



## Aristotle's Concept of Nature: Traditional Interpretation and Results of Recent Studies

Enrico Berti

Aristotle's concept of nature dominated Western culture – including the Islamic world – from late antiquity to the Middle Ages, and was then permanently displaced by the concept of modern science introduced by Galilei and Descartes in the seventeenth century. However, despite its long rule, the true meaning of Aristotle's concept was not always understood. In particular, its application to living beings was interpreted as an “essentialist” and “fixist” model, as opposed to the “evolutionistic” model introduced by Darwin. In this paper I would like to explain briefly why this interpretation, which has become the traditional one, is largely the result of a misunderstanding due to a Platonic or Neoplatonic reading of Aristotle's concept of nature as “form” or “essence”.

In the famous chapter on the meanings of the term “nature” (*phusis*), contained in Book V of the *Metaphysics*, which is considered Aristotle's dictionary of philosophical terms, he distinguishes among the various meanings of this term, present in common parlance or in the theories of the philosophers preceding him: “generation” (*genesis*), “growth” (*phusis* with a long *u*), “matter” (*hulē*) from where things come from, and the “form” (*eidos*) or “essence” (*ousia*) of natural entities, that is, the things that have in themselves and as such the source of their own movement. While the first two meanings belong to common parlance, the third belongs to the philosophies of the Presocratics and the last one is the correct meaning which, according to Aristotle, must be given to the term “nature”, allowing us to make a distinction between “natural” entities, which have nature as their source, and “artificial” entities, which have “art” (*technē*), that is, man, as their source.

At the end of the above-mentioned chapter, Aristotle declares:

“From what has been said, then, it is plain that nature in the primary and strict sense is the substance of things which have in themselves, as such, a source of movement; for the matter is called nature because it is qualified to receive this, and processes of becoming and growing are called nature because they are movements proceeding from this. And nature in this sense is the source of the movement of natural objects, being present in them somehow, either potentially or actually”.[1]

In Book II of the *Physics*, which is the treatise that Aristotle officially devotes to the concept of nature, he reiterates that nature is not in matter, but in form, specifically in the form of entities that have in themselves the source of change and are thus capable of generating themselves. In support of this argument he mentions the difference between a man and a bed, which lies in the fact that man is generated by man, whereas a bed is not generated by a bed.[2] To understand this explanation it is necessary to recall that Aristotle viewed the generation of living beings as essentially the work of form, which he calls “soul”, intended not in the Christian sense of spiritual principle, but in the sense of vital principle, which is also in common with plants and non-human animals.

All interpreters agree on the need to consider the term “substance” in the sense of “essence” or “form”, for example in the passage of *Metaph.* V and other similar ones, like Aristotle himself says at the end of Book VII of the *Metaphysics*, which is devoted to clarifying what is substance. But this view of nature as “essence” is what has led modern philosophers to attribute to Aristotle a kind of “essentialism”, that is, a concept of nature as characterized by the admission of universal and unchanging essences, which apparently guide natural events, in particular the reproduction processes of living beings, in an absolutely fixed and regular way, excluding any possibility of evolution: the so-called “fixism”. An exemplary expression of this interpretation is W.K.C. Guthrie's book on Aristotle in his monumental *History of Greek Philosophy*, where, in commenting on Aristotle's treatise on substance in Book VII of the *Metaphysics*, he states:

“Doubtless this is not a satisfactory explanation of reality. For it makes Darwinian evolution impossible”.[3]

According to the traditional interpretation, the “form” mentioned by Aristotle is precisely a universal, immutable form, like the Ideas accepted by Plato. This is due to the fact that Aristotle calls form *eidos*, which is the same term Plato uses to refer to Ideas. In Greek this term also means what we call “species”, that is, not an individual, but a class of individuals, a kind. According to the traditional interpretation, the only difference between the Idea accepted by Plato and the form accepted by Aristotle is the fact that the Idea is a transcendent entity, one that exists in another world, different from the sensitive one, the so-called intelligible world, whereas the form

is an entity immanent in matter, that is, existing in the sensitive world. According to this interpretation, Aristotle did nothing but transfer Plato's Ideas from the intelligible world to the sensitive world, that is, to nature.

This interpretation, however, has been refuted for several decades now, first of all by a specialist in Aristotle's biological works, David Mowbray Balme (1912-1989). In a famous article entitled *Aristotle's biology was not essentialist*, he points out that, according to Aristotle, form is the moving cause of animal reproduction, because it produces, through the *pneuma* contained in the male seed, the movements that give form to the material provided by the female parent, thus constituting the embryo and guiding its development until the complete formation of the individual (a process that William Harvey called *epigenesis*).[4] As Balme shows, this form has nothing to do with species, which is a mere universal obtained by generalization, resulting from the similarity between parents and offspring produced by the form.

The form that causes reproduction is what Aristotle calls "soul" (*psyche*), which, as we have said, means something different in part from the way in which we speak of soul in Christianity. According to Aristotle, the soul of the male parent, through the movements that it imparts to the material, generates the embryo's soul, which is evidently of the same species as its parent's, but is an individual soul, distinct from the latter. This form always acts on matter, impressing the characteristics proper of the species, but may in turn be subject to the action of matter, which may bring about a few differences between individuals of the same species.[5] Balme observes, for example, that Aristotle in his *Metaphysics* explains that individuals of the same species such as males and females in animals, or blacks and whites in humans, are different, respectively, because of sex and skin color.[6] Balme also recalls that in his *Historia animalium* Aristotle notes that there are differences between animals of the same species, for example cicadas:

"one, small in size, the first to come and the last to disappear; the other, large, that comes last and first disappears".[7]

Similarly there are differences in the Egyptian ibis species, white and black:

"the white ones are found all over in Egypt, excepting in Pelusium; the black ones are found in Pelusium, and nowhere else in Egypt".[8]

More in general, Balme remarks that Aristotle states that animals of the same species differ according to their location, for example:

"variety in animal life may be produced by variety of locality: thus in one place an animal will not be found at all, in another it will be small, or short-lived, or will not thrive",[9]

or animals of the same species have different characteristics and behaviour according to the season, for example:

"a considerable number of birds change according to season the colour of their plumage and their note; as, for instance, the owl becomes yellow instead of black, and its note gets altered, for in summer it has a musical note and in winter a discordant chatter. The thrush also changes in colour; about the throat it is marked in winter with speckles, in summer spotted".[10]

In short, Aristotle considered that many differences between animals of the same species depended on external circumstances, such as place and time, or even environment and lifestyle. Thus Balme can state that:

"The extraordinary later misinterpretations of Aristotle, the magical entelechies and real specific forms, must be largely due to these imported concepts – *Species*, *Essentia*, *Substantia* – which presided like three witches over his rebirth in the Middle Ages, but should be banished to haunt the neoplatonism from which they came".[11]

We could add that for Aristotle those that we call natural laws, for example the law by which animals of a certain species generate animals of the same species (Aristotle repeats countless times that "man generates man"), are not "always", i. e. "out of necessity", valid, like the laws of mathematics, but are only valid "for the most part", that is, in most cases. Thus, certain exceptions are admitted and according to Aristotle they are an "accident", that is, a product of "chance", and this accident or chance depends on matter,

"which is capable of being otherwise than as it for the most part is".[12]

It is clear that those "mutations" are possible in the margin of indetermination left vacant by the laws of nature and this is what makes evolution possible, according to modern genetics. When a modern geneticist like Jacques Monod explains evolution in terms of "chance and necessity", he unknowingly repeats the association between these two concepts already employed by Aristotle to explain natural phenomena.[13] This does not mean, of course, that Aristotle was an evolutionist, but one cannot even say that he was "fixist", like Linnaeus and Cuvier, or, if he was, he certainly did not know it. It simply means that Aristotle's biology was not incompatible with the theory of evolution, as an Irish philosopher, Fran O'Rourke,[14] recently explained

thanks to extensive documentation. With regard to this subject, it is important to remember that, after reading the English version of Aristotle's *De partibus animalium*, Charles Darwin wrote a letter to the translator of the work, William Ogle, saying:

"Linnaeus and Cuvier have been my two gods, though in very different ways, but they were mere schoolboys to old Aristotle".[15]

Besides, the interpretation of form, or essence, as an individual reality, and thus not coincident with the species, which Balme had arrived at through the analysis of Aristotle's biological works, was also confirmed by the analysis of the Aristotelian metaphysics made by two German scholars who are considered among the greatest contemporary scholars of Aristotle, Michael Frede and Günther Patzig. Indeed, in a famous commentary on Book VII of the *Metaphysics*, they showed not only that, for Aristotle, substance coincides with form, but that Aristotle does not consider substantial form as universal, like the species, but as individual, like the soul.[16] Indeed, this is the only way to explain otherwise incomprehensible passages such as the following:

"the causes of things in the same species are different, not in species, but in the sense that the causes of different individuals are different, your matter *and form* (*eidos*) and moving cause being different from mine, while in their universal formula they are the same".[17]

Besides, a decade earlier than Balme's article, the great biologist Max Delbrück, 1969 Nobel Prize for Medicine, wrote that, if it were possible to give a Nobel prize posthumously, we ought to give it to Aristotle for having discovered the implicit principle in DNA, i.e. in the acid contained in the nucleus of the cells of every living being. This principle, following Delbrück, is just the form, which acts as a «programme», or a «plan of development», guiding the embryo from its conception up to the complete development of the mature individual, plant or animal.[18] Following Delbrück's studies, and probably also taking Balme's article into account, another great biologist and historian of biology, Ernst Mayr, stated that he had changed his mind about the concept of form in Aristotle. These are his words:

"No other ancient philosopher has been as badly misunderstood and mishandled by posterity as Aristotle [...]. Delbrück is entirely right when insisting that it is quite legitimate to employ modern terms like *genetic program* for *eidos* where this helps to elucidate Aristotle's thoughts. One of the reasons why Aristotle has been so consistently misunderstood is that he uses the term *eidos* for his form living principle, and every body took it for granted that he had something in mind similar to Plato's concept of *eidos*. Yet, the context of Aristotle's discussions makes it abundantly clear that *his* *eidos* is something totally different from Plato's *eidos* (I myself did not understand this until recently)".[19]

Similar considerations can be made about Aristotle's famous teleology with regard to nature, which is also subject to numerous misunderstandings. The abundant literature dispelling these, however, is unfortunately known almost exclusively to specialists of Aristotelian philosophy, and for the most part is unknown to scientists and biologists. Even in this case, a significant exception is Ernst Mayr who, in a paragraph of his above-mentioned book, explains "The Multiple Meaning of Teleological", exonerating Aristotle from much of the naiveté attributed to him. But this is another matter that would require a more thorough examination.

#### Footnotes

[1] Aristot. *Metaph.* V 4, 1015 a 13-19 (*The Complete Works of Aristotle*, The Revised Oxford Translation, Edited by J. Barnes, Princeton 1985).

[2] Aristot. *Phys.* II 1, 193 b 6-12.

[3] W.K.C. Guthrie, *A History of Greek Philosophy, VI, Aristotle: An Encounter*, Cambridge 1981, p. 222.

[4] D. M. Balme, *Aristotle's biology was not essentialist*, «Archiv für Geschichte der Philosophie», 62, 1980, pp. 1-12, reprinted with Appendixes in A. Gotthelf & J. G. Lennox (eds.), *Philosophical Issues in Aristotle's Biology*, Cambridge 1987, pp. 291-312.

[5] Aristot. *De gen. an.* IV 3, 768 b 15-25.

[6] Aristot. *Metaph.* X 9, 1058 a 29-b 10.

[7] Aristot. *Hist. An.* V 30, 556 a 14-15.

[8] *Ibid.* IX 27, 617 b 28-29.

[9] *Ibid.* VIII 28, 605 b 22-25.

[10] *Ibid.* IX 49, 632 b 14-20.

[11] Balme, *art. cit.*, p. 306.

- [12] Aristot. *Metaph.* VI 2, 1027 a 5-20.
- [13] J. Monod, *Le hasard et la nécessité: essai sur la philosophie naturelle de la biologie moderne*, Paris 1970.
- [14] F. O'Rourke, *Aristotle and the Metaphysics of Evolution*, «The Review of Metaphysics», 43, 2004, pp. 3-59.
- [15] Cfr. A. Gotthelf, *Darwin on Aristotle*, «Journal of the History of Biology», 32, 1999, pp. 3-30.
- [16] M. Frede – G. Patzig, *Aristoteles 'Metaphysik Z'*, Text, Übersetzung und Kommentar, 2 Bände, München 1988. Balme too simultaneously reached the same result in the first Appendix added to his above mentioned article: *Note on the aporia in Metaphysics Z*.
- [17] Aristot. *Metaph.* XII 5, 1071 a 27-29 (emphasis of mine).
- [18] M. Delbrück, *Aristotle-totle-totle*, in J. Monod and E. Borek (eds.), *Of Microbes and Life*, New York 1971, pp. 50-55.
- [19] E. Mayr, *Toward a New Philosophy of Biology. Observations of an Evolutionist*, Cambridge, Mass. 1988, pp. 56-57.