CHAPTER 1. Aristotle, Animal Boundaries, and the Logos of Nature

1.1. Away from the Stars: Animals' Common Nature

A distinctive, unannounced feature of the first book of Aristotle's *Parts of Animals* is the grand apology[1] that follows the presentation of the methodological criteria (*horoi*) to be reviewed in this chapter. Rather than a mere rhetorical tangent,[2] this apology has a foundational intent: it shows that Aristotle felt compelled to justify his interest in animals and the apparent new context of his inquiry. Why devise a method to study animals? To what end? And, at any rate, why not instead devote attention to other sublime specimens of beings? This apology is crucial for understanding not only Aristotle's general view on the animal world and its diversity, but also his awareness of the project's novelty.

> Among the substantial beings constituted by nature, some are ungenerated and imperishable throughout all eternity, while others partake of generation and perishing. Yet it has turned out that our studies of the former, though they are valuable and divine, are fewer for as regards both those things on the basis of which one would examine them and those things about them which we long to know, the perceptual phenomena are altogether few. We are, however, much better provided in relation to knowledge about the perishable plants and animals, because we live among them (*dia to syntrophon*). For anyone wishing to labour sufficiently can grasp many things about each kind. Each study has its attractions… Perishable things, however, take the prize in respect of understanding because we know more of them and we know them more fully. Further because they are nearer to us and more akin to our nature (*oikeiotera physis*), they provide a certain compensation compared with the philosophy concerned with divine things. Since we have completed stating the way things appear to us about the divine things, it remains to speak about animal nature, omitting nothing in our power, whether of lesser or greater esteem. For even in the study of animals disagreeable to perception, the nature that crafted them likewise provides extraordinary pleasures to those who are able to know their causes and are by nature philosophers. Surely it would be unreasonable, even absurd, for us to enjoy studying likenesses of animals—on the ground that we are at the same time studying the art, such as painting or sculpture, that made them—while *not* prizing even more the study of things constituted by nature, at least when we can behold their causes. For this reason we should not be childishly disgusted at the examination of the less valuable animals. For in all natural things there is something marvelous. Even as Heraclitus is said to have spoken to those strangers who wished to meet him but stopped as they were approaching when they saw him warming himself by the oven—he bade them to enter without fear, 'for there are gods here too'—so too one should approach research about each of the animals without disgust, since in every one there is something natural and beautiful (Arist. *PA* 1 644b23-645a25, with a slight modification)[3]

In considering animals on a large basis that encompasses in anonymity all living beings (*ta zōa*), here Aristotle is adopting the perspective of the earlier physicists: no special position is assigned to humans; they merely blend into the larger category of the living.

At the same time, however, as in Plato's cosmological account and in line with a belief held in the Academy,[4] stars and planets are considered members of the animal kingdom and endowed with a privileged status and biology.[5] The celestial animals are immortal and divine. In Plato's *Timaeus*, the body of the cosmos is spherical, and self-sufficient: its movement is limited to rotation, and it does not need to eat to exist. It is a perfect body, undifferentiated, without members or organs, and its activity coincides with that of the rational soul. And so are the bodies of the celestial animals.[6] In Aristotle's *On Heaven*, likewise, the sky, planets and stars are assigned divine bodies (*theia sōmata*) and are said to enjoy a happy life— to hold the best disposition (*aristē diathesis*), unblemished by the *dyskhereia*, "difficulty" that afflicts the mortals.[7] In their immortality and constitution, the celestial creatures are opposed to the animals of this earth that come into life, grow and perish, and are equipped with a body that is suitable and functional to these biological processes.[8] Thus the animal kingdom is articulated through a series of oppositions—high/low, heavenly/terrestrial, immortal/mortal and therefore divine/nondivine, worthy (*timios*)/unworthy (*atimos*)—where value is directly proportional to immortality and the degrees of approximation to it along with the respective animals' bodies and activities.

In the passage from *Parts of Animals* quoted above, however, while Aristotle maintains a hierarchy between higher and lower animals, he defines a field of inquiry that is circumscribed to the "less worthy," terrestrial animals, as opposed to the celestial ones, and, by extension, as we will consider in the next section, as hived off from the cosmological discourse that interested the Presocratics. Thus Aristotle reserved the discussion of the planets and stars for *On the Heaven* and deals separately with the other

animals, striving, in Moreau's words, "to transfer to the study of the living beings the feelings of admiration and the religious emotions which for his contemporaries were attached to the contemplations of the stars."[9] Rescued from an evaluative comparison with higher beings,[10] mortal animals now become relevant in themselves: their bodies and the lives they sustain morph into objects worthy of contemplation. This is possible because Aristotle introduces a new scale of value, that of knowability.[11] The animals of this world, recognizes our philosopher, can be known better than the celestial ones[12] and hence provide inconceivable joys to those who are able to know the causes of things and are philosophical by nature.[13]

Animals are (better) knowable on account of two distinct, interrelated factors: on the one hand, their physical proximity, and, on the other, their nature. We can study animals more fruitfully "on account of living together" (*dia to syntrophon*),[14] Aristotle states at one point, adopting an expression (*syntrophos*), which in the ancient sources applies to animals, whether from the same species or not, to indicate a "shared life." And along with coexistence, this expression implies a sense of familiarity and recognition. In *History of Animals*, for instance, while describing the character of the lion Aristotle remarks on the playfulness and affection the animal shows to "those reared with (*syntropha*) and familiar" to it.[15] But what makes animals knowable is also, and importantly, the possession of a nature that is more akin (*oikeiotera physis*) to that of humans.[16] This point is often neglected in commentaries on Aristotle, but it is interesting and is of the greatest importance, since, as we will soon see, it provides a legitimate basis for the study of animals in a comparative framework that forms the core of Aristotle's biological project. Animals are not only better known because they are accessible to

direct observation, which made Lennox remark that "this is one of the strongest assertions of the centrality of extensive perceptual experience in developing scientific understanding of nature."[17] Importantly, animals are also better known because they share with us their perceptual experience. In their mortal bodies—and by extension in the activities and lives sustained by their bodies—animals are more closely related to us than the celestial entities, which are isolated in their complete rationality, senseless bodies, and perfect movements in far regions around the sky. And this notion of kinship (*oikēiosis*), which Aristotle interjects here and which tacitly sustains his comparative study of animals, will be forcefully developed by Theophrastus, who, departing from his teacher, will turn it into a foundational reason to oppose animal sacrifice and meat-eating.

Despite its application to an ethical discourse, which in fact is irrelevant to Aristotle's zoology, Theophrastus' testimony— a fragment belonging to the treatise *On Piety* and reported by Porphyry in his *On Abstinence*— is worth reporting in full. For in concisely discussing the human/animal relatedness it helps us define retroactively the focus, framework, and methodological questions of Aristotle's biological inquiry while also supporting the integral role that the apology plays in *Part of Animals*.

> In this way, too, we class all humans as related (*syngeneis*) both to each other and to all animals. For their bodily origins (*arkhai*) are by nature the same. By this, I do not mean to refer to the primary elements, since plants are also made of these, but for example skin, flesh and the type of fluids that are natural to animals. And much more are they related through their souls being no different in nature, I mean in their appetites (*epithymiai*), anger (*orgai*), and again in their reasonings (*logismoi*) and above all in their senses (*aisthēseis*). But as with their bodies, some animals have souls more finely tuned, others less so, but they still all by nature have the same origins. And this is shown by their passions (*pathē*) being akin (*oikeiotēs*).[18]

An interplay of resonances connects Theophrastus' statement on the kinship between humans and the other animals with Aristotle's overall discussion in *Parts of Animals* and helps to illuminate the basis for animals' "more familiar nature" (*oikeiotera physis*). First, there is an emphasis on parts and their composition. Like Aristotle, so Theophrastus

acknowledges the presence of different orders of compositions (*synthesis*), forming animal bodies from the basic elements (*arkhai*) to the different organic parts, and he further alludes to the peculiar status of plants, which are composed of the same elements as the animals, but have less differentiated bodies than animals do: plants too are considered "living beings," but ones deprived of sensation.[19] We will return to these aspects of Aristotle's treatment later in the chapter. Second, and more importantly, in Theophrastus' passage kinship between humans and animals is predicated on the basis of their sharing the same soul, intended as the source of desires (*epithymiai*) and of a diverse range of affections. Theophrastus mentions anger (*orgai*) and in general passions (*pathē*), but emphasizes, above all, sensations (*aisthēsis*). Humans are kin to the animals of this earth because unlike plants— or, we could add, the celestial animals— they are living beings that feel. They are made of the same basic flesh-stuff and share "in the perceptive powers to which this flesh is heir."[20] Thus, approaching the apology of *Parts of Animals*, and the treatise at large, from this particular angle, it is plausible to understand in Aristotle's acknowledgment of animals' *oikeiotera physis* his very definition of animals as sentient beings. In other words, the animals of this planet have a nature more akin to us than the celestial animals do because they are made of the same stuff and, like us, they feel.[21] And if the capacity to feel, in one or multiple ways, is what all animals share[22] and what, in fact, defines them and grants legitimacy to a study of them in their plurality, then at bottom it is imperative to consider Aristotle's project in *Parts of Animals*, along with the other zoological treatises—despite their intrinsic specificities and individual goals—an exploration of the common nature of animals, humans included, and a forceful affirmation of the unity of all forms of (sentient) life.[23] Significantly, this aspect of

Aristotle's inquiry finds a theoretical counterpart in *On the Soul*, which will be discussed extensively in chapter 2. Here let it suffice to mention that in this treatise Aristotle proposes to find the most common (*koinotatos*) definition of the soul,[24] namely one that can be applied to all living things and beings (*zōnta/zōa*). To this effect he devises a tiered model of the soul, whose basic part—the nutritive one—is shared by all forms all life enabling them to perform the same essential functions such as nutrition, growth and reproduction.[25] Indeed it is by sharing the same soul that trees, oxen and humans are all able to be alive, to reproduce and nourish themselves, to grow and decay. In contrast to plants however the animals (*zōa*), humans included, also possess besides the nutritive soul the sensitive one, which enables them all to perceive despite the specificity of their physical conformation.[26] Thus those activities that animals share with plants via the nutritive soul, namely nutrition and reproduction, are accompanied by sensation, desire, pleasure and pain, in a way that distinguishes them fundamentally from the vegetal world.

1.2. The Centrality of Sensation, Reason, and the Articulation of the Common

Animals for Aristotle are sentient beings, all of them, with no exclusion. This definition returns over and over in *Parts of Animals*, almost with the force of an axiom, and is anchored in the cardio-centric model—or its organic equivalent in bloodless animals— that sustains animal physiology.[27] "An animal is defined," writes Aristotle—, "by the fact that it possesses sensation: and the part of the body to have sensation first is the part that has blood in it first—in other words, the heart, which is the source of the blood and the first part to have it."[28] The heart is the first sentient part of animals' bodies.

In fact, it is an animal in itself, and the site of the soul.[29] In *On the Generation of Animals* it appears as the part that gives life to the embryo and makes it grow,[30] from which we understand its overall primacy in animal physiology. But, while present first of all in the heart, sensation permeates animals' bodies. It takes place in the uniform parts that constitute them and that Aristotle distinguishes, in a first, basic examination of animal constitution, from the nonuniform ones, which are, by contrast, instrumental.[31] All animals share at least one sense, that of touch, which for the blooded animals resides in the flesh and for the bloodless ones in its equivalent.[32] Thus, on account of their constitutions, animals are intrinsically sentient, and sensation is coextensive with the very fabric of their bodies and, ultimately, with their lives.[33]

The centrality of sensation in the definition of animals has an ideological/methodological consequence, which Aristotle addresses extensively in the course of his discourse on method in *Parts of Animals* and which contributes to the new basis of his study vis-à-vis that of his predecessors. Aristotle situates himself against Democritus, who claimed that man and by extension all other animals could be defined by their shapes (*skhēma*), consisting ultimately in the arrangements of the bodily parts, and by their colors (*khrōma*).[34] Aristotle criticizes this position by advocating strongly an identity of bodily parts, and ultimately the body itself, on the one side, and bodily parts' functions, and the body's function, on the other, so that—as he claims in respect to the human animal—a hand made of bronze, and therefore incapable to "act," is only nominally a hand; it is not a real one.[35] And so it goes for the other animals as well: they cannot be identified merely in terms of their inert shapes, or parts, which must, instead, be considered in relation to their specific activities (*erga*), therefore in movement and in

the context of life. This "*ergon* argument," as scholars have called it, is central[36] in Aristotle's study of animals, and it is significant not only as a pillar of Aristotle's teleological system and explanatory intent,[37] but also because it constructs a discourse on animals that centers on their being sentient and alive—each one of them in the specificity of its constitution and shape— and, by extension, on their actions in the external world. So in *Parts of Animals,* one after the other, the parts of animals' bodies are cast into their "vital" activities and reviewed systematically from the inside to the outside of the body, from the high and the low along a vertical axis provided by the body of man, but also intersecting, at the same time, the nutritive apparatus that is essential for any living being to exist.[38] "Everything that grows must of necessity take food," states Aristotle.[39] Whether intrinsic to each animal species or adapted, working under conditional necessity or not,[40] each animal part sustains and contributes to the life of a living being, from the crucial business of the heart—or its equivalent in bloodless animals—as the prime mover, the blood and heat producer, and the original site for sensation to the brain, whose cooling, counterbalancing effect provides "safety" (*sōteria*) to the entire body.[41] In Aristotle's biology, teleology, as Johnson has argued, is immanent,[42] and each living being is conceived in the tension and effort of being alive.[43]

That animals must be regarded as living, sentient beings calls for a fundamental feature of Aristotle's zoology, the inclusion of the study of the soul. One of the aporetic alternatives leading to the establishment of the methodological boundaries of Aristotle's inquiry on animals is in fact whether the natural philosopher should consider the soul in its entirety or only some parts of it.

In view of what was said just now, one might puzzle over whether it is up to natural science to speak about *all* soul, or some part…However, it is not the case that all soul is an origin of change, *kinēsis,* nor all its parts; rather, of growth, *auxēsis*, the origin is the part which is present even in plants; of alteration,

alloiōsis, the perceptive part, *to aesthētikon,* and of locomotion, *phora*, some other part, and not the rational *to noētikon*; for locomotion is present in other animals too, but thought, *dianoia,* in none. So it is clear that one should not speak of all soul; for not all of the soul is a nature, but some part of it, one part or even more.[44]

Although it is still a principle of life and, as such, shared by all living beings, just as it was for the Presocratics, the soul lacks the homogeneity for Aristotle that it had for his predecessors.[45] Instead, in line with the Platonic version, which is expounded in the *Timaeus* and other dialogues, the soul is a composite entity[46] whose discrete parts coincide with specific faculties of the living being: growth, sensation, locomotion, and thought. The soul is the source (*arkhē*) of these activities, which, in turn, constitute psychological powers (*dynameis*).[47] Yet not all parts of the soul are relevant to the study of animals, but only those that make creatures "move," where movement (*kinēsis*) is intended as the key phenomenon of nature[48] and in an array of manifestations. Indeed, movement (*kinēsis*) for Aristotle encompasses a range of changes that systematizes his predecessors' reflections on animals, subsuming under the same metaphenomenon a diversity of affections, from physical growth, or conversely decay,[49] to the bodily alteration that accompanies the phenomenon of sensations to the specific ability to move from one place to another.[50] Related to the parts of the soul, which are responsible for them, these changes call for a consideration of the nutritive (*threptikon*), sensitive (*aisthētikon*), and locomotive soul. By contrast, Aristotle excludes from the study of animals the soul's intellectual part (*noētikon*), whose function is thought (*dianoia*)[51] and unrelated to physical, bodily movement.[52] Indeed, *dianoia* is distinctive of only one animal species, the human.[53] The rational soul, with *dianoia* and its other faculties (such as the exercise of reason (*logos*) through speech, and calculation (*logismos*)), is exiled from a project, and a field, that aims at discussing animals in terms of their filiation from

nature and their intrinsic power to move in whatever form they possess it (growth and decay, sensation, and locomotion). True, as we will soon see, in this project reason may still appear as an attribute of the human animal,[54] but it does not constitute for Aristotle a proper object of zoology.

At the same time, while Aristotle decentralizes and exiles reason, he also marginalizes the human being, thereby departing from Plato too. For the exile of reason from his method releases reason from being the absolute standard against which to account for animals as Plato does in *Timaeus*.[55] Aristotle's animals are not seen—at least not from his methodological point of view as presented in *PA* 1—in terms of their progressively degrading distance from the sublimity of the human being, the only creature endowed with reason, nor do animals carry on their bodily shapes the visible marks of that distance, from birds to fishes through quadrupeds, each kind more and more removed from mortal perfection. It is true that the long excursus on animals' kinds in book 4 of *Parts of Animals* echoes *Timaeus*.[56] In the wake of Plato, Aristotle presents the human being as the only one among the animals who stands upright on account of his divine nature and essence (*physis kai ousia theia*) along with the power of reason these features equip him with. Indeed, Aristotle claims, the "work" of what is divine is to think and be intelligent (*noein kai phronein*); the human being is the only living being empowered to do so and a downward posture would hinder him in this capacity.[57] Likewise, in the same passage, Aristotle proceeds to compare blooded (nonhuman) animals to man, defining them notoriously as "dwarf-like" (*nanōdes*), and ultimately connects bodily structure and locomotion to intelligence.[58]

> The bird and the fish kind, and every blooded kind are, as has been said, dwarf-like, *nanōdes*. And because of this all animals are less intelligent, *aphronestera,* than human beings.[59]

But the terms of Aristotle's discussion are descriptive, not evaluative.[60] The attribute "dwarf-like," as he explains, indicates a specific proportion of a body in which the upper part is bigger than the lower part.[61] In human adults (alone) the two are proportionate. While *Timaeus* makes the failing of reason in men's lives the key for understanding animals' degenerate embodiments and progressively witless nature, Aristotle explains animals' body (at first that of quadrupeds, and subsequently that of the other land animals, including plants) in terms of "physical" constitution.[62] That is, the cause of animals' posture and difference in limb number (compared to the upright, biped human being) lies in the synergy of the heat and earthy material that composes their bodies and not in their lack of reason.[63] And it is because of their weighed-down body structure that all blooded animals are indeed "less intelligent" than human beings. Thus, in contrast to Plato's account, for Aristotle animals' growth (conceived of in terms of "spatial" orientation) and capacity to move across space take center stage, while their removal from (or lack of) reason become an attribute referred to, and explained through, their body constitution.[64] In line with Plato, reason instead remains central in explaining teleologically the upright position of the human being (and its bipedness),[65] but emblematically loses the centrality it had in Plato's consideration of the nonhuman animals.[66] In sum, in this excursus on animals' kinds influenced by *Timaeus*, Aristotle remains faithful to his discourse on method in book 1, where he voices the plurality of the soul and claims to privilege in his study those parts which make animals' "move,"[67] to the exclusion of the rational part.[68] True, mind and intelligence still enter Aristotle's discussion, as in *PA* 4, where they characterize the human being and are "negative attributes" of nonhuman animals. But, as Aristotle has prescribed in his discourse of

method, they are not the proper object of his study and remain rather marginal and tangential to a treatment that focuses on animals as creatures of nature that have in themselves the origin of movement and rest and that are defined by the power of sensation and their empowerment to live.

The human body may well offer a roadmap to follow in the treatment of animal parts,[69] namely an analytical itinerary that goes from the head down, but, as Lennox has shown, this does not happen because man is taken as a model. Of the three factors that Aristotle invokes to explain this methodological preference—human organic complexity and consequent good life (*eu zēn*); familiarity; and the matching of the order of the parts in the human body with the natural order[70]—one, in particular, stands out: the familiarity of the human body. Indeed, this will be the only reason adduced in *On the History of Animals* to justify a treatment of the animals' bodily parts according with the vertical axis provided by the human body.[71]

> And first, we should consider the parts of the human body. Every community reckons its currency in relation to that most familiar to itself, and we must do the same in other situations –and mankind is of necessity the most familiar of animals to us. (*HA* 1, 6 491a20-23, transl. by A. L. Peck, with slight modifications)

This discourse, which equates the use of the human body to that of a community currency, betrays on Aristotle's part the awareness of the relativity of a method of inquiry that cannot avoid being partly self-referential in order to acquire knowledge of other life-forms that are less known because less familiar to us. And that the goal of this method lies outside the human animal itself, even though it is the point of departure, becomes evident if we consider the outset of *Physics*, where Aristotle anchors the inquiry into nature to the search of the first principles (*arkhai*) and recommends an inquisitive path that starts "from the things which are more knowable and obvious to us toward those that

are clearer and more knowable by nature."[72] Used as a heuristic tool, the human animal with its body does not take central stage in Aristotle's discussion and only appears in relation to its idiosyncratic uniqueness. For instance, in *Parts of Animals* the human animal is the one that blinks more often than the other animals with two eyelids, and it is the only one that has eyelashes on the two lids; it also possesses the hairiest heads and the softest tongues. The examples could continue [73] showing the coherence of a methodological principle that Lennox has forcefully argued for when discussing Aristotle's philosophy of biology. Lennox writes:

> Parts should be predicated of the widest kind that possesses them, and explained at the same level: and the corollary of this principle, features should be explained at a narrower level of extension only when they are distinctive of kinds of narrower extension. Thus humans are mentioned specifically only when they have a feature which distinguishes them from the various other kinds that Aristotle is discussing.[74]

In sum, the human animal is mentioned for what distinguishes it in terms of its body, and eventually physiology.[75] And if the reference to its exclusive intellectual faculties (*to noein* and *to phronein*) explains teleologically its body structure in Plato-style,[76] it is legitimated by the narrower level of extension of a part of its body. For the human animal is the only one among living beings to possess hands.[77]

While their presumed deficiency of reason is not relevant in Aristotle's overall study, animals are seen in their full, "kind-specific" aptness to live.[78] Those parts of the soul that for Plato explained animals' degradation in the absence and failing of reason are now invoked, in a different formulation and order,[79] to explain different forms of life, in a sequence of living beings, distinct from the scale addressed in the discussion above,[80] and going, in this case, from plants to stationary animals to the other animals that are endowed with "traveling movement" (*kinēsis poreuomenē*), humans included. "An animal can neither exist nor grow without food," states Aristotle in *Parts of Animals*

letting us soon after understand that, inasmuch as they take in food and grow, plants are also living beings (*zōnta*), but not fully animals (*zōa*).[81] Without sensitive part, the nutritive soul alone is insufficient to grant a living being the status of animal.[82] Here too, in denying that plants are animals, Aristotle moves away from the Presocratic conception.[83]

Further, the inclusion of the consideration of the locomotive soul in his discourse on method seems directed toward comprehending the animal world by differentiating those living beings that can feel and move, first, from those that merely feel but are stationary (*monima*), and then further defining—albeit "horizontally"—the scale of nature.[84] For when considered in relation to the conformation of animal bodies, the power of locomotion explains animals' specific ways of moving across space, from flying to walking and crawling to swimming, and allows the identification of distinct animal types whose difference is articulated around modes of movement that are intrinsic to their being.

With all sharing the nutritive and sensitive souls, and with some also possessing the locomotive one, animals are for Aristotle ensouled bodies. On these premises, his method is based on inclusiveness rather than exclusiveness, of which the comparative anatomy exposed in *Parts of Animals* is only the most visible result. The first aporetic dilemma with which Aristotle starts his discourse on method, and the dilemma whose resolution sustains the plan not only of *Parts of Animals* itself but also, tacitly, of *History of Animals*, *On the Soul*, and *Parva Naturalia*,[85] is whether to address animals species by species or by those phenomena that happen in common (*ta koinēi symbebēkota*) to different groups of animals. This is a problematic point to which Aristotle returns several

times in the course of his treatise on method, refining it and making it the first, fundamental boundary (*horos*) of his inquiry.

> Should we take each single species severally by turn (such as man or Lion, or Ox, or whatever it may be) and define what we have to say about it, in and by itself? Or should we first establish as our basis the attributes that are common to all of them because of some common character, *ta koinēi symbebēkota,* which they possess?—there being many attributes which are identical though they occur in many groups which differ among themselves, e.g. sleep, respiration, growth, decay, death, together with those other remaining affections, *pathē,* and conditions, *diatheseis*, which are of a similar kind. (*PA* 1 639a16-23)[86]

The solution to this dilemma arrives later in the treatise, once Aristotle has laid out another methodological boundary, that which gravitates around division (*diairesis*)[87] and which consists in a strategy to identify animal species based on the simultaneous embodiment of multiple differences against Plato's adoption of simple dichotomy.[88] In the end Aristotle opts for the common attributes (*ta koinēi symbebēkota*).[89] As Stenzel pointed out, Speusippus also had adopted a method based on "*koinēi*" and considered both animals and plants in terms of similarities, an aspect of the inquiry which Aristotle accepts,[90] although from *Posterior Analytics* it is clear that he distances himself from Speusippus' epistemological holism,[91] which was probably also at the core of his discussion of life's forms in the treatise *Likes*. In *Parts of Animals* Aristotle articulates the common traits in terms of degree (*kata genos*) and by analogy (*kat' analogian*), thereby fathoming animals' commonality (*to koinon*), both within kinds and across kinds, while he addresses the traits of species that are one of a kind, like that of man, as "specific" (*kat' eidos*).[92] For instance, individual species of birds differ in terms of the qualities of their parts, by "the more and the less": a crane has bigger, and likely tougher, wings than a sparrow, but both species still have wings. As for the common attributes across kinds, a man's bone corresponds to the spine of a fish. On the other hand, the fact of walking erect is an attribute peculiar and unique to the human species (*kat' eidos*).

It is in the context of the delineation of animal kinds[93] that Aristotle refers explicitly to a common nature (*physis koinē*) making it the condition for a species' membership to the same kind and for a consideration of animals' parts according to "the more and the less." In this respect, through an analysis of relevant passages in *History of Animals*, Charles has shown that "the idea of a *common nature* rests on the thought of one organized collection of methods of moving, reproducing, feeding and breathing";[94] consequently, the sharing of similar bodily parts, like the bigger or smaller wings of birds mentioned in *Parts of Animals*, involves a larger spectrum of shared features that include not only the morphology and physiology, but also the social habits—such as feeding— of those animals that share a common nature. Yet importantly, for Aristotle, a sort of commonality also exists across animals' kinds, and in this we clearly face an influence of Empedocles' approach to living beings as expressed in frag. 82: "Hairs and leaves and the dense feathers on birds are the same and the scales on stout limbs."[95] This type of commonality is more remote than the one embodied by the creatures that share a common nature (*koinē physis*), but it is still compelling and pervasive and consists in analogies, like the one relating a man's bone to a fish's spine or the roots of a plant to the head of a human being.[96]

In fact, being receptive to this pivotal feature of Aristotle's method—namely the search for, and focus on, what is common among animals—helps us avoid the risk of anachronism, which so often and for so long, as Pellegrin has pointed out, has tinted the exegesis of Aristotle's biological studies and in particular his evaluation on the basis of a classificatory intent.[97] In respect to this feature too—the exploration of the common— it becomes evident that Aristotle did not intend to formulate a classification of animals, but

that division among animal kinds and species was applied, at least on one level of his inquiry, in order to bridge it, letting transpire the articulation of animal commonalities via differences. Taken in this way, then, in Aristotle the systematization of animals could not be complete, nor rigidly "monovalent," as if laid out by modern standards.[98] For it was not meant to be so. Rather, in Aristotle classification became a flexible strategy for finding common grounds among living beings, while avoiding repetitions. In *PA* 1, however, Aristotle distinguishes between his discourse on method turning around *ta koinēi* and an ontological discourse in which each animal species has its own, irreducible *ousia*, a discourse to which he remains in principle faithful despite the methodological choice. For at the end, when reviewing the aporia between treating animals species by species or according to common traits, Aristotle admits that

> it would be best, if one could do, to study separately the things that are particular and undivided in form—just as one studies mankind, so too bird; for this kind has forms. But the study would be of any one of the indivisible birds, e.g. sparrow or crane or something of this sort (*PA* 1 644a30-34, transl. by J. Lennox)

Aristotle here voices a tension that remains unresolved.[99] For he admits that, in a discourse on animals situated "outside" the constraints required by method, animals should be considered in their ontological specificity. The animal world is fundamentally plural: each sparrow and crane, and likewise every living being, independently of membership to a larger group, has an ontological reality, just as man does.[100]

This decision to discuss what is common among animals (*ta koinēi*) initiates in de-anthropocentric terms a systematic exploration of that "more kin nature" (*oikeiotera physis*) which, we saw earlier, Aristotle presents in his apology as an incentive to devote his attention to the mortal animals of this earth and value their study. Yet the overall perspective presented in the foundational discourse of *Parts of Animals*, from the

emphasis on sensation and the exile of reason to the focus on different modes of "the common" (*to koinon*) that connects animals' lives, displaces the human animal from a central, self-referential position. Overall, as it will be argued in the final part of this chapter and at various intersections of this book, Aristotle's focus is zoocentric, not anthropocentric.

An extreme example of this perspective framing Aristotle's approach is his presentation of the beak of birds within a wider treatment of the lips in blooded animals, worth mentioning at this point.

> For in the birds, as we said, for nourishment and strength their beak is bony. It has been joined together into one, in place of teeth and lips, just as if someone who had removed the lips from a human being were both to fuse the upper teeth together, and separately the lower teeth, and then were to draw them both out to a point; in fact this would be already a bird-like beak. (Arist. *PA* 2 659b20-27, transl. by J. G. Lennox)

In order to reveal the nature of a bird's beak, and the analogy that connects it to human teeth and mouth taken together, in this passage Aristotle asks his readers to envision an experiment of bodily manipulation where a human being loses his soft, flexible lips and find his teeth, both the upper and lower ones, respectively welded forward. In this living being two parts of the human body are exchanged for another that characterizes, instead, a different kind of animal forcing, at least hypothetically, the new human so manipulated to embrace a physical difference and therefore be different. Thus Aristotle asks his readers to conceive a human being that, in respect to nutrition, "interaction," and language articulation, feeds and feels—for, in the context of animals, feeding is a form of feeling—and acts like a bird, endowed as he is with a beak that allows him to eat in a certain way and defend himself, but not to speak to the degree of articulation humans naturally do. Certainly, the primary force of this example in Aristotle's discourse is explanatory and works at the level of morphology and function, illuminating a common

trait of animals' bodies by analogy (*kat' analogian*) and showing, in this case, the relation between human teeth and lips, on the one side, and a bird's beak, on the other. In other words, with this example Aristotle explores the potentialities of a differently composed body without raising the question of subjectivity. There is no allusion, for instance, to what it means for a living being as such, endowed with the rational soul, to be constrained in a physical form that does not allow him or her to fully express him- or herself via articulate speech, a tragic mismatch that will be at the core of many stories of metamorphosis from Homer on.[101] Nor, conversely, is there any allusion to what it means for a bird to feel like a bird beyond the range of activities allowed by a beak. Yet this example is also emblematic of Aristotle's overall unbiased, classless perspective on animals, predicated in *PA* 1 and open to understanding them through the interplay of commonalities and differences. Ultimately, in Aristotle's biological treatises, under the comparative method—which he so strongly advocates and follows—and in light of the first basic common trait connecting all animals, namely sensation, the human animal becomes one of the many, despite its erect posture, superior intelligence, and portable divinity; the last two qualifications are in fact irrelevant in a study of nature. Like some other creatures that feature specific traits,[102] man too has a few idiosyncrasies. In the course of *Parts of Animals* and elsewhere, Aristotle discusses these idiosyncrasies to follow soon again the track of "the common" (*to koinon*), which he articulates via degree (*kata genos*) and via analogy (*kat' analogian*) and on the basis of which the points of contact among animals, in respect to morphology, physiology, and life, become manifest.

1.3. A New Beginning

In line with the Presocratic tradition, Aristotle considers animals in the context of the inquiry about nature (*peri physeōs historia*).[103] But for him, as Pellegrin has remarked, nature has lost the grand scope it had in the past; it is not a total science anymore. The list of areas constituting its realm, mentioned at the beginning of the *Meterologics* and culminating with the treatment of animals and plants, indicates this circumscription clearly. Aristotle's inquiry on nature extends from the principles of the natural beings and a theory of natural movement discussed in the *Physics* to the consideration of the ultimate components of matter and their transmutation of the *On Generation and Corruption* and of the celestial movements of *On Heaven*,[104] but much is now excluded: the immobile being, all that concerns human deliberation, the ethical and political domains, and the technical activities and mathematics.[105] This reduction of the natural realm, significantly, is accompanied in Aristotle by a radical change of perspective. So far for the Presocratics, the inquiry into nature aimed at retracing the process of formation of the cosmos from the very beginning up to the present. Even Plato in the *Timaeus* adhered to this chronological model, despite the subversive introduction of a managing demiurge. To know the origin (*arkhē*), which was tracked down to the primordial matter and the process of becoming it underwent, meant to know the true nature of something whether the object under inquiry was the world or one of the creatures that inhabited it. In this respect, as Kahn has remarked,

> *physis* can denote the true nature of a thing, while maintaining its etymological sense of "the primary source or process" from which the thing has come to be. "Nature" and "origin" are combined in one and the same idea.[106]

The Presocratic inquiry unfolded as a history of nature that advanced without a preordained design, and therefore under the overall influence of chance (*tykhē*), but not without rules. Each theory, included channeling "forces" and devices that granted

structure and harmony—and therewith an explanatory basis—to the organization of the primordial matter into physical entities, big and small, animate and inanimate. While embracing chance (*tykhē*), the Presocratics still accounted for an orderly history, balanced changes, and a present harmony. In its unpredictability nature proceeded systematically. Everything in its history happened for a rational, somehow intrinsic reason wherever this was situated, whether in the combination of Empedocles' four elements under the synergy of Love and Strife, or the "law of attraction" among similars effecting the aggregation of Democritus' atoms, or the separation of the elements in Anaxagoras under the rule of Mind,[107] or, again, in the physical changes of air by rarefaction and condensation supporting Diogenes' cosmology.[108] And the theoretical principles that guided the conception of the universe were consistently adopted to account for that of its creatures:[109] a homology of treatment that reveals the homology intrinsic in nature and its processes, and the pervasive unity of its embodied manifestations. Ultimately, physiology and, in particular, embryology were used to counterbalance the influence of chance and to explain the continuity of animal species and the preservation of the genders.[110] Yet all along the focus remained on an open-ended process—one dictated by explainable mechanisms, it is true, but one whose direction developed step by step along with nature, not in any preordained way that aimed at a definite goal. This implied for the rise of living beings not a few mishaps along the way, like the diversely shaped zoogonies of Empedocles, aborted attempts to live by creatures unable to survive.[111] And for cosmology at large, it entailed the collapse of this world, literally and also, so to speak, ideologically. Empedocles' cosmology contemplated different stages of the world, from the complete unity of the elements in the *Sphairos* under the tyranny of Love to their

ultimate disaggregation under the regime of Strife, while Democritus envisioned the presence of alternative, coexisting worlds and featuring exclusive ecosystems, with the inherent likelihood that ours might not be the best after all.

Aristotle breaks with this approach to natural philosophy, dramatically. The order of the universe is now eternal and ingenerated.[112] As Kahn has remarked, "The traditional attempt to construct it [the order of the universe] from a hypothetical starting point (*arkhē*) is systematically rejected in favor of a new kind of *arkhai*, the 'fundamental principles' into which cosmic movement and change are to be resolved."[113] Aristotle's *Physics* presents a discourse on method based on principles (*arkhai*), causes (*aitiai*), and elements (*stoikheia*) that dissolves the chronological trajectory of the earlier students of nature (*physiologoi*) into a set of heuristic tools for understanding its processes. As for the Presocratics, so in Aristotle nature is intrinsically connected with change. Notoriously, in *Physics* he claims that all "beings by nature" are those that contain in themselves the origin of movement (*arkhē kinēseōs*) and rest (*stasis*); he lists among them "animals and their parts, plants and those bodies that are simple, like, for instance, earth, fire, air and water."[114] Displaced from a cosmological discourse where it indicated a "hypothetical starting point," and along with it the original matter,[115] now the *arkhē* is anchored in each being that exists by nature. Each natural being is, by definition, the source of its own "movement" (*kinēsis*) and it is on the exploration of this exclusive relation that, breaking new ground, Aristotle focuses as an aspect of his inquiry on nature, thereby giving rise to his study of animals.[116] No longer considered in relation to the cosmos and its origin, now animals deserve attention in themselves, as autonomous, self-sufficient beings that carry in themselves the origin of their movement. It is significant

that in the very passage of *Physics* where he defines "beings that are by nature" Aristotle introduces the same range of movements (*kinēsis*) that he mentions in *Parts of Animals*:[117] locomotion, growth (*auxēsis*) and, conversely, decay (*phthisis*) and alteration (*alloiōsis*).[118] But while in *Physics* he introduces these movements to illuminate the membership and filiation of specific beings—elements, animals and their parts, plants—from nature, in *Parts of Animals* he refers to them in the context of discussing what parts of the soul the natural philosopher has to take into consideration, whether all parts or only those responsible for such movements. In treating movement as the common denominator of related subjects—nature, the animals, the soul—this cross-reference traces Aristotle's inquisitive itinerary and underscores, in particular, his stance on subsuming the study of (parts of) the soul into that of animals,[119] a feature that was addressed earlier in this chapter, while, at the same time, he forcefully places animals along with their psychological aspects as elements of inquiry in the realm of nature.[120]

1.4. Animals, Tykhē, and the Logos of Nature

In fact, animals enjoy a privileged relation with nature. "The animal is the natural (physical) being par excellence," writes Pellegrin,[121] but not only because, as we saw before, "in them nature as the internal principle of change manifests itself to the highest degree." It is also, and fundamentally, because, in being goal-oriented, the change they undergo emblematically represents nature's own "original" proceeding, which is always directed toward an end and never happens at random.[122] Aristotle radically displaces chance (*tykhē*) from animals as works of nature and in so doing severs a fundamental tie that defined it for the Presocratics. In *Physics* where he discusses the possibility of

whether *tykhē* could be a cause of natural phenomena and realities, he denies it on the basis that what happens regularly and normally cannot be due to chance, which is responsible, instead, for extemporary and unpredictable results. If in a given animal teeth always grow in the same way and are arranged so that the front teeth are sharp and the molars broad, the first ones fitted to bite the food, the others to grind it, this cannot be the product of chance, but reflects the finality inherent in nature.[123] In fact, interestingly, in *Physics* Aristotle even redefines the field of *tykhē* and makes it pertain to the sphere of moral choice (*proairēsis*) and therefore applicable only to humans, not to animals, whose actions with fortuitous outcomes fall, instead, under spontaneity (*to automaton*).[124] At any rate, his disavowal of chance in the works of nature unfolds as a critique of Empedocles, on two fronts. On the one side, Aristotle criticizes the random combination of parts that characterized Empedocles' zoogonies and, by extension, his flora—Aristotle mentions, in particular, "the men-headed ox-progeny" and "the olive-headed vines' progeny"—and, on the other, he rejects the idea that entire parts or whole-natured (*oulophyeis*) living beings were born first, as abrupt, already-formed creatures, completely disconnected from a process of formation.[125] For Aristotle, instead, exercising philological authority, "seeds must have come into being first and not straightaway animals: the words 'whole-natured first' (*oulophyeis*) must have meant seeds."[126] And as he breaks down animals and their parts to the original seeds from which each living being ultimately derives via a process of growth,[127] Aristotle also traces a natural development that is orderly and unidirectional. "For those things are natural which, by a continuous movement originated from an internal principle arrive at some completion: the same completion is not reached from every principle; nor any chance completion, but always

the tendency in each is towards the same end, if there is no impediment."[128] Thus organic development follows a precise, uninterrupted itinerary, step after step.

The completion toward which, as subjects of natural generation (*genesis physikē*), animals develop, coincides with their essence (*ousia*), a notion that was regularly absent in the reflections of the Presocratics, as Aristotle recognizes in the brief historical outline presented in *Parts of Animals*.[129] And while this type of movement from *arkhē* to *telos* partially overlaps and intersects with those types that are identified at work in the domain of nature at large and are functions of the soul—*auxēsis* and *phthisis, alloiōsis*, locomotion—[130] it has profound ontological and gnoseological import. If each living being follows a biological trajectory from birth to completion (*telos*) in an orderly, systematic way,[131] it is only when reaching the stage of completion, its *telos*, that, endowed of a full-blown body made of its requisite parts, any animal lives to the fullest of its capacities in accordance with the functions of the soul that are proper to it. Only at this stage, then, does an animal fulfill its nature and perfectly fit its definition (*logos*). In this perspective, which is at the foundation of Aristotle's inquiry on animals as beings by nature and an interface between ontology and biology, form (*morphē*) and end (*telos*) coincide, and represent the very nature of a living individual, as Aristotle[132] clarifies in the *Protrepticus*:

> The end conformed to nature, *physis*, is what is reached as last in the process of becoming when this develops with continuity until completion.[133]

Aristotle bases this innovative perspective identifying form and end, and both of them with nature (*physis*) on a major critique of the Presocratics, which leads in *Parts of Animals* to the establishment of two more interconnected methodological boundaries.[134] One addresses which natural cause (*aitia*) is to be considered prior, among the others, in

his inquiry on animals, and the other discusses whether to follow the process of animals' development or, instead, its final result.[135] Causes (*aitiai*) are for Aristotle pillars of knowledge, and to understand fully an organism's biological trajectory from beginning to completion requires an aetiological discussion. In nature there are four causes—material, efficient, formal, and final—and these constitute complementary modalities in which nature "produces" living beings and which are, in turn, facets of their identity.[136] In trying to discover "the material principle (*hylikē arkhē*) and such a cause (*aitia*)" for Aristotle the Presocratics reduced all their study of nature to an account of matter and its mechanisms.[137] For them animals and plants were seen in relation to their formation under the working of matter: air, for instance, opens up the respiratory channels, while water carves the body's interior receptacles for food and liquids. By contrast, in Aristotle's study of nature, matter (*hylē*) is still relevant inasmuch as physical reality is coextensive with bodies[138] and the constitution of bodies requires diversified material,[139] but it becomes secondary. Indeed, form (*morphē*) and essence (*eidos*) are more congruent with nature than matter is. For, as Aristotle explains in *Physics*, "nature is rather form than matter because every reality is said nature when it is in actuality more than when it is in potentiality."[140] In his view, then, for each individual organism change moves reassuringly toward a definite end, which, we saw, constitute at once its form and nature. Applying these theoretical principles to the discourse on method in *Parts of Animals*, since as for nature at large so for animals the final cause is more fundamental than the other causes, animals must be considered when they have reached their completion (*telos*) and not merely according to the processes of formation:

> We should not forget to ask whether it is appropriate to state, as those who studied nature before us did, how each thing has naturally come to be (*pephykenai*) rather than how it is (*einai*). For the one differs not a little from the other. It seems we should begin, even with generation (*genesis*), precisely as we said before:

first one should get hold of the phenomena concerning each kind, then state their causes. For even with house-building, it is rather that these things happen because the form (*eidos)* of the house is such as it is, than the house is such as it is because it comes to be in this way.[141]

In other words, for Aristotle it is fundamental to discuss animals in their actuality, namely when they have fulfilled their end, and not in relation to the processes that lead to their formation. Thus, Aristotle leaves in the background the process of becoming, which his predecessors have followed in its unfolding, to focus on the *physis* of animals in their finally reached perfection. The solution to this aporia too represents a significant departure from the Presocratics. Both the inclusion of the soul and the priority of essence (*ousia*) at the expense of process determine Aristotle's general outlook in the zoological treatises, where he investigates animals in respect to their physiology, activities, characters, and lives as fully formed individuals rather than giving a step-by-step account of their growth, and related activities, from the moment of their formation. This topic will receive a separate treatment in *On the Generation of Animals,*[142] which features their development as a *diakosmēsis*, a coming into order,[143] but in the other treatises animals are dealt with in their crystallized *physis*, each as perfect embodiments of their natural ends, with no exception.[144] When considered in this way, namely from the perspective of their completion, animals are creatures full of *logos*, where *logos* represents the rationality immanent in their bodies' composite nature (and likely differentiated material),[145] and is visible and operative in all aspects of their existence that, rooted in such bodies, express finality. Aristotle let us understand it explicitly in *Parts of Animals* when, in advocating the priority of the final cause versus the efficient one, he asserts

Now it is apparent that first is the one we call for the sake of which (*heneka tinos*); for this is *logos* and the *logos* is an origin (*arkhē*) alike in things composed (*ta synestēkota*) according to art and in things composed by nature. (*PA* 1 639b15-7, with slight modifications)[146]

Significantly, animals are here referred to with a periphrasis combining the dative of agent referring to nature (*physei*) with the substantive perfect participle *ta synestēkota*, "the things which have been composed." This participle stresses the complex constitution of living beings' bodies, which (in respect to "having been composed" by nature and what this entails) are (we may add for the sake of clarification) inherently different from the elements' natural simple bodies (and even the bodies of plants),[147] allowing a legitimate parallel between nature and art. In Aristotle's words, both the works composed by nature and those composed according to art "come into being for something," and this something, their *telos*, is *logos*. Considered in terms of finality, *logos* is also an origin (*arkhē*)[148] in that it preexists the process of "composition" for the products of nature and art alike.[149] Hence, in the realm of nature, *logos* pertains to animals (as opposed to elemental bodies) inasmuch as they result from a process of formation that follows "an original plan," step by step, and that brings about a form, conceived of in terms of structure. For in being "things that have been composed," animals present a composition of parts, which amounts to structure.[150] Aristotle illustrates animals' orderly body by analogy with the attainment of health and the construction of a house, for which a doctor and a builder can respectively account by giving the causes (*aitiai*) and rational grounds (*logoi*) for everything each one of them does and why it must be done in that way.[151] And for living beings too, that the order of composition and final (composite) result can be explained in terms of causes and rational grounds calls for the priority of the final cause and a study that focuses on them in their completed form, which correspond to the two interrelated methodological boundaries discussed above.[152]

True, plants too are composed by nature and as such they also embody a structure.[153] But it is noteworthy that, as far as I know, Aristotle speaks of *logos* in terms of finality and resorts to a parallel with the proceedings of art only when laying out the foundations of his study of animals,[154] a fact which incidentally explains why he devotes to them a separate treatment. Indeed, as we still learn from *Parts of Animals*, plants do not exhibit a great variety of nonuniform parts. Their *telos* is, so to speak, "simple": with hardly any functions to perform, plants' bodies possess with a definite proportion and size[155] but a few organs,[156] and engage in only one mode of living, namely nutrition, growth, and decay.[157] By contrast, in being sentient creatures, animals have a "more multiform shape" (*polymorphotera idea*) and engage in a wider range of activities, both internal to the organism itself and in the external world.[158] Their body architecture and life functions present an artful complexity that is alien to plants.[159]

1.4.1 Animals' Logos from Speech to Body and Life

Used widely in the biological treatises and elsewhere in Aristotle's work, *logos* is a polyvalent word whose meanings range from "definition," "reason," and "proportion" to "speech" and "word."[160] In the passage quoted above, *logos* has been translated in English as "definition" and "account," in German as "plan."[161] Earlier translations feature in English "reason," in French "raison," and in Italian "essenza."[162] On the other hand, Peck (and after him Torraca), whose rendition I follow, has merely transliterated it to avoid adopting "an inadequate or misleading word." In this respect, Peck observes

> Here is a term of very varied meanings, a term which brings into mind a number of correlated conceptions, of which one or another may be uppermost in a particular case. It is an assistance if we bear in mind that underlying the verb *legein*, as it is most frequently used, is the conception of rational utterance or expression, and the same is found with *logos*, the noun derived from the same root. *Logos* can signify simply, *something spoken or uttered*; or with more prominence given to the rationality of the utterance, it

can signify *a rational explanation expressive of the thing's nature,* of the *plan* of it; and from this comes the further meanings of *principle*, or *law*, and also of *definition,* or of *formula*, as expressing the structure or character of the object defined.[163]

As speech, in Aristotle's zoology, *logos* is a faculty that in its extreme versatility is exclusive to humans, whose movable tongue, front teeth, and mouth are so conformed as to enable them to speak to the degree of articulation they do.[164] Birds too, however, speak, and in *History of Animals* Aristotle even goes so far as to recognize dialects' regional variations for the same species.[165] In the zoological treatises Aristotle does not stress in *logos* as speech the correlated conception of reason, which by contrast is dominant in the ethical treatises, and particularly *Politics*, where he notoriously links speech and reason, making man the most political of animals. It is by means of *logos* that man reveals the advantageous and harmful, and based on these, the just and unjust, which in turn enable him to live together with other humans in households and cities.[166] Speech that conveys reason is the fundament of political communities. The neglect of reason in the discussion of humans' speech in the zoological context, however, should not surprise us given that, as we saw earlier, Aristotle clearly limits the parts of the soul that are pertinent to the inquiry on nature to the nutritive, sensitive and locomotive ones while he exiles the rational part. The student of nature (*ho physikos*) must approach animals in relation to their capacity to grow and feel and move, not their capacity to think. *Logos*, however, we have seen, is still pertinent and operative in a discourse about animals, but at a more pervasive and fundamental level that involves them, and equally each one of them, as (composite) products of nature. Not an intrinsic faculty of the soul, which only the human animal possesses, *logos* is coextensive with animals' very lives, in that it

coincides with their immanent finality and—unsurprisingly given the coincidence of the two—with the form they attain when reaching completion.

In *Parts of Animals* 2, while reverting to a comparison with art as he did in the discussion of the priority of the final cause in book 1, Aristotle deals once more with the form (*morphē*) attained by living beings; identifies it with the end (*telos*); and refers to *logos* but in new complementary applications that, while compatible with *logos* as *telos*/*arkhē* discussed earlier, further clarify his approach to the study on animals.

> In generation things are opposed to the way they are in substantial being; for things posterior in generation are prior in nature, and the final stage in generation is primary in nature. For instance, a house is not for the sake of bricks and stones, but rather these are for the sake of the house—and so it is with other matter. Not only is it apparent from a consideration of cases that this is the way things are, but it also accords with *logos*; for every generated thing develops from something and into something, *i.e.* from an origin into an origin, from a primary mover which already has a certain nature to a certain shape, *morphē,* or other such end. For a human being generates a human being, and a plant a plant, from the underlying matter of each. So the matter and the generation are necessarily prior in time, *khronōi*, but, *logōi,* in *logos* the substantial being, *ousia*, and the shape, *morphē,* of each thing. This would be clear if someone were to state the *logos* of the generation of something; the *logos* of house-building includes that of the house, while that of the house does not include that of house-building. And so it is in the other cases as well. Thus the matter of the elements is necessary for the sake of the uniform parts, since these are later in generation than the elements, and later than the uniform are the non-uniform parts; for these have already attained their ends, *telos*, and limit, *peras*, having achieved a constitution of the third sort, as often happens when generations are completed.[167]

In the field of nature that pertains to living beings— as well as in that of art *tout court*— the process of formation follows an order that is opposite to the essence (*ousia*): the last things (*ta hystera*) are in fact the first (*ta prōta*) and that which comes at the end of the process (*teleutaion*) is at the beginning (*prōton*). As a house precedes its construction with bricks and stones, so any fully formed animal[168] is prior to the entire process that leads to its formation.[169] Hence Aristotle presents two perspectives from which to look at the "causes" of animals as products of nature: one perspective in respect to time (*khronōi*) and another in respect to *logos* (*logōi)*. Of the two it is the second that reflects the proceedings of nature (and that Aristotle wants to follow). In considering living beings in respect to time (*khronōi*), matter and generation come first; in respect to

logos (*logōi*), however, the essential being (*ousia*) and shape (*morphē*) are prior. Indeed, this last perspective constitutes, as we saw in the last section, one of Aristotle's methodological boundaries in *PA* 1, according to which animals must be considered not in their developments from formation, but as perfect embodiments of their natural end (*telos*), corresponding in turn to their (composite) form as fully developed individuals.[170] Thus, in this application, *logos* is contrasted with time (*khronos*) and relates to the formal nature of the living being, which bridges, so to speak, efficient and final cause. On this view, an orderly and systematic relation frames the generation of living beings and involves the transmission of shape (*morphē*).[171] In this respect, Aristotle transcends the particularism of Empedocles, who followed the process of animal formation in materialistic terms, and *in fieri*,[172] and pinpoints, instead, in the relation between the adult and the new organism—the chronological and logical priority of the first over the latter, and its transmission of movement and form—the key to understanding the regularity informing the birth of living beings. "A man begets a man and a plant plant," he remarks, thereby reframing in a new theoretical context an observation that had already been made, in other words, by Democritus.[173] As Aristotle privileges the *telos* in the process of animals' formation, the linear chronology so dear to the Presocratics becomes secondary. Still important in the consideration of nature and its products and itself a manifestation of *logos*,[174] it yields to an alternative chronology that starts from the end and that is fundamentally ontological.

But in the passage from book 2 quoted above, *logos* is not only used in contrast to time (*khronos*) to qualify a perspective that looks at animals in terms of *telos* (and formal nature), it also subsequently features in another compatible sense. As Peck notes, when

Aristotle claims that the *logos* of house-building includes the *logos* of the house, but that the *logos* of the house does not include that of house-building, the meaning of *logos* is close to "definition" and, we may add, serves Aristotle to reinforce by means of an example the methodological boundaries so far presented. For transposed in the context of his zoological project, this claim means that as objects of study animals have a *logos* that does not include their formation (*genesis*), but is restricted to them *qua* composed, living (ensouled) beings that (we may now "safely" add) embody *logos* in the sense of *telos*.[175] Hence, Aristotle's zoology turns around animals' bodies, structures, and functions, culminating, as we will soon see, in the body's complex action (*polymerēs praxis*) that is life itself, the ultimate *telos* and *logos* of animals.

Indeed in Aristotle's study shape (*morphē*) is not just intended outwardly as it seems to have been for Democritus,[176] who, as discussed earlier,[177] claimed that a human being, and by extension any other animals, can be identified with *morphē*, or *skhēma*, indicating only the contour and surface of the body, and with color (*khrōma*).[178] The analogy between the living being and the house, which Aristotle refers to in the passage quoted above, illuminates his position in this respect. For him, the shape of an animal is teleologically intended, namely the end result of a process, and, importantly, as with a house made of timber, bricks, and stones, a composition of parts that have functions.[179] More specifically, the shape (*morphē*) of animals derive from the progressive intersection of three sorts of compositions (*synthesis*) involving in turn three different types of constituents, from the elements to the parts of the body itself, uniforms and nonuniforms. In Aristotle's view, the composition of elements, so important for Empedocles,[180] represents only the "first," most basic level of *synthesis* among a progression of three

discrete levels leading, in a hierarchically arranged teleological sequence, to the formation of animals. Each body constituent from the elements to the uniform to the nonuniform parts,[181] from the more basic to the less, has a function and is instrumental to the formation and/or working of other parts and ultimately to the complex action (*polymerēs praxis*) of the animal's body as a whole, which is life itself.[182] In other words, "in some way the body exists for the sake of the soul",[183] and the specific functions of the bodily parts exist for the body's *ad hoc* function of life. Thus, Aristotle "deconstructs" the complex architecture of animals' bodies, identifies different, progressive orders of composition ("elements," uniform, and nonuniform parts), and explains each of them in terms of finality, the ultimate *telos* being life. He therefore gives us in this (albeit here general) way for the animals as well that rich fabric of causes (*aitiai*) and reasons (*logoi*), which leads to their ultimate *telos* and which, to return to the analogy he has himself used,[184] a doctor and builder alike would be able to provide when accounting respectively for the attainment of health and the construction of a house.[185]

Significantly, for Aristotle the finality of body composition (*synthesis*) extends into animals' mode and space of existence.[186] That is, combining their different *dynameis*, the uniform parts enable the body's nonuniform parts, such as the eye, the nose, and the face as a whole, to do their work for the sake of the multiform range of activities and movements in which the entire animal engages in order to live (*polymorphai praxeis kai kinēseis*). In this way, Aristotle sees a continuum connecting the functions of the uniform parts with those of the nonuniform ones and, in turn, with animals' practices. A passage of *Physics* is in this respect illuminating. In it Aristotle complements and corroborates the arguments presented in his discourse on method in

Parts of Animals 1, and in particular the finality and consequently the *logos* of animals' lives, but focuses this time on their activities in the external world, as agents that live, work and make things. This testimony is of special interest to our discussion especially because it addresses the *telos* of the other animals (*ta alla*) in comparison with humans where the major gap between the two groups is reducible to the presence or lack of *logos* as rational speech. In other words, the other animals in *Physics*, although they are not explicitly labeled as such, are the nonhuman animals lacking speech, the *aloga zōa.*

> It [the end, *telos*] is especially visible for the animals other than men (*alla zōa*), who do not act (*poiein*), neither by art (*tekhnē*), nor by research (*zetein*), nor by deliberation (*bouleuesthai*). Henceforth, some are at a loss whether the spiders, the ants and animals of this sort work (*ergazesthai*) with intelligence (*nous*) or something similar. Going forward in this direction, it seems that also in the plants themselves useful things are produced for an end, as, for instance, the leaves in order to protect the fruit. If therefore it is by nature and on account of something that the swallow builds its nest and the spider its web, and if the plants produce their leaves on account of fruit, and direct their roots not upwards, but downwards on account of the nourishment, it is clear that this sort of causality exists in those that come into being and exist by nature.[187]

In this passage Aristotle temporarily breaks the overall unifying outlook characteristic of his own method and, for the most part, that of the Presocratics to focus on *ta alla zōa*, the other animals. As Ross has remarked, in referring to the bewilderment of "some" when accounting for the work of animals like spiders and ants, Aristotle may be thinking of Democritus, who paid attention to the works of the *aloga zōa* and attributed to them more than five senses and a status and capacity equal to diviners, seers, and the gods.[188] Aristotle sidesteps the question of what specific faculty enables animals to attend to their particular tasks; instead he explains it in terms of the finality of nature, which is, we saw, at the core of the arguments presented in his apology for the study of animals in *Parts of Animals* and the ensuing treatment. In *Physics*, however, while he suggests a set of differences between human and the other animals he still acknowledges some common ground. Nonhuman animals make things (*poiein*); they work

(*ergazesthai*), but not by the same means that humans adopt. The other animals, the *aloga zōa,* do not have art, they do not research or deliberate; they are not involved in activities that are proper to humans and that derive to them from the possession of the rational soul, which is excluded, as we have seen, from Aristotle's treatment of nature and its products. Yet importantly, the other animals still act and work like humans. And it is in this synchronicity of the poietic dimension of their lives and the parallel absence of human-like activities—such as art, deliberation, and research—that the finality and therefore *logos* of nature is supremely visible.

It appears, then, that it is this practical, poietic dimension of animals' lives which is at the core of Aristotle's interest and of which the webs of spiders and the organized activities of ants are only the most symptomatic and blatant manifestations. For in actuality every animal, its body and in turn its parts all working in masterful coordination, accomplishes a function and "works," thereby fulfilling its end. And while *Parts of Animals* is ultimately dedicated to exploring in a comparative framework the working of animals' bodily parts as activities essential to the life of a living being, from the majestic elephant to the modest mole, in *History of Animals* our philosopher will ultimately follow animals' differences tracing them in the particular dispositions (*ēthos*), activities (*praxeis*), and modes of life (*bios*)[189] that characterize animal species, kinds, or groups vis-à-vis other living beings. In sum, therefore, Aristotle's inquiry on animals' lives in the external world is tied to the description of their morphological differences. This external dimension of animals' lives, from their environments and feeding habits to their interpersonal relations to the practices that are peculiar to the political animals (*politika zōa*) and conducive to their definition as political, will be the topic of chapter 6.

1.4.2. On Animals' Egalitarianism and the Birth of Zoology

Animal shape, for each living being with no distinction, is a structure functional to life, and as such a manifestation of *logos*. Under this light, as Aristotle has announced in the apology to the study of animals discussed earlier, there is no worthless animal; every one of them, when considered in terms of physical form and the ensuing aptness to live, may become—and in fact is, from a philosophical perspective—an object of contemplation (*theōria*) and an expression of beauty (*to kalon*).[190] Indeed, the purpose that drives the formation of animals has "its place among what is beautiful," he explains in the apology.[191] Forcefully, Aristotle states that he will not leave out any of them, "neither more worthless (*atimōteron*) nor worthier (*timiōteron*), because, when contemplated (*kata tēn theōrian*) each animal show in its body the actual causes of its existence."[192] Significantly, in this claim for animals' beauty and the erasure of traditional categories of worthless and worthy, Aristotle seems to echo Anaxagoras' language in fragment 12,[193] where the Presocratic philosopher advocated the presence of *nous*, mind, in every animate being, either bigger (*meizō*) or smaller (*elattō*). From Anaxagoras to Aristotle the two sets of adjectives switch emphasis, from size to worth,[194] but both philosophers use them to dispel discriminatory parameters when considering animals as creatures of nature that depend, respectively, on *nous* and *logos.* And it is again significant that in *Metaphysics* Aristotle bursts into a eulogy of Anaxagoras as the only sane man—the only one who, in contrast with his predecessors, "said that there is mind (*nous*) in nature (*physis*), just as in animals (*zōa*), and that this is the cause of all order (*kosmos*) and arrangement (*taxis*)."[195] Here Anaxagoras' Mind can be taken as a

notion parallel to Aristotle's *logos* in that, despite their different nomenclature, each of them is considered the cause of the visible order and arrangement that inform animals' bodies and, ultimately, their lives.[196] Indeed, on the basis of Aristotle's praise of Anaxagoras, who attributed *nous* not only to nature but equally so to animals, it is possible to argue that for the Stagirite too the rationality at work in the designing nature (*dēmoiurgousa physis*)[197] is transferred to, and embodied by, the animals themselves in their act of being alive.

Conceived of in this way, zoology emerges as the science that, within the wider field of nature, studies all animals *qua* living, that is, in terms of their body structure and related activities that constitute (and contribute to) their life. Indeed, considered from the perspective of the "general" study of nature (*ta physika*), animals require an *ad hoc* treatment inasmuch as, alone among the other natural bodies, they are the source (*arkhē*) of a constellation of movements. Besides growth, nutrition, and decline, which Aristotle includes under *auxēsis* and further defines in "biological" terms in *On Generation and Corruption*,[198] animals are also the origin of a peculiar form of alteration (*alloiōsis*), namely sensation (*aisthēsis*),[199] which defines them all in contrast to other forms of life, such as plants and the celestial beings. But (some) animals are also able to move across space (*kinēsis kata topon*). Key to understanding animals' unique range of movements is their body structure, which Aristotle considers, in teleological terms and in analogy with art, as *logos*, making it (along with the movements it entails and the consequent activities in the external world) the proper object of his study of animals. And as he takes animals' structure as a manifestation of *logos*, Aristotle banishes *logos* as speech and reason (which only the human animal possesses) from being the proper object of zoology. Thus,

based on movement and life, the perspective animating his study of animals is fundamentally zoocentric, not anthropocentric.

True, Aristotle's zoology is not the place for radical egalitarianism. All animals are equal as objects of study, namely insofar as they are composed living bodies and, as such, partaking of a common *logos*. So while he considers each animal equal in its structural capacity to move and live, Aristotle still maintains a hierarchy of Platonic legacy: he calls the human being divine and considers him, alone among the other animals, aligned with the orientation of the cosmos and conforming to nature.[200] Besides, Aristotle also sees a hierarchy at a more extensive level that involves animals' material natures. In *On Generation of Animals*, for instance, he distinguishes animals in terms of elemental composition and inherent heat, claiming that animals have different levels of perfection, which in turn is reflected (explaining it) in their different embryogenesis.[201] In Leunissen's words, "The more perfect the animal, the more perfect its product of generation is, and more perfect according to Aristotle means hotter, less earthy (i.e., purer) and moister."[202]

Nonetheless, it should be stressed, this hierarchy coexists, and is consistently subdued, by the flexibility of a discourse,[203] which rather than focusing on the radical break between orders of living beings, strives to pursue their common nature and to unveil in a systematic way the complex action of animals' lives in terms of their filiation from nature and the unique range of movements that originate from their bodies—at the minimum *auxēsis* together with a form of *alloiōsis,* that is, the sense of touch. Ultimately, no matter their different degree of perfection, animals are all equal because they act and live for the sake of living. Indeed, as we will see in chapter 3, under the scientist's

contemplative glance animals' *telos* appears to include for each of them not only the capacity but also the desire to live. All the natural functions animals perform are for the sake of (their own) life.[204] Aiming at living forever, but constrained by the limits of their nature, animals can continue to live only through their offspring. In "physical" terms this implies the capacity to perpetuate (projected into another natural complex body) the constellation of movements of which each of them is the source, a fact that may explain why in discussing the *telos* for both products of nature and art Aristotle claims that there is more finality (and "goodness") in entities composed by nature (the animals) than in those composed according to art.[205] For, we may well argue, while the finality of works of art is confined to the static accomplishment of the works themselves, that of works of nature is realized in the dynamic embodiment of their own movements and life into another living being for eternity.[206] And it is in sharing this feature that animals for Aristotle are quintessentially equal: whether conscious or not, they all aspire to the immortality that characterizes divinity, and they all act according to their own individual nature in order to attain it.

[1] This section of Aristotle's discourse on method in book 1 of *Parts of Animals* has traditionally been taken as an exhortation to study the sublunary animals (see, for instance, Balme 1987, Lennox 2001). Yet it seems that this "exhortation" does not merely present in a positive way the reasons one should study the living beings of this world. Indeed, it embodies, buried within, an anticipation of the critiques and resistance to a study of animals, thereby unfolding also as a defense of it. The main points to which Aristotle replies are 1) the unworthiness of the sublunary animals (*ta atimōtera zōa*) when compared to the "ungenerated and imperishable substantial beings constituted by nature," namely planets and stars, and 2) their unattractiveness—both of bodies and their organic constituents—to human perception (see the expression *ta ou kekharismena* and, in the part subsequent to the one cited above, Aristotle's reference to the disgust *dyskhereia*, that the consideration of animals' organic parts bodies elicits in those looking at them, *PA* 1 645a26-31). In respect to this second point, Aristotle insists on the "more akin nature"

(*oikeiotera physis*) of nonhuman animals with humans, which constitutes the main counterpoint to point 1 (see below) and promotes a new legibility of animals' bodies, one that transcends the materiality of their parts, subsuming it into a consideration of the bodies' whole conformation (*holē morphē*).

[2] See Lennox (2011), who reviews the position advocated earlier in his commentary (2001) and addresses the integral role of the apology in the treatise's narrative. It is true that, as many critics have observed, *PA* 1 is composed of different essays, but they still construct a systematic discourse. For instance, this section of *PA* may well have a more rhetorical style and tone than what precedes and follows it, but it is not a mere interruption of Aristotle's layout of his method. Rather, it seems a rhetorically charged, climactic closure of the discussion of criteria (*horoi*), which up to now have been presented aporetically. After this "apology" Aristotle will resume his discussion of the method in a positive way, giving guidelines of interpretation, and not alternatives to be assessed as before.

[3] All translations of this treatise are by J. G. Lennox.

[4] Cf. Plat. *Leg.* 12 966d-67 where stars are presented as gods; cf. Moreau 1959.

[5] Lennox 2001, 172.

[6] Plat. *Tim.* 30B, cf. Zatta 2019, 142-3.

[7] See respectively Aristot. *Cael.* 2, 1, 284 a, 17 and 2, 12 292b, 2; in the first passage Aristotle appeals to the authority of the tradition (*arkhaioi kai patrioi logoi*), which identified something immortal and divine in those bodies that possess limitless motion; in the second he claims that "the action, *praxis*, of the planets are analogous to that of animals and plants." Now Aristotle frames the "commonality" between celestial animals and their terrestrial counterpart in terms of analogy showing that they belong respectively to different kinds, but however elusive that analogy may be, it is undeniable that for him the celestial beings are animals. Just a little earlier Aristotle has rectified the conception of stars by attributing them action and life: "We think of stars as mere bodies (*sōmata*) and as units with a serial order indeed, but entirely inanimate; but we should rather consider them as enjoying action (*praxis*) and life (*zōē*)" (292a19-22); cf. also fragment 18 (Rose) of *On Philosophy*, where to be atheist in front of the visible divinity of the sun is considered an extraordinary fact. On the heavenly bodies as living beings with a soul, see Johansen 2009, 22-3.

[8] An interesting parallel can be found also in the spurious treatise *On the Cosmos*, where the author discusses the cosmos as divided in the upper and lower regions along with their respective inhabitants. To the first region he assigns the immortal gods, to the second the "creatures of a day" (*ta ephēmera zōa*), inclusive of all living beings subject to mortality (Pseud-Aristot. *Mu.* 393a3-6). Ultimately this distinction is inscribed in Aristotle's general statement about different orders of inquiry pertaining to "things that are not subject to change, things that are changed but imperishable" and "things that are perishable" (*Phys.* 198a29-31). On the constitution of the celestial bodies, see Falcon 2001 and for a general discussion of natural bodies in terms of tridimensionality and movement, Falcon 2005, 31-42.

[9] Moreau 1959, 60.

[10] It is true that occasionally Aristotle does compare human beings with the divine cosmos, and in turn with the other animals (see, i. e. *PA* 4 686a24-87a2 and 2 656a3-13; cf. *de Resp.* 477a22), but these references speak of the particularity of the human kind vis-à-vis the other animals rather than offering a standard criterion of analysis and evaluation for all. Indeed, because, as he states in this discourse on method, his study of animals lies fundamentally on their definition as sentient beings rather than rational beings, the comparison with the celestial animals, which are entirely rational, can only intersect his study of living beings when he discusses the human being, who is partly rational, but it is peripheral to his treatment of the forms of life as a whole. When considered in this light, Aristotle's overall approach ultimately tends to grant autonomy to sublunary animals as subjects of inquiry in themselves, from the unworthier to the worthier (cf. *PA* 1, 5), and apart from both a consideration of the celestial beings and the uniqueness of human kind (see discussion below).

[11] Lennox identifies two scales of value at work in Aristotle's consideration of the "objects of natural science": intrinsic value and divinity and knowability (2001, 172).

[12] On the limitations on the knowledge of planets and stars, see, for instance, *Cael.* 2 291b 24 and *Met.* 12 1074 a 14.

[13] *PA* 1 645a10-12. The philosophically-oriented student will discover in animals (and each one of them, even the more worthless) something natural and beautiful (*ti tou physikou kai kalou*). Significantly Aristotle exemplifies this discovery with the so-called Heraclitus anecdote. One day the philosopher was warming himself up at the oven in a kitchen when some visitors showed up, but they were hesitant to enter.

Heraclitus invited them to come in stating that even there, in a modest kitchen environment, there were gods. The immediate reference for "gods" is the "more worthless" terrestrial animals, mentioned by Aristotle earlier, in opposition to "worthier" animals (for a thorough discussion of Heraclitus anecdote, see Gregoric, 2001, 1-13). Yet, given that Aristotle's apology develops balancing out the study of worthy, celestial, divine living beings (planets and stars) with worthless, terrestrial, mortal living beings (the animals) on account of their different knowability, it is compelling to extend Heraclitus anecdote to the wider context of the apology and see in the reference to the gods in the kitchen an allusion to the worthy nature of terrestrial animals when looked at from a philosophical approach investigating the causes of their existence (*PA* 1 645a19-23). In this respect, it should be remarked that for Aristotle every living being and thing reproduces another like itself because it has an intrinsic desire for immortality and divinity (*de An.* 2 ; see chapter 3); cf. *GA* 2 731b33-732a2 where we learn that "what is generated" (the animals) becomes eternal in the way it is open to it, namely "specifically", but not "numerically." Thus while maintaining the hierarchy higher(celestial)/lower (terrestrial) animals, Aristotle also softens it by recognizing in every lower animal the attainment of immortality in the way its nature allows it to.

[14] Given the priority of the nutritive soul in Aristotle's discussion of animals' life (see chapters 2 and 3), it is tempting to read in *to syntrophon* the notion of "eating together", as still evoking physical proximity, but with an accent on the function of nutrition (as accompanied by sensation, and pleasure and pain).

[15] Aristot. *HA* 8 629b8-12. Cf. Plu. *Aem.* 10; S. *Aj.* 861; Xen. *Mem.* 2, 3, 4. Cf. *History of Animals* offers an interesting parallel involving the sacred crocodiles of Egypt, wild animals that become tame on account of being fed (*HA* 8 688b30-3); see chapter 6.

[16] In this respect, in the passage quoted above Aristotle calls his object of study the "living nature" (*zōikē physis*), by which we need to understand the nature of the terrestrial living beings (*zōa*), humans included.

[17] Lennox 2001, 172.

[18] Porph. *Abst.* 3, 25; cf. Sorabij 1993 and Cole 1992. It seems, however, that a partial or absent account of Aristotle's biological treatises, and in particularly of the apology in *PA*, have led to a displacement of Aristotle's position in respect to the philosophical tradition. For instance, Sorabji ignores the acknowledgment of kinship between humans and animals and its development in the biological treatises, and overemphasizes the intellectual distinction between men and animals, thereby associating Aristotle with the Stoics, who would deny reason to animals, and exile them from the extended community of humans and gods (1993). On the other hand, also Cole, while recognizing Theophrastus' kinship between humans and animals situates him in strong opposition with Aristotle, who, she claims, considered humans and animals decisively separated (1992, 52-5). For a discussion of the "Aristotelian premisses" in this passage and the actual closeness of Theophrastus to Aristotle, see by contrast Brink, 1955, 129-131.

[19] On the discontinuity between animals and plants, see Thphr. *HP* 1, 1-4. Cf. *PA* 2 646a14-24 and 655b4-656a7, where Aristotle announces a distinct treatment for plants and their formation inasmuch as they do not have the faculty of sensation, which is essential in the definition of animals (*ta zōa)*; see also *PA* 4 680b10-29.

[20] Cole 1992, 55.

[21] I intend by "to feel" the experience of a range of sensations (*aisthēseis*) and affections (*pathēmata*) that the possession of the sensitive soul enables animals to have—each according to its nature—i.e., from the feeling of hot and cold and the other sense perceptions (see *DA* 2, 2) to that of fear, courage, and similar emotions (see *HA* 7 588a16-588b4 and 8 60811-608b20), along with the pain or pleasure by which each sensation and affection are accompanied. See the discussion in chapter 5.

[22] Not all animals possess all senses, but all possess at least touch. On senses—their "allocation" and "architectures"—see chapter 4.

[23] Le Blond 1945, 41. On the difficulty to assess the purpose of Aristotle's biological treatises, see Balme 1987b. A fundamental feature of Aristotle's method, to be discussed later in the chapter, unequivocally reveals the common nature of animals. Indeed, the first, and therefore prior, methodological dilemma Aristotle confronts is whether animals should be discussed species by species or by common traits (*PA* 1 639a-639b6). He opts for the second path and returns on it multiple times, a sign that it was a difficult, and perhaps, controversial choice, yet methodologically sound.

[24] *DA* 2 412a6. More specifically, Aristotle is concerned with finding a definition that may suit every (part of the) soul and hence every being possessed of soul.

[25] In book 1 of the *On the Soul* Aristotle calls the nutritive soul the first principle (*prōtē arkhē*) and claims that animals and plants have in common (*koinōnein*) this alone (*DA* 1 411b29-30).

[26] See Aristot. *DA* 2.2; on the nutritive soul, see below chapter 2 and 3.
[27] Manuli 1977.
[28] *PA* 3 666a34-b1; cf., *PA* 2, 647a, 653b21-35; for the crucial role of the heart as principle of animals' "organization" (*diakosmēsis*) in the process of embryological formation, see *GA* 2 740a6-24.
[29] In fact, Aristotle locates the soul in the heart only in *Parts of Animals* (2 655b36, 656a38), while in *On the Soul* he considers it the functional organization of bodies, without anchoring it to a specific organic part. See chapter 3.
[30] Aristot. *GA* 2 740a2-9.
[31] Aristot. *PA* 2 647a4-8; cf. *HA* 1 486a5-8.
[32] Aristot. *PA* 2 647a14-24.
[33] On the coextensiveness of animal life and sensation, see also the discussion of Aristotle's general treatment of sensation in *DA* 2.5 in chapter 4.
[34] Aristot. *PA* 1 640b30-2; see Zatta, 2019, 50-2. The same critique of Democritus as privileging animals' body structure and "surface" rather than "movement" (and life) appears also in *On the Generation of Animals,* but in reference to the development of the embryo. According to Aristotle's testimony, Democritus believed that "the external parts" (*ta exō*) of the animal would be the first to become visible and were then followed by the internal ones (*ta entos*), but for our philosopher this model pertains to the animals of art, carved out of wood and stone, and not to the animals of nature as having in themselves the principle of movement and rest (*GA* 2 740a13-17; see also 740a37-38).
[35] Aristot. *PA* 1 640b36-641a2. Cf. also *DA* 2 412b11-413a3, where, in the context of the examination of the soul, Aristotle discusses the eye whose action is that of seeing, and in the failure of sight considers the eye as existing only in an equivocal sense. The same argument is then applied to the whole body, whose activity—life—depends on the possession of the soul.
[36] See, for instance, Johnson 2005; cf. Tipton 2014.
[37] Leunissen 2010.
[38] On the order of exposition, see Lennox 1999.
[39] Aristot. *PA* 2 650a3-4.
[40] On the flexibility of nature, see Leunissen 2011. For a discussion of conditional necessity, see chapter 3.
[41] Preservation (*sōteria*) figures widely in the treatise to qualify bodily parts and their role. See, for instance, *PA* 2 652b8.
[42] Johnson 2005.
[43] Cf. *PA* 1 645b15-20, where Aristotle forcefully places the finality of bodily parts in the soul, which in its basic meaning, inherited from the Presocratics, corresponds to the activity of life. "Now, as each of the parts of the body, like every other instrument, is for the sake of some purpose, viz. some action (*praxis*), it is evident that the body as a whole must exist for the sake of some complex action. Just as the saw is there for the sake of sawing and not sawing for the sake of the soul, because sawing is the using of the instrument, so in some way the body exists for the sake of the soul (*psykhē*) and the parts of the body for the sake of those functions to which they are naturally adapted." Cf. also *PA* 1 641a19-21, where Aristotle establishes the coincidence of soul and life. On the soul, its basic meaning and functions, see Johansen 2012 and below chapters 2, 3 and 4.
[44] Aristot. *PA* 641a33-641b10, trans. by J. G. Lennox.
[45] On the homogeneity of the soul for the Presocratics, see chapter 2.
[46] See, for instance, Plat. *Tim.* 69c-70d and *Resp.* 4 435e-441c. For an extensive discussion of Plato's partition of the soul and Aristotle's departure from it in his study of living beings, see chapter 2. Here let it suffice to remark that despite some analogies between Plato's and Aristotle's conception of the soul, namely its composite nature and the identification of the rational part, there are also fundamental differences that pertain, for instance, to its immortality—completely irrelevant for Aristotle, who speaks, by contrast, of its "departure" from the body—the "psychological affections and activities" each part of the soul represents, and, finally, the very relation it entertains with them and the body. Cf. Aristotle's passage quoted in this page and Plat. *Tim.* 69c-71.
[47] Cf. Aristot. *DA* 2 413a21-414.
[48] Cf. *Phys.* 2 192b16 and next section.
[49] Within this range of changes, it should be remarked, it is growth (*auxēsis*) and conversely decay (*phthisis*) that properly overlap with the Presocratics' very notion of *physis,* as encompassing all stages in a

given process of formation, inclusive of beginning, growth, and final result (Naddaf 2005). On the definition of growth as a strictly biological phenomenon, see chapter 3.

[50] This centrality, in the consideration of the soul, of a movement that is intrinsic to the very fabric of the body—whether movement is intended as growth, sensation, or locomotion—is in line with the definition of animals as beings that exist by nature because, unlike those produced by art, they have in themselves the origin of "movement (*kinēsis*) and rest (*stasis*)" (*Phys*. 2 192b9-23). See below. By contrast, reason is excluded from this array of movements because as Aristotle claims in *On the Soul* within a critique to Plato's *Timaeus* thinking (*noēsis*) seems to correspond more to a state of rest (*ēremēsis*) or a halting (*epistasis*) than a movement (*kinēsis*) (*DA* 1 407a33-4); see n49 below.

[51] In *On the Soul* Aristotle attributes the cause for "traveling movement" (*poreuomenē kinēsis*) to appetite (*orexis*) and mind (*nous*), intending for this last one the practical mind (*praktikos nous*), which in contrast to the theoretical one (*theoretikos nous*) pursues an end outside itself (Aristot. *DA* 3 432b7-433a10).

[52] Aristotle gives two reasons for the exclusion of the rational soul. On the one hand, treating of mind (*nous*) along with its objects (*noeta)* would undermine the systematization of Aristotle's corpus, on the other, mind and related activities are uninvolved with nature (*physis*). For a discussion of these two reasons in relation to one another and to Aristotle's pursuit of the "animal as such," and the crucial importance of this "ultimate object" of study, see chapter 3. Aristotle is completely faithful to this proscription (the exclusion of the rational soul) in his discussion of animals in *Parts of Animals* (Lennox 1999). For a discussion of Aristotle's position on the rational soul in the context of his inquiry on the soul as the principle and cause of life in *On the Soul*, see chapter 2.

[53] In *History of Animals*, it should be noticed, when describing animals' behavior Aristotle acknowledges the presence of psychological abilities that have to do with reason (see Labarrière 1990) and explicitly attributes *dianoia* to the swallow inasmuch as a skillful architect (*HA* 612b18-27). These abilities have to be considered as natural capacities (*physikai dynameis*), disconnected from moral ones (see Lloyd 2013), and are explainable via animal physiology—namely the blood quality—rather than as endowments from the rational soul. See below note 63 and chapter 6.

[54] See n. 10 and below.

[55] I discuss animals' physical degeneration as emblematic of their progressive removal from reason (and man) in *Timaeus*' account of the origin of animal kinds in Zatta, 2019, chapter 6.

[56] Aristot. *PA* 4 686a24-686b22; cf. Lennox, 2001, 317.

[57] Aristotle explains humans' upright nature by the intensity of the heat around the heart pushing growth upward (2 653a9-32), but leaves unexplained why a heavy upper part of the body would hinder the faculty of reason. As Lennox notes (2001, 218), this question has to do with the material basis of reason and *de Somn.* 3 may shed some light on it. In this treatise the digestion-induced upward movement of the blood to the region of the head is the cause of sleep (and the ceasing of the process of cognition that accompanies it) (456b32-457a6).

[58] In Aristotle's view, the weight (bending an animal down) makes thought (*dianoia*) and common sense (*koinē aisthēsis*) (*PA* 686a21-32) sluggish and it is on account of their body structure that nonhuman animals are less intelligent than human beings.

[59] *PA* 4 686b21-3, transl. by J. G. Lennox.

[60] On this point, see again Lennox 2001, 319.

[61] The upper part extends from the head to the anus while the lower parts encompass the members of the body that supports it and effects locomotion. For the evaluative use of the compound *nanophyēs* (with the stature of a dwarf), see Ar. *Pax* 790.

[62] More specifically, in *PA* 4.10 Aristotle discusses the earthbound structure of nonhuman animals in two "movements," first addressing the quadrupeds (*PA* 4 686a32-35) and, subsequently, the blooded many-footed and footless animals (*PA* 4 686b29-31). In the case of quadrupeds, he combines the mechanistic explanation invoking the elemental composition of their body with a teleological explanation that stresses ambulatory functionality and ignores reason. Indeed it is for the sake of "security against falling" (*asphaleia*) that nature has provided animals' earthbound body with two forelegs instead of arms and hands (*PA* 4 686a34-35).

[63] In sum, animal posture is indicative of a specific physiology, more corporeal and earthier for those that are more inclined to the ground, a fact that has consequences on the intellectual soul, but not, as it seems from this passage, on the sensitive one. Further, in his excursus Aristotle discusses blooded animals, from different types of quadrupeds to snakes, ending up surprisingly with plants, an inclusion that stands in

contrast with his separation of plants from animals on account of their lack of sensation. But he includes them here because he is looking at living beings' differences from the perspective of body structure, limb number, and locomotion. Further, in this passage, the association of animals and plants may also be due to the overall influence of *Timaeus* where plants are considered animals, endowed with sensations but of a different type than those of man (*allai aistheseis*) (Plat. *Tim.* 77a).

[64] The decentralization of reason in Aristotle's discussion is also apparent from the comment he makes about dwarf adults as compared with other adults: they are inferior in intelligence (*nous*), but they may have other characteristics in which they are superior (*PA* 4 686b25-26).

[65] *PA* 4 686a27-32.

[66] Indeed, in moving from the human to the nonhuman animals, Aristotle also departs from a Platonic-based interpretation, turning around reason, to a consideration of animals' structure and nature which is purely 'mechanic.'

[67] Indeed, as we have seen, Aristotle focuses on animals' growth (*auxēsis*) and locomotion, which pertain respectively to the nutritive and locomotive parts of the soul.

[68] See n. 52 and chapter 3.

[69] Likewise, in *Generation of Animals* human embryogenesis guides the discussion of animals' generation (see, for instance, books 2 and 5).

[70] On the discussion of these points, see Lennox 1999, 6-8. To the important discussion of the spatial coordinates of "up" and "down" on the basis of the natural order of things, which ultimately corresponds to the order of the universe, it should be added that this cosmological reference in *Parts of Animals*, the only one of this kind in the treatise, is perhaps a residue of the cosmological framework within which animals had been ordinarily treated and from which Aristotle moves away (see below section 1.4. *A New Beginning*).

[71] For a difference between *Parts of Animals and History of Animals* in the order of treatment of animals' parts, see again Lennox 1999, 16 n.10.

[72] Aristot. *Phys.* 1 184a17-19.

[73] For a discussion of the unique features of the human animal, see Lloyd 1983, 30.

[74] Lennox 1999, 9; see also Lennox 1985 and 2001, 141, where he adds that "Aristotle treats mankind as he treats every other animal—whatever we share in common with a wider group is treated as a feature of the wider group. Humans are singled out for separate discussion, just as elephant or camels are, only when there is some part that distinguishes them from the other animals." In other words, humans' attributes when unique to human species are treated as "specific" (*kat'eidos*). See below.

[75] For instance the human being has the larger brain for his size than other blooded animals—and man has larger than the woman—because of the great heat in the region of the heart and the lungs. Indeed, the function of the brain, which is cold, is that of balancing the heat of the body, thereby granting the animals' good health and preservation (*PA* 2 652a24-653b9).

[76] *PA* 4 686a29.

[77] It is noteworthy that Aristotle appeals to the teleological principle also later on in *Parts of Animals* when he replies to Anaxagoras that the human being has hands because it is the most intelligent animal and not the other way around as the Presocratic had instead claimed (Aristot. *PA* 4 687a8-10; DK 19 A 12).

[78] When considered in this respect, all animals, in spite of the specific degree of sophistication they may embody, are perfect (*teleia*). See Aristot. *DA* 3 432b22-5: "Then seeing that nature does nothing in vain, and omits nothing essential, except in maimed or imperfect animals (and the sort of animal under consideration is perfect and not maimed; this is proved by the fact that they propagate their species and have a prime, *akmē,* and a decline, *phthisis*), they would have also parts instrumental to progression." This passage, which belongs to a longer section devoted to inquiry on what part of the soul enables the living being to move across space, contains in fact an important general assertion. Aristotle let us understand that there is a standard of perfection inherent in each animal, regardless of species or genus, inasmuch as it is able to reproduce and follow the curve of life.

[79] Significantly, Aristotle breaks the assignment of the parts of the soul to distinct parts of the body that sustained Plato's hierarchical and anthropocentric view. He adopts, instead, an abstract model and conceives the soul like a figure that progressively encompasses its different parts, from the nutritive to the sensitive to the locomotive to the rational (*DA* 2, 2-3). See chapter 2.

[80] See pp. 14-5.

[81] Aristot. *PA* 2 655b33-656a2; see also *GA* 1 731b4-8.

[82] Aristotle, however, remains cautious in assessing consistently secure membership, aware as he is of the difficulty of establishing rigid divisions among beings, from the lifeless ones to plants to animals. Indeed, some cases present ambiguities. Elsewhere, in *Parts of Animals*, when discussing the Ascidians, commonly known as sea-squirts, with which he probably became familiar during his permanence in Lesbos (Lee 1985, 3-8), Aristotle acknowledges that they are very similar to plants (*phyta*) and yet more akin to animals (*zōtikotera*) than the sponges. For, he goes on to explain, "nature passes in a continuous gradation from lifeless things (*apsykha*) to animals (*zōa*) and on the way there are living things (*zōnta*), which are not actually animals, with the result that one class is close to the next that the difference seems infinitesimal" (*PA* 4 681a10-15).

[83] See chapter 2. On the status of plants as animals in Presocratic doctrines, see Zatta 2019, chapter 4.

[84] Cf. Solmsen, who connects the parts of the soul and their functions to the scale of nature, but considers the locomotive soul in this context irrelevant (1955, 149).

[85] For all these treatises dealing with animals as living beings are based on the notion of commonality articulated via difference. *History of Animals* addresses animals' differences with regard to distinct aspects of their lives (see 6.1.1), *Parts of Animals* accounts for the causes of differences with respect to body parts, *On the Soul* aims at finding the most common definition (*koinonatos logos*) of the soul, while *Parva Naturalia* discusses those attributes that are identical among different groups, i.e., sleep, respiration, growth, decay, death.

[86] Aristot. *PA* 1 639b4-6; 644a24-644b10; 645b1-14.

[87] Cf. Lennox (2001, 122), who detects a tension between being and universality, which Aristotle expresses elsewhere in *Metaphysics* (2 1003a5-17; 6 1038b10-12) and *Posterior Analytics* (1, 24).

[88] On division in Aristotle's method in *PA*, and in relation to Plato, see Lloyd (1961), Balme (1975), and Pellegrin, who offers a state of the question and emphasizes its definitional rather than classificatory value (1986).

[89] On the attributes, see Lloyd 1981, 162 and n. 4, and Granger 1981.

[90] Stenzel 1929, 1652-3. In the treatise *Likes* Speusippus engages in the study of plants and animals, offering accounts similar to those found in Aristotle's *History of Animals* and directed at exploring, as the title itself suggests, similarities among living beings. Although we do not know exactly the criteria by which these similarities were established, Speusippus' groupings indicate the presence of the division between blooded and bloodless animals that will cut across the animal kingdom for Aristotle (Lang, 1964 repr., 9-15) . For instance, in one of the twenty-five fragments preserved by Athenaeus, we read that "trumpet-shells, purple-fish, snails and clams are similar," whereas as in many other fragments similarity is based on physical constitution (Ath. *Deipn.* 3, 86c, trans. by Gulick). Tarán (1981), however, pinpoints in the adoption of the similarity based on locale a major difference between Speusippus and Aristotle's methods.

[91] See Aristot. *Post. An.* 2, 13 96a7-11, where Aristotle declares the impossibility of a method, attributed by the ancient commentators to Speusippus, for which each being is fully determined by the totality of the relations—of both identity and difference—that connect it to other beings.

[92] Aristot. *PA* 1 644a24-644b10; cf. Aristot. *GA* 1 715a1-3, where, reviewing the subject of *PA*, Aristotle underscores the method based on discussing the parts in common, *koinēi*, to all animals, and then those to distinct groups.

[93] In *History of Animals* Aristotle distinguishes ten major groups, "major genera"—man, birds, fishes, cetaceans, viviparous quadrupeds, oviparous quadrupeds (the blooded kinds), crustaceans, testaceans, mollusks (i.e., cephalopods), and insects (bloodless kinds); see Balme 1987a, 80.

[94] Charles 1990, 158.

[95] DK 31 B 82/ Aristot. *Mete.* 4 9, 387 b4; for a discussion of this fragment in relation to the use of analogies as a tool to identify connections among different kinds of living beings, see Zatta, 2019, 53. So the great intuition on the "nexus between anatomical structure and physiological functionality" which Lanza and Vegetti attribute to Aristotle (1971, 39-40) and consider at the basis of his zoological project can in fact be traced back to Empedocles.

[96] On analogies of animals' parts see also *PA* 4 692b15-18, where birds' beaks are analogous to other animals' teeth and lips (see below), the elephant's trunk to humans' hands and the tongue of certain insects to the mouth of creatures belonging to other kinds.

[97] Pellegrin 1986; cf. Balme 1975.

[98] The two major differences with Linnaean taxonomy are the lack of intermediate groups between kinds and species (Balme 1975) and the shifting levels of generality attached to kinds (*genos*) and species (*eidos*) (Pellegrin 1986).
[99] Lennox 2001, 170; cf. Lanza, Vegetti 1971, 556, n. 4. On the resolution of this tension see also Kullman (1974, 75), who speaks of a "compromise between entitlements of theory and praxis," and also Carbone (2002, 560), who sees it as an urgency for "a point of contact between the ontological point of view, according to which the substance is intended first of all and principally as individual, and the practical needs connected to the research in the zoological field."
[100] This point finds further support if we consider that for Aristotle's each living being is both the *arkhē* and *telos* of its own movement. See below and chapter 3.
[101] In the *Odyssey* the episode of transformation of Odysseus' companions into pigs encapsulates the tension of a human mind trapped into an animal body, and once the heroes achieve their original shape they burst into tears (*Od.* 10, 198-399).
[102] Among the blooded animals, for instance, also elephants, lobsters, and moles present specific traits. See respectively *PA* 2 658b34-659a37, where Aristotle presents a detailed description of the elephant's most extraordinary part (*idiaitaton morion*) among the other animals; *PA* 4 684a32-6, which discusses the uniqueness of the lobster in having a claw larger than the other; and *HA* 1 491b27-36, where the mole is introduced as the only life-bearing animal that does not possess eyes; cf. *HA* 4 533a2-3.
[103] Aristot. *PA* 1 639a14.
[104] For the different treatises and relative objects of Aristotle's research plan on nature, see also chapter 3.
[105] Pellegrin 1995, 14, although, it should be remarked, that while excluded from the study of nature, in Aristotle art becomes an analogue, and imitator, of nature.
[106] Kahn 1960, 202-3.
[107] These examples are taken from Aristotle's *Parts of Animals* (1 640b5-13) and discussed in Zatta, 2019, 35-7.
[108] The prototype of a conception of the world based on the view of nature as cosmos, discussed here in relation of the pluralist philosophers, goes back in fact to Anaximander (Kahn 1960).
[109] Longrigg 1993.
[110] See Zatta, 2019, 66-71.
[111] Cf. Aristot. *Phys.* 2, 199b5-8.
[112] In the spurious treatise *On the Cosmos*, for instance, the cosmos and its organization along with its dynamics and resulting harmony, are discussed as a reality already established, and not in the process of formation (Pseud.-Aristot. *Mu.* 391b9-13).
[113] Kahn 1960, 202-3; on Aristotle's revision of the Presocratics' position on "change," his endorsement of first principles and the development of "a *theory* of contrariety," see also Falcon, 2005, 23-6; cf. *Metaphysics* (5 1013a17-9), where Aristotle states that "all things can be *arkhai*…the common character of all principles is to be the first factor from which the thing is or comes into being or is known."
[114] Aristot. *Phys.* 2 192b8-14, 192b9-23.
[115] For the Presocratics, *arkhē* was used as not only a chronological notion, but also a material one.
[116] In this respect, see the fundamental critique that Aristotle poses to the philosophers of nature in the *Metaphysics.* After having reviewed the progressive development of their respective doctrines from the consideration of matter to the explanation—albeit partial—of movement, once he arrives at Leucippus and Democritus, Aristotle acknowledges that "the question of movement—whence, *hothen,* or how, *pōs,* it is to belong to things that are, *ousi,* these thinkers, like the others, lightly neglected" (*Met.* 1 985b20). Cf. also Aristot. *DA* 2 41215-8.
[117] On the rich intertextuality between *PA* 1 and *Physics* 2, and their dating the two to the same period after the composition of the rest of *Parts of Animals*, see Balme 1987b, 17; cf. also 1991, 84).
[118] Cf. Aristot. *Phys.* 2 192b14-5 and *PA* 641-8, where Aristotle discusses the finality of nature by analogy with art, which, also like nature, produces its works according to design. On living being's movement in the sense of growth, see chapter 3, in the sense of alteration, chapter 4.
[119] For a review of the presence of Aristotle's general psychological theory and specific psychological doctrines in his zoological inquiries, see Lloyd 1992, 147-157. For Aristotle's treatment of the soul in *On the Soul* as an introduction to his study of animals, see also Pellegrin 1996 and introduction abovex. Yet, Aristotle's outline of the fields of inquiry encompassed by the study of nature, presented in *Meteorologics* (1 338a20-339b9, see p. 26 above), ends with animals and plants without mentioning the soul and it

remains, I believe, problematic whether the study of the soul conceived of as a non material and immobile entity strictly belongs for Aristotle to the study of nature. So much is certain: the study of the soul greatly contributes to the study of nature, and in particular of living beings as creatures of nature inasmuch as the soul is the principle of animals (*DA* 1 402a1-7). And conversely, the science of animal nature, i.e. zoology, should treat of the parts of the soul that make animals move, but not of the soul in its entirety (*PA* 1 641a18-641b10, see above and chapter 3).

[120] See chapter 3.

[121] Cf. Pellegrin, 1995, 19.

[122] Also, art is goal-oriented, but in being so it imitates nature. Cf. Aristot. *PA* 1 639b19-21, where Aristotle claims that there is more finality in the works of nature than in those of arts. At any rate, among the products of nature, animals feature as those, which (literally) embody finality to the highest degree. See discussion below.

[123] *Phys.* 2 198b18-199a8. In the same passage Aristotle also mentions the case of air becoming water as a counterexample that, happening by necessity (*anankē*), may illustrate the working of nature and deny that the growth of teeth (and by extension of living beings/things and related parts) may happen "for an end" (*Phys.* 2 198b18-21); see discussion in chapter 3. On the different involvement of causes (material versus final) in natural phenomena, see Charlton, 1970, 115, and 120-121.

[124] Aristot. *Phys.* 2 196b10-198a14.

[125] This notion of birth of complete, fully formed living beings evokes parallel formations accounted for in Greek myth like that of the Spartoi, who also sprung from the earth as full-blown individuals.

[126] Aristot. *Phys.* 2 199b8-10.

[127] For Aristotle's definition of growth as a key phenomenon of life, see chapter 3.

[128] Aristot. *Phys.* 2 199b15-19.

[129] Aristot. *PA* 1 642a24-31.

[130] See above.

[131] See *PA* 1 640a33-640b4, where Aristotle states, "Hence it would be best to say that, since this is what it is to be a human being, on account of this it has these things; for it cannot be without these parts. If one cannot say this, one should say the next best thing, i.e. either that in general it cannot be otherwise, or that at lest it is good thus. And these things follow. And since it is such, its generation necessarily happens in this way and is such as it is. (This is why this part comes to be first, then that one)." It should be remarked, however, that an interesting, and "exceptional" case is that of the so-called deformed animal kinds, which do not use their bodily parts to the fullest and are, so to speak, naturally incomplete. Among them, for instance, features the mole, qualified as *ateles*, incomplete (*HA* 1 491b27-36; Witt 2012).

[132] For a recent assessment of Aristotle's authorship, see Johnson and Hutchinson 2005.

[133] Aristot. *Protrept.* Fr. B 18 Walzer; cf. *On Generation of Animals* (1 715a7-9), where Aristotle also affirms the identity of the final and formal causes.

[134] So far we have discussed the *horos* pertaining to which parts of the soul the natural philosopher has to consider and the aporetic alternative between individual species and common attributes; see above.

[135] See respectively Aristot. *PA* 1 639b12-21 and 640a10-28.

[136] Aristot. *Phys.* 2 192b9-194b34. Cf. *PA* 1 639b12-639b28 and 1 640b27-9. A backbone of Aristotle's study of nature in *Physics*, the theory of the four causes is still relevant in a study of animals inasmuch as they are beings that exist by nature. But as scholars have remarked, in the context of animals the emphasis is different than when discussing causes in nature at large (on this aspect, see also chapter 3). In *Parts of Animals*, rather than discussing the four causes in specific combinations as he does in *Physics*, Aristotle first discusses the efficient and final cause (*PA* 1 639b12-15) and, later on, the material and the formal cause (see note below and *PA* 1 642a3-18).

[137] Aristot. *PA* 1 640b5-29. For Aristotle, overall the Presocratics ignored form (*eidos*) apart from some extemporary exceptions in Empedocles and Democritus. See *PA* 1 642a.19-29.

[138] Cf. *Physics*, where Aristotle states that "all natural entities are substance…they have a certain substrate" and discusses the differences between mathematics and physics, which may well deal with the same notions such as "surfaces and dimensions, length and points," but the first in abstraction, the second in bodies (2 193b22-35). Further, matter is relevant also in terms of its qualities and availability, and as such discussed in relation to conditional necessity, which affects both natural beings and technical products (see *Physics* 2 199b33-200a16, *PA* 1 639b21-30 and chapter 3).

[139] Bodily materials must possess different *dynameis* that allow an animal and its parts to accomplish specific actions and movements (Aristot. *PA* 2 646b15-19).
[140] Aristot. *Phys.* 2 193b6-8; cf. *PA* 1 640b27-9, where Aristotle considers form (*morphē*) of more fundamental importance (*kyriotera*) than matter (*hylē*).
[141] *PA* 1 640a10-7.
[142] At the outset of the *Generation of Animals* (*GA* 1 715a1-18) Aristotle remarks on this shift of perspective and how in *PA* he has addressed the parts in relation to all the four causes—final, formal, material, and efficient—while the present treatise, in dealing with the parts that serve the animals for the purpose of generation, turns around the efficient cause (*aitia kinousa*), and, therefore unfolds, one could add, a linear account of animals' formation. As Aristotle continues, "Consideration of this cause [the efficient] and the consideration of the generation of each animal come to the same thing." It should be remarked, however, that while Aristotle's discussion follows in this case a chronological order, it is still informed by the same theoretical apparatus including form and end. For animal generation is ultimately conceived as a transmission of form and, in this respect, *Generation of Animals* shows "how teleology actually works" (see Balme, 1987, 10).
[143] *GA* 2 740a6-24.
[144] Difficulties in reaching the final end may happen, and Aristotle discusses them in terms of monstrosities and aberrations, see *Phys.* 2 199a35-8; *GA* 4 769b11-770b27.
[145] On the possible inclusion of the differentiated material in *logos*, see *Phys.* 2 200b5-10, and n181 below.
[146] Cf. *PA* 2 646b1-10 and see discussion below.
[147] On animals' bodies (*qua* ensouled bodies) as "other" (*heteros*) and more divine than the elements, see *GA* 2 736b30-32.
[148] It is noteworthy that for Aristotle *logos* is the embodied *telos* in works "that have been composed by nature" (as in the passage we are discussing here) as well as the disembodied *telos* that preexists the work's formation. In this respect, see what looks like a marginal, clarifying note to the proceeding of art at *PA* 1 640a32-33, "as for those things whose producing agent is preexistent, e.g. the art of statuary, no spontaneous formation occurs. Art is the *logos* of the work without matter."
[149] In the case of nature, Aristotle is likely thinking at the regularity of form that characterizes the process of generation. See, for instance, *PA* 1 640a19-27 and discussion on p. 41 below.
[150] As it will be seen below, this structure is a highly sophisticated one in that is in fact the result of three orders of compositions: of elements, of uniform and non-uniform parts.
[151] *PA* 1 639b17-19.
[152] See pp. 33-35.
[153] See *Phys.* 2 199b10-11 where Aristotle claims that also plants manifest purpose (*to heneka tou*), "though they are less elaborately articulated (*hētton diarthreisthai*)" (than animals). On plants' soul and living activities, see chapters 2 and 3.
[154] *Logos* is equally absent in the discussions of plants that feature in the Aristotle's zoological treatises as well as in the treatment of plants' parts in Nicolaus Damascenus' *On Plants*, which was likely based on Aristotle's homonymous treatise and Theophrastus' work. For an overview of the text history, see Drossaart Lulofs and Poortman, 1989, 1-4. In fact, as Frey points out, there are significant differences between natural bodies and artifacts (2007, 174-5, 198-200), but what interests Aristotle in *Parts of Animals* is to underline the complex structure that characterizes equally animals and artifacts when completed.
[155] *DA* 2 416a10-18. In this passage, Aristotle discusses the growth of animals and plants as naturally composed beings remarking that they have a limit and proportion (*logos*) of size, on account of *logos*, intended as form/end and not matter.
[156] See *PA* 2 656a1-3.
[157] Even the function of nutrition, which plants share with animals, is carried out as a minimal process and with a basic body equipment: plants do not have a stomach with which to process ingested food, but absorb from the earth already concocted nourishment (*PA* 2 655b33-37). The fact that plants do not concoct their food likely implies that they do not possess a standard body temperature against which to discriminate the tangibles (see n159 below and chapter 4). On Aristotle's treatment of plants in the works devoted to animals, see Falcon 2015; for plants' only mode of life, see chapter 2. It bears noting that if animals share an *oikeia physis*, plants possess a *physis* of their own (*idia*) (Aristot. *de Long.* 467a13).
[158] *PA* 2 656a3-5.

[159] Ultimately, plants' bodies lack the sophisticated form of receptivity to the sensibles that characterizes animals and that Aristotle defines as the capacity "to receive forms without matter" (*DA* 2 424a17-21); see chapter 4.
[160] See Bonitz 1955**.** Lanza and Vegetti in the "terminological note" dedicated to *logos* in Aristotle present its general meaning as "discourse," "reasoning," or "argument" and proceed to highlight its different connotations in logic, ontology, and mathematics, and in the presence of the adverb *eulogōs* (1971, 1251), discussed later. On the other hand, Lennox stresses the "discursive core" of *logos* and claims that it "can refer to a variety of linguistic units (words, definitions, reasons, arguments, books), as well as to mathematical relationships, such as ratio; …to the *content* of a definition, or to the *relationship* denoted by a ratio" (2001, 126). On the polysemy of *logos*, see also Shields (2016, 381-2), who identifies a "semantic" and a "nonsemantic," metaphysical meaning.
[161] See, respectively, Balme 1992, Lennox 2001, and Kullmann 2007, for whom "plan" well captures the identification of *logos* with the form or the definition of the structure, which equates with the final cause rather than with the formal one.
[162] For the English translation Ogle 1882, for the French Louis 1956, Le Blond 1995, who in the note *ad loc.* specifies it as "contenu intelligible," and Gain 2011, who, also in the note to this passage, points out that "the term *logos* can designate the explanation of a thing as well as its definition"; for the Italian see Lanza and Vegetti 1971, Torraca 1962, and, finally, Peck 2006 (first ed. 1937), who further adds to the transliterated *logos* "rational grounds" as an apposition.
[163] Peck 2006, 26-7 under *logos*.
[164] See respectively Aristot. *PA* 2 660a14- 28, 3 661b8-14, 662a17-23.
[165] See Aristot. *PA* 2 660a26-660b4; cf. *HA* 536b11-13; cf. Zirin 1980; Long 2011, 79-81.
[166] Aristot. *Pol.* 1 253a8.
[167] Aristot. *PA* 2 646a29-646b10, with a slight modification.
[168] For "fully-formed animal" here I do not only refer to the end (*telos*) of the animal's process of formation, but, in light of Aristotle's inclusion of the soul in his study of animals, I also refer to the movements, namely the living activities, that such an end enables a given animal to possess.
[169] Aristot. *PA* 2 646a25-30. On these two chronologies, see also *Metaphysics* (1 989a15-20) and discussion below.
[170] See above.
[171] As Carbone notices, in the process of formation movement is always associated to the transmission of form (*morphē*) (Carbone 2011, 98).
[172] However, also Empedocles investigated the process of generation and discussed the contribution of the male and female parents to the formation of the embryo (see DK 31 B 63/*GA* 1 722b10-12; cf. Zatta, 2019, 68 n.41), but for Aristotle in his focus on the "sculpting effect" of matter Empedocles neglected to consider the transmission of form.
[173] Aristot. *PA* 2 646a34-5; cf. *PA* 1 640a25-6.
[174] Indeed, that a doctor or a builder are able to account for the causes and rational grounds of everything they do in order to achieve their respective *telos* means that also the stages encompassed by the process of formation of a given animals are teleologically intended and, as such, included in the *logos* as *telos*/*arkhē* (see *PA* 1 639b17-19 and discussion above).
[175] By contrast, the *logos* of animals' formation includes both process of formation and *telos*, an object of study, which, as mentioned earlier, Aristotle deals with in *On Generation of Animals* (see above).
[176] See above pp. 9-10.Also Empedocles had perhaps this "superficial" view of animals' shapes as it appears from his identification of analogies of parts among living beings, but on the basis of function rather than constitution (DK 31 B 82/Aristot. *Mete.* 4 387b4-6).
[177] See p. 10.
[178] Aristot. *PA* 1 640b30-36.
[179] That form involves composition rather than simply matter, is explicitly stated toward the end of *PA* 1: "Just one who discusses the parts (*moriai*) or equipment (*skeuai*) of anything should not be thought of doing so in order to draw attention to the matter, nor for the sake of the matter, but rather to draw attention to the overall shape (*holē morphē*) (e.g., to a house rather than bricks, mortar, and timbers); likewise, one should consider the discussion of nature to be referring to the composite (*synthesis*) and the overall substantial being rather than to those things which do not exist when separated from their substantial being" (*PA* 1 645b30-6).

[180] Empedocles—under the guidance of truth (*alētheia*) as Aristotle ironically puts it—felt compelled to introduce the notion of *logos* in the understanding of the nature of the organic parts of the body. Bones, for instance, derived from an exact formula: two measures of water, two of earth, and four of fire. Empedocles calls it the proportion of the mixture (*logos mixeōs*) (Aristot. *PA* 1 642a21-24; DK 31 A78), where *logos*, in Furth's words, "evinces *no* appreciation of the difference between *mixture* and *structure* (1988, 91).
[181] For a discussion of the three levels of composition and, in particular, the novel range of relations that, in Aristotle's view, the elements are liable to entertain on account of their double qualities, see Mingucci, 2015, 40-54.
[182] This follows a specific order of composition, first of the elements into the uniform parts—the blood, tissues, bones and other organic "ingredients" of animals' bodies—and then of the uniform parts into the nonuniform ones—including noses, eyes, members and similarly well-defined parts—and, finally, of these last parts into complete bodies, apt to fulfill their functions as wholes and in their parts. On the purpose of the whole body and each of its parts, see also *PA* 1 642a10-4.
[183] *PA* 1 645b19.
[184] See above.
[185] In the rest of the treatise Aristotle will then proceed to discuss animals' bodies, part after part. For a list of the parts and the order in which they are arranged, see Peck, 2006, 15-18.
[186] *PA* 2 646b11-19. Cf. the above discussion on how the common nature as the condition for a species' membership to the same kind involves, for instance, social habits (pp. 21-22).
[187] Aristot. *Phys.* 2 199a20-9; all translation of this treatise are by P. H. Wicksteed and F. Cornford.
[188] Ross, 1936, 529; cf. DK 69 A 116/Aët. 4, 10, 4; see Zatta, 2019, 65-66.
[189] Cf. Aristot. *HA* 1 487a11-2.
[190] Aristot. *PA* 1 645a4-29.
[191] *PA* 1 645a24-27.
[192] It should be remarked that Aristotle stresses on the visual approach to animals. Not only does he use *theōria,* and introduce a contrasted analogy with the images produced by artists; he also adopt the verb *kathoran* as the action that allows the student of animals to see their causes (*PA* 1 645a15).
[193] DK 59 B 12.
[194] Cf. *On the Soul* where Aristotle paraphrases Anaxagoras' fragment 12 juxtaposing the categories of size and nobility: "for mind he [Anaxagoras] regards as existing in all living things, *apanta zōa*, great and small, *megala kai mikra*, noble and base, *timia kai atimotera*" (*DA* 1 404b4-7, transl. by W. S. Hett). The direct quotation in *On the Soul* confirms in fact the implicit reference to Anaxagoras in *Parts of Animals.*
[195] *Met.* 1 3 984b15-8.
[196] While Aristotle praises Anaxagoras for recognizing the presence of mind (*nous*) in nature and animals alike, in *On the Soul* he criticizes him for confusing at times *nous* with soul, and thereby, we can infer, for attributing what in Aristotelian terms is the rational part of the soul to all living beings, big and small (*DA* 1 404b1-3; cf. Zatta, 2019, 89).
[197] For the use of *dēmiourgein* as qualifying nature's "creating activity," see, for instance, *PA* 1 645a9, 2 654b32, *GA* 1 731a24, 2 743b23.
[198] See chapter 3.
[199] See chapter 4.
[200] Aristot. *HA* 1 491a24-26; cf. *PA* 2 656a9-13 and 4 686a24-29 and discussion above on pp. 13-16; on man's cosmic and natural orientation, see Preus, 1990, 473-477; cf. also Aristot. *Resp.* 477a15-25, where animals with more heat are called "worthier" (*timōtera*) and are attributed a "worthier" soul, and a "worthier" nature.
[201] See *GA* 2 732b8-733b17, and especially 732b28-33 and 733a34-733b17.
[202] Leunissen 2018, 60.
[203] In this respect, see *GA* 1 731a34-731b3, discussed in the introduction, in which Aristotle acknowledges two perspectives from which to look at animals *qua* sentient, knowledgeable beings: the intelligence (*phronēsis*) of human kind, on the one hand, and the kind of lifeless entities (*genos tōn apsykhōn*), on the other. When compared to human intelligence, the possession of touch and taste is nothing, but if we compare it to the entire lack of sensibility, "it seems a very fine thing." On the other hand, in *On the Caelo* Aristotle calls all animals endowed with the capacity of locomotion "perfect" (*teleia*) (*Cael.* 284b21-4).
[204] *DA* 2 415a27-415b2. It is true that animals share with plants the desire to live and the faculty of reproduction through the nutritive soul (for all living entities reproduction manifest such desire, even in

passive plants, devoided of any cognition). But animals are endowed with sensation, and this implies a significant discontinuity from plants in psychological and bodily terms: for animals desire is accompanied by pleasure and pain and ultimately knowledge (see *DA* 2 414b3-6; cf. 2 413b21-23 and *GA* 1 731a30-731b8) and is "felt" in a body that is more complex than that of plants. See above, and chapters 2 and 4.

[205] *PA* 1 639b19-21.

[206] Plants unite in a single individual the male and female sex, while in animals male and female are separate (*GA* 1 731a2-10).