an internal moisture that is less water-like than the one found in animals, and so their moisture is less easy to congeal.⁴⁷ The second is that this inner moisture has a viscosity and an oiliness that make it easier for plants than for animals to retain their moisture.⁴⁸ These two causes jointly go a long way toward answering the question of why some plants live longer than all kinds of animals. Since inner moisture and vital heat are found in animals and plants, it is possible to give a common explanation of longevity in terms that are common to plants and animals. By themselves, however, the first two causes do not suffice to explain why some plants live longer than animals. At this point, Aristotle recalls a fact that is peculiar to plants and sets them apart from animals:

Plants renew themselves continuously, which is why they last for a long time. There are always new shoots while the old ones grow old, and the roots do the same. But not at the same time. Rather, at one time the trunk and the branches die, and new ones grow up next to them. When they do so, new roots spring from the existing part of the plant, which in this way continues to live while a part dies, and another grows.⁴⁹

Aristotle elaborates further on the claim that, unlike animals, plants renew themselves continuously. Plants have a power to regenerate themselves that has no equivalent in animals. While it is true that some insects can continue to live for a while when they are cut, the principle of life left in the divided insects cannot produce new body parts. By contrast, every part of a plant contains a potential root and a potential stem.

Plants are like insects, as we said earlier. The reason is that when they are cut, they continue to live and become two or more than two from one. But insects, although they manage to live, cannot do so for long. The reason is that they do not have organs and the source of life that is present in them cannot produce them [*sc.* the organs]. But the source [of life] present in plants can; the reason is that *plants have potentially a root and a stem everywhere* [πανταχῇ γὰρ ἔχει καὶ ρίζαν καὶ καυλὸν δυνάμει]. So it is from this source that the new and the old [in the plant] grow, with the new parts cut from the plant having little difference in terms of longevity. Indeed one might say that in a way the same happens in the case of

⁴⁶ In dealing with the case of longevity in animals, Aristotle assumes that “to be an animal is to be wet and hot, and to be alive [for an animal] is to be of such a constitution” (*Long.* 5, 466a18–19: δεῖ γὰρ λαβεῖν ὅτι τὸ ζῶν ἐστὶ φύσει ὑγρὸν καὶ θερμόν, καὶ τὸ ζῆν τοιοῦτον); he goes on to posit that old age is linked to being dry and cold, as is death (466a19–20).

⁴⁷ Aristotle, *Long.* 6, 467a6–7. ⁴⁸ Aristotle, *Long.* 6, 467a8–9.

⁴⁹ Aristotle, *Long.* 6, 467a13–18.

propagation by slip, since the shoot cut off is a part [of the plant]. Thus, in the case of propagation by a slip this happens because the slip is separated from the plant, whereas in the other case [this happens] in virtue of its continuity. The reason is that *the source [of life] is everywhere, being present potentially* [ἐνυπάρχει πάντῃ ἡ ἀρχὴ δυνάμει ἐνοῦσα].⁵⁰

In the context of a study of longevity in animals and plants, it is not at all surprising to discover that Aristotle insists on the continuity between animals and plants by looking at the case of those insects that, when they are cut, can go on living for a while as divided animals. Aristotle does not say what insects he has in mind. Elsewhere he explicitly refers to centipedes as animals that continue to live when they are divided into two or more parts.⁵¹ Note, however, that there remains a significant difference between insects and plants. The principle of life that is present in insects and is responsible for their continuing to live even when they are divided does not have the power to generate new organs. The organs in questions are the body parts that the animals use as tools for nutrition, reproduction, and locomotion. Without such organs, the divided insects may be able to survive as two or three separate living beings, but they cannot do so for a significant length of time.

By contrast, a part detached from a plant is potentially able to grow into a new plant. Aristotle states this principle by saying that plants “have potentially a root and a stem everywhere.” To fully appreciate this claim, we need to keep in mind that for Aristotle root and stem are the first parts to grow out of the seed.⁵² Hence to say that plants have potentially a root and a stem everywhere amounts to saying that any detached part of a plant can reconstitute itself in a self-sufficient living organism. To be sure, this claim requires considerable refinement. It is manifestly not true that any part of any plant has the power to grow a root and a stem. Still, this refinement can be deferred to a separate study of plants where the focus is on what is specific about the different kinds of plants.⁵³ Although Aristotle stops short of giving a full account of plant propagation, what he says on

⁵⁰ Aristotle, *Long.* 6, 467a18–30.

⁵¹ Aristotle, *Juv.* 9 (= *Resp.* 3), 471b20–22 and *IA* 7, 707a27–30. In *Juv.* 2, 468a25–27 Aristotle mentions wasps and bees as animals that continue to life after being cut into two. But their case is different because the claim is that the part that contains the controlling principle continues to live after being cut from the rest of the body. A full discussion of these passages as well as the others in which divided insects are mentioned can be found in LEFEBVRE 2002: 5–34.

⁵² Aristotle, *Juv.* 3, 468b21–22.

⁵³ Theophrastus makes the distinction among the different manners in which plants propagates at the beginning of his study of the modes of generation in plants. I return to this topic in Chapter 5, Section 2.

the topic of longevity in plants is enough to establish that plants are a different kind of perishable living beings from animals because they possess a different kind of principle of life – that is, a different kind of soul.

I would like to conclude my review of what Aristotle says on the topic of longevity in animals and plants with two remarks. To begin with, what Aristotle says in *Long.* 6 does not exhaust the topic of longevity in plants. Quite the opposite: Aristotle explicitly refers his reader to a study of longevity in plants. This is far from being a surprising development. *Long.* 6 is concerned with the rather narrow question of why some plants live longer than all animals. We can restate this point by saying that *Long.* 6 is concerned with the relative longevity of *animals and plants* rather than longevity in *plants*. This leads to my second remark. Aristotle's reference to this further study of longevity in plants is self-consciously crafted in impersonal terms. It is also a reference to a future investigation. Aristotle says that "it will be determined about these things also separately by themselves in the study of plants." The future tense need not have chronological significance; it can be taken to be evidence that there is a definite order in the Peripatetic study of perishable living beings: the study of plants follows not only the study of animals but also the study of what is common to animals and plants *in the order of inquiry*.

In his study of longevity Aristotle applies the more general approach to perishable life that he has outlined in the opening lines of the *Meteorology*. This strategy consists in approaching the study of perishable life through a study of animals. This strategy is implemented also in the study of longevity: *first animals* (*Long.* 5), *then plants* (*Long.* 6). One final observation is in order. Even when Aristotle ventures into a discussion of plants, his primary focus remains on animals. This is an important and often overlooked point that deserves to be stressed. Whatever Aristotle has to say on the topic of longevity in plants, or on the topic of the relative longevity in animals and plants, is embedded in his study of animals. The latter remains his primary concern. What Aristotle tells us at the end of his account of longevity confirms this overall impression:

The cause of length and shortness of life has now been given for animals as well [τῶν ἄλλων ζῶων].⁵⁴ It remains for us to study youth and old age, life

⁵⁴ The words "τῶν ἄλλων ζῶων" have been considered problematic. In his *apparatus criticus*, Ross writes: "ἄλλων *delundum aut* ἄλλων ζώντων *scribendum*." In other words, either "ἄλλων" is an intrusive gloss or "ζῶων" is a corruption of ζώντων. But perhaps the transmitted text can be saved: ἄλλος can be used attributively with a substantive, which in this case is to be regarded as an appositive (SMYTH 1920: §1272). If we accept this suggestion, the transmitted text can be rendered as I have done here.

and death. *Once these things are determined, the investigation of animals might well come to a conclusion* [τούτων γὰρ διορισθέντων τέλος ἂν περὶ τῶν ζώων ἔχοι μέθοδος].⁵⁵

In looking ahead to the topic of youth and old age, life and death, Aristotle tells us that as soon as he has dealt with this topic, *his investigation of animals* (μέθοδος τῶν ζώων) may well come to a natural conclusion. Scholars tend to be skeptical (if not outright dismissive) of cross-references that come at the end of a work because these cross-references generally feel like expendable additions. But this is emphatically not the case here. The words at the end of *Long. 6* are a non-trivial addition to the text. If these words are taken seriously, both the inquiry into the longevity of animals and plants and the study of youth and old age, life and death contribute, directly and immediately, to the study of animals. This conclusion confirms that Aristotle has moved away from the study of the soul. In other words, the essays collected in the *Parva naturalia* are not a prolongation of *De anima*; rather, they contribute to a different project altogether. Moreover, this project has a special research focus on animals. This *explicit* suggests that the investigation of animals contains, *as one of its components*, an investigation of whatever may be explained in common for animals and plants. This observation does not contradict what we have seen so far but confirms that the study of perishable life is approached via a study of animals. Whatever can be said in common about animals and plants is said in the context of the study of animals. Among other things, this confirms the somewhat special role that the study of animals plays in Aristotle's research agenda.

4 Beyond Longevity

Aristotle's account of longevity is by far the most promising text for evaluating how he goes beyond his chosen focus on animals to deal with "everything that has life." In the end, the reader comes away with the impression that there is little Aristotle is able, or willing, to say in common for animals and plants. This impression is confirmed when we turn to the last essay transmitted in the context of Aristotle's *Parva naturalia*. This essay is concerned with the explanation of youth and old age, life and death. The pairings youth/old age and life/death, as well as the order in which they are mentioned, are important. Every perishable living being,

⁵⁵ Aristotle, *Long. 6*, 467b5–9.

whether animal or plant, goes by nature through a cycle of growth, activity in its prime, decline, and death. In short, perishable life characteristically passes through a few phases, which are arranged in a definite order.⁵⁶ Hence, it makes good sense for Aristotle to offer a joint discussion of the powers of the soul (and the corresponding life activities) involved in the explanation of youth and old age, life and death. From the start, however, his research focus is squarely on animals. Tellingly, Aristotle also announces that a treatment of respiration is embedded within the discussion of life and death since, *for some animals*, life is contingent upon respiration:

We must now speak about youth and old age, and life and death: at the same time [we must] equally state the causes of respiration, since *for some animals being alive or not being alive comes about on account of this* [ἐνίοις γὰρ τῶν ζώων διὰ τοῦτο συμβαίνει τὸ ζῆν καὶ τὸ μὴ ζῆν].⁵⁷

This *incipit* has caused embarrassment. Shouldn't Aristotle be concerned with more than just animals? Isn't it true of plants as well that they go through a cycle of growth, activity in their prime, decline, and death? The most recent interpreter of *Juv.* 1–6 takes ζῶν to mean “living beings” rather than “animals” on the ground that a restriction to animals, to the exclusion of plants, would be arbitrary.⁵⁸ But this reading cannot be accepted. At this point, the meaning of ζῶν is fixed by what Aristotle has established in his research in the soul. It can only mean animal to the exclusion of plants.⁵⁹ A better, more convincing move consists in assuming that the research focus on animals is carried forward from what we are told at the end of the treatment of longevity. If so, the *explicit* of *Long.* 6 not only contains instructions on how to understand the explanatory strategy adopted in the work on longevity but also offers a justification for the move made at the outset of *Juv.* 1. The close connection between the end of *Long.* 6 and the beginning of *Juv.* 1 is confirmed by the presence of the adverb “νῦν” in the second text. Aristotle has just completed a study of longevity and he is *now* ready to turn to the topic of youth and old age, life and death.

One may try to resist this reading by objecting that Aristotle does not mention respiration at the end of *Long.* 6. Upon reflection, however, this objection is not very strong. The omission of respiration at the end of *Long.* 6 does not create a tension with what we are told in the opening lines of *Juv.* 1. The investigation of respiration is conceptually subordinated to the

⁵⁶ This is a major theme in KING 2001 (especially 1–16). On the life cycle, see by the same author: KING 2010: 171–187 and KING 2021a: 138–139.

⁵⁷ Aristotle, *Juv.* 1, 467b10–13. ⁵⁸ KOROBILI 2022: 21–22. ⁵⁹ See Chapter 1, Section 2.

investigation of youth, old age, life, and death, so it is perfectly appropriate for Aristotle to look ahead to the next item on his research agenda without making explicit reference to respiration. This reading is confirmed by what we read in *Juv.* 27. As Aristotle looks back at what he has accomplished in the treatise as a whole, he makes no reference to respiration.⁶⁰ This does not mean that the account of respiration is expendable but only that this account is embedded in a larger project. Aristotle is interested in the relation between respiration and living, but his primary focus is on life and death (and youth and old age).

Even if the research focus is from the start on animals rather than everything that has life, it remains true that the significance of the treatise greatly exceeds the study of animals. So we need to better understand how Aristotle negotiates his decision to focus on animals with the explanatory requirement to go beyond animals whenever appropriate. My overall approach to this issue is best understood in contrast with a recent reading of the opening lines of *Juv.* 1. According to James G. Lennox, at the outset of *Juv.* 1, Aristotle distinguishes the account of youth and old age, life and death (*Juv.* 1–6) from the subsequent account of respiration (*Juv.* 7–27 = *Resp.* 1–21).⁶¹ Aristotle would do so by indicating, right from the start, that these accounts are given at different levels of generality: while the first would hold in general for all perishable living beings, the second would apply to all those animals that are engaged in the activity of respiration (breathing). Since Lennox is programmatically concerned with Aristotle's account of respiration, it remains to be seen how he thinks that the requirement of giving explanations at the right level of generality is implemented in the first part of our essay (*Juv.* 1–6). I do not find textual evidence that this is how Aristotle proceeds in these chapters. His strategy strikes me to be something like this: *Aristotle stays as close as possible to the case of animals and goes beyond animals whenever it is possible and appropriate for him to do so.*

This strategy is reminiscent of how Aristotle deals with the topic of longevity. In both cases, animals come first in the order of investigation. As a result, Aristotle starts his inquiry by focusing on *animals*; but then, whenever possible and appropriate for him to do so, he extends his results to *everything that has a share in perishable life*. When we accept that the research focus in *Juv.* is from the start on animals, but we also keep in mind

⁶⁰ Aristotle, *Juv.* 27, 480b21–22: “so then we have said perhaps everything [which was to be said] on the topic of life and death and the things related to this inquiry.” It is of course open to us to read an indirect reference to the treatment of respiration in the words “the things related to this inquiry.”

⁶¹ LENNOX 2020: 221.

that the power of the soul controlling the full cycle of life from beginning to end has a wider extension than animals, we can better appreciate why Aristotle opens his discussion in *Juv.* 1 by distinguishing between *being an animal* and *being alive*.⁶² For Aristotle, being an animal and being alive are not one and the same thing; rather, they entail the presence of different kinds of powers. To be sure, both kinds of powers are necessarily present in the same bodily part. But while the life-sustaining powers the animal possesses insofar as it is alive are not existentially separate from its higher (cognitive) powers, they are not exclusive to animals. This opening move creates the conceptual space for an investigation whose significance goes beyond animals even though the primary focus remains on them. A central question for Aristotle in *Juv.* 1 is where in the body the life-sustaining powers of the soul are located. This question falls squarely within the project attempted in the *Parva naturalia*. Here Aristotle is programmatically concerned with what is common to the body and the soul. It is perfectly appropriate for him in this context to ask where exactly in the living body the nutritive power controlling growth and decline, life and death is to be found and why.

Let us look at how Aristotle answers this question, with a special concentration on his overall argumentative strategy. The starting point is the observation that *in animals* the basic powers of the soul are conceptually but not physically separate. This starting point confirms that the research focus is on animals. What matters to Aristotle is that the nutritive power controlling the life-sustaining activities of the animal as well as the power responsible for their being perceptually informed about the surrounding world are to be found in the same bodily part.⁶³ At this early stage of his argument, Aristotle does not argue for the view that these powers are to be found in the heart (or in its bodily analogue). He is content to recall that the power-controlling sense-organ must be located midway between the front and the back of the animal: “there is a single sense-organ common to the special sense-organs, in which it is necessary for actual sense-perceptions to come together, and this must be located between the parts called front and back (‘in front’ means the direction from which perception comes to us, and ‘back’ the opposite).”⁶⁴

To understand this claim, we must recall that the articulation of the living body into a front and a back follows from possessing the power for

⁶² Aristotle, *Juv.* 1, 467b13–24.

⁶³ Aristotle, *Juv.* 1, 467b25–27. The modal statement is found in Aristotle’s text: It is *necessary* (ἀναγκαῖον) for both powers to be in one and the same body part.

⁶⁴ Aristotle, *Juv.* 1, 467b30.

sense-perception. The perceptual system is a centralized system with a definite orientation that is captured by the pair front/back. The front of the animal is the part of the body where the sense-organs are implanted. Aristotle does not stop to elaborate on the claim that there must be a common sense-organ in addition to the peripheral sense-organs. Rather, he shifts his attention to the nutritive capacity of the soul. Moreover, he does so in a way that no longer makes the presence of this capacity contingent upon the creature being an animal and having the capacity for sense-perception: "the body of *all living things* [ζώντων πάντων] is divided into an upper and a lower part (for all [living beings] possess upper and lower parts, so plants do too)."⁶⁵

Aristotle goes out of his way to stress that this claim is true for plants as well. We find here a very good instance of his concern for making claims at the right level of generality. This second statement is no longer true of animals to the exclusion of plants, but it is meant to capture a salient feature shared by both animals and plants *qua* perishable living beings. As a result, it must be crafted in a way that is appropriate to the relevant level of generality. This statement exemplifies in a clear way the Aristotelian concern for making claims, or supplying explanations, that apply as broadly as possible while at the same time also grasping salient articulations of the natural world. The conclusion that Aristotle derives from the two premises highlighted above is also conveniently expressed in a way that is true for both kinds of perishable living beings: "it is clear that they [*sc.* animals *qua* living beings] must have the nutritive principle midway between the above parts."⁶⁶ I supplied in square brackets what I take to be the implicit subject: neither animals nor plants nor living beings but rather animals *qua* perishable living beings. This allows Aristotle to reach the following conclusion: in perishable living beings that only possess the nutritive soul, the nutritive principle will be midway between the upper and lower part. But in those that also have perception, this principle is to be found not only midway between the upper and lower part of the living body but also midway between the front and the back.

It does not take long to see that Aristotle is relying on a rather abstract conception of the living body. This conception provides him with the conceptual tools to arrive at a conclusion that holds for everything that has a share in perishable life. The obvious question is how much of what Aristotle has established so far is applicable to plants. To be sure, plants do not have their living body articulated into a front and a back part since this

⁶⁵ Aristotle, *Juv.* I, 467b32–33.

⁶⁶ Aristotle, *Juv.* I, 468a1.

articulation is contingent upon the presence of the power for sense-perception. But the articulation of the living body into an upper and a lower part applies to them as well if we qualify this thesis. To begin with, the upper part of plants coincides with their roots since plants are stationary and take in their nourishment directly from the soil. In other words, the roots in plants are functionally analogous to what is called mouth (στόμα) in animals.⁶⁷ Moreover, plants have their living body articulated into an upper and a lower part even though they do not have a designated part to discharge useless residue. In fact, Aristotle believes that plants do not process their nourishment, but they take it in already concocted from the soil. As a result, there is no leftover to be discharged from their bodies. Admittedly, Aristotle does not alert us to this important difference here.⁶⁸

When we reflect on the argument offered in this stretch of text, we see that animals have their living body *minimally* organized into a front and a back, an upper and a lower part.⁶⁹ We also see that this level of bodily organization is not found in plants since the latter have their living body articulated into an upper and a lower part but not into a front and back. Far from being trivial or bizarre, this doctrine provides us with the conceptual tools to generate claims that hold for animals and plants. More to the point: these claims go beyond what is specific about either animals or plants. We can say, for instance, that *here on earth* being alive requires a certain level of organization and claim that *perishable* living beings have their bodies minimally organized into an upper and a lower part.⁷⁰ The

⁶⁷ Aristotle, *Juv.* 1, 468a9–12. The addition of καλούμενον next to στόμα need not be taken as evidence that Aristotle keeps some distance from what he regards as a popular designation. On the contrary, Aristotle is appropriating a popular designation and turning it into a term of art. Both “mouth” and “roots” are technical terms to designate specific body parts in the Peripatetic study of animals and plants. Both Aristotle and Theophrastus use them to designate the entry point of nourishment in animals and plants. The phenomenon we observe here is far from being unique. Instances of popular designations appropriated by Aristotle and Theophrastus are “birds,” “fishes,” and “trees.” While the first two are the names of two of the largest kinds in Aristotle’s study of animals, the third is the name for the standard of inquiry that Theophrastus adopts in his study of plants. More on this in Chapter 4, Section 3.

⁶⁸ But he does so at the outset of *PA* II 10. More on this text momentarily.

⁶⁹ I add the qualification “minimally” because animals that can displace their body from one place to another have their living body further articulated into a right and a left part. More on this articulation in Chapter 3, Section 4.

⁷⁰ The additions of the qualifications “here on earth” and “perishable” are important. At least for Aristotle, there is plenty of life in the superlunary world. According to him, imperishable life may or may not entail the presence of a body. While the disembodied intellects are incorporeal substances, the celestial bodies are embodied intelligences. However, the body is conceived as a simple one. In this case, what Aristotle finds to be true for perishable ensouled living beings cannot be extended to imperishable ensouled living beings.

link between perishable life and organization may strike us as a commonplace.⁷¹ But what is today a commonplace was at some point a theoretical achievement. To my knowledge, Aristotle is the first to establish a link between forms of perishable life and levels of organization. For him, there are different levels of organization corresponding to different forms of perishable life, so he offers us a non-reductive, and at the same time informative, way to express this fundamental truth.

While the conclusion reached in the second part of *Juv.* 1 holds for everything that partakes of perishable life, the focus of the investigation remains squarely on animals. This becomes clear as soon as we turn to *Juv.* 2. This chapter begins with the observation that perfect (that is to say, complete) *animals* have their body articulated into three parts: the part by which the animal takes in nourishment, the part by which the animal expels the useless residue, and the part between these two, which is called chest.⁷² No matter how complex the living body of the animal is, the nutritive principle of the soul is always located in the middle part.⁷³ The ensuing discussion in *Juv.* 2–4 consists of a set of empirical and logical arguments in support of this claim. The empirical arguments (or arguments κατὰ τὴν αἴσθησιν) take up most of *Juv.* 2–3. The logical arguments (or arguments κατὰ τὸν λόγον) are advanced in the first part of *Juv.* 4. What is remarkable about the overall strategy employed in this stretch of text is that Aristotle proceeds by concentrating on the most perfect (most complete) animals. They happen to be *blooded animals*. The results achieved in the study of these animals are subsequently extended to the remaining animals. Aristotle calls them *bloodless animals*. This move is an application of the general rule of inquiry introduced in the previous chapter where we learned that our investigation should always start from the most determinate and end with the least determinate.⁷⁴ Blooded animals are the most complete (and most perfect) animals for Aristotle, so his study of animals must start from them.

Animals remain not only the starting point but also the primary focus throughout *Juv.* 2–4. This focus confirms, indirectly, that the use of the expression “*animals and everything that has life*” adopted at the outset of *Sens.* 1 not only contains a reference to two distinct objects of study, corresponding to two different explanatory levels in his research project,

⁷¹ This complaint is voiced in THOMPSON 1995: 248–295 (and repeated in THOMPSON 2008: 35–39).

⁷² Aristotle, *Juv.* 2, 468a13–16. Here too Aristotle may be signaling to the reader that he is turning a popular designation into a piece of abstract jargon (“στῆθος” means “chest” or “breast” already in Homer and Hesiod, who take it to be the seat of the heart, thought, and the emotions).

⁷³ Aristotle, *Juv.* 2, 468a21–23. ⁷⁴ See Chapter 1, Section 3.

but also indicates that the direction of the investigation is from the first (“*animals*”) to the second (“*everything that has life*”). Aristotle turns out to be, once more, a careful writer when it comes to describing what he is going to do in his works. His descriptions contain clear instructions as to how his investigation unfolds and how his works are to be read.

At this point, we are also able to fully appreciate what Aristotle means when, at the outset of *Sens.* 1, he invokes the methodological principle: “*first about what is first.*” Elsewhere Aristotle uses these words (or an equivalent expression) to remind us of how we should proceed within our study of animals.⁷⁵ But here, at the outset of his *Parva naturalia*, he uses this expression to indicate how we should proceed beyond his chosen research focus on animals. We need to study animals first because the best organized and most determinate perishable living beings are found among animals. When we have completed this task, we are ready to engage in the study of everything that has a share in perishable life. But we engage in this further project by relying on the results achieved in the study of animals. This methodological insight controls not only how Aristotle organizes his own agenda across the *Parva naturalia* (with an account of longevity and an account of youth and old age, life and death coming at the end of the whole project) but also how he proceeds within the essays contributing to this project. His account of youth and old age, life and death displays this strategy in an especially clear way.

At this point I answered the third question raised at the beginning of the chapter, namely how Aristotle goes about generating common explanations of animals and plants. It is time to turn to the fourth question, which is how far Aristotle is able, or willing, to carry out the project of a common study of animals and plants. Judging from what we read in the rest of *Juv.*, the answer can only be this: *not very far*. To begin with, Aristotle is willing to entertain the view that there must be a middle part in plants as there is one in blooded and bloodless animals. This view is implied by what we read in *Juv.* 1. If a living body is articulated into an upper and a lower part, this body must also have a part located midway between the other two. But what Aristotle says in *Juv.* 1 and 2 does not require him to posit the existence of a centralized vital organ in plants. There is no textual evidence that Aristotle is willing to ascribe such an organ to plants. His argument appears to be carefully crafted to avoid such

⁷⁵ Aristotle, *GA* II 4, 737b 25–27: “we must begin from the things that are first.” Aristotle, *PA* II 10, 655b28–29: “let us speak again, as it were from the beginning, first from the things that are first.” Finally, Aristotle invokes this rule of inquiry also in the *explicit* of the *PA* I as he is about to engage in his review of the body parts of animals (*PA* I 5, 646a4).

a conclusion. At the same time, he seems to be able to say that there is a middle part in plants just as there is one in animals. Aristotle goes on to state that plants, like animals, grow from the middle (*Juv.* 3).

This middle (the Greek is τὸ μέσον) is that which is formed first so that it can serve as the starting point for the growth of the other relevant body parts. This is what Aristotle seems to imply when he says that growth from a seed comes to pass for all perishable living beings from the middle.⁷⁶ He also invokes grafting and plant propagation by slips and cuttings as evidence for this claim. In these cases, the growth of a new plant takes place from an eye, which serves as the starting point and so the center of a new life.⁷⁷ Evidently, Aristotle thinks of plants as having potentially many centers of life in their living body as well as one actual center, the one that is midway between the upper and lower parts of the living body. When the text is read in this way, there is no longer an intolerable tension with what Aristotle says in his account of longevity, where he argues for the view that some plants live longer than all animals because they potentially have life everywhere.⁷⁸ Every eye in a plant can serve as the starting point for a new organism with its own upper and lower parts.⁷⁹ Finally, Aristotle establishes that life is contingent on the preservation of this inborn natural heat for all perishable living beings (*Juv.* 4). As perishable living beings progress in age, they become increasingly less able to maintain this vital heat; death comes to them when this heat is exhausted or extinguished (*Juv.* 5).

I will return to the thesis that plants and animals *qua* perishable living beings have some internal, natural heat.⁸⁰ But at this stage of my argument I only need to drive home the following point: important as it is, this thesis does not appear to constitute a sufficiently secure basis for launching into a common study of animals and plants. At the very least, Aristotle does not appear to think so. In fact, he goes on to underscore the existence of important differences separating animals from plants. When it comes to internal, natural heat, the most conspicuous difference is this: nourishment that plants take from the soil is enough to keep their internal, natural heat somehow constant; as a result, their life ends when the cold coming from the outside extinguishes their vital heat or when the supply of nourishment stops for some reason. By contrast, all animals need a natural mechanism to maintain the temperature of their body. We learn that for some animals

⁷⁶ Aristotle, *Juv.* 3, 468b18–19. The dative πᾶσι is slightly ambiguous. I understand it as referring to all [living beings].

⁷⁷ Aristotle, *Juv.* 3, 468b23–28. ⁷⁸ See Section 3.2.

⁷⁹ I owe this point to KOROBILI 2021: 155–158. ⁸⁰ Chapter 6, Section 4.

this natural mechanism entails taking in air to cool their bodies (*Juv.* 6). This observation prompts an extended discussion of the physiological significance of breathing.

This discussion takes up much of the second part of the treatise (*Juv.* 7–27 = *Resp.* 1–21). We do violence to the original train of thought when we isolate this discussion and (following a scholarly tradition that has no textual basis in the manuscript tradition) consider it a separate, relatively self-sufficient work.⁸¹ The link that exists in Aristotle's mind between breathing, vital heat, and the nutritive power of the soul makes it natural for him to discuss the function of breathing in the context of his treatment of growth and decline, life and death. Moreover, this link makes it natural for Aristotle to subordinate the discussion of breathing to the main goal of the essay, which is announced at the end of *Long.* 6 (and, if I am right, it is also repeated at the outset of *Juv.* 1): to offer an account of youth and old age, life and death.

5 Interim Conclusion

At this point we can draw a provisional conclusion. The epistemic principle mandating that we look for explanations at the right level of generality may be taken to imply that we start our inquiry into perishable living beings from what is common to animals and plants *qua* perishable living beings. But this is not how Aristotle proceeds in his actual investigation. As he moves away from his research into the soul and turns to the study of animals and everything that has a share in perishable life, Aristotle shows little or no interest in starting his investigation into perishable life from what is common to animals and plants. His preferred strategy is an oblique one. *Aristotle concentrates on the case of animals and, whenever it is possible and appropriate for him to do so, he derives a conclusion that holds for everything that has a share in perishable life.* What looks like an idiosyncratic, if not unprincipled, strategy is in fact a straightforward application of the epistemic principle that requires him to begin his study of perishable life from the more organized and more definite form of life (animals). Aristotle appears to build his whole science of perishable living beings starting from this principle.

⁸¹ This editorial practice goes back to Bekker, who is the first to add a separate numeration for the chapters devoted to the zoological significance of breathing. All the modern editors of the *Parva naturalia* have followed him.

In the end, however, there is not much that Aristotle is able to explain in common for both animals and plants. What we read outside the *Parva naturalia* confirms this impression. Let us consider, briefly, what we are told at the outset of *PA* II 10, where Aristotle negotiates the transition from the study of the uniform to the non-uniform body parts of animals. Here Aristotle argues that there are two parts that are most indispensable to animals. They are the part for taking in nourishment and the part for discharging useless residue as it is not possible to grow without nourishment.⁸² Since nutrition is common to all living beings, the part for taking in nourishment is found also in plants. This part coincides with their roots. So far there is nothing new; we have already seen that the roots in plants are functionally equivalent to the mouth in animals. This time, however, Aristotle goes a bit further. He makes it clear that plants do not have a part for eliminating useless residue. His reason for this claim is that plants take in concocted nutriment from the soil.⁸³ But this also means that plants do not have the part between the two most indispensable ones – namely, the part dedicated to receiving and processing unconcocted nourishment. This is in line with what Aristotle says in *PA* II 3, where he tells us that plants employ the soil and the heat in it *in lieu* of having a stomach to prepare their nourishment.⁸⁴

This stretch of text is interesting for us because Aristotle is engaged in the attempt to say something in common for both animals and plants. Both animals and plants, insofar as they are living beings, need nourishment to survive. Both actively maintain their own being by taking in nourishment. But while animals take in unconcocted nourishment, plants take in concocted nourishment. And yet there is not much else that Aristotle is able, or willing, to say on the topic of plants and animals *qua* perishable living beings.⁸⁵ This is confirmed by what Aristotle says immediately after our text:

⁸² Aristotle, *PA* II 10, 655b30–32. ⁸³ Aristotle, *PA* II 10, 656a32–35.

⁸⁴ Aristotle, *PA* II 3, 650a20–23. In this second passage, Aristotle goes on to say that almost all animals, and surely all those that engage in locomotion, have a stomach (κοιλία), which is equivalent to earth inside their body. In this case, the analogy is reversed. Instead of plants using the earth as their stomach, we read of animals having the equivalent of earth inside their bodies. With this reversal, Aristotle is able to make the following additional point: The blood vessels sink into the stomach like the roots into the earth. The concocted nourishment (blood) is taken from the stomach and distributed to the rest of the body through the blood vessels. There is no need to follow Aristotle's train of thought any further here. What matters is that all animals have one part for taking in nourishment – the mouth (στόμα) – and another dedicated to receiving and processing it – the stomach (κοιλία). While these two parts are different in different animals, they receive a single name. Theophrastus adopts these technical terms in *HP* I. See Chapter 4, Section 4.

⁸⁵ A similar point can be made in connection with the parallel passage taken from *PA* II 3 (650a2–31). I singled out the passage from the outset of *PA* II 10 because Aristotle draws the additional conclusion that plants must be treated separately.

The nature of plants, being stationary, does not have a variety of non-uniform parts, for the use of fewer organs is required for fewer activities. *This is why their visible aspect should be studied separately* [διὸ θεωρητέον καθ' αὐτὰ περὶ τῆς ἰδέας αὐτῶν].⁸⁶

Rather than building a bridge between the two relevant domains (animals and plants), this passage confirms their separation. For Aristotle, animals and plants do not appear to constitute a single investigative domain. Admittedly, he never says so explicitly, but he does not seem to be able to find explanatory starting points common to both animals and plants. These starting points alone could justify a unified treatment of animals and plants. Moreover, Aristotle shows no willingness to use the few basic truths that he has established in the context of the *Parva naturalia* as his starting points for a science of perishable living beings. And yet we would expect him to give more prominence to these findings if he were indeed trying to build a systematic study of perishable living beings out of what is common to animals and plants. In fact, these findings are relegated to the margins of the project of the *Parva naturalia*. They are also embedded in the study of animals. In the end, it looks like the only way for Aristotle to pursue a science of perishable living beings is (1) via separate studies of animals and plants and (2) starting from animals rather than from plants.

This conclusion is not a problem for us since we do not share the rather demanding conception of the scientific enterprise advocated by Aristotle in the *Posterior Analytics*. Today we are no longer committed to offering commensurately universal explanations: explanations that are as general as possible while at the same time they also remain sufficiently specific to capture salient articulations of the phenomenon under discussion. While we may still appreciate the value of establishing a truth as broadly as possible, we do not make scientific success depend on the application of this epistemic requirement. For instance, it is perfectly appropriate for us to focus on special cases of long-lived animals or on long-lived plants in order to discover the secret of their longevity. Aristotle would have found this approach unprincipled. If common explanations that apply to both animals and plants exist, failing to give them is not really an option for Aristotle. And yet we do not find explanations given in common for animals and plants outside the *Parva naturalia*.

⁸⁶ Aristotle, *PA* II 10, 656a2–4. This is equivalent to saying that the *morphology* of plants is to be studied separately. That plants are to be studied via study of their morphology becomes clear from what we read in *HP* I. I refer the reader to Chapter 4, Section 3.

More to the point: we do not find very many explanations of this kind even in the context of the *Parva naturalia*. But if we do not find very many explanations given in common for animals and plants, we must conclude that such explanations are the exception to the rule. This is an interesting result, and one that is worth underscoring at this stage of my overall argument. This result confirms that Aristotle conceives of the study of perishable living beings as consisting of two separate studies, namely a study of animals and a study of plants. It also suggests that this way of thinking about animals and plants poses serious limits to what can be said in common (or in general) by Aristotle on the topic of perishable living beings.