CHAPTER 1

Biology and Theology in Aristotle's Theoretical and Practical Sciences

Monte Ransome Johnson

Biology and theology are interdependent theoretical sciences for Aristotle. In prominent discussions of the divine things (the stars and their unmoved movers) Aristotle appeals to the science of living things, and in prominent discussions of the nature of plants and animals Aristotle appeals to the nature of the divine. There is in fact a single continuous series of living things that includes gods, humans, animals, and plants, all of them in a way divine. Aristotle has this continuum of divine beings, and a theory of value that corresponds to it, in mind not only in key parts of his theology and biology, but also in his practical philosophy. Here I can do little more than call attention to some important texts and attempt to offer a coherent account of them, without being able to enter into the usual interpretive disputes.[1] I begin by clarifying the terms "theology" and "biology" and their place in Aristotle's division of philosophy. Next, I discuss how Aristotle's theology is informed by his biology, and then how his biology is informed by his theology. I end by discussing some implications of the interdependence of biology and theology for Aristotle's ethics and exhortation to philosophy.

Theology and Biology in Aristotle's Philosophy

Unlike the terms "biology" and "zoology," Aristotle himself used the term "theology," referring to "ancients" who carried on "concerning their theology" (*peri tas theologias*, *Mete.* 2.1.353a34–35). He means didactic poets such as Hesiod, who wrote a *Theogony* – a narrative of the genesis and genealogy of the gods. Aristotle does not consider *theologoi* ("those who give accounts of the gods") to be philosophers. According to him, philosophy begins with the *phusiologoi* ("those who give accounts of nature") and their works concerning nature (*peri phuseôs*), in which both divine things and living things were discussed in a new prosaic fashion.[2]

Aristotle conceives of natural science, theology, and mathematics to be three theoretical "philosophies" (*philosophiai*) or "sciences" (*epistêmai*) differentiated by their objects. Natural science apprehends causes inseparable from material but movable; mathematical science causes inseparable from material but immovable; and "theological science" or "first philosophy" causes both separable from material and immovable (*Metaph.* 6.1.1026a13–16).

> All causes must be eternal, but especially these, for they are causes for the appearances of the divine things (*tôn theiôn*). There must, then, be three theoretical philosophies (*philosophiai theôrêtikai*): mathematical, natural, and theological (*mathêmatikê, phusikê, theologikê*); since if the divine (*to theion*) exists anywhere, it exists in this kind of thing by nature (*phusei*). (6.1.1026a17–21)

Aristotle calls the science of causes that are separable from material and immovable "theological" because this science has as its object the final causes of the "divine things" or "gods" that appear to us. These divine things are the stars in the heaven, including the sun, moon, and planets. Because the ultimate cause of their motion must be separable from material and immovable it cannot be an object of natural science, even though its effects are apparent in natural phenomena. If such a cause did not exist, then "the natural one would be first science" (1026a28–29), but since an immovable cause, separable from material, of natural things must exist, theological science "must be prior and first philosophy" (*philosophia prôtê*, 1026a30). In saying this, Aristotle does not only mean that theology comes first in the process of inquiry, but also that theology has to supply certain first principles to natural science; in due course, we will examine such principles.

Natural science, then, is second, since theology is first. In *Meteorologica* 1.1, Aristotle describes the method of natural science, and it is in this context that we are introduced to the idea of an inquiry into the nature of plants and animals: what we, following modern convention, now call "biology." Having already discussed the first principles of nature and natural motion and the stars and the elements, Aristotle announces that after discussing meteorology, "we can theorize about how we have been able to give an account, both generally and separately, concerning animals and plants (*peri zôiôn kai phutôn*). For then we will have reached the end of everything we wanted to go through from the beginning" (339a5–9). Natural science, then, is a single continuous inquiry beginning with general principles and proceeding to give an account of stars and elements, before ending with animals and plants.

We have already seen from *Metaphysica* that theology as "first philosophy" has priority among all the theoretical sciences, and now we see that the science concerning the stars has priority in the process of inquiry in the natural sciences, coming after the exposition of general principles of nature, but before the discussion of the terrestrial elements, animals, and plants. Despite these evident priorities, in the exhortation of *De Partibus Animalium* 1.5 Aristotle argues that the science concerning animals and plants should not be considered less valuable than the science of the divine things.

> Each of these is delightful. Although our contact with eternal beings is slight, nonetheless because of its surpassing value this knowledge is more pleasurable than all other things around us, just as to briefly catch a glimpse of those we love is more pleasurable than seeing other even great things with precision. Perishable things, however, excel in respect of science because we have knowledge of more of them, and we know them more fully. Further, because they are nearer to us and more of our own nature, they afford a certain compensation compared with the philosophy concerned with the divine things. Since we have explained how things appear to us about divine things, it remains to discuss the animal nature, omitting nothing in our power, whether of lesser or greater value. (644b31–645a7)

In this protreptic argument,[3] Aristotle distinguishes two kinds of natural living things: the first kind are eternal and indestructible, the divine stars; the second kind are born and perish, the mortal plants and animals, here referred to by the term *zôikos*.[4] Even though it is difficult because "our contact with them is slight," knowledge of the stars is surpassingly valuable. Nevertheless, "although they are valuable and divine (*theias*), astronomical observations are fewer; for as regards both those things on the basis of which one would investigate about them, and those things about them which we long to see, the things that are visible to our sensation are vanishingly few" (644b24–28). Aristotle assumes that telescopic investigation of the heavenly bodies, including even the moon, is impossible and we can touch them only "a little bit" (644b32).[5] On this score, the science of stars compares unfavorably with the science of animals and plants: "about the perishable plants and animals, however, we are much better supplied with respect to knowledge by observation, because we grow up and are nurtured along with them" (644b28–29). Aristotle promises "indescribable pleasures to those who are able to know by observation their causes and are by nature philosophers" (645a9–10). He ridicules those "childishly disgusted at the inspection of the less valuable animals" (645a15–16), insisting that "in everything there is something natural and beautiful" (645a21–23).

He reaches a rhetorical climax by invoking Heraclitus' saying: "for gods (*theous*) exist even in here."

There is a deep and even fundamental methodological point to be discerned here. Aristotle holds that the study of divine things and the study of animals is continuous: in both the outer heavens and "in here" there are living things, and both in outer space and down here on earth the living things are divine things. When we study divine things we literally study living things, and when we study animals and plants we literally study divine things. However unpopular this conception of either gods or animals has become, there can be no doubt that it is Aristotle's conception.

In general, Aristotle rejects the idea of a single super-science or theory of everything and in the *Analytica* he endorses a general methodological prohibition against applying the principles proper to one kind of science to a demonstration or explanation in a different science, that is, a science with different objects. But at the same time he allows that in certain cases it is necessary to use the principles of one science to explain the phenomena in another: in cases where the objects overlap, as for example in the case of music (where arithmetic principles are needed to explain the empirical acoustical phenomena) or meteorological optics (where geometric principles are needed to explain the empirical phenomena connected with rainbows and halos).[6] The relevance for his theology and biology is as follows: in many ways, the science of divine things (theology), the natural science of the stars (astrophysics), and the natural science of the animals (biology) are treated as separate sciences for Aristotle, sciences with different objects and different principles used to explain the phenomena in their domain. But in other ways, these sciences overlap. For example, Aristotle invokes a biological principle to explain certain phenomena in the heavens, including the variety of locomotion among the stars (in *Cael.* 2.12). And Aristotle invokes a theological principle to explain certain biological phenomena, including animal and plant reproduction (in *De an.* 2.4 and *GA* 2.1). These examples are hardly marginal: locomotion is the primary activity of the stars, and reproduction is the primary activity of animals and plants. I will discuss these cases in the next two sections, and their implications for Aristotle's practical philosophy in the final section.

Biology and the Explanation of Divine Things

In *Physics* 8, Aristotle argues for the existence of a first "unmoved mover" of the stars without any reference to gods or the divine, but in *Metaphysics* 12 he asserts that the first mover "passes the best life, which exists for us for

a short time" (1072b14–15). Its activity is positively described as "pleasurable" (1072b16). Aristotle traces this pleasure to being awake, sensing, and thought, and asserts that "the kind of thought in accordance with itself is the best in accordance with itself, and that which is especially thought is especially best" (1072b18–19). What is "especially thought" is "thought thinking itself" because then thought and its object become one and the same. Therefore "this activity seems to be how the intellect is divine, and how its contemplation is the most pleasurable and best" (1072b23–24). In this context, Aristotle offers the following definition: "a god is a living thing, eternal, and best" (*theon einai zôion aidion ariston*, 1072b29).[7] Prima facie these three predicates conform to traditional views about the gods in Greek religion. But Aristotle's radical critique of the *theologoi*, and the naturalistic orientation of his own *theologia*, emerges when he accepts from traditional views only a single observation about the immortality of the stars, "the divine bodies which move through the heaven" (1074a30–31).

> It has been handed down to us by the ancients, and by very old things left behind to posterity in the shape of myth, that these things are gods and the divine includes the whole of nature. But the rest was mythically added as useful for the persuasion of the majority, and for the laws and the beneficial. For they say that the gods are in human form, and some are like the other animals, and other things follow from these and are similar to these which have been mentioned; which, if one separates this off taking only the first part – that they thought the gods to be the first substances – we should think this divinely inspired, and consider that, it being likely that each capability and art and philosophy has often been discovered and again destroyed, these beliefs have persisted like relics up to the present. The belief of our ancestors and the first thinkers seems clear to us only to this extent. (12.8.1074a38–b14)

The myths of the *theologoi* are obviated by Aristotle's *theological science*, a theory focused on the final causes of the movements of the divine stars. Aristotle announced in *Metaphysics* 1.2 that the wisdom connected with such knowledge would be "universal knowledge in the highest degree" (982a22–23), "for it is most divine and most valuable" (983a5). It is most divine for two reasons. First, because "the one which among the sciences the god would especially have would be divine" (983a6–7). Second, because any science would be divine "if it has one of the divine things as its object" (983a7). The science which takes the unmoved mover of the stars as its object has both of these features, and is therefore divine. "For god seems to be a principle and one of the causes for everything, and this kind of principle belongs either alone or most of all to god. All other sciences are more necessary, but none is better" (983a8–11). Aristotle here is literally

referring to the science (*epistêmê*) that god and the unmoved mover of the stars has when divine thought thinks itself. This is first philosophy, the best science, theology, and it has as its object "a principle and one of the causes for everything" (983a8–9).

By saying this science belongs "especially" or "either alone or most of all" to god, Aristotle hints at his conviction that humans too can think like god, and so become like god; a conviction important, as we will see, for his ethics and exhortation to philosophy. Hence Aristotle criticizes *theologoi* who anthropomorphically describe the gods as jealous and discourage humans from seeking the divine kind of science (982b29–983a2). Against this Aristotle gives a reply that is echoed in his exhortations to the study of animals and plants: "it would not be worthy for a man not to seek the kind of science that is in accordance with himself" (982b31–32). In the *Metaphysics*, this is an exhortation to the theory of the divine, theology; in his exhortation to the theory of living things in *De Partibus Animalium* I.5, Aristotle says of the person who rejects the study of the rest of the animals as an unworthy task: "he must think the same way also about himself" (645a27–28).

Despite the human potential for godlikeness, Aristotle acknowledges not only the greatness but also the difficulty and limits of the "divine science" and theology. Everything said by the *theologoi* may be discarded for the purposes of theological science, except the traditional idea that the stars are gods. This traditional view is also mentioned in *De Caelo* in the context of Aristotle's proof that the first body out of which the heaven is composed (ether) is eternal (*Cael.* 1.3.270b1–4). In addition to the arguments he gave in *De Caelo* 1, in *De Caelo* 2 Aristotle argues that his view about the eternality of the ethereal stars is actually supported by a consensus of foreign and Greek beliefs about the gods (270b5–11). All humans are agreed that immortal gods must exist, and Aristotle identifies these immortal gods with the stars in the heaven. He appeals to the testimony of ancient Babylonian astro-meteorological records as additional empirical evidence that the stars and their movements are eternal (270b11–16). The stars, planets, sun, and moon have never stopped moving or changed their courses throughout recorded time, and Aristotle takes this to be empirical confirmation that the gods exist and live eternally.

The constant and eternal vital activity of these immortal gods is thus taken to be an empirical fact in Aristotle's cosmos – a visible phenomenon that must be taken into account and explained by theoretical science. With reference to the extensive arguments of *De Caelo* 1, in *De Caelo* 2.1 Aristotle asserts that he has established by argument that the universe (*ho pas*

ouranos) is one and eternal, and was never generated and can never be destroyed, and thus has no beginning and no end (283b26–284a2). He refutes the views of both *theologoi* and *phusiologoi* who held the gods or the universe to have been created or generated. In fact, he claims to support the more traditional "belief in its immortality and its eternality" (284a1–2). After his technical refutation of the *phusiologoi* he makes a further appeal to those traditional beliefs themselves: "That is why it is good to be persuaded also by the true arguments of the ancients and especially those of our ancestors, that there is something immortal and divine among the things that have movement" (284a2–4).

Aristotle thinks that the ancient beliefs of traditional religion and the Babylonian records help to show that the stars in the heaven are living things, divine and immortal. His own arguments show that they are also indestructible and ungenerated, which neither the *theologoi* nor the *phusiologoi* had understood, since their accounts wrongly focused on the genesis and geneology (the "coming to be") of the gods, the universe, and living things, instead of focusing on the singular order of nature and its eternal forms.[8] Plato specifically failed by assuming that the heaven moves itself by the eternal necessitation of a soul, "for the kind of life lived by this soul would then not be painless and blessed" (284a28–29). In Aristotle's view, the activity of the stars must involve no labor or pain whatsoever, but instead be as enjoyable as possible and thus appropriate for their status as gods. Since the relevant mode of causality is not efficient but final, the unmoved mover and the stars are able to cause the reproduction and locomotion of the rest of the living things without any effort or difficulty whatsoever, according to Aristotle's first philosophy or theology. Grasping the true nature of the divine (i.e., a principle of theology) thus precludes a certain conception of the causality at work in the heaven (i.e., in a domain of natural science) and lends support to a completely different one: "only in this way will we have accounts consistently in agreement with our conjectures concerning the divine" (284b3–5).

For example, since the living stars move in the same direction eternally and continuously, it is possible to establish absolute directionality in the heaven: "Since it has been established by us that these kinds of capabilities belong in the thing having a principle of motion, and that the heaven is animate (*ho ouranos empsuchos*) and has a principle of movement, it is clear that it has both the up and the down and the right and the left" (285a27–31). The heaven is said to be "animate" or "ensouled" (*empsuchos*) just because it contains animate things, namely the divine stars. Since intelligent extra-terrestrial living things move themselves for the sake of divine

activity, the explanation of various motions in the heaven will refer to principles discussed in "works on the movement of animals":

> At the start we may say that, if right and left are applicable, there are prior principles which must first be assumed. These principles have been defined in the works concerning movement of animals (*en tois peri tas tôn zôiôn kinêseis*), because they are proper to the nature of them. (2.2.284b10–14)

Accordingly, *De Motu Animalium* begins with an account of the first mover and the eternal movement of the stars that depends on inferences from the study of animal movement. Aristotle infers that there must be some part of the universe that is immobile from the fact that there must be some part of an animal that is immobile (namely a joint) in order for animals to move: "it is clear that for visible things too movement is impossible if there is nothing at rest, and in the first place in these, the animals" (*MA* 1.698a14–16). He also argues that there must be something immobile outside the heavens in order for the stars to move on the basis of the fact that there must be something immobile outside an animal in order for it to move: "the point of rest in an animal is entirely ineffectual unless there is something outside it which is absolutely at rest and immovable. And it is worth stopping and examining what has been said; for it involves a theoretical observation which applies not only to animals but even to the rotation and movement of the universe" (*MA* 2.698b8–12); "we may resolve that there is something so related to the whole of nature as the earth is to animals and the things moved by them" (*MA* 3.699a24–26). In this same context, Aristotle also refers to his theological account in the *Metaphysics* of the cause of all motion in general (the first mover) but he indicates, not surprisingly, that this account is less clear than the account of the cause of animal motion,[9] and maintains that "from these considerations it is clear that in one regard that which is eternally moved by the eternal mover is moved in the same way as every living creature, in another regard differently" (*MA* 6.700b29–31). The result is that both theological and biological principles are needed to explain the divine things that appear to us in the heavens. The appeal to biological works in the context of explaining the activity of the stars shows that the study of the divine cannot be isolated from biology and natural science. This is also apparent when Aristotle appeals to the fact that gods are living things in order to support his arguments about the very shape and form of the heaven and universe. In this context he specifies the *ergon* (function or work) of god.

> When there is an *ergon*, each thing exists for the sake of its *ergon*. Immortality is an actual function of a god (*theou . . . energeia athanasia*), and this means

> living eternally (*zôê aidios*). So, then, it is necessary that eternal movement exist for the god. But the heaven is this kind of thing, for it is a divine body (*sôma . . . theion*), so for this reason it has the circular body which by nature moves always in a circle. (*De Caelo* 2.3.286a8–11)

Aristotle goes on to argue that the hypothesis that the stars are living things (or animals) is best able to explain *all* of the phenomena related to the stars: "we have become accustomed to thinking that the stars are mere bodies, and that they are points having order but are entirely lifeless. But it is necessary that we conceive of them as embracing activity and life (*praxeôs kai zôês*). For then none of the phenomena will seem unreasonable" (*Cael.* 2.12.292a18–22). Thus Aristotle, armed with a biological conception of the gods, attacks the problems of explaining the variability of the motions of the fixed stars, planets, sun, moon, and earth. The reason why there is not a direct linear increase in movement the more distant one gets from the primary body, as one might expect, is supplied by the following method: "we must think of the activity of the stars (*tên tôn astrôn praxin*) as similar to that of the animals and plants" (*hê tôn zôiôn kai phutôn*, 292b1–2). Planetary motion turns out to resemble human action in being extremely variegated, while the motions of the other stars may be compared with the relative simplicity of the other animals, and the immobility of the earth may be explained by analogy to a rooted plant. The implication of this network of passages is that the science of the stars, which has as its object the divine things that appear to us in the heaven, depends on principles not only of first philosophy or theology, but also of biology.

Theology and the Explanation of Animals and Plants

When we take up the protreptic advice of *De Partibus Animalium* 1.5 and turn from Aristotle's account of the divine things that appear to us in the heaven to his works on animals, we quickly realize that the striking idea that "gods exist even in here" is not merely a metaphorical or rhetorical maxim. In fact, we have to accept a biological principle that is at the same time a theological principle in order to understand the most basic phenomena of living things, beginning with the final cause of their generation and reproduction. According to the *De Anima*, all plants and animals, since they depend on vegetative capabilities, have their primary *ergon* determined in accordance with nutritive and reproductive activities. Since the vegetative soul inheres in all plants and animals, it is "the primary and most common capability of soul" (415a24–25). Aristotle specifies its *erga* as nutrition and reproduction (415a25–26). "For the most

natural of the *erga* for living things, as many as are perfect and not mutilated or generated spontaneously, is to produce another like oneself, an animal an animal, a plant a plant, in order that they participate in the eternal and the divine as much as possible" (415a26–b1).

The *ergon* of the eternal and divine, the immortal gods, thus determines the *erga* of all other living things. As we saw, the *ergon* of a god is immortality, that is, eternally living (*De Caelo* 2.3.286a8–11). And in the *De Anima* Aristotle keeps in mind that "the gods all move continuously and eternally, moon, sun, the stars and the whole heaven" (*De an.* 1.2.405a32–b1). By contrast, no mortal living thing can, like the stars, eternally move continuously, and so their "most natural *ergon*" becomes the reproduction of their own forms in order "to participate in the eternal and the divine (*tou theiou*) as much as possible" (*De an.* 2.4.415a29–b1). Thus, the final cause of all plants and animals is specified as a theological and biological principle. The divine life of the gods is the starting point for the rest of the series of living things, establishing what is in accordance with nature for it: "for everything desires this, and does for the sake of this what it does in accordance with nature" (415b1–2). It is because the mortal series cannot live *continuously* as the same numerical thing (as the divine stars do) that they must approximate divine activity through reproduction:

> since they are unable to have a share in the eternal and the divine in a continuous way (because for none of the destructible things is it possible to remain the same in number), as far as each is able to participate it gets a share of this, some more, others less, and remains not the same but like the same, not one in number, but one in form. (415b3–7)

A very similar biological and theological principle is reiterated in *De Generatione Animalium* 2.1.

> Among the things that exist some are eternal and divine, but others admit the possibility of being and not being. But the beautiful and the divine are a cause, in accordance with their own nature, of the better in the case of things that are possible. But that which is not eternal admits the possibility of being and not being, and the worse and the better. But soul is better than body, and the animate is better than the inanimate – because of the soul, and because *to be is better than not to be* and *to live is better than not to live* – for these reasons there is genesis of living things (*genesis zôiôn*). For since the nature of this kind of thing cannot possibly be eternal, the thing being generated becomes eternal in accordance with a way that is possible. While it is impossible in number (for the substance of things that exist in this way are individual; and were it this kind of thing it would be eternal), nevertheless it is possible in form. Thus, there will always be kinds of humans and animals and plants. (731b24–732a1)

In addition to the principle that it is the nature of living things to strive to be eternal, Aristotle invokes as even more fundamental principles that "to be is better than not to be" and "to live is better than not to live." These axioms ultimately explain both why the stars live and move continuously, and why there will always be a continuous generation (reproduction) of living things. The mode of causal explanation is final: there will always be life and movement of the stars and continual generation of living things for the sake of eternal living and being. These principles inform both the natural science of stars and that of animals, thus they are higher principles than either science. They apparently belong, like the explanation of all motion in general, to Aristotle's "first philosophy" or theology, the science that comprehends, as we saw, "a principle and one of the causes of everything" (*Metaph.* 1.2.983a8–9). Thus, as the explanation of the most basic activity of the stars (locomotion) is given according to a biological principle, so the explanation of the most basic activity of animals and plants (reproduction) is given according to a theological principle.

Aristotle's works on plants are lost, but in the *Historia Animalium* Aristotle collects a mass of information about the phenomena connected with animals and makes some general remarks about plants. He argues that natural kinds can be rank-ordered according to their *erga*, and that *erga* form a continuous series that extends even beyond plants into lifeless things:[10] "from the lifeless things nature makes a transition little by little into the living things, such that the border between them, and which side the intermediate thing is on, escapes our notice. For beyond the kind of lifeless things is, first, the kind of plants" (*HA* 8.1.588b4–7). In *De Generatione Animalium*, even spontaneously generated organisms are said to show differences in kind that make them "more or less valuable" (*GA* 3.11.762a24–25), depending on the "degree to which they embrace the principle of animation" (*tês archês tês psuchikês*, 762a25–26). According to the *Historia Animalium*, plants clearly have an *ergon*, but it is mere reproduction: "among the plants that come about through seeds there is no other *ergon* apparent except to make another again like itself" (8.1.588b24–26). But degrees of vitality exist even among plants: "even among plants, one kind differs from another kind with respect to seeming to participate more in life; but as a whole the plant kinds seem animate relative to the other bodies but, relative to animals, inanimate" (588b7–10). Although Aristotle does not in any extant work elaborate on how plants exhibit different degrees of vitality, he makes it clear here that plants resemble both inanimate things and animals. Some animals have virtually no *ergon* beyond that of a plant (588b26–27) but others resemble humans

more. And the transition between animal kinds with respect to degrees of vitality and activity, as with plant kinds, is continuous.[11] There is a continuous variation of kinds (meaning, in accordance with the above passage: their boundaries are imperceptible) with respect to moving and living (*zôên*, 588b21–23) and to "the activities of their way of life" (*tas tou biou . . . praxeis*, 588b23). Animals thus show great variation in degrees of vitality and activity with respect to their ways of life, in the first place with respect to their modes of reproduction, having sex (and the pleasure they derive therefrom), their means of giving birth (by means of eggs, grubs, or live births), and the degree of sociality and intellectual activity (588b21–589a2; cf. *GA* 2.2).

Important methodological implications of these views for the science of animals emerge clearly in *De Partibus Animalium* 2.10. Having discussed the uniform parts of animals, Aristotle begins to explain their nonuniform parts. He attributes the greater variety of physical forms and parts of animal kinds (relative to plant kinds) to the greater differences in their *erga*; and the greater variety of human kinds (relative to animal kinds) to greater differences in human *erga* (656a2–7). Humans have the greatest variation in ways of life as a species, and thus greater variation in their own natural parts. Their final cause necessitates a greater variety of organic forms and activities. The unique features of the human form, such as standing erect, having a non-fleshy head, the position of sense organs, having arms and hands, large feet, soft and broad tongues with wet lips, greater dexterity, etc., correspond to the variety of human ends and *erga*.[12] Because they have the best form and the greatest variety of functions, human life serves as the model for the more limited variation of forms and *erga* of the lower animals. Additionally, the organization of the natural parts of a human being corresponds to the overall order of the universe: "for of the living things or animals known to us, either humans alone, or humans most of all, participate of the divine (*metechei tou theiou*). Because of this, and because the shape of human external parts is most familiar to us, one ought to speak first about them" (656a7–10).[13] Aristotle thus methodically begins his account of the heterogeneous parts of animals with the human being. Later he specifies that intellectual activity is the ultimate cause of the human way of life, and the human form and posture is determined accordingly. "For humans alone of the animals are upright, on account of the fact that their nature and substantial being are divine; and it is an *ergon* of that which is most divine to think and be intelligent" (*ergon de tou theiotatou to noein kai phronein*, 4.10.686a25–29). This *ergon*, Aristotle argues, would be impossible were the human being pressed under the burden of a heavy body and, like the quadrupeds, inclined

towards the ground; the senses and intellect would be impeded by such a bodily structure. For this reason, and because they are the most divine, humans walk upright on two legs, a posture that frees up their limbs to become arms and hands and so to serve as tools of the intellect.

After describing the human being as a model species and explaining the adaptation of its organs and posture to its vital activities, Aristotle speaks as if the other animals were devolved from this human form, as when he explains animals "becoming four-footed" because of their unintelligence (*PA* 4.10.686a25–b2). It turns out that all other living things, including all birds and fish, are "dwarfish or ill-proportioned" (*nanôdês*, 686b23) and "this is why all the animals are less intelligent than the humans" (686b23–24). The cause of lack of intelligence among human children and the senile, who also have ill-proportioned constitutions, is similar to that of the other animals who are confined to that condition for their entire existence. Moving continuously in the same direction, Aristotle says that animal forms become insects and even plants (686b29–34; cf. *GA* 1.23.731a25–b8, 5.1.778b29–779a4). Thus, Aristotle's general explanation of the entire series of animals presupposes the theological doctrine that humans are the most divine of mortal living beings, and that all living things exist on a single continuum, so that the capabilities of the other animals can theoretically be rank-ordered in accordance with their proximity from the godlike form and capabilities of humans. In practice, Aristotle often ignores this rank-ordering, as for example when he is absorbed in the empirical details of biological inquiry, and even when he is examining the causes explaining facts about animal species. Aristotle's theological views do not usually intrude on his biological inquiries; on the contrary, they are often irrelevant to his biological explanations, and in fact he shows much more restraint in his "teleological explanations" than many biologists before and after Darwin. Still, where they are not in the foreground, Aristotle's theological views remain in the background of his biological theory. And the way in which his theological views have influenced his biological views is foregrounded in key parts of his practical philosophy, as I will now briefly argue.

Theology and Biology in Aristotle's Ethics and Exhortation to Philosophy

The passages in which Aristotle describes lower animals as modifications of the human form are best interpreted not in terms of a literal devolution of species,[14] but rather as an axiological rank-ordering of plants and animals relative to the "most divine" model species of human beings. An examination

of the way that Aristotle applies this rank-ordering in his protreptic to philosophy and ethics confirms that his theological view of living things pervades not just his metaphysics, astrophysics, and biology, but his practical philosophy as well. In his popular exhortation to philosophy (the *Protrepticus*), the idea of becoming like a plant or animal is compared with becoming like a god: "when sensation and intellect are taken away, a human becomes roughly the same as a plant; when intellect alone is taken away, he turns into a beast; when irrationality is taken away but he remains in his intellect, a human becomes similar to a god."[15] In this context, it is emphasized that, although the other animals excel humans in certain ways,[16] they have nothing of theoretical wisdom:

> What makes us different from the other animals shines through in this life alone, a life in which what happens cannot fail to have great worth. For animals too have small glimmers of reason and intelligence, but they have absolutely no share of theoretical wisdom, and this is shared only with the gods, just as humans are actually left behind by many of the animals in the acuteness and strength of their senses and drives.[17]

The gods are understood by Aristotle to be immortal living things continually engaged in intellectual activity, and humans are described as being most godlike not only in their activities, but in the very shape and posture of their bodies and the functions of organs like hands. The lower animals engage in intellectual activities less frequently, and their shapes and postures and the functions of their organs accord with this; plants resemble the gods only in their reproductive activity.

This rank-ordering of the continuum of living things is applied in key arguments about the human *ergon* and the superiority of the theoretical life in the ethical works. All plant and animal capabilities are eliminated as candidates for the human *ergon*: "Living seems common even to plants, but we are seeking something unique for a human. Let us reject, therefore, the life of nutrition and growth. Next would be sensation, but it also seems common even to the horse, the ox, and every animal. There remains, then, an active life of the part having reason" (*EN* 1.7.1097b33–1098a4; cf. *EE* 2.1.1219b20–1220a1). Throughout his *ergon* arguments, Aristotle presupposes his theological and biological doctrines about the continuity of living kinds, gods, humans, animals, and plants. It is because the other animals and plants cannot participate in this kind of divine activity that "neither a horse, nor a bird, nor a fish" can possibly be *eudaimon* (*EN* 10.8.1178b27–30; *EE* 1.7.1217a22–29). Thus, intellectual activity counts as the final end for humans both because this activity is not shared with the other animals

and plants and because it is shared with the gods. Divine life engages in intellectual activity continuously, and human life only intermittently. But the human engagement is enough to give them an inkling not only of *eudaimonia* but of divine living itself, and so a human can become like a god – and this capability truly does set them apart from all the other living things, who can imitate the divine activity only through locomotion and reproduction.

This key argument of Aristotle's practical philosophy is grounded in his theoretical science, and specifically in his theology and biology. As we have seen, Aristotle's natural science takes some of its basic principles from his theology (from "first philosophy"), and not only his account of the motion of the stars, but also his account of the reproduction of animals and plants. But the part of Aristotle's natural philosophy that deals with the gods and the divine that appears to us in the heavens also borrows some of its principles from his biology. His account of the activity of the stars, humans, animals, and plants all depend on a more general conception of the nature of living things as all being, in a sense, divine things. But, as we saw, although the most fundamental principles of biology are technically "theological," Aristotle considers the study of the plants and animals to be the best way for us to come to understand divine nature, "for there are gods even in here."

Notes

1 All translations are mine.

2 See also 983b28–32, 1000a9–11, 1071b26–28, 1075b24–27, 1091a33. See discussion in Bodéüs 2000: 75–80 and Menn 2012: 425–426.

3 This argument is parallel to the protreptic opening of *De Anima* (1.1.402a1–7), which champions the inquiry of the soul on the basis of two criteria: (1) the value of the object of the inquiry; and (2) the clarity or acuteness (*akreibeia*) of the science. These criteria correspond to a set of dialectical and rhetorical tropes discussed in *Top.* 3.1.116a21–22 and *Rh.* 1.7.1364b7–11; tropes that had already been employed by Aristotle in the *Protrepticus* (*apud* Iamblichus *DCMS* 23.72.2–73.3 Festa) to argue for the superiority of the mathematical sciences.

4 The adjective *zôikos* usually means "animal" (and is usually translated accordingly here), but it can also indicate the more general "living," and so be understood to apply to plants and humans, in accordance with the extension of the noun *zôion* not to animals but, commonly, to living things in general. We know from the methodological statement of *Meteorologica* 1.1 that Aristotle intends to include plants in his natural science, and we know that he also counts them among the beautiful and valuable, even divine, natural living things. For a further discussion of the relevant terminology, see Johnson 2018.

5 *IA* 4.699b17–21. In *GA* 3.11.761b12–22, Aristotle states that since there are living things in earth, water, and air, there ought to be some in fire as well, most likely in the region of the moon; this speculation is apparently unconfirmed because of the impossibility of examining the region of the moon adequately.

6 The exceptions to Aristotle's prohibition on kind-crossing explanations are discussed in *A. Po.* 1.13.78b34–79a13. See Johnson 2015: 175–178.

7 See also discussion of the definition of god at *Top.* 4.2.122b12–14, 4.5.126b35–127a2, 5.1.128b19–20.

8 *Ph.* 2.4.196a17–b5; *Cael.* 1.10.279b4–280a11; *PA* 1.1.640a10–b29; *Metaph.* 1.8.988b26–989b29. Aristotle unequivocally rejects intelligent design creationism, including Plato's version. Attempts to show that Aristotle was committed to creationism in his exoteric works, or at an earlier phase of his development, are flawed. See Johnson 2019; Johnson 2005: 258–263; cf. Sedley 2007: 167–204.

9 "All inanimate things are moved by another thing, and the principle of all the things moved in this way is things which move themselves. And of these kinds of things we have spoken concerning the animals . . . but it is not clear whether there is some higher and primary mover, but there is another account concerning this kind of starting point" (*MA* 4.700a16–21). The other account he refers to is apparently that of the final cause of all motion from *Metaph.* 12.7: "the manner of the movement of the first and eternally moved, and how the first mover moves it, has been determined before in our work on first philosophy" (*MA* 6.700b7–9).

10 That even lifeless natural things have *erga* is asserted at *Mete.* 4.12.390a3–21. At *GC* 2.10.336b25–337a6 Aristotle argues that the elements reciprocally transmute into one another for the sake of ensuring the continuity of generation and destruction. He even says that in order to approximate eternal being the simple bodies "imitate circular motion" (337a3–4). In specifying the final cause, Aristotle invokes the axiom "it is better to be than not to be" (336b28–29) just as in *GA* 2.1.731b24–732a1.

11 *HA* 8.1.588b10–21; cf. *PA* 4.5.681a10–29.

12 Erect posture: *PA* 2.10.656a10–14, 4.10.686a25–32, 686b21–687a2, 689b10–15. Non-fleshy head: 2.10.656a14–b14. Position of sense organs: 2.10.656b15–657a13, 4.9.686a6–18. Arms and hands: 686a25–686a3, 687a3–b22. Relatively large feet: 4.10.690a28–b10. Soft and broad tongues with wet lips: 2.17.660a15–28.

13 Compare *HA* 1.8.491a19–23 where the same methodology is followed, but the only reason given is that the human being is more familiar to us. Nevertheless, even in the *HA* Aristotle seems to presuppose that humans are the most divine and therefore model animals, as for example when explaining their posture (494a26–33). Aristotle follows a methodology similar to the *PA* in *De Incessu Animalium*, and apparently for the same reason. See *IA* 1.4, where the human is said to be "more in accordance with nature than the other living things" (706a19–20); "and the other starting points exist and are more especially

defined in accordance with nature in the human being" (706a24–25). This is followed by the discussion of other kinds of animals, ending in chapter 19 with the discussion of mollusks.

14 Other passages in which Aristotle speaks as if one kind of animal can be transformed into another include: *PA* 4.10.686a25–b34; *GA* 2.1.731a25–b8, 5.1.778b29–779a4; *Pol.* 5.3.1302b34–1303a3.

15 Aristotle *Protrepticus* fragment B28 Düring, *apud* Iamblichus *Protr.* 5.35.14–18 Pistelli. For the idea of "becoming like a beast" in Aristotle, see *De an.* 3.3.429a6; *EN* 3.10.1118b5; *EE* 1.5.1215b36; *MM* 2.6.1203a18–29; *Pol.* 3.11.1281b20. On the comparison of the rational activity with becoming godlike, see *EN* 10.8.1179a20–30; *EE* 7.15.1249b10–25.

16 In *De an.* 2.9, Aristotle points out that humans fall behind other animals with respect to all of the senses except touch (421a30; cf. *HA* 1.1.494b18; *GA* 5.2.781b17).

17 Aristotle, *Protrepticus* fragment B29 Düring, *apud* Iamblichus, *Protr.* 5.36.6–13 Pistelli.

Guide to Further Reading

The still standard account of Greek theology is:

Burkert, W. 1985. *Greek Religion* (Cambridge, MA: Harvard University Press).

Recent useful studies of Aristotle's theology include:

Baghdassarian, F. 2016. *La question du divin chez Aristote* (Louvain-la-neuve: Peeters).

Bodéüs, R. 2000. *Aristotle and the Theology of the Living Immortals* (Albany, NY: State University of New York Press).

Menn, S. 1992. "Aristotle and Plato on God as Nous and as the Good," *Review of Metaphysics* 45: 543–573.

2012. "Aristotle's Theology," in C. Shields (ed.), *The Oxford Handbook of Aristotle* (Oxford University Press), 422–464.

Segev, M. 2018. *Aristotle on Religion* (Cambridge University Press).

G. E. R. Lloyd offers indispensable discussion of the general problems of the development of the Greek life sciences against the background of other systems of beliefs, including theological views; in the following works he set the agenda for the discussion of general issues, and then those specific to Aristotle's philosophy.

Lloyd, G. E. R. 1983a. *Science, Folklore, and Ideology: Studies in the Life Sciences in Ancient Greece* (Cambridge University Press).

1996a. *Aristotelian Explorations* (Cambridge University Press).

J. G. Lennox has engaged Lloyd on several of these issues and established the agenda for the discussion of some other specific issues, including the role of humans as model species.

Lennox, J. G. 1999b. "The Place of Mankind in Aristotle's Biology," *Philosophical Topics* 27: 1–16.

Lennox, J. G. 2001b. *Aristotle's Philosophy of Biology: Studies in the Origin of Life Science* (Cambridge Studies in Philosophy and Biology) (Cambridge University Press).

An engaging, extremely useful, and mostly convincing study of the implications of theology for philosophy, especially natural science and cosmology, from the early Greek naturalists through the Hellenistic philosophers is:

Sedley, D. 2007. *Creationism and its Critics in Antiquity* (Berkeley, CA: University of California Press).

A clear and useful study of the divisions and methodology of Aristotle's natural science is:

Falcon, A. 2005. *Aristotle and the Science of Nature: Unity Without Uniformity* (Cambridge University Press).

A solid explanation of how Aristotle's account of the continuous series of living things or *scala naturae* coheres with his logic, scientific method, and metaphysics is worth consulting.

Granger, H. 1985. "The *Scala Naturae* and the Continuity of Kinds," *Phronesis* 30: 181–200.

1987. "Aristotle and the Finitude of Natural Kinds," *Philosophy* 62: 523–526.

A recent account of Aristotle's methodological principle that "Nature does nothing in vain" as a natural state model of biological development is important because it shows that the principle does not entail any commitment to a creationist or providential theology, despite the alternative formulation found in *De Caelo*: "the god and nature make nothing in vain" (1.5.271a33).

Gottlieb, P. and Sober, E. 2017. "Aristotle on 'Nature Does Nothing in Vain'," *Hopos: The Journal of the International Society for the History of Philosophy of Science* 7(2): 246–271.

THE CAMBRIDGE COMPANION TO ARISTOTLE'S BIOLOGY

EDITED BY

SOPHIA M. CONNELL

Birkbeck College, University of London

CAMBRIDGE
UNIVERSITY PRESS