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## ALEXANDER OF APHRODISIAS ON THE CAUSES OF ANIMAL GENERATION

### **Abstract**

The discussion of the soul as a principle of life in ancient Greek philosophy was not limited to the soul's relation to the body, the capacities of the soul, and the functions of the living organism. The debates about the soul and life also concerned issues of embryogenesis, such as the generation, formation, and animation of an organic body in the womb. The fragments of these debates can be traced in the writings of Alexander of Aphrodisias, particularly in his treatise *On the Soul*. In this paper, I examine Alexander's views on animal reproduction, especially considering the problematic question of the life and animation of the embryo. Analyzing generation among the other capacities of the nutritive soul in *On the Soul*, Alexander considers the causes of embryogenesis. As the first cause, he indicates the nutritive capacity, which is transmitted from the parent through the seed and acts in the embryo. In addition, as Simplicius states in his commentary on Aristotle's *Physics*, Alexander claims that the soul of the parent acts as a *paradeigma* that specifies the order and the goal of the embryo's development. Thus, I explain Alexander's understanding of the causes of the embryo's development and animation in the context of his idea of the soul as a capacity (*δύναμις*) and state (*ἔξις*).

### **Keywords**

Alexander of Aphrodisias, Aristotle, Theory of the Soul,  
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Aristotle, as a supporter of the theory of epigenesis, considers the generation of an animal to be a complex process. In it, from the seed, which contains a certain possibility of the soul and the driving power transmitted from the parent, more and more new parts of the living and, therefore, animated body successively arise.<sup>1</sup> These parts of the future animal are not contained in the seed but arise in the womb. Aristotle compares the successive generation of a complex organism from a small amount of matter to the movement of miraculous automata (τὰ αὐτόματα τῶν θαυμάτων), in which the master sets in motion the first part, which, in turn, sets in motion the next, and so on until all parts of the whole successively come into motion (Arist. *GA* 734b6-17).<sup>2</sup> But he also gives another example, comparing generation to the plaiting of a net (*GA* 734a19-20), since in the process of generation there is not only a transfer of movement from one emerging part to another, but also a gradual complication of the organic structure. The organs that have emerged do not merely follow one another; rather, they constitute a single whole in which all the parts function together and each part can only function effectively within the parameters of the whole. The joint action of the organic parts of the nascent animal occurs because the animal, although its generation has not yet been completed, is already animate and alive. Initially, the nutritive soul acts in it; but, after the formation of the corresponding organs, its sensitive soul becomes actual (*GA* 736a22-736b15).

Aristotle's theory of embryogenesis was discussed both in various treatises and in commentaries on the *Physics* and *De Anima*. First of all, the commentators discussed the causes of generation and the order of animation of the living being. In this article, I will consider the views of Alexander of Aphrodisias on the development and animation of the embryo. In the texts that have come down to us, Alexander touches on the issues of

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<sup>1</sup> The soul is considered by Aristotle both as a formal and as an effective cause of the development of the embryo after conception. On the soul as the cause of embryogenesis in Aristotle, see Code (1987) pp. 54-5; Gotthelf (1987) p. 217; Whiting (1995) p. 94; Johansen (2012) pp. 129 ff. A. Bos believes that in the seed all parts of the soul inherent in the nature of this species are contained in the possibility (Bos 2009, p. 386). However, the organs and parts of the body necessary for perception and locomotion are generated under the influence of the nutritive soul (cf. Bos 2009, pp. 388-9 and Johansen 2012, pp. 118, 138, 141).

<sup>2</sup> For Aristotelian 'automata' and the embryogenesis in the context of Aristotle's teleology, see De Groot (2008) pp. 58-63.

embryogenesis only occasionally,<sup>3</sup> therefore, the purpose of this article is to compile, present, and interpret these passages within the broader framework of Alexander's beliefs regarding the soul and life. To understand how he interprets the causes and process of generation and animation of the embryo, I rely on two passages from his treatise *On the Soul*,<sup>4</sup> and also on the arguments of Alexander that Simplicius cites in his commentary on Aristotle's *Physics*.<sup>5</sup>

### 1. *The Life of the Embryo in the Womb*

The context in which embryogenesis was considered in the commentary tradition, has changed. While Aristotle initially defines the embryo as something alive (he calls even unfertilized wind-eggs alive in some sense, *GA* 741a16-23), the life of the embryo becomes a problematic issue in the later tradition. The embryo is a part of its mother, which means that one incomplete living being lives and grows as part of another complete one. The question is, to what extent is the embryo a part, and to what extent is it a living being? In his commentary on Aristotle's *On the Soul*, Philoponus provides a number of arguments regarding the animation and life of the embryo, and in doing so, he outlines the spectrum of views among ancient philosophers on this matter. I propose to consider Alexander's position as part of the debate described by Philoponus. An overview of these arguments will allow us to understand Alexander's place in this debate and to suggest the premises that may be behind the statements he makes in his *De Anima*.

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<sup>3</sup> Although Alexander generally pays no attention to Aristotle's biological treatises, he does take some ideas from these treatises into consideration in his works. Cf. Falcon (2021) pp. 250-1.

<sup>4</sup> Alexander sets out his views on the generation of animals and the animation of the embryo in the context of a discussion of the activities of the nutritive soul (*Alex. De An.* 31.7-38.11), as well as in the context of a discussion of the faculties of the sensitive soul and its difference from the rational and nutritive soul (*De An.* 74.15-25).

<sup>5</sup> Simplicius analyzes the causes of embryogenesis in his *Commentary* on chapter 3 of the second book of *Physics*, in the context of a discussion of the four causes and nature as an irrational power (*δύναμις*) that acts for a purpose; and in the same place he sets out the views of Alexander (*Simpl. In Phys.* 310.25-312.1). See also Henry (2005) pp. 21-3 and 27.

So, the opinions reported by Philoponus can be divided into three positions:<sup>6</sup>

1) An embryo is not a living being. Life consists of nourishment and growth, which the body accomplishes through its own organs. An animal that finds its food and feeds through its mouth is alive, while an embryo gets nutrition not from its mouth, but from its mother through the umbilical cord. Therefore, the embryo is neither an animal nor something that possesses life (Philop. *In De An.* 213.8-11).

2) An embryo is a living being, though not an animal. Nutrition is the process not only of consuming but also of digesting and absorbing food. The animal receives food through its mouth and then absorbs it through its own organs. Similar to the way that food travels through an animal's blood to every part of its body, the embryo gets food from its mother through the umbilical cord and then absorbs and distributes it through its blood to every part of its body, just as in living animals (*In De An.* 213.19-23). The mother only prepares food for the embryo, which is not yet able to receive it through its mouth. Since the embryo uses its own organs, its nourishment becomes the cause of its growth, and this growth comes from itself. Its growth also occurs according to the stages and measures of its nature, and not without measure, as in the case of fire. However, the embryo, although alive, is incapable of living an animal life, precisely because it is incapable of self-feeding through its mouth and of moving around locally in search of food.

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<sup>6</sup> Philoponus's whole argumentation is given here: Philop. *In De An.* 212.28-214.33. For a detailed discussion of Philoponus's arguments, see Scholten (2005) pp. 382-5, Wilberding (2017) pp. 142-4. Philoponus believes that it is not the nutritive soul as such that is transmitted from the parent through the seed since the seed is not animated, but the *logoi* of natural capacities, which are indivisibly contained in the seed (*In De An.* 268.18-19). C. Scholten interprets Philoponus as follows: natural *logoi* are transmitted from the parent through the seed, and these become the formal cause of embryogenesis, from which the capacities of the plant soul are generated. See Scholten (2005) pp. 393-4. Blumenthal also points out that the faculties of the nutritive soul depend on the immaterial natural *logoi* which are contained in the seed; see Blumenthal (1986) pp. 376-7. Philoponus carries his arguments further and proves that the embryo goes through all the stages of natural generation: at first, it is not alive; then, during the formation of organs, the nutritive soul acts in it; after developing the ability to move certain body parts, it lives as a zoophyte – the middle step between a plant and an animal – but only after birth does it receive a sensitive soul (*In De An.* 214.2-33; 235.30)

The embryo is connected to and dependent on its mother, just as a plant is connected to the earth and receives nourishment from it. So, the embryo does not lead an animal life, but instead a plant life (*In De An.* 213.26-31).

3) An embryo in the womb is a living being and lives, not like a plant, but like an animal. The embryo acts in the womb more like an animal than a plant because it uses its own organs to feed and grow, as well as for locomotion, that is, the arbitrary movements of its bodily parts, of which the plant is incapable (*In De An.* 213.22-25). It is enclosed in the womb and fed by its mother because, it requires assistance, protection, and time to form its body, like the new-born animal. Nevertheless, based on its organic structure and the movement of its body parts, it possesses a sensitive soul in actuality.

Here, the most important point for us is that nutrition through its own organs is the first formal sign of life, and nutrition through its mouth and locomotion turns out to be a formal sign of animal life.

## *2. The Nutritive Soul as the Efficient Cause of Generation*

Discussing the faculties of the nutritive soul – nourishment, growth, and generation – Alexander calls the faculty of generation the most perfect of these. The process of generation is similar to the process of nourishment which includes three parts:

[...] that which nourishes, that which is nourished, and that with which it is nourished. The soul for nourishing [oneself], or first soul is that which nourishes; that which is nourished is the body whose form is the power just mentioned; and that with which it is nourished is the nourishment (*Alex. De An.* 36.10-12).<sup>7</sup>

The soul causes the movement of nourishment, the body carries out this movement, and the food, being subject to nourishment, changes from unlike to like; food that enters through the mouth becomes blood, which nourishes every part of the body. By analogy with nutrition, Alexander identifies three components of the process of generation: the efficient cause of generation, which is the nutritive soul; the instrumental cause of generation, which is the

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<sup>7</sup> [...] τοῦ τρέφοντος, τοῦ τρεφόμενου, ὃ τρέφεται, τὸ μὲν τρέφον ἐστὶν ἡ θρεπτικὴ τε καὶ πρώτη ψυχὴ, τὸ δὲ τρεφόμενον τὸ σῶμα, οὗ εἶδος ἡ προειρημένη δύναμις, τὸ δὲ ὃ τρέφεται ἡ τροφή.

body of the parent and the seed; and the subject of generation – a living being similar in nature to the parent. Heat and blood are the instrumental causes of growth, while the seed is the instrumental cause of generation. The seed arises from the final nourishment (ἡ ἐσχάτη τροφή), that is, from the blood,<sup>8</sup> under the influence of the nutritive faculty, and is the most perfect product of the nutritive soul; it is by means of the seed that the soul produces generation (*De An.* 35.26-36.5).<sup>9</sup>

The nutritive soul not only causes the production of the seed but is also present in the seed as a possibility (δύναμις), which, receiving suitable matter (ὑλης ἐπιτηδείου),<sup>10</sup> becomes the cause of the formation of the embryo after conception. It is the nutritive soul that determines the composition of the animal's body: "The soul and power for nourishing [oneself] is the cause responsible for the initial formation of the animal's body as well as for its being, increase, and growth [...]" (*De An.* 36.19-21; cf. 32.1-5; 36.21-37.3; *Simpl. In Phys.* 311.12-14).<sup>11</sup> The nutritive soul shapes the matter of the embryo, so that through nourishment and growth this matter becomes more complex and acquires an organic structure and form similar to that of the parent.<sup>12</sup> Thus, the nutritive soul, which produces the seed and resides in it,

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<sup>8</sup> See Alex. *De An.* 35.26-36.5. According to Aristotle, the seed is the excretion of the last food, and the last food is blood in animals with blood or its analogue in animals without blood (Arist. *GA* 726b1-5).

<sup>9</sup> Alexander, following Aristotle, emphasizes the importance of the heavens and the sun as causes of generation, acting together with the father's seed; however, if the seed is the cause of the generation of a particular animal, then the rotation of the celestial sphere, according to Alexander, is the cause of the continuous generation of animals of each species. See Alex. *Quaest.* 1.25, 2.19, 3.5; Sharples (1994) p. 170.

<sup>10</sup> Cf. *De An.* 36.23: ὅταν ὑλης ἐπιτηδείου λάβηται ("once [the soul] receives matter suitable for it").

<sup>11</sup> ἔστι δ' ἡ θρεπτικὴ ψυχὴ τε καὶ δύναμις αἰτία καὶ τῆς συστάσεως τὴν ἀρχὴν τῷ τοῦ ζώου σώματι, ὡς περὶ οὖν καὶ τοῦ εἶναι τε καὶ τῆς ἐπιδόσεώς τε καὶ αὐξήσεως.

<sup>12</sup> Alexander presumes similarity in nature and not family resemblance. However, the question of similarity to parents in Aristotle's embryology includes the discussion of the causes of family resemblance and leads to the important account of the role of the male and female in embryogenesis. In *GA* II 5, Aristotle discusses the life of wind-eggs and claims that the mother provides not only matter for the generation but also a potential nutritive soul (*GA* 741a6-b6). Peck concludes from this assertion that the female supplies matter and the nutritive soul to the fetus, whereas the male supplies the sensitive soul as a form of the animal (Peck 1942, p. viii). Therefore, other researchers find this interpretation questionable (Gelber 2010, p. 200; Connell 2016, p. 173). It is unlikely that we can divide the possibility

becomes the efficient cause of the nourishment, growth, and formation of the embryo.<sup>13</sup>

Alexander distinguishes between plant and animal life, based on organic structure, nutrition, reproduction, and the function of the soul. While the nutritive soul is present in the whole plant, the sensitive soul is not homogeneous (ὁμοιομέρης). The plant's organic structure is simpler and its soul homogeneous; therefore, the nutritive capacity of the plant is present throughout its entire body. Meanwhile, the animal has a more complex organic structure, and the nourishing capacity of an animal is present only in the organs of nutrition. Therefore, an animal, unlike a plant, requires digestive organs for nutrition "and it cannot form them without the seed that possesses their powers" (Alex. *De An.* 37.11-38.4).<sup>14</sup> So, the seed contains a possibility of a nutritive soul; but when this soul becomes actual, it produces not merely a living being that is capable of nourishing itself, but a being similar to its parents and possessing those organs and parts of the body that

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of a sensitive soul in the semen from the possibility of a nutritive one. The female material supplement is not just passive matter, like wood for a carpenter; rather, it is complex matter, which includes the possibility of all the bodily parts (*GA* 737a 22-24), and along with that, it includes the possibility of a nutritive soul. However, this possibility of a nutritive soul supplied by the female could not become the actual soul of the fetus. What the female supplies needs the efficient and formal principle from the male's semen. The male semen, in turn, includes the possibility of both a nutritive and sensitive soul. Therefore, some researchers prefer to maintain that there is interaction between the male and female in conception, which results in the actuality of the nutritive soul of the fetus as a cause of the gradual development of the embryo (Connell 2016, pp. 173-7; Gelber 2010, pp. 200-2; Henry 2006, pp. 282-4; Bos 2009, pp. 396-7; see also Wilberding 2017, p. 27 n. 17). In *De Anima Liber* Alexander does not discuss the role of the female in the development of the embryo, but I deduce from his words (*De An.* 36.19-37.3; 38.2-4) that he considers the male semen to provide the sensitive soul as a form of the animal, as well as the nutritive soul as a cause of its development and growth.

<sup>13</sup> The activity of the nutritive soul in the embryo allows the generation of the parts and organs of the animal; therefore, the nutritive soul of the animal differs from the nutritive soul of the plant. However, the nutritive souls of animals and plants differ not in their functions, but in their subject – in each living being, these souls perform their functions in different ways, through different organs. See Connell (2016) pp. 148-9; Johansen (2012) p. 118.

<sup>14</sup> [...] οὕτε οἶά τε ταῦτα συστήναι μὴ τοῦ σπέρματος τὰς δυνάμεις αὐτῶν ἔχοντος (Alex. *De An.* 38.3-4).

are specific to its nature. The question is, why can the nutritive soul in the embryo produce the body of an animal and not of a plant?

The answer is found in Alexander's reading of Aristotle's example of a mechanic puppet.<sup>15</sup> In his commentary on the *Physics*, Simplicius quotes Alexander's explanation of the process of embryogenesis under the influence of the faculty present in the seed (Simpl. *In Phys.* 311.5-25). Alexander, according to Simplicius, understands the process of generation as the movement of a puppet (τὰ νευροσπαστούμενα),<sup>16</sup> in which the movement originating from the seed proceeds to the first part, which in turn causes movement in the next, and so on, until all the puppet's parts are moving. Thus, the δύναμις of the seed, united with suitable matter, successively causes all subsequent changes until it produces an animal similar in kind to the parent. This process of generation takes place according to number and order (κατὰ τινὰς ἀριθμοὺς καὶ τάξιν), and not by chance, but for a definite purpose, since nature always works for the sake of something. Both Alexander and Simplicius define the purpose of generation in the same way: the generation of a similar being and participation in the eternal and divine through the extension of the existence of the species (Alex. *De An.* 32.11-14; 36.16-17).<sup>17</sup> So, the nutritive capacity in the seed acts as a trigger for the specific type of motion – ceaseless nutrition and growth, which results in the step-by-step emergence of an animal body. This motion is organized like that of a puppet, i.e. it has a permanent order. The order of the motion is determined by the nature of an animal, present in the parent, and cannot be changed, which means, that every animal of that species emerges in the same way. So, the seed works as a first push, the nutrition and growth of an emerged animal body are caused by the actual nutritive soul of the embryo, whereas the order of that emergence is caused by the nature of the animal, present in the parent.

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<sup>15</sup> For Aristotle's example, see *GA* 734b9-10; for Alexander's reading of the mechanic puppets, see Simpl. *In Phys.* 310.25-312.1.

<sup>16</sup> D. Henry believes that although Simplicius uses the term τὰ νευροσπαστούμενα when discussing Alexander's words, Alexander himself speaks of "automata" (τὰ αὐτόματα), referring to examples from Aristotle's treatises *De generatione animalium* (734b6-17) and *De motu animalium* (701.1-10); see Henry (2005) p. 11 n. 29.

<sup>17</sup> Simplicius speaks of identity in species or genus (*In Phys.* 311.15-17; 31-32), since in the case of mules, which are descended from two different species, it is not possible to speak of identity in species.

### 3. *The Soul and Life of the Embryo*

The embryo itself is a puzzling thing: it has the organic structure of an animal but an actual soul of a plant. The question “what is it?” in the case of the embryo turns out to be the question “how does it live?” Discussing the life of the embryo, Alexander separates consuming and digesting food: the embryo receives food from the mother, but digests it through its own organs; therefore, the assimilation of food and growth come from itself (ἐξ αὐτοῦ), that is, according to the activity of its nutritive soul (*De An.* 36.26-37.1). Alexander does not seem to suggest that the embryo after conception is inanimate, just as he does not call it a zoophyte; instead, he says that only the nutritive soul acts in it from conception to birth:

But even in animals, the nutritive power is inherent in them from the first formation (for the nutrition begins along with the emerging of the animal itself, and while still in the womb, an animal lives, acting only under this capacity alone); whereas the sensitive soul appears in them after they are born. The contractions and extensions of bodily parts that the animal carries out in the womb do not occur according to its own sensitive capacity, but because it is part of an [actually] animate being (*De An.* 74.17-23).<sup>18</sup>

The term “first formation” or “composition” here most likely refers to conception – it is at conception that the form which exists in the seed in its potentiality combines with matter and begins to act as a nutritive soul or faculty. Alexander does not deny that the embryo in the womb behaves to some extent like an animal – that is, it moves the parts of its body; however, he denies that it could have its own sensitive soul. Alexander does not discuss the question in detail, nor does he explain why the sensitive soul appears in the animal only after birth. I believe that, to gain a better understanding of his position, it will be helpful to consider his arguments in light of Philoponus’ exposition of different perspectives on the life of the embryo. According to Philoponus, the idea that the nutritive power acts in the

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<sup>18</sup> ἀλλὰ καὶ ἐπὶ τῶν ζώων τὸ μὲν θρεπτικὸν ἀπὸ τῆς πρώτης συστάσεως αὐτοῖς ἐνυπάρχει (τρέφεται γὰρ εὐθὺς γινόμενον ἔτι τὸ ζῶον, καὶ κατὰ γαστρὸς ὄν ζῆ κατὰ μόνην τήνδε τὴν δύναμιν ἐνεργοῦν), ἡ δὲ αἰσθητικὴ ψυχὴ ἐγγίνεται αὐτοῖς ὕστερον ἀποτεχθεῖσιν. Αἱ γὰρ συστολαὶ τε καὶ αἱ ἐκτάσεις μερῶν τινῶν, ἃς ποιεῖται κατὰ γαστρὸς ὄν, οὐ γίνονται κατ’ οἰκείαν αἴσθησιν αὐτῶ, ἀλλ’ ὡς ἐμψύχου μέρος κατὰ ταῦτα κινεῖται (my own translation).

embryo until birth is motivated by the following arguments: 1) the sensitive soul appears only when the animal ceases to receive nourishment from its mother; 2) the sensitive soul appears when the animal begins to feed itself through its mouth. Thus, to be an actual animal, the embryo should feed like an actual animal; however, because it feeds like a plant in the womb, it is unable to move like an animal. Therefore, the motion of the embryo's bodily parts does not occur according to its sensitive soul, because the embryo is not an animal.

The efficient cause of an animal's self-motion is its actual sensitive soul. The key part of such motion is sense perception.<sup>19</sup> Without sense perception, animal motion in place cannot exist. An existing animal of whatever kind is already complete and, therefore, it moves by itself, according to its sensitive soul. Whereas the embryo is not yet complete, so it has a sensitive soul only potentially. An incomplete embryo, in Alexander's view, cannot use its sensitive organs and cannot perform perception; consequently, it cannot move on its own like a fully formed animal. Nevertheless, it is in motion: it feeds and grows under the action of its own nutritive soul, and it moves the parts of its body under the action of the actual soul of its parent. So, for Alexander, it moves as a part of its parent, which is animated by a sensitive soul.

Thus, it has its own actual nutritive soul. The nutritive soul is the driving power of generation and operates in the embryo from conception to birth. Does this mean that the embryo is alive and lives like a plant? Alexander claims that the embryo can be considered neither as a self-mover, nor as a self-sufficient living being.

Even though animals are nourished in the womb, it is still as parts of the mother bearing them. For while they are nourished in virtue of the power in them, they receive nourishment

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<sup>19</sup> The role of the soul as a mover and the role of sense perception in self-movement is widely discussed. See Corcilius' detailed examination of self-motion under the influence of the soul (Corcilius 2021, pp. 180-7). The scheme described by Corcilius deals exclusively with movement in place. This interpretation of self-motion is supported by other researchers; see Furley (1994) pp. 8-10; Richardson (1995) p. 379; Berryman (2002) p. 90; Gill (1994) p. 17. According to this interpretation of self-motion, the embryo is not a self-mover at all, because it does not move itself in place toward a goal, nor does it use perception as a cause of its movement.

in so far as they are parts [of the mother]. Hence, animals still inside the womb are not yet said to be an animal or alive simply as such and on their own (*De An.* 38.4-8).<sup>20</sup>

Why is the embryo, which has a nutritive soul in actuality, not living by itself? After all, it is the soul that is the principle of life, and nutrition as well as growth are the movements through which life is first determined. The answer to this question may be related to the fact that when an animal comes into being, under the influence of the nutritive faculty, an organic structure arises that should be subject of a soul which is not nutritive, but sensitive.

A plant animated by a nutritive soul is alive by itself: it receives food from the earth, digests it, grows, and reproduces itself according to the plant's organic structure.<sup>21</sup> The embryo, although it digests its food by itself and is attached to its mother like a plant to the earth, cannot live on its own, as a plant does, for it does not exist separately and does not possess a plant body. Since the organs of the embryo intended for nutrition are different from those of the plant, it is not possible to say that it lives on its own, because, in contrast to a plant, autonomous nourishment through its mouth is necessary for the perfection of its organic structure. As long as it does not feed itself through its mouth, not only its sensitive but also its nutritive soul cannot be complete, and it cannot be called a separate living being. Therefore, Alexander argues that because the embryo does not have even a nutritive life by itself, it cannot be regarded as an animal, plant, or zoophyte.

In *De Anima Liber*, Alexander emphatically stresses that the soul, which is responsible for the bodily structure, is an inseparable form of the body.<sup>22</sup>

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<sup>20</sup> διὸ καὶ κατὰ γαστρὸς ὄντα ἔτι ὡς μέρη τῆς φεροῦσης αὐτὰ τὴν τροφήν λαμβάνει. Τρέφεται μὲν γὰρ κατὰ τὴν δύναμιν τὴν ἐν αὐτοῖς, δέχεται δὲ τὴν τροφήν ὡς μέρη. διὸ οὔτε ζῶον ἤδη οὔτε ἀπλῶς ζῆν καὶ καθ' αὐτὰ λέγεται τὰ ἔτι κατὰ γαστρὸς ὄντα.

<sup>21</sup> Alexander emphasizes that plants are alive according to the capacities of their soul. See *De An.* 31.7-8.

<sup>22</sup> Cf. Mittelmann (2013) pp. 552-3 and 555; Moraux (2001) pp. 356-8. Speaking of the composition of the body, some scholars distinguish two different views of the body as the subject of the soul. First, such a body is a mixture of elements, a composite body; and second, a living organism, a functional body (see, e.g., Whiting 1995, pp. 79-84; Cohen 1995). The existence of the composite body depends on the unity of the functional body, and the functional body exists only when it is already animated. Alexander, to a greater extent than Aristotle, emphasizes the significance of the composite body in the question of the emergence of animated beings. He believes that while the organic body is a mixture of elements, the soul, which is the form of this body, is the form of forms and, in a sense, includes the

The embryo possesses the organic structure of an animal, it digests food like an animal, has a beating heart, and blood flows through its body – but only the nutritive soul acts in it. As an animal, it can be complete and capable of independent existence when only the sensitive soul is active in it; the nutritive soul’s activity alone is insufficient to allow it to exist as a separate entity rather than as a part. For this reason, even though the embryo develops and nourishes itself – that is, lives – it does so only as a part of its mother; and the embryo’s activity is linked not only to the actuality of its nutritive faculty but also to the actuality of the mother’s sensitive soul.<sup>23</sup>

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*dynameis* of simpler natural forms that enter into the composition of the organic body (*De An.* 4.4-11; 7.15-9.11. Cf. Accattino 1995, 191-7 and 201). Alexander highlights this context both in *On the Soul* (*De An.* 2.10-11.13) and in *Quaestio* 2.3 of the *Quaestiones*, where he discusses the influence of the divine power on the emergence of physical bodies. In *Quaestio* 2.3 he argues that the divine power not only moves the heavens and all the elements but is also the cause of the difference between the matter of inanimate bodies and that of more perfect animate bodies. Namely, the divine celestial power transforms the matter composed of the elements so that this matter becomes more perfect and suitable to be the subject of the soul (*Quaest.* 48.12-49.4; 49.15-22). The body as the subject of the soul is no longer a composite but a functional body, that is, a body possessing organs and a more complex form. However, whether a body can be the subject of the soul depends not only on its functional structure but also on its elemental composition (see Fazzo 2001, pp. 168-70). By determining the elemental composition of the functional body, the divine power, according to Alexander, can influence the individual properties of the embryo and, in the case of human beings, their character and destiny (cf. Fazzo 1988, pp. 637-41; 634-5). However, in this paper, I am interested in the order of development and animation of the fetus in the womb, which is primarily determined not by the relationship of the celestial powers and elements, but by the nature of each species. The heavenly power can influence the matter of an individual and partly determine her/his properties, character, and destiny, but, as it seems to me, does not influence the nature of the species; therefore, it does not affect the natural order of the species’ reproduction and animation.

<sup>23</sup> Aristotle postulates the dependence of the embryo on its mother because it is the mother’s body that prepares and provides the food for the embryo. Arist. *GA* 740a24-28, cf. Connell (2016) p. 147. The Stoics called the embryo part of the mother’s body; therefore, unlike the Stoics, Alexander believes that the nutritive soul acts in the embryo. See Moraux (2001) p. 362 n. 201; Caston (2012) p. 137 n. 337.

4. Soul as εἶδος, δύναμις, and ἔξις

Let us return to the example of miraculous automata or puppets and the question of how an animal's organic structure is generated in a specific sequence and according to a specific measure under the influence of the nutritive δύναμις. According to Simplicius, Alexander connects the sequence of generation to the nature of species, which is contained in the seed along with the nutritive soul. Alexander (as well as Simplicius) defines nature as ἄλογος δύναμις, which means a power that acts for the sake of a goal but strives for this goal out of necessity rather than as a result of a choice, decision, knowledge, or art – that is, not as a result of some *logos* (Simpl. *In Phys.* 310.25-311.1). That is why the irrational power of nature has no alternatives and acts only in one direction and only in one possible sequence, as in the case of automata: one part moves another, the second moves a third, and so on; the sequence of movement of these parts is unchangeable.<sup>24</sup> The influence of one part on another occurs not by choice and not according to the *logos*, but according to the design of the automaton, although this design itself is determined by the master's intention.

The sequence in which the embryo-automaton moves is determined by the purpose of nature – nature strives to continue the existence of its forms, that is, to produce an animal that is similar to its parent. Simplicius himself suggests that such a sequence of organic generation requires not only a goal but also a *paradeigma*; nature, acting for the sake of a goal, generates a particular bodily structure in accordance with the paradigm, and the paradigm is the non-material natural *eidōs*.<sup>25</sup> According to Simplicius, for

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<sup>24</sup> On the action of irrational power, see Arist. *Metaph.* 1048a2-9.

<sup>25</sup> See Simpl. *In Phys.* 311.12-21; 313.4-9. Simplicius believes that nature, although it is an irrational power and, therefore, produces generation not by choice, but by necessity, moves for the sake of a goal, and that this goal is predetermined by the *paradeigma*, or the natural *eidōs* that acts in the father. However, the paradigm is not the form itself of the father, but the intelligible *eidōs* of the natural body, which is in the mind and not in matter, and nature itself as a creative cause (ποιητικὴ αἰτία) is understood as a co-cause (συναίτια) of generation or as a co-cause of higher causes (*In Phys.* 314.9-14). Thus nature, although it does not know the *logos* of creation, creates according to the *logos* that the mind knows (314.19-21). On nature as the co-cause of generation, which determines the development of the embryo as a whole, cf. Henry (2005) pp. 21-3 and 27. The idea that the natural form of the body is separated from the soul as an entelechy is also present in the commentary of Ps.-Simplicius on

Alexander such a paradigm is the form of the parent (which Simplicius himself considers incorrect): Alexander calls a paradigm the form that comes into being together with matter (τὸ γινόμενον περὶ τῆ ὕλης εἶδος) since it is this form that nature strives for when it creates a living thing (Simpl. *In Phys.* 311.1-7).<sup>26</sup>

Thus, Alexander in his statements most likely relies on Aristotle, who says that the cause of generation is not an immaterial *eidos* or *paradeigma*, but the form of the parent: “Consequently we evidently do not need to set up forms as paradigms [...] But here it is sufficient that the begetter is the producer [of form], and is the cause of the form being in the matter” (Arist. *Metaph.* 1034a2-5).<sup>27</sup> Alexander himself, like Aristotle, emphasizes that the form of any body exists only in matter and cannot exist separately from it (*De An.* 4.20-27). In addition, he, unlike Simplicius, does not distinguish nature as a form of the body from the soul – he believes that the soul is the natural form of the body.<sup>28</sup> So, Alexander considers nature not as some principle that determines only the bodily structure and is, at the same time, lower than the nutritive soul,<sup>29</sup> but as a general horizon within which there is a ‘ladder of

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*De anima*, see Simpl. *In De An.* 87.12-25, 86.19-30. See also Blumenthal (1996) p. 78. As Simplicius reports, Alexander, though he considers the form as a paradigm for embryogenesis, understands it differently. For Alexander, the paradigm is an actual form existing in matter. On Alexander’s view of the role of the paradigm and of nature in embryogenesis, see the detailed study by Henry (2005) pp. 11-8. Henry claims, that a paradigm for Alexander is an enmattered (ἐνυλος) form, which is a goal for the process of embryogenesis, whereas nature, for Alexander, instead plays a mechanical role: it organizes the order of the development and ensures the correct sequence to achieve the goal. However, Henry does not understand the paradigm as a form of the parent.

<sup>26</sup> See Moraux (2001) p. 359; Henry (2005) pp. 7-8 and 11.

<sup>27</sup> ὥστε φανερόν ὅτι οὐθὲν δεῖ ὡς παράδειγμα εἶδος κατασκευάζειν [...] ἀλλὰ ἱκανὸν τὸ γεννῶν ποιῆσαι καὶ τοῦ εἶδους αἴτιον εἶναι ἐν τῇ ὕλῃ.

<sup>28</sup> According to Aristotle, the soul is defined as the formal and effective cause of the movement of a body that has life in potentiality – the cause that a living body has ἐν αὐτῷ ἢ αὐτό. According to this definition, the soul is considered to be a natural cause. Cf. Sorabji (1988) p. 222. Alexander claims that nature is the form and the principle of the movement of every natural body, both simple and complex, that is, organic ones (*De An.* 3.20-26; 7.15-23). He believes that the soul, as a form of the organic body, is a natural principle (*De An.* 10.1-11.7; 28.10), whereas both Philoponus and Simplicius consider the soul as a supernatural cause. See also Caston (2012) pp. 4 and 125 n. 271.

<sup>29</sup> Simplicius defines nature as “the lowest level of life” (ἐσχάτη ζωή), see Simpl. *In Phys.* 289.25-26. Cf. Blumenthal (1996) p. 78.

forms': from the simple form of the element to the rational soul, as the most complex form of the human body.<sup>30</sup> If the soul is the natural form of the body, just as gravity is the natural form of the stone,<sup>31</sup> then the nature of the species, or the specific form of the parent, exists only as the form of the individuals of that species. Since the form of the organic body is the soul, then the nature of the species is its animal (or rational) soul, as the form of an actual living individual. And precisely this form, which is in matter, is the formal cause or paradigm for the generation of a new being of the same species.

So, as mentioned above, the embryo lives and acts as a part of its parent, that is, the activity of the embryo is connected to the activity of the sensitive soul of its parent, just as the formation of its organic structure is connected to the soul of its parent as a formal cause. Alexander notes that although the embryo does not yet possess a sensitive soul in its actual form because its body is not yet prepared to function as an independent animal, it does possess the capacities of a sensitive soul in its potentiality due to its own nutritive soul, which it received from its parent through the seed:

What is inside the womb engages in an activity on its own solely in virtue of this soul power, since even though it possesses the sources and principles for the other powers and suitable

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<sup>30</sup> Natural bodies are classified as either simple or complex, with the matter of the complex bodies including the matter of the simple ones, and the forms or powers of the former including those of the latter. (Alex. *De An.* 7.17-8.13). Complex organic natural bodies, of which the soul is the form, can be more or less complete; the form or soul of a more complete body includes a greater number of faculties, just as a complete body itself has a greater number of capacities. Alexander asserts that there is a specific hierarchy between simple and complex bodies, with elements differing from plants in the same proportion and degree that plants differ from animals (*De An.* 10.10-19). Thus, he understands nature as the general basis for the order of natural bodies (Caston 2012, p. 125 n. 271 and 136 n. 335), and such an understanding of nature allows him to draw analogies between lightness/gravity as the power of simple bodies and the faculties of the soul (*De An.* 22.5-12; 23.24-24.4; cf. Caston 2012, pp. 4-5) and to define the soul as a form of forms (*De An.* 8.12-25; 10.28-11.5; 16.18-17.1; cf. Moraux 2001, p. 356; Kupreeva 2012, p. 119; Kupreeva 2004, p. 85).

<sup>31</sup> Interpreting the soul or the first entelechy of an organic body as a power or ability on the basis of which the body acts, Alexander draws an analogy between animate and simple bodies: gravity or levity is the nature, form, power, and condition (ἐξίς) of a simple body, just as the soul is the nature, form, power, and possession/state of the underlying organic body (*De An.* 9.14-26; 22.5-12; 23.29-24.4). Sorabji (1974) p. 83 speaks of a similar analogy between the movement of elements, the growth of plants, and the striving of animals in Aristotle, linking the possibility of such an analogy to the teleological nature of any natural movement.

conditions for the dispositions that its parent likewise possessed, it does not yet have these in activity, since in a way it does not yet possess the parts through which the activities of those powers [are exercised] (*De An.* 36.26-37.3).<sup>32</sup>

Although the sensitive soul is not active, the abilities of this soul are contained in the embryo; thus, this soul resides in it in potentiality.<sup>33</sup> So, it can be said that the natural irrational power, which determines the sequence of generation, contains not only the possibility of a nutritive soul, present in the seed but also the possibility of a sensitive soul, present in the embryo. The embryo, having the possibility of such a soul, does not yet possess this soul in actuality and, therefore, lives and moves as a part of its parent – that is, as the subject of its parent’s sensitive soul.

In his treatise *On the Soul*, Alexander defines the soul as a power and habitus or state (ἔξις).<sup>34</sup> Similar to how a stone’s form determines its gravity – that is, its capacity to move downward – the soul, as the first entelechy of the organic body, is the power or sum of the powers that cause actions of the animate body. However, the relationship between the soul and the animate body is not the same as that between an instrument and a teacher or a helmsman and a ship (*Alex. De An.* 20.26-21.21; 23.24-28), but rather that between a wrestler and the art of wrestling or a flutist and the art of playing the flute (*De An.* 23.6-24).<sup>35</sup> Similar to how a flutist’s art is a specific ability or skill (ἔξις) that allows him to play, an animate body’s soul is a *hexis* or state

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<sup>32</sup> καὶ κατὰ ταύτην μόνην τὴν ψυχικὴν δύναμιν ἐνεργεῖα τὸ κατὰ γαστρὸς ὄν ἐξ αὐτοῦ ἔχον μὲν καὶ τῶν ἄλλων δυνάμεων ἀρχάς τε καὶ ἐπιτηδειότητας, ὧν τὰς ἔξεις εἶχεν καὶ τὸ γεννήσαν αὐτὸ, οὐ μὴν ἤδη καὶ ἔχον αὐτὰς ἐνεργεῖα, τῷ μὴδὲ μόριά πως ἔχειν, δι’ ὧν αἱ κατ’ ἐκείνας τὰς δυνάμεις ἐνεργεῖαι.

<sup>33</sup> Moraux (2001) p. 363 n. 201 points out that, unlike the Stoics, Alexander does not believe in ‘animating from outside’ at birth but thinks that all the faculties of the soul are transmitted from the parent and are present in the embryo in a potential state.

<sup>34</sup> Burnyeat (2002) p. 62 distinguishes between two types of change in Aristotle: a change that leads to a changeable or temporary state, *διάθεσις*; and a change that results in a stable state, *ἔξις*. If the first change concerns primarily matter, then the second concerns human nature, leading to the completion of the natural ability (*Arist. DA* 417b16; Burnyeat 2002, pp. 63, 77; Johansen 2012, p. 139; see also Sorabji 1974, p. 69 n. 21). Aubry (2008) shows that Alexander, like Porphyry later, defines the first potentiality as the fitness (*ἐπιτηδειότης*) of matter to obtain some form, and the second potentiality as the possession or state (*ἔξις*) (cf. Afonasin 2013, p. 186 n. 22 and 196 n. 50). Cf. *Alex. In Metaph.* 391.19-392.30, where Alexander considers *ἔξις* to be one of the meanings of potentiality (*δύναμις*).

<sup>35</sup> Mittelmann (2013) pp. 551-3 discusses Alexander’s examples in detail.

that affects the body, enabling it to perform a variety of movements. In defining the soul as *hexis*, Alexander draws on Aristotle's distinction between two kinds of potentiality and two kinds of entelechy.<sup>36</sup> Using knowledge as an example, Aristotle discusses two types of change in chapter 5 of the second book of *De Anima*, which correlate to two types of potentiality: the pupil possesses knowledge in potentiality because she/he belongs to the human species and has the ability to learn grammar and arithmetic, even though she/he has not yet done so. However, the grammarian also possesses knowledge in potentiality because she/he has already learned the material and can use it anytime she/he chooses. The first potentiality is associated with matter, and the transition from this potentiality to entelechy is connected to material change; the second potentiality is correlated to some form, completion, or skill (ἔξις)<sup>37</sup> – the grammarian already has knowledge as a skill or *hexis*, but does not apply it at the moment, and therefore this skill is power or potentiality (δύναμις). The second potentiality is the first entelechy; but when a person who possesses knowledge applies this knowledge, she/he acts according to her/his *hexis*, that is, she/he passes from the first entelechy to the second one or from the second potentiality into actuality.<sup>38</sup> To return to Alexander's example: the flutist's first entelechy is his ability to play as a possession or skill, according to which his body is already trained for certain movements. Similarly, the soul as the first entelechy of an organic body is a power (δύναμις), or more precisely, the compound of several faculties, and a state (ἔξις), according to which this body is disposed to carry

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<sup>36</sup> Alexander in *De Anima Liber* does not clearly distinguish between two potentialities, but, referring to Aristotle, he speaks of two entelechies, one of which is the power of the animated body to act, and the other is actuality or activity (ἐνέργεια) according to this power (*De An.* 16.1-10). Aristotle, although he distinguishes between two potentialities and two entelechies, does not use the terms "first potentiality" and "second potentiality", nor does Alexander.

<sup>37</sup> In *De anima*, Aristotle uses the term ἔξις to define art or knowledge, but not the soul as a form of an organic body or levity/gravity as a form of fire or earth. It is Alexander who begins to interpret the natural form and the cause of movement (whether the soul or the form of the element) as ἔξις.

<sup>38</sup> On the connection of two types of change in Aristotle with the development of the embryo, see Johansen (2012) pp. 140-1.

out the movements inherent in it by nature (*De An.* 10.26-11.5; 23.24-24.17).<sup>39</sup>

To continue the analogy proposed by Alexander between possessing a soul and possessing an art, the development of an embryo can be compared to learning. A pupil can learn to write or play the flute, that is, she/he has this skill in potential. When the pupil learns to play, she/he is influenced by a teacher who already possesses the art of playing the flute as the first entelechy. When the pupil has already learned to play, that is, has completed the movement of learning, then she/he has the art of playing in entelechy – the art is her/his skill and ability, and therefore she/he can play at any moment, without any additional learning. The transition from the first potentiality to the second one is connected for the pupil to the influence of an external efficient cause (the teacher) and to the training of various bodily abilities. At the same time, a person who already has the skill of playing does not require any external efficient cause or learning time to act according to her/his ability. Similarly, an animated animal, already possessing organs and a soul as the first entelechy, acts by itself according to the faculties of its soul and does not require an external efficient cause. The seed of an animal contains the possibility of a nutritive soul but does not possess this soul in entelechy since it is not yet an organic body; therefore, an external efficient cause is necessary for the movement of the seed, and this cause is the nature or soul of the parent. In fertilization and the formation of the embryo, the first potentiality of the nutritive soul becomes the entelechy, and the embryo is nourished and grows. However, it does not feed by itself, and it grows like a plant, but it has the body of an incomplete animal; therefore, its body is suitable for a sensitive soul, and it possesses a sensitive soul as its first potentiality. For this possibility of the sensitive soul to become the entelechy of the complete organic body, the embryo must go through a series of material changes under the influence of the soul of the parent, which is already an entelechy, just as the pupil needs to train under the influence of the teacher. While the embryo is being formed and nourished, and is growing in the womb, it does not have a soul as an entelechy or *state/hexis* and remains part of its parent, that is, it moves under the influence of the parental form or nature, which determines

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<sup>39</sup> Cf. Mittelmann (2013) p. 553.

both the purpose and the sequence of generation.<sup>40</sup> After birth, the animal is not a part of its parent anymore, and its sensitive soul becomes the entelechy of its own organic body – that is, it has a soul of its own and already acts independently based on its own powers.

In the case of learning to play the flute, the effective cause of learning, the teacher, can be distinguished from the formal cause, the art of playing as an entelechy or skill. Analogically, in embryogenesis, the effective cause can be distinguished from the formal and final one. According to Alexander, the nutritive soul, which is transferred through the seed and results in the successive generation of embryo's parts, is the efficient or moving cause of embryogenesis. The formal cause is its parent's soul as a form and the first entelechy, according to which the embryo's organic structure is articulated and the faculties of its animal soul are pre-formed. The final cause is the generation of a new being of the same species, which is the emergence of an organic body that has its own soul – not as a potentiality, but as the first entelechy.<sup>41</sup>

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<sup>40</sup> As I indicate *supra*, in n. 12, Alexander does not discuss in detail the female's role in the conception and growth of the embryo. But it should be noted that the embryo grows as a part of the mother's womb; therefore, the actual soul, which becomes the active cause of the embryo's development, is the soul of the mother. I suppose that for Alexander the question here is not about male and female, but rather about the animal species and its *eidōs*. The mother's soul acts on the embryo not as a female principle, but as a soul and form of an animal.

<sup>41</sup> Henry (2005) p. 11 believes that, unlike Simplicius, Alexander does not distinguish between form and goal. On the one hand, this is true: the form of the parent, as a specific nature, is both a formal and a final cause (*De An.* 24.11-17). However, on the other hand, this specific nature itself exists only as a form of various individuals. Therefore, it is possible to separate the formal cause – the nature of species that exists in the parent – from the final cause – the nature of species as an entelechy of the formed and born animal. Sharples (1994) pp. 168-9 points out that in the Aristotelian doctrine of the generation of animals, form and purpose are identical. He notes that for Alexander the actual form of the animal is the purpose of generation. This form is produced by the form of the parent by means of a seed through a sequence of changes in matter, which, as an effective cause, launches a chain of changes in matter.

### Bibliography

- Accattino, P. (1995) 'Generazione dell'anima in Alessandro di Afrodisia, *De anima* 2.10-11.13?', *Phronesis*, 40 (2), pp. 182-201.
- Afonasin, E.V. (tr.) (2013) 'Porphyry on the Ensoulment of the Embryo', *Schole*, 7 (1), pp. 174-236 (In Russian).
- Aubry, G. (2008) 'Capacité et convenance: la notion d'épitédeiotés dans la théorie porphyrienne de l'embryon', in Brisson L., Congourdeau M.L., Solere J.L. (eds.), *L'Embryon: formation et animation. Antiquité grecque et latine, traditions hébraïque, chrétienne et islamique*. Paris: Librairie Philosophique J. Vrin, pp. 139-56.
- Berryman S. (2002) 'Aristotle on Pneuma and Animal Self-Motion', *Oxford Studies in Ancient Philosophy*, 23, pp. 85-97.
- Blumenthal, H.J. (1986) 'Body and Soul in Philoponus', *The Monist*, 69 (3), pp. 370-82.
- Blumenthal, H.J. (1996) *Aristotle and Neoplatonism in Late Antiquity*. New York: Cornell University Press.
- Bos, A.P. (2009) 'Aristotle on Soul and Soul "Parts" in Semen (*GA* 2.1, 735a4-22)', *Mnemosyne*, 62, pp. 378-400.
- Bruns, I. (ed.) (1887) *Alexandri De anima Liber cum Mantissa*, in *Alexandri Aphrodisensis Praeter Commentaria Scripta Minora*, Vol. 2, Part 1. Berlin: Reimer.
- Bruns, I. (ed.) (1892) *Alexandri Aphrodisensis Quaestiones*, in *Alexandri Aphrodisensis Praeter Commentaria Scripta Minora*, Vol. 2, Part 2. Berlin: Reimer.
- Burnyeat, M. (2002) 'De Anima II.5', *Phronesis*, 47, pp. 28-90.
- Caston, V. (ed., tr.) (2012) *Alexander of Aphrodisias: On the Soul*. Part 1: *Soul as Form of the Body, Parts of the Soul, Nourishment and Perception*. London & New York: Bloomsbury.
- Code, A. (1987) 'Soul as Efficient Cause in Aristotle's Embryology', *Philosophical Topics*, 15 (2), pp. 51-9.
- Cohen, M. (1995) 'Hylomorphism and Functionalism' in Rorty A. and Nussbaum M. (eds.), *Essays on Aristotle's De Anima*. Oxford: Oxford University Press, 2nd ed., pp. 61-76.
- Connell, M.S. (2016) *Aristotle on Female Animals*. Cambridge: Cambridge University Press.

- Corcilius, K. (2021) 'Aristotle's Theory of Animal Agency and the Problem of Self-Motion' in Connell S.M. (ed.) *The Cambridge Companion to Aristotle's Biology*. Cambridge: Cambridge University Press, pp. 176-94.
- De Groot, J. (2008) 'Dunamis and the Science of Mechanics. Aristotle on Animal Motion', *Journal of the History of Philosophy*, 46 (1), pp. 43-68.
- Diels, H. (ed.) (1882) *Simplicii in Aristotelis physicorum libros quattuor priores commentaria*. Berlin: Reimer (Commentaria in Aristotelem Graeca, Vol. IX).
- Falcon, A. (2021) 'The Reception of Aristotle's Biology in Late Antiquity and Beyond' in Connell S.M. (ed.) *The Cambridge Companion to Aristotle's Biology*. Cambridge: Cambridge University Press, pp. 246-60.
- Fazzo, S. (1988) 'Alessandro D'Afrodisia e Tolomeo: aristotelismo e astrologia fra il II e il III secolo D.C', *Rivista di Storia della Filosofia*, 43 (4), pp. 627-49.
- Fazzo, S. (2001) *Aporia e sistema: la materia, la forma, il divino nelle Quaestiones di Alessandro di Afrodisia*. Piza: Edizioni ETS.
- Furley, D. (1994) 'Self-movers', in Gill, M.L., Lennox J.G. (eds.) *Self-motion. From Aristotle to Newton*. Princeton: Princeton University Press, pp. 3-15.
- Gelber, J. (2010) 'Form and Inheritance in Aristotle's Embryology', *Studies in Ancient Philosophy*, 39, pp. 183-212.
- Gill, M.L. (1994) 'Aristotle on Self-motion' in Gill, M.L., Lennox J.G. (eds.) *Self-motion. From Aristotle to Newton*. Princeton: Princeton University Press, pp. 15-35.
- Gotthelf, A. (1987) 'Aristotle's Conception of Final Causality', in Gotthelf, A., Lennox J.G. (eds.), *Philosophical Issues in Aristotle's Biology*. Cambridge: Cambridge University Press, pp. 204-42.
- Hayduck, M. (ed.) (1891) *Alexandri Aphrodisiensis in Aristotelis Metaphysica commentaria*. Berlin: Reimer.
- Hayduck, M. (ed.) (1897). *Ioannis Philoponi in Aristotelis De anima libros commentaria*. Berlin: Reimer.
- Henry, D. (2005) 'Embryological Models in Ancient Philosophy', *Phronesis*, 50 (1), pp. 1-42.
- Henry, D. (2006) 'Understanding Aristotle's Reproductive Hylomorphism', *Apeiron*, 39 (3), pp. 257-87.
- Jaeger, W. (ed.) (1957) *Aristotelis Metaphysica*. Oxford: Clarendon Press.
- Johansen, K. T. (2012) *The Powers of Aristotle's Soul*. Oxford: Oxford University Press.

- Kupreeva, I. (2004) 'Aristotelian Dynamics in the 2nd-century School Debates: Galen and Alexander of Aphrodisias on Organic Powers and Movements', *Bulletin of the Institute of Classical Studies*, 47, pp. 71-95.
- Kupreeva, I. (2012) 'Alexander of Aphrodisias and Aristotle's *De Anima*: What's in a Commentary?', *Bulletin of the Institute of Classical Studies*, 55 (1), pp. 109-29.
- Mittelman, J. (2013) 'Neoplatonic Sailors and Peripatetic Ships: Aristotle, Alexander and Philoponus', *Journal of the History of Philosophy*, 51 (4), pp. 545-66.
- Morau, P. (2001) *Der Aristotelismus bei den Griechen*, vol. 3. Berlin: Walter de Gruyter.
- Peck, A.L. (ed., trans.) (1942) *The Generation of Animals*. Cambridge: Harvard University Press.
- Richardson H.S. (1995) 'Desire and the Good in *De Anima*' in Rorty A.O., Nussbaum M.C. (eds.) *Essays on Aristotle's De Anima*. Oxford: Clarendon Press, pp. 367-86.
- Ross, W. D. (ed.) (1956) *Aristotelis de Anima*. Oxford: Clarendon Press.
- Scholten, C. (2005) 'Welche Seele hat der Embryo? Johannes Philoponus und die Antike Embriologie', *Vigiliae Christianae*, 59, pp. 377-411.
- Sharples, R.W. (1994) 'On Body, Soul, and Generation in Alexander of Aphrodisias', *Apeiron*, 27 (2), pp. 163-70.
- Sorabji, R. (1974) 'Body and Soul in Aristotle', *Philosophy*, 49, pp. 63- 89.
- Sorabji, R. (1988) *Matter, Space and Motion*. London: Duckworth.
- Whiting, J. (1995) 'Living Bodies', in Rorty A.O., Nussbaum M.C. (eds.) *Essays on Aristotle's De Anima*. Oxford: Clarendon Press, 2nd ed., 78-95.
- Wilberding, J. (2017) *Forms, Souls and Embryos. Neoplatonists on Human Reproduction*. London & New York: Routledge.