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The Scope of Natural Teleology  
in Aristotle's *Physics* II

Tesis de Maestría bajo la dirección del Dr. Ricardo Salles



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México, D. F., 2004



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### *Agradecimientos*

De febrero de 2002 a agosto de 2004 la Secretaría de Relaciones Exteriores me otorgó una beca que me permitió realizar mis estudios de maestría. La culminación de este trabajo fue posible gracias al apoyo de una beca del proyecto UNAM/PAPIIT-IN 401301. Sin estos apoyos este trabajo no hubiera sido posible.

Agradezco infinitamente al Dr. Ricardo Salles, cuya cuidadosa lectura y valiosas observaciones han contribuido a lo bueno que hay en este trabajo. También estoy profundamente en deuda con el Dr. Rasmus Winther por sus agudos comentarios que enriquecieron mi estudio y mi trabajo.

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## *Introduction – The Problem and the Aim of the Present Work*

The present investigation is an inquiry into the presence of the *τέλος*, the end, in the natural world, according to Aristotle's natural philosophy as presented in the second book of the *Physics*. According to Aristotle the *τέλος* is a causal element that extends from the field of human intentional and deliberated actions, where it is embodied in some purposes or desires, to the field of natural things and natural changes, that is, among things that lack intentional behaviors. However, even if the presence of the *τέλος* in the natural world has been recognized as one of the most famous Aristotelian thesis about natural philosophy, there is not general agreement among scholars about the *scope* of this presence in the field of nature according to Aristotle. As some authors state, Aristotle defends the presence of ends in the changes of all natural substances, from living organisms to inanimate objects, whilst according to other authors, Aristotle argues that ends are present only in a specific domain of nature - the biological realm. The present study tries to give an answer to the following question: according to Aristotle, are ends in nature present in all natural changes, or are ends present only in the changes proper of living things? The purpose of this investigation is to show that, according to Aristotle, the *τέλος* is a causal element in nature not in all changes, but only in the changes proper of any form of life.

The problem of the *scope* of Aristotle's natural teleology does not start only because of a disagreement among Aristotelian scholars, but it seems to derive from the main character of the notion of *τέλος* as a kind of cause (*αἴτιον*) of something. An inquiry into the *τέλος*, in fact, is first of all an inquiry into causes, *αἰτία*, since the *τέλος* is reckoned among one of the four kinds or species in which something is said to be an *αἴτιον*. But what is, according to Aristotle, an *αἴτιον*? The answer is given in *Phys.* II 3, where Aristotle is defining his inquiry about nature as an inquiry about causes.

For since the aim of our investigation is to know (*εἰδέναι*), and we think we have knowledge of a thing only when we can answer the question about it 'on account of what?' (*τὸ διὰ τί*) and that is to grasp the primary cause (*τὴν πρώτην αἰτίαν*) – it is clear that we must do this over coming to be, passing away, and all natural change.<sup>1</sup>

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<sup>1</sup> *Phys.* II 3, 194 b 17 – 22.

As nowadays all authors recognize, the notion of ‘cause’ in Aristotle has a very broad sense and it faces very different problems with respect to the modern Humean notion of causal power and connection between earlier and later events. According to Aristotle, in fact, an *αἴτιον* is any answer to the question ‘on account of what?’ about a certain thing. For example, in order to have not only a simple experience about change, that is, if we want to know not only the fact (τὸ ὅτι) that change exists, but to have a real knowledge (*εἰδέναι*) of it, then we have to understand on account of what (τὸ διότι) change exists, and that means grasping its causes. The ‘cause’ of something, then, is the answer to a question that points, not to a simple description of something, but rather to an *explanation* of it. Thus, the theory of the four ‘causes’ is, first of all, a theory about explanation, and its formulation has, in the passage quoted above, an epistemological character<sup>2</sup>. It is true that, as Wieland has pointed out<sup>3</sup>, Aristotle’s theory of the four causes is not a theory about four determinate entities (which is a departure from the inquiries into the causes of nature of his predecessors) but rather a theory about four kinds (τρόποι) or species (εἶδη) of explanatory factors, and thus a theory about four ‘universal concepts’ with whose aid we inquire into concrete natural phenomena. However, this does not mean that the four causes lack any ontological ground. Even if in their universal definition the causes are general ‘concepts’ or ‘discourses’ and not four ‘things’ or ‘entities’<sup>4</sup>, with regard to the concrete and particular phenomena that are explained through these concepts, we are pointing towards ontological entities, that is, elements of reality that are as particular and concrete as the things explained by them: “your matter and form and source of change are different from mine, while in their universal definition they are the same”<sup>5</sup>. An Aristotelian cause, then, is not only the answer to a question, a concept or a discourse that explains a certain thing or a certain success, but also something present in the world that is *responsible*, in some way, for another thing, and that is something as concrete and determined as the thing explained. And the ways in which something can be responsible for a certain thing can be reduced to four kinds or species.

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<sup>2</sup> Cfr. Moravcsik, J. [1991], p. 33.

<sup>3</sup> Cfr. Wieland, W. [1970].

<sup>4</sup> Cfr. *Metaph.* Λ 5, 1071 a 19 – 20, “The universal causes, then, do not exist”.

<sup>5</sup> *Metaph.* Λ 5, 1071 a 28 – 29.

According to one way of speaking, that out of which as a constituent a thing comes to be (*τὸ ἐξ οὗ γίγνεται τι ἐνυπάρχοντος*) is called a cause; for example, the bronze and the silver and their genera would be the causes respectively of a statue and a cup. According to another, the form (*εἶδος*) or model is a cause; this is the account of what the being would be (*λόγος ὁ τοῦ τί ἦν εἶναι*), and its genera – thus the cause of an octave is the ratio of two to one, and more generally number – and the parts which come into the account. Again, there is the primary source of the change or the staying unchanged (*ἀρχὴ τῆς μεταβολῆς ἢ πρώτη ἢ τῆς ἠρεμῆσεως*): for example, the man who has deliberated is a cause, the father is a cause of the child, and in general that which makes something of that which is made, and that which changes something of that which is changed. And again, a thing may be a cause as the end (*τέλος*). That is what something is for (*τὸ οὗ ἕνεκα*), as health might be what a walk is for. On account of what does he walk? We answer ‘to keep fit’ and think that, in saying that, we have given the cause.<sup>6</sup>

According to Aristotle, then, when we explain something we are pointing to elements of reality that, in different ways, are responsible for other elements. One way to give the answer to the question ‘on account of what’ about something is pointing towards its material stuff, parts or constituents, characterized by Aristotle as “that out of which” something comes to be. For example, if we are asked “on account of what does a house exist?”, we may answer that it exists because there are bricks and posts. In this way we explain the existence of a house pointing to elements or things present in reality that are responsible for the existence of a house as its material conditions. A second way to answer this question, and thus to grasp the *αἴτιον* of the existence of something, is pointing to the form or *εἶδος*, that is, the structure or organization in which the parts or constituents of something are organized. A house, for example, exists not only when there are bricks and posts, but when bricks and posts are organized in a certain way, and analogously a man can be accounted for not only by his internal constituents, as blood, bones, and flesh, but also by the pattern under which these constituents are organized, that is, his anatomical structure. The organization of the house and the anatomical structure of the man, then, are two different and concrete configurations of elements present in the world that play an analogous causal role with regards to the thing explained. Another way, the third one, of

<sup>6</sup> *Phys.* II 3, 194 b 23 – 35.

explaining on account of what something exists is to point out the element or the factor that has produced or originated that thing, that is, what Aristotle calls the “source of change or staying unchanged” of something. Thus, a house exists because of the activity of a builder, the patient is healthy because of the cures of a doctor, and someone lives because of his father. In this sense, then, the *αἴτιον* as “source of change or staying unchanged” of something is a concept that expresses a certain causal relation that is played in each determined case by concrete things of reality - the builder, the doctor, and the father - which are responsible for a certain thing as what acts over something, its movers, the producers or originators of a certain change. And, finally, it is the same for the concept of *τέλος*, which is a form of explanation of something through a function, an aim, a purpose, but even in this case it is something really existent, determined and concrete, as ‘health’ is the concrete state of affairs which is responsible for the man’s walking and ‘a house’ is for the actions of a house builder.

Since we know something when we know its causes, and since our inquiry is about natural changes, it is clear that we must seek the four kinds of causes regarding “coming to be, passing away, and all natural change”. With his doctrine, Aristotle is not claiming that everything in nature has causes of all four kinds, but he is only showing the necessity of distinguishing the different meanings of the term ‘cause’, and thus different ways in which something can be responsible for a certain thing<sup>7</sup>. This distinction is very important in all kinds of inquiry, since it prevents the student from errors and confusions, such as thinking that different factors that are reckoned as “causes” of something are responsible in the same way for that thing. Thus, the student of nature should seek and look for all four types of things responsible for a certain substance’s change, but it is not certain that he will find all four. In all sorts of inquiries, according to Aristotle, the number of kinds of causes must be in accordance with the thing of which they are causes, that is, the search for causes must be appropriate for the subject of inquiry. There is, as Gotthelf points out, an ontological basis for the use of a certain kind of explanation, and that means that there is something different *in the world* in those cases in which we use a certain kind of cause rather than another one<sup>8</sup>. The facts of mathematics, for example, are explained only by means of formal causes, that

<sup>7</sup> Cfr. Charlton, W. [1970], p. 99 and p. 114, and Berti, E. [1977], p. 313.

<sup>8</sup> Cfr. Gotthelf, A., [1997], p. 74.



is, by means of the definition of what a certain figure is. We cannot find in the field of mathematics the cause of something in the sense of its material constitution, since the facts of mathematics do not have *per se* a material constitution<sup>9</sup>. Similarly, some events in history, like the beginning of a war, can be explained only by means of a purpose (“they fought for domination”) or of a source of change (“because of border raids”), without reference to any form or matter.

And even in the field of nature, then, we must look for the causes of something according to the thing or the kind of things into which we are inquiring, without being sure of finding all four kinds. And thus even in this field we are allowed to ask whether a certain kind of cause, the *τέλος*, concerns the whole field of natural changes or only a part of it. In this sense, our question about the scope of the presence of the *τέλος* in nature is a question about the kind of things that constitute the ontological basis for an explanation in terms of ends. The question whether the end in nature is responsible for all natural changes or only for a certain kind of change, is a question about *what there is*, in the field of nature, that admits the *τέλος* as a factor responsible for a substance’s change.

Our study will be one that concerns, first of all, elements and configurations of elements in reality. It will be, primarily, an ontological inquiry. And it is properly within this framework that we shall study the problem of the scope of Aristotle’s natural teleology in the second book of the *Physics*. We shall show that the *τέλος* is a casual factor responsible not for all natural changes, but only for the changes proper of living things.

In order to reach this conclusion, in the first chapter we shall deal with the definition of the term ‘nature’ (*φύσις*) as it is given in *Phys.* II 1. The purpose of this chapter is to show that in the field of nature there are two different kinds of change. To the first kind of changes belong the spatial movements of inanimate substances, whilst to the second belong the activities proper of living things (such as nutrition, growth, and reproduction). On the one hand, these two kinds of processes belong to the study of nature insofar as they are produced and originated by a principle that is internal to the substance that performs the process – this is precisely what the ‘nature’ of something is -. On the other hand they constitute two different kinds of natural changes insofar as they are produced by different kinds of internal principles. The internal principle that produces the spatial movements of

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<sup>9</sup> Cfr. *Phys.* II 2.

inanimate substances is the matter of these substances, whilst the principle that originates the activities proper of living things is the specific way in which the matter of these substances is organized, that is, the form or *εἶδος* of these substances.

On the basis of this, in the second chapter we shall investigate whether what licenses the use of *τέλος* as an explanatory factor is the simple presence in the substance of an internal principle able to produce the change, or whether this internal principle must belong to one of the two kinds found in Chapter 1. In other words: is the *τέλος* present in the changes of all natural substances by virtue of having an internal mover, or is there something different, among natural substances, which constitutes the ontological basis for the use of the *τέλος*? In order to answer this question, in this chapter we shall inquire into the definition of the term *τέλος* as it is given in *Phys.* II 2. The aim of this part is to show that the definition of the term *τέλος* only applies to the form of living things. According to Aristotle, in fact, the end of a process is first of all its result or outcome. However, according to Aristotle, not any result of a process is an end. To be an end, the result of a process must be the same state of affairs that is able to produce the process, that is, it must be the ‘nature’ of the substance that changes. If this second condition is lacking the result of a process cannot be its end since it would have no causal role in the change. According to this definition, hence, the spatial movements of inanimate objects cannot have a *τέλος* since the result that they reach – the arriving at their natural place – is not the principle that originates the movement in those substances, which is their matter. On the contrary, the outcome of the activities proper of living things – the preservation and reproduction of the form of the organism – is the same state of affairs that produces those changes. Only among living things, then, the outcome of a change has a causal role in the change since it is identical with the factor that originates it. Thus, only the changes proper of living things are due to a *τέλος*.

Finally, having demonstrated that the ‘end’ is present only in biological changes, in the third and last chapter we shall try to refute some arguments deployed by some authors, according to whom the scope of Aristotle’s natural teleology encompasses all natural substances. For this purpose, we shall examine some passages of *Phys.* II 8 where Aristotle tries to defend the presence of ends in nature through a refutation of a ‘mechanistic’ account, according to which nothing in nature is due to an end but all things come into

being by necessity. Based on these passages, in fact, many authors concluded that through the refutation of the mechanistic account Aristotle wants to prove that nothing is due to necessity but all natural changes are due to an end. The purpose of this chapter, then, is to cast doubt on this interpretation by showing that, on the contrary, all the arguments proposed by Aristotle against his mechanistic opponents only show that not all natural changes are due to necessity, but some changes are due to an end. According to our interpretation, then, what Aristotle does not accept is not the mechanistic account as a whole, but the generalization of this account, which holds for the movements of inanimate substances, to the domain of living things.

## Chapter 1 – Nature

According to Aristotle, when we speak about ‘natural things’ or when we say that something ‘is due to nature’, we show that we think of nature as a fundamental field of our experience, something unitary that possesses a distinctive characteristic. In the following chapter we shall inquire what nature is and what are, according to Aristotle’s discussion in *Phys.* II 1, its main characteristics. The aim of this first part is to show that in his account of nature Aristotle tries to preserve the unity present in our experience of natural changes and, at the same time, the original multiplicity, variety and diversity of kinds of change displayed by it. According to Aristotle, as we shall see, there are two kinds of natural changes: on the one hand there are the changes proper of natural inanimate objects, and on the other hand there are the activities proper of living things. Both kinds of changes are ‘natural’, since both are produced by a principle that is internal to the substance that changes. But while in the case of inanimate objects this internal principle is the matter of which the substance is made, in the case of living things this internal principle is identified with the way in which the matter of the substance is organized, that is, its form.

### 1.1 – The World of our Experience

The world of our experience, according to Aristotle, is a world originally characterized by multiplicity, variety, variability, and diversity. It is a world populated by many different kinds of substances, qualities, quantities, affections, dispositions, changes, relationships etc. All of them are different kinds of ways of being, irreducible to one another. But within this original variety, the world of our experience finds a certain order and a certain structure, which is given by one of these ways of being, the *οὐσία* - substance -.

An *οὐσία*, according to Aristotle, is what possesses two main characteristics: first of all it is something *separated*, that is, something that exists in itself and in nothing else. Second, it is something determined, namely, what Aristotle defines as a *τόδε τι*, a *this*<sup>1</sup>. These are the concrete objects of our experience, individuals like a particular stone, a

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<sup>1</sup> *Metaph.* Z 3, 1029 a 27 – 28.

certain tree, a machine, a person, a house, a dog, etc. All of them, in fact, exist in themselves and in nothing else, that is, they have attributes but are not attributes of anything<sup>2</sup>. And all of them are determined things, namely, something particular and individual, always situated in a precise space and time.

And these are the characteristics that give the *οὐσία* the primacy among the other ways of being that constitute our world and that are the objects of our experience. A certain quality, a certain disposition, a certain action, for example, is not capable of being separated, but it exists only as a quality, a disposition, or an action of an *οὐσία*<sup>3</sup>. Even these kinds of being, as objects of our experience, are determined and individuals. But none of them can exist in themselves. Rather, in order to exist they have to presuppose the existence of an *οὐσία*, and that is why they are called *συμβεβηκότα*, that is, ways of being that exist or happen only in relation or accompanying something else.

The notion of *οὐσία*, then, is what gives a certain order and structure to the original variety and diversity present in our world. But this original diversity and multiplicity is primarily displayed by our experience of change, which implies a passage, a succession of different items. Variability, changeability and fluidity, then, are also constitutive aspects of our world. And even these aspects receive an order and a structure through the notion of *οὐσία*. According to a very famous Aristotelian doctrine, in fact, “there is no change apart from the thing that changes”<sup>4</sup>: we do not say, for example, that whiteness comes to be darkness, or that smallness comes to be bigness, but rather that something white comes to be dark, or that something small comes to be bigger. The *οὐσία*, then, has a primacy over change with respect to its existence, since change exists only as a certain substance’s change. But the *οὐσία* has a primacy over change also with respect to knowledge, since the knowledge of the causes of change is knowledge of the causes responsible for a certain substance’s change.

This is, then, the basic structure of the world of our experience, and it is within this structure that Aristotle inserts his inquiry about nature and natural changes. It is, first of all, an inquiry about substances and their changes. And since in each inquiry the search of causes must be appropriate for the subject of inquiry, it is obvious that, according to

<sup>2</sup> Cfr. *Metaph.* Δ 8, 1017 b 13 – 14.

<sup>3</sup> Cfr. *Metaph.* Ζ 1.

<sup>4</sup> *Phys.* III 1, 200 b 32 – 33.

Aristotle, the material and the form are two kinds of *αἰτία* that must always be taken in consideration in the study of nature. The kinds of being that are the object of the study of nature, in fact, are determined and particular substances, that is, the concrete objects of our perceptions, material bodies as stones, plants, animals etc.. In this respect, matter and form are those aspects of substances that allow us to perceive, identify and know them. We can perceive something only if it is situated in a certain place at a certain time, and that is possible only when the thing possesses a certain material constituent. But this material constituent is not separable from a certain *εἶδος*, that is, an aspect or form under which the material is organized and that is what allows us to know what kind of substance it is.

In this sense, the material and the form are *αἰτία* that must always be known by the student of nature because they are factors or elements that explain on account of what a certain substance exists. For example, we can say that a man exists because there are blood, flesh and bones, and in this way we are pointing to the material conditions that constitute a man, and thus are responsible for his existence. But, according to Aristotle, the presence of a certain material, certain parts or constituents is only one possible answer to the question “on account of what does a man exist?”. In another sense, in fact, we grasp the *αἴτιον* of something pointing towards its form or *εἶδος*, that is, the structure or organization under which the parts and constituents are arranged, the factor that defines what a certain substance is. Thus, a man must be accounted for not only by his internal constituents, as blood, flesh and bones, but also by the pattern under which these constituents are organized, that is, his anatomical structure. A certain substance is a man not only when it is a mere collection of blood, flesh and bones, but when it is blood, flesh and bones organized in a specific way.

This is, then, the sense in which matter and form play a causal role in the *constitution* of the objects of study of physics. But matter and form are also reckoned as playing a causal role in the *change* that involves substances. This is the main result of the investigation of the first book of the *Physics*, presented by Aristotle as an investigation regarding the ‘causes’ (*αἰτία*) and ‘principles’ (*ἀρχαί*) of change<sup>5</sup>. In this first book of the *Physics* the terms ‘causes’ and ‘principles’ are regarded as those logically distinguishable factors or elements that justify the possibility of change. In other words, the question

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<sup>5</sup> *Phys.* I 1, 184 a 10 – 16.

which Aristotle is trying to answer in his first book is: 'what must there be in the world if there is coming to be, passing away, displacement, alteration and increase?'. But this question, which is a question about causes that make change possible, is a question that involves substances – the only things that can change - and thus it is a question like: 'what elements must be present in a substance to allow a change in that substance?'. This question needs a logical and philosophical analysis of coming to be, which Aristotle gives through an extensive discussion of his predecessors. And after reviewing the most important theories of his predecessors about the causes and principles of change, he presents his own solution to the problem claiming that these causes or principles are the same basic elements that constitute substances, that is, form and matter. Matter and form, in fact, are the elements that justify the possibility of change in that they allow distinguishing the permanent from the transitory aspects of change. Some substances, in fact, assume different forms while their matter remains the same, as when clay is transformed into a vase, whilst other substances preserve their form and present a change in their matter, as when a tree changes the color of its leaves remaining the same tree or when someone loses weight.

However, this causal structure of substances seems not to be sufficient to account for nature. In the world in which we live there are many different substances. All of them are of some quality, of some shape or size; all of them possess dispositions, affections, functions, and all of them are subject to change - and that might be in the sense of coming to be and passing away, alteration, increase and decrease or spatial movement -. All of them, furthermore, are compounds of form and matter, which account for their existence and their constitution and which are identified by the philosophical analysis as necessary conditions for their changes. But we do not say about all of them that they are natural substances or natural things. In this way, we recognize nature as a particular field within the world of our experience. The question that arises is then, what is there in the world that allows us to speak about 'nature' and 'natural'? What are those factors or elements on the basis of which we identify something as 'natural' and something as 'non-natural'? What is there, in the world of our experience, that we call 'nature'?

## 1.2 – The Definition of Nature

In the second book of the *Physics* Aristotle approaches the definition of the term “nature” by means of a distinction, present in our ordinary language, between things that exist and that are due to nature (*φύσει*), and things that exist and that are due to other causes (*ἄλλας αἰτίας*)<sup>6</sup>. The difference between natural substances and non-natural substances is thus immediately introduced in a causal field. The point, in fact, is that when we say that a certain thing is ‘natural’, we want to say that there is an element or a factor that is responsible for its characteristics, and that distinguishes it from other things. Thus, it must be clear that ‘nature’, according to Aristotle, is not a substance, or the object about which we have to investigate the causes, but rather a certain type of cause of the substances that populate our world, it is an answer to the question “on account of what does this substance exist?”.

Among the things that we say that exist and that are due to nature, Aristotle includes “animals and their parts, plants, and simple bodies like earth, fire, air and water”<sup>7</sup>, whilst among the things that we normally consider non-natural objects he includes such things as beds or coats, that is, artificial objects, things that come to be by art (*τέχνη*) or by another rational activity. As Berti points out, in this respect Aristotle is not claiming something absolutely new, but rather he is connecting with an earlier tradition, according to which the causes of coming to be were essentially *φύσις* and *τέχνη*<sup>8</sup>. Now, what distinguishes objects due to art from objects that we regard as due to nature, is that each of the substances that we classify as ‘natural’, as stones, animals, plants etc., “has in itself a source of change and staying unchanged”<sup>9</sup>, whilst on the other hand what we call ‘artificial’, as a bed, a coat, or a house, “has no innate tendency to change”<sup>10</sup>.

The element or the factor that is responsible for the difference that we establish between natural and artificial objects, then, is not found – at least not immediately - among the elements that are responsible for the existence of a substance in the sense of its material conditions or in the sense of its structure, form, or organization. Under this respect, in fact,

<sup>6</sup> *Phys.* II 1, 192 b 8 – 9.

<sup>7</sup> *Phys.* II 1, 192 b 9 – 11.

<sup>8</sup> Berti, E. [1977], p. 305 – 306.

<sup>9</sup> *Phys.* II 1, 192 b 13 – 14.



both natural and artificial substances are compounds of form and matter in the same way: a chair exists because there is a certain material and because this material is arranged in a certain way; analogously a dog exists because there is a certain matter organized under a certain anatomical structure. Rather, what distinguishes something due to art from something due to nature is an element responsible for the existence of a substance in the sense of its 'source of change'. The difference, hence, is found among those factors that are responsible for a certain substance in the sense that they *produce* and *originate* a change in that substance.

Even this kind of *αἴτιον*, the source of change, must be always taken into consideration by the student of nature. To account for changes that involve material bodies, in fact, we have to consider not only the elements responsible for the constitution of the thing or the factors that justify the possibility of change, but also we have to consider the elements that actually produce it, that actually bring something from a state of rest to a state of change, and vice versa. And it is within this kind of *αἴτια* - necessary to explain changes - that Aristotle finds the difference between natural and artificial objects. Natural objects, in fact, are those objects that exist by virtue of a source of change internal to them, whilst objects due to art are those objects whose source of change is "in something else and external"<sup>11</sup>.

Here the internal 'source of change' of a substance is not only the internal 'source of coming into being' of that substance, but also the internal source of all the kinds of changes performed by a certain substance. The term 'change' is intended in a broad sense, that is, not only as generation and corruption, but also as movement, alteration, increase and decrease. A certain body like a stone, for example, has an innate tendency to move downward, and we do not have to look outside or beyond the thing – at least partly - in order to explain why it moves. We can simply give reason to its movement claiming that "it falls because it is a stone", that is, it falls because it is a kind of substance which finds in itself the element that originates the movement; similarly, if we ask, for example, why an apple-tree grows its fruits in summer, or why a child grows his teeth in his first year of life, we may answer that it is the nature of an apple-tree to grow fruits in summer, and it is

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<sup>10</sup> *Phys.* II 1, 192 b 18 – 19.

<sup>11</sup> *Phys.* II 1, 192 b 29 – 30.

the nature of a man to grow teeth in the first year of life. And with that answer we want to say that among the elements that originate the change there is something that belongs intrinsically to the substance that changes. Even in these cases we do not find – at least partly – that we have to go outside the substance in order to explain its changes.

With this, Aristotle is not claiming that natural substances change *only* by virtue of an internal principle. It is important, in fact, to highlight that this internal principle explains *at least partly* the movements, the production and the functioning of a natural substance. External conditions, in fact, are always required to account for natural changes. For example, it is true that the falling of the stone is accounted for by its internal tendency to move downwards, but this internal tendency is able to make the stone fall only when the stone is unsupported, or when it is removed from its natural place. Analogously, it is true that a certain seed has an innate tendency to grow into a certain plant, and that a child grows teeth during his first year of life according to an internal principle, but the plant or the child also need external conditions in order to realize these actions: they need light, heat, nourishment, etc. This internal principle of change, then, is not thought of as an *absolute* originator of change out of complete immobility; rather, nature is a *δύναμις*, it is a capacity or a disposition to change that also needs some external condition in order to actually originate and produce that change. The characteristic of a natural thing, hence, is that it possesses a disposition which, under some external actions, responds by a change of its own<sup>12</sup>. Thus, natural substances are not things that owe their changes *only* to an internal principle, but rather substances that owe their changes to external and *also* to an internal principle, which is responsible for the proper changes of a certain substance. For example, heat, the earth and the sun are also factors responsible for the growth of apples in a tree. But the growth of apples is not accounted for only by these factors. To answer *why* this tree develops apples we also have to say “because it is an apple-tree”, that is, we also have to point to a factor that is internal and proper of the substance that changes. This factor gives the substance a certain *δύναμις*, a power or a capacity that differentiates it from all other substances that, under the same external conditions, are not able to develop apples.

According to Aristotle, then, natural things have in themselves *a* source of their change, not *the* only source of their change. On the contrary, artificial objects are those

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<sup>12</sup> This point is well illustrated by Wieland, W. [1970], p. 293 – 322, and Berti, E. [1977], p. 304 – 319.

objects that owe their changes *only* to external factors: what properly differentiates them from natural things is that they lack *any* internal source of change. It is through this basic distinction, then, that Aristotle formulates his definition of the term “nature”:

This suggests that nature is a sort of source and cause of change and remaining unchanged in that to which it belongs primarily of itself (*καθ' αὐτό*), that is, not by virtue of concurrence (*μη κατὰ συμβεβηκός*)<sup>13</sup>.

This is, then, what the nature of a certain substance is: first of all nature is reckoned as an *αἴτιον* in the sense of ‘source of change’, that is, a factor that produces a change, an element that originates a variation in a substance. Now, since there are many factors that are responsible for a change in a substance, we call ‘nature’ the one that is internal to the same substance that undergoes the change.

This point must be made more precise, since it might be objected that an artifact too, as a bed, or a chair, has in itself an innate tendency to fall, that is, to initiate a change of place if it is unsupported, or to give rise to a process of change of quality if, for example, time made the resistance of the bed weaker. Even these changes, in fact, can be regarded as changes due to a factor which is internal to them. To avoid this kind of confusion, Aristotle distinguishes two ways in which the cause of change of something can be present internally in it: it can be internal *καθ' αὐτό*, that is, as a consequence of what the thing is – according to its structure or definition –, or it can be internal *κατὰ συμβεβηκός*, that is, internal accidentally, by virtue of some factors, elements or properties that belong to the thing but that do not define what the thing is. According to this distinction, then:

A bed, or a coat, or anything else of that sort, considered as satisfying such a description, and in so far as it is the outcome of art, has no innate tendency to change, though considered as concurrently (*συμβέβηκεν*) made of stone or earth or a mixture of the two, and in so far as it is such, it has<sup>14</sup>.

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<sup>13</sup> *Phys.* II 1, 192 b 21 – 23.

<sup>14</sup> *Phys.* II 1, 192 b 16 – 20.

Thus, even if we can say that a bed has an internal tendency to change, it does not have it by virtue of what defines it as a bed, that is, by the form or structure that has been given to it by the artisan; rather, it has this tendency because it is composed of simple bodies, that is, by virtue of some elements that are present in the substance but that do not define what the substance is. This is very important, for it means that we have to regard something as a natural object if it has *as such* an internal tendency to initiate a change, and something as a non-natural object if it does not have *as such* an innate power to give rise to a variation. A chair, for example, does not have the capacity of changing by itself because it is a chair, but only because it is made of wood; in this case the internal power of producing a change that we find in a chair is not determined by the structure that defines it as a chair – the arrangement of its parts –, but by an element present in that substance that nevertheless does not define what it is – its material –. On the contrary, an apple-tree has the capacity of growing apples during a certain season *as such*, that is, because it is an apple-tree; in this case the internal capacity of giving rise to a change that we find in a natural thing is not given to it by any accidental element present in that thing: there are a lot of internal elements that the apple-tree shares with other kinds of plants, but only apple-trees grow apples. In natural substances, then, this power is determined by the same structure that defines *that* kind of thing and it is responsible for the proper and specific behavior of *that* kind of thing. This is, then, what traces the difference between a natural object and an artifact:

Similarly with other things which are made. None of them have in themselves the source of their making, but in some cases, such as that of a house or anything else made by human hands, the source is something else and external, whilst in others the source is in the thing, but not in the thing of itself (οὐ καθ' αὐτά), i.e. when the thing comes to be a cause to itself by virtue of concurrence (κατὰ συμβεβηκός).<sup>15</sup>

Under this respect, then, artifacts do not have such a principle for two reasons: on the one hand, if they have an internal source of change, it belongs to them accidentally (κατὰ συμβεβηκός) and not by virtue of what they are. On the other hand, the specific source

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<sup>15</sup> *Phys.* II 1, 192 b 27 – 32.

of change that is responsible for their coming to be what they are, their proper operations, works or functions, is always external to them, that is, it resides in a substance different from them: a hammer, for example, comes to be and works as it does only by virtue of the disposition, capacity or ability present in the artisan. On the contrary, a natural substance like a plant, although needing external conditions to grow and act, nonetheless also has an internal disposition, analogous to that of the artisan, which is responsible for the proper and specific changes of that substance, and which differentiates it from other substances that, under the same external conditions, do not come to be, grow and work as it does.

### 1.3 – Two Problems

Some substances, then, undergo changes and perform actions that are originated by elements or factors that are internal to the same substance that changes, and that belong to that substance *καθ' αὐτό*, that is, by virtue of what the thing is. According to this definition, then, there is a very close relation between what a thing is and its nature. Nature is a disposition, a capacity, a power to make the substance change, that is present in a thing and that is determined by the same structure of the thing, and “anything which has a source of this sort – Aristotle says – has a nature, and such a thing is always an *οὐσία*”<sup>16</sup>. This is, then, the principle that binds all natural substances together.

According to this definition, we can notice two important and interrelated aspects of this disposition. First, it is *internal*: it exists within the substance, it is an internal element of the substance, something that constitutes the substance. Second, it is *specific*: it is always determined by the structure of the substance and hence it is responsible for the proper and specific changes of that substance. If we are asked why a pine grows such thin leaves, or why a stone falls to the ground if unsupported, we may answer - among other reasons - pointing to “the nature of the pine” or “the nature of the stone”. With this explanation we are pointing to a factor which is *internal* to the pine or the stone, and which is *specific* of the substances that possess this factor, and thus, it is responsible for the *specific* behavior of the pine and the *specific* behavior of the stone.

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<sup>16</sup> *Phys.* II 1, 192 b 32 – 33.

Having pointed to these two basic characteristics of nature, its being an *internal* source of change and *specific* to the kind of substance to which it belongs, the present inquiry – a study about the elements present in the world that are responsible for the changes of natural objects – must proceed giving a solution to these two questions about the nature of something:

- (1) With regard to its being *internal* to a substance: what is that element in a natural substance which originates the change?
- (2) With regard to its being *specific* to a substance: is that factor the same for different kinds of change performed by different kinds of substances?

Let us proceed in order, and consider the first problem. Nature, we are told, is something internal to an *οὐσία*, that is, it is a factor, an element which constitutes it. What is, then, this internal element that constitutes an *οὐσία* and that gives it an internal power of originating a change? The answer to this question presupposes that we know, first of all, what the elements that constitute a substance are, and second, to look at them to see if, apart from constituting a substance, these elements are also able to produce a change in a substance. The first part of this inquiry, then, brings us back to the investigation about the factors that *constitute* a certain substance, that is, to form and matter. These two elements, as we saw, were reckoned as two kinds of *αἴτια*, that is, elements responsible for the existence and constitution of a certain substance. Thus, if ‘nature’ is defined as a principle or cause of change *internal* to a substance, asking what such a principle consists of and where it resides is asking what among the elements that constitute a substance – form or matter - is that principle.

These two elements, moreover, were also reckoned as playing a causal role regarding a substance’s change, in the sense that they were the factors that make change possible. But the question now is not about the mere possibility of change. Rather, what we want to know is which of these two elements is actually able to produce a change, to originate a variation, and to take effectively a substance from a state of rest to a state of change and vice versa.

But there is another, related problem, with regards to the definition of the term ‘nature’. ‘Nature’, in fact, is not any internal element that causes a change in a substance, but it is an element that belongs *καθ’ αὐτό* to a certain substance, which means that it is

related to the structure of the thing and thus it is responsible for the proper and specific changes of *that* thing. But if we follow the examples of 'things that are due to nature' that Aristotle gives, we shall find that φύσις belongs to a very broad and heterogeneous set of things, which we can list in two wide groups: there is, on the one hand, the group of inanimate substances to which belong simple bodies like earth, water, air, and fire<sup>17</sup>, and inanimate compounds, like bronze and gold<sup>18</sup>: these objects are 'natural' insofar as they have an innate tendency to move up or down. But, on the other hand, there is the group of living things, among which he includes plants (and their parts)<sup>19</sup> and animals (and their parts)<sup>20</sup>, which not only are subject to these kinds of spatial movement, but are also subject to growth and decay, the development of their parts, nutrition, reproduction and, in the case of animals, locomotion and perception.

With respect to natural substances in general, there seems to be a general consensus between Aristotle and his predecessors in claiming that the upwards and downwards movement of all sorts of things are due to the matter of which they are made. It is because earth and water, for example, have a tendency to move downwards, and because air and fire, on the contrary, have the power to move upwards, that all substances, whether inanimate objects or living things, have this tendency too according to the material of which they are constituted, independently of their form. And thus, Aristotle says, "fire, earth, air, and water have been held to be the nature of things, some people choosing just one for this role, some several, and some making use of all"<sup>21</sup>. This is the general opinion shared by the presocratic tradition, according to which "the nature and the substance of a thing which is due to nature is the primary constituent present in it, something unformed in itself"<sup>22</sup>. This is, according to Aristotle, "one way of using the word 'nature'"<sup>23</sup>, that is, this is certainly one thing, present in a natural substance, which is able to produce a change in it. But this, according to Aristotle, seems not to be the same element that is responsible for the specific changes proper of any form of life. Changes like nutrition, growth, locomotion, etc., seem rather to be due to the manner in which a substance is arranged, that is, its

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<sup>17</sup> *Phys.* II 1, 192 b 10.

<sup>18</sup> *Phys.* II 1, 192 b 20.

<sup>19</sup> *Phys.* II 1, 192 b 9 – 10.

<sup>20</sup> *Phys.* II 1, 192 b 9 – 10.

<sup>21</sup> *Phys.* II 1, 193 a 21 – 23.

<sup>22</sup> *Phys.* II 1, 193 a 9 – 11.

internal structure or form. It is regarding these kinds of change, and thus the particular constitution of those substances that perform these changes, that Aristotle, as we shall see, develops his own account of nature claiming that the internal mover or originator of change is not only the matter of a thing but also its *εἶδος*, its form or structure.

Thus, the investigation about which of the two elements of a natural substance, matter and form, must be considered its internal source of change, seems to be subordinated to a more fundamental question, that is, whether different kinds of changes are originated by the same factor – matter - or by different factors - matter and form -. It is the original variety and diversity of kinds of change present in the natural world that constitute the main problem of Aristotle's inquiry about nature. And it is, as we shall see, his attempt to give unity and order to our experience of natural change without sacrificing its original diversity and variety that led him to his formulation of nature in terms of matter *and* form.

#### 1.4 – Nature as Matter

The first step to determine what is the internal element or factor that produces a change in a substance is the examination of the opinion of the presocratic tradition, according to which the nature of something is its material, the primary constituent present in it. Aristotle certainly agrees with this old opinion. As we have seen, in fact, he thinks that an artifact like a bed, or a chair, possesses an internal source of change, and thus a power to originate a movement by itself, insofar as it is made of a certain material. A bed or a chair, for example, falls to the ground if unsupported not because it is a bed or a chair, but because it is made of wood, and thus the falling is attributed to the stuff of which it is made, not to the way in which the stuff is organized. And this is certainly true about several natural changes: the falling of a stone from a mountain, the falling of a leaf from a tree, the movements of clouds, meteorological events etc.; all these changes are changes that involve natural substances, that is, compounds of form and matter, but in which the form or constitution is not responsible for the substance's movement. Rather, a stone, a leaf, or

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<sup>23</sup> *Phys.* II 1, 193 a 28.



anything else of that sort fall because they are made of a mixture of earth and water, which have the innate tendency to move downwards.

That matter is a source of change internal to natural substances, then, seems not to constitute a very controversial point. The examination of the presocratic tradition, then, seems rather to respond to the question “to which extent” matter can be considered the source of change and behaviours in natural things. More precisely, Aristotle’s review of the thesis of this tradition is conducted in order to discuss a more complex set of theses: (1) how and in which way matter is a source of change internal to a natural substance, (2) if it is the only internal source of change, (3) if it is the same for different kinds of change, from the simple spatial movements of inanimate substances to more complex changes performed by living things and (4) how the old tradition denies that form plays any role in the production of change. To show and criticize this point, Aristotle exposes an argument from Antipho as the representative of this thesis:

It is an indication of this, Antipho says, that if you bury a bed, and the decomposition gets the ability to send up a shoot, what comes up will not be a bed but wood: this seems to show that the disposition of parts customary for beds and the artistry belong only by virtue of concurrence (*κατὰ συμβεβηκός*), and that the substance is that which persist uninterruptedly while being affected in these ways<sup>24</sup>.

What is then, according to Antipho<sup>25</sup>, the argument that shows that the nature of a thing is always and only matter? With a sort of mental experiment, Antipho says that if we were able to bury a bed, and if the decomposition were to put forth a shoot, this would be wood, and not a bed. This argument is based on what comes to be without the intervention of human activity. If we leave a certain substance under the earth, like a bed, and leave it completely alone to start a change, then what will result is the complete disappearance of its form, that is, the “disposition of its parts”, and the persistence of its matter, wood, through changes that occur by virtue of wood itself.

<sup>24</sup> *Phys.* II 1, 193 a 12 – 17.

<sup>25</sup> Antipho’s identity has been the subject of endless scholarly controversy. All authors seem to converge in that Aristotle is referring to Antipho the Sophist, a contemporary of Socrates. But the controversy is whether Antipho the Sophist is the same man as the orator Antipho of Rhamnus, whose chronology is about the same. Regarding this controversy Cfr. Guthrie, W. K. C. [1971], pp. 285 – 294.

We have to pay attention to the way in which matter is considered as an internal source of change in substances when no human action acts on them. The absence of a human intervention, in fact, does not mean that matter is able to originate a change without any kind of external intervention. Nothing in nature, in fact, can *absolutely* change itself, but whatever is subject to change is changed also by something else<sup>26</sup>. In general, as we have seen, any change that affects something is due to the intervention of an external source of change, a mover, or an action, which activates a *δύναμις*, a potentiality present in the thing and according to the ‘nature’ of that thing. To be more precise, then, we cannot simply assert that natural changes are due only to matter, but rather that they are due to the action of a certain external mover over a certain matter which, according to certain dispositions present in matter, give rise to a change that affects the substance. Certainly a stone falls to the ground because it is made of an earthy stuff, but it falls down when it is removed from its natural place. Analogously, a piece of wood, like a bed, a trunk, or anything else of that sort, is able to give rise to a process of decomposition when it is buried, that is, when some elements or factors – earth, water, humidity – act on it. In this way, then, we are able to explain the decomposition of wood as the result of the action of an external mover over a certain matter *in accordance with the nature of this matter*. Wood, in this case, is a certain matter that, under certain conditions, is able to give rise *καθ’ αὐτό*, that is, by virtue of definition, to some proper and specific changes. For example, wood can catch fire if it is near a flame, it can fall downward if it is unsupported, and it can decompose if it is buried. And all these changes are changes of wood inasmuch as it is wood. Thus, if a trunk, a chair, or a bed catches fire when burnt, if it falls when unsupported or if it decomposes when buried, it is *because* it is made of wood, and in this process the form of the *οὐσία* which is subject to change plays no role.

This is, according to Aristotle, one way of using the word ‘nature’, that is, “the primary underlying matter in each case, of things which have in themselves a source of their movement and changes”<sup>27</sup>. Some changes performed by some natural substances, then, are the outcome of a disposition proper of their matter which, under the action of external sources of change, gives rise to some specific behaviors. This is an explanation

<sup>26</sup> Regarding this aspect of nature, Cfr. Furley, D. [1980].

<sup>27</sup> *Phys.* II 1 193 a 29 – 30.

that, as we shall see, points to what Aristotle calls the “necessity” present in matter<sup>28</sup>: if a stone is removed from its natural place, it necessarily falls; if water is heated, it necessarily boils and turns into water. Here the “necessity” present in a certain matter means the regularity with which a certain matter behaves when affected by a certain action or under certain circumstances. Saying that wood naturally decomposes when it is buried means that wood, under certain circumstances, always decomposes.

If this is one way of using the word ‘nature’, then it means that we can explain a certain thing’s change, among other causes, *also* by an internal disposition or power which belongs to its matter. And this is true, according to Aristotle, about several natural changes. The spatial movements of inanimate objects or the chemical reactions of certain substances, for example, are due to a disposition proper of the matter of those things.

Up to this point in the discussion, as Aristotle points out, these considerations only show that “in one way” the nature of a thing is matter. But this argument is not sufficient to demonstrate that the nature of a thing is *only and always* matter, which is the main thesis of the ancient tradition. To reach this conclusion, we have to exclude that the other candidate for being the internal source of change in a substance, the form, has in no way the power of giving rise, by itself, to a change. And this is what Antipho wants to show when he claims that, if we buried a bed, it would come to be wood, not *a bed*. If we leave a bed free to initiate a change without human intervention, it would decompose, producing new wood, but it would never produce a bed, or a chair. And according to Antipho this proves that the form of a thing does not have a power to give rise to a change by itself: the disposition of parts possessed by the bed plays no role in the process of change that affects the bed by itself. And thus, Antipho concludes, the form, the structure, and the disposition of the parts of a substance are “mere affections, states, or dispositions”<sup>29</sup> imposed on the wood from outside, which belong to a substance *κατὰ συμβεβηκός*, that is, by virtue of concurrence, as a mere accidental and secondary result that is due only to the action of an external source of change over matter according to the particular dispositions present in its matter.

<sup>28</sup> *An. po.* II 11, 94 b 37 – 95 a 3. Cfr. Chapter 3, sections 1 and 2 of the present work.

<sup>29</sup> *Phys.* II 1, 193 a 25 – 26.

According to Antipho's view, then, the coming to be and the particular features of any substance, whether natural or artificial, are accounted for only by two factors: (a) the action of an external source of change and (b) the particular dispositions of the matter of the substance on which the external action acts. In this scheme, then, there is place for form only in the first factor, that is, the *external* source of change. This conclusion is drawn through an analogy between natural and artificial substances: natural objects and artifacts are both material bodies with a certain constitution, form, or shape. In artificial objects matter constitutes the only internal source of change: if a chair or a bed fall to the ground, that is due to the stuff of which they are made, not to the way the stuff is disposed. On the contrary, the form and disposition is imposed accidentally on that matter through the intervention of an external force. And on this basis, Antipho concludes that even in natural things, which are material bodies structured in a certain way, the only internal source of change is the underlying matter, and that the form belongs to them only by an imposition of external forces or actions. If Antipho is right, then, not only simple spatial movements of inanimate objects, or qualitative changes of some compounds, which seems an uncontroversial point, but also living things, their growth and their features can be explained by and only by the action of an external power on their matter. The analogy between natural substances and artifacts, in fact, is adopted by Antipho to put in the same field a process of manufacture and a process of growth, which is a kind of change proper only of living things.

### 1.5 – Criticisms to Antipho's Argument

The point of the controversy between Antipho and Aristotle, then, is not the claim that matter is a source of change in natural substances. A stone, for example, naturally falls to the ground because it is made of earthy stuff. And this is, according to Aristotle, one appropriate way in which we use the word 'nature'. There are natural substances, then, who owe their proper movement to a power given to them *only* by their matter, and in which the form plays no role. And since all natural substances are compounds of form and matter, and since matter was proved to be a source of change, then we are right to conclude

that all natural substances involve changes that are due to a power present in matter. All actions performed by natural substances, from inanimate objects to living things, involve a tendency of change which is present in their matter. In that respect, according to Aristotle, Antipho is right.

But Antipho also claims that natural substances involve *only* matter as their internal source of change. According to him, all actions performed by natural substances, from the movements of inanimate objects to the proper changes performed by living things, are due *only* to a power present in their matter. This is, then, the polemic point between Antipho and Aristotle.

Antipho, as we have seen, argues that the source of natural changes is always and only matter, basing this conclusion on two considerations. The first is the experience of that which grows without the intervention of human activity, the second is the analogy between artifacts and natural substances. And these are the two points that Aristotle criticizes in Antipho's account. In fact, if 'nature' is what can grow without the intervention of human activity, then, Aristotle replies, this argument does not prove that the nature of a thing resides in its matter rather than in its form, in fact:

Men come to be from men, but not beds from beds. That is why people say that the nature of a bed is not the shape but the wood, since if it sprouts, what comes to be is wood and not a bed. But if this shows that the wood is nature, nature is form too; for men come to be from men<sup>30</sup>.

If we say that nature is matter by considering the fact that if a bed had enough vitality to send up a shoot, it would produce wood, but not another bed, then on the same principle we have to conclude that form is also nature, since man comes to be from man. It is evident that Aristotle is criticizing the *range of experience* of natural changes on which Antipho is basing his argument. The thing that is buried in Antipho's mental experiment, in fact, is a simple inanimate object, whether it is a simple piece of bark, a table, or a chair. And if we base our analysis on such a kind of substances, we rightly have to conclude that the only source of change is matter. But if we extend our experience to living things in

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<sup>30</sup> *Phys.* II 1, 193 b 8 – 12.

general, as in the case of a man, what persists in the process of generation is the form: man does not give birth merely to organs and tissues, but to another man, that is, to a form that organizes matter in a specific way. Thus, if matter has an internal power to be a source of change, some kinds of form – in this case the form of living things - have this power too.

But this counter-argument, besides showing that Antipho's argument does not prove that nature resides only in matter rather than in form, also makes clear the errors present in his use of the analogy between art and nature. Both artifacts and natural objects are compounds of form and matter: a bed is a certain matter, organized under a certain form, with some specific functions; analogously, a man is a certain matter, organized under a certain form and with some specific functions. This is what natural things and technical objects have in common, and Antipho based his argument on this analogy to conclude that form, both in natural things and in artifacts, is something accidental and superficial. But, according to Aristotle, the analogy between art and nature cannot be used to claim that the form is something that comes from outside the substance, as the case of the man clearly shows. Rather, the analogy between art and nature must be used to make clear first of all the difference between natural things and artifacts, and the main difference is due to that aspect of the two kinds of things in which the analogy does not hold: "men come to be from men, but not beds from beds".

This observation brings us back to the definition of a natural object as stated at the beginning of the *Phys.* II 1: something due to nature is something that owes its proper changes - displacements, coming into being, growth, functions – to an internal source of change. This internal source of change belongs to a natural substance *καθ' αὐτό*, that is, according to what a thing is. On the contrary, something due to art is something that owes its coming into being and its functioning to a source of change external to it. An artificial object, considered *καθ' αὐτό*, that is, *insofar as it is an outcome of art*, has no innate tendency to change. The only internal source of change that it possesses belongs to it because *κατὰ συμβεβηκός* it is made of a certain stuff, that is, by virtue of some elements possessed by it but that do not define what the thing is.

For these reasons, claiming that "the nature of a bed is the wood, of a statue the bronze"<sup>31</sup> is to confuse what belongs to an artificial object *καθ' αὐτό* and what belongs to it

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<sup>31</sup> *Phys.* II 1, 193 a 11 – 12.

κατὰ συμβεβηκός. A bed and a statue, insofar as they are a bed and a statue, are not instances of τὰ φύσει ὄντα, of natural things, and thus they are not due to nature. Rather, they are due to art, and only because κατὰ συμβεβηκός they are made of wood or of bronze they exist by nature<sup>32</sup>. As Ross has rightly pointed out, Aristotle's counter-argument makes visible that "even if the fact that a bed, if it had enough vitality to put forth a shoot, would produce not another bed but merely a shoot, shows that its bedness is due to art and only its woodness is its nature"<sup>33</sup>.

Once we have made clear the difference between natural things and artifacts, the analogy between 'art' and 'nature', as causes that produce a change in a substance, can be used to show that, contrary to Antipho, both natural and artificial substances come to be and owe their functions primarily to their form:

Just as that which is in accordance with art and artificial is called art, so that which is in accordance with nature and natural is called nature. And as in the one case we would not yet say that a thing is at all in accordance with art, or that it is art, if it is a bed only in possibility, and has not yet the form of a bed, so with things constituted naturally: that which is flesh or bone only in possibility, before it acquires the form which accords with the account by which we define what flesh or bone is, does not yet have its proper nature, and it is not a thing due to nature.<sup>34</sup>

Once we have distinguished artificial substances from natural ones, we are able to analyze the manner in which the word 'art' as well as the word 'nature' are used with respect to the substances that, respectively, are said to be 'natural' or 'artificial'.

In the case of an artificial object, for example, we identify the element of 'art' or that which is 'artificial' not with its bare matter, but with the form imposed on it. We speak of 'art' and 'artificial', Aristotle says, not when a certain thing *could be made* into a house, that is, when it is a house only in possibility, but when it actually has the form that corresponds to the definition of a house. Here the matter of a thing is identified with the *potentiality* of being something and the form with its *actually* being something, and this is

<sup>32</sup> Cfr. Ross, W. D. [1936], p. 502 – 503.

<sup>33</sup> Ross, W. D. [1936], p. 504 – 505.

<sup>34</sup> *Phys.* II 1, 193 a 31 – 193 b 3.

very important to understand Aristotle's point. For example, a house is a certain matter, organized under a certain form, with a proper function, which is sheltering man and his possessions. Now, if we ask why a house shelters man and his possessions, then it would be absurd to answer "because it is made of bricks and posts": a simple amount of bricks and posts, in fact, is not able to shelter people until it is organized under a certain form. Thus it is rather the form under which the bricks and posts are disposed which actually gives the house a certain function. But this is true not only about the proper functions of the house, but also with respect to its coming into being: a house comes to be not because the bricks have the tendency to fall down and the posts, which are lighter, to go on top<sup>35</sup>. Rather, the house comes to be by the action of an artisan, who performs an activity able to dispose bricks and posts *according to a certain form*, the form of the house that is present in the artisan's mind. At the very beginning of the process of realization of an artifact, then, there must already be a form, and it is *by virtue of that form* that the artisan is able to build a house.

And this is what happens also with some natural substances, that is, with living things. Even here what we call 'nature' or 'natural' in a substance like a man, is not the matter that in possibility could come to be a man, but the form of a man that, according to its definition, a certain matter has actually acquired. If it is right to claim that a stone falls to the ground because it is made of earth, it would be ridiculous to claim that a man walks because he is made of bones, flesh and tissues. A simple collection of bones, flesh and tissues, in fact, is not able to walk just as an amount of bricks is not able to repair and shelter. Rather, the internal element or factor that, under certain external conditions, gives a man the capacity of walking is his anatomical structure, that is, the way in which its parts are arranged. In this sense a man walks because he has legs, that is, because bones and flesh are organized in a certain way. And even in this case, the form is the internal factor that not only originates the proper functions of the substance, but which is also responsible for the coming into being and the growth of that substance. Men, in fact, come to be from men. Even in the process of generation of a living thing, the specific form of a substance is present since the very beginning of the process. And it is *by virtue of that form*, which is

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<sup>35</sup> *Phys.* II 9, 199 b 35 – 200 a 5.



transmitted to a certain matter, that a certain substance acquires a specific power to grow and work as it does.

This is then the Aristotelian conception of nature, as an internal source of change of substances, with regards to living things. This conception is centered in the notion of form, which not only constitutes the internal source of change *within* substances - thus being responsible for the proper functions of a substance - but also is the internal source of change within the *growth, formation and generation* of substances. To understand this last point it is useful to look to the structural analogies between a process of manufacture and natural generation. There are then two main factors that art and nature have in common: first, they both are principles of generation of things that are intrinsically determined by a certain form - which gives the substance some proper functions -, and second, in both cases the form is transmitted to matter by something that, in some way, already possesses the form. But insofar as the analogy between art and nature can show us the identical structure underlying these two processes, it must also make clear the main difference between them. And the difference resides in that in the process of manufacture the form of the substance which is produced - the artifact - is different from the form of the substance which produces it - the artisan -, whilst in natural generation the form of the substance that comes into being - the son - is the same as the form of the substance which generates it - the father. The difference between natural substances and artifacts, then, is a difference between things whose form possesses an internal power to produce a substance of the same kind, that makes them grow and function, and substances whose form does not have, by itself, such a power but must take this power from an external source.

### 1.6 - Aristotle's own Account of Nature

The controversy between Aristotle and Antipho, whose argument was taken to represent the position of those who claim that nature is the primary underlying matter in each object, does not lead to a simple opposition between two irreducible points of view. Rather, it reaches an articulate view about two different ways in which natural objects have in themselves an internal principle responsible for their changes. In other words, the polemic

with Antipho is not a simple contrast of “matter vs. form”, but rather a confrontation with at least three different and interrelated theses which allow Aristotle the construction of his own account.

The first thesis holds that the nature of a thing, that is, the internal source of change present in a substance, is its matter. This, according to Aristotle, is certainly true in many cases. In fact there are a lot of changes present in natural things in which we invoke an explanation in terms of their matter. This is the case, for example, with the movement of the simple bodies like earth, water, air, and fire, which have an innate tendency to give rise to a spatial change. If we leave a stone unsupported, it will fall; and if we bury a piece of wood, it will decompose. In this case, both the processes of falling and decomposition occur by virtue of what the substances are made of. Hence, concludes Aristotle, matter is one way of using the word “nature”.

But this thesis is different from a second one, which holds that nature is *always and only* matter. This is, according to Aristotle, clearly false: a man produces not merely organs, bones and flesh, but a man, that is, what the organs, bones and flesh constitute<sup>36</sup>. The flaw in Antipho’s argument is that he is considering only a limited range of natural changes - the changes proper of inanimate objects – without considering the original variety and diversity of kinds of change present in the natural world. Thus, we can well explain the behavior of inanimate natural things according to the matter they are made of, but this leads to absurdity if we try to generalize this explanation to the behavior of living things. The flaw of Antipho’s argument, then, makes it clear that different kinds of changes cannot be originated by the same kind of causal factors – matter -, but rather they must be produced by different kinds of factors – the specific form of each substance *and* matter -. It is true that living things too are made of natural elements, but the innate tendencies of natural elements or their compounds is not able, alone, to account for complex behaviors of living organisms like reproduction, growth, nutrition, locomotion, etc. In order to give rise to such changes there must be a form, a structure that organizes matter and its tendency, and it is this organization which is the internal factor responsible for the change: an animal owes the possibility of locomotion not simply to bones, nerves, and muscles of which it is made of, but rather to the way in which bones, nerves and muscles are arranged.

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<sup>36</sup> Cfr. Ross, W. D. [1936], p. 505, and Charlton, W. [1970], p. 91.

This leads us to the third thesis present in Antipho's argument: that the form or organization present in living things is only an accidental attribute due to a process that involves only matter and external conditions. If this were right, then we could explain that living things grow and behave with the characteristics they do only by the action of external forces on their matter. Form would play no causal role in this process, being only a superficial disposition due to accidental interactions. Here the causal role of form is denied not only *within* the substance, but also *within the generation* of a substance, which is the condition to be subject to any other sort of change. Again, Antipho's conclusion is drawn as a generalization of the model of generation and corruption of inanimate substances - the transformation from a natural element into another - to the field of living things. Water, for example, turns into air when heated. The process of transformation, in this case, is due to the action of an external force over matter, in accordance with the disposition of its matter. And the result, air, is the mere outcome due to the accidental conjunction of two independent processes: an external source of change - heat - and the necessity present in the matter of the thing affected - water -. But, again, this model is insufficient to explain all kinds of coming into being of a substance. An example is the insufficiency of this model to account for processes of manufacture, which, as Antipho also admits, is a process strictly analogous to the process of reproduction and growth of living things. The coming to be of a bed, for example, is well accounted for by the action of an external source of change - the art of the carpenter - over wood. And this outcome is well accounted for, in this case too, as the result of this action on a certain matter according to the necessity present in that matter (that is, inasmuch as the matter on which he is acting is wood, not water or wool). But in this case the form of the thing which is produced, the bed, cannot be regarded as a mere outcome due to the accidental conjunction of two independent things. On the contrary, the form is properly the element that explains why the artisan has acted in that way and why he has chosen wood and not another matter. Here the outcome - the form produced in a substance - is not a question of mere necessity and contingency, but it is the element or the factor that must be present in the source of change and that orients and determines this source of change from the very beginning of the process.

It is then through the analysis of these three different theses that Aristotle comes to formulate his own account of nature. According to Aristotle, there are *two ways* of using the word ‘nature’: one for “the primarily underlying matter (ὕλη) in each case”<sup>37</sup>, and one for “the shape (μορφή) and form (εἶδος) which is in accordance with a thing’s account”<sup>38</sup>. Even in this second sense in which we use the word ‘nature’, and which constitutes Aristotle’s most novel contribution, we are not talking about a power to absolutely initiate a change, but rather a disposition, a capacity internal to a substance that is activated by some external actions and that is present by virtue of the organization of these substances. Matter, in this case, does not disappear as a causal factor in producing a change: a house must be made of bricks in order to shelter, and a man must be made of bones and muscles in order to walk. Rather, the causal role of matter is subordinated to the configuration in which it is structured: bricks do not have the capacity of sheltering until they are arranged as a house, and bones and muscles do not have the capacity of walking until they are arranged as a man. Thus, concludes Aristotle:

There is another way of speaking, according to which nature is the shape and form of things which have in themselves a source of their changes, something which is not separable except in respect of its account [...]. And the form has a better claim than the matter to be called nature. For we call a thing something, when it is that thing in actuality, rather than just in possibility.<sup>39</sup>

And the fact that there are two ways of using the word ‘nature’ has, according to Aristotle, a strong ontological consequence, since it means that “there are two sorts of things called nature”<sup>40</sup>, that is, there are two different kinds of natural substances. Nature, then, is an internal source of change, that belongs to some substances *καθ’ αὐτό*, and that is responsible for the proper and specific changes of that substance. All things that possess this kind of principle are substances, and this is what binds all natural substances and what constitute the subject matter of the *Physics*. But this internal factor is not identical in all natural substances. The world of nature is populated by different kinds of substances,

<sup>37</sup> *Phys.* II 1, 193 a 29.

<sup>38</sup> *Phys.* II 1, 193 a 30 – 31.

<sup>39</sup> *Phys.* II 1, 193 b 3 – 8.

which perform different kinds of activities, and that cannot be reduced to one and the same kind of cause. What accounts for different kinds of change, according to Aristotle, are different kinds of elements that originate change. On the one hand there are the upward and downward movements that belong to all natural substances and are due to the matter they are made of, independently of their form. Both a stone and a man have the tendency to go downwards, and they owe this tendency only to the matter that constitutes them, not to the way in which matter is organized. Thus, in the case of inanimate objects - whose only change is the spatial movement upwards and downwards -, the internal source of change is identified only with the material of which the substance is made. But this is not the case for living things: plants, in addition to performing this kind of movements, also have the power to grow and decay, to nourish and reproduce; and animals have the capacities of locomotion and perception. All of them, moreover, perform these kinds of changes in a specific way: a certain plant grows some specific parts, just as a certain kind of leaves or fruits, etc., and a certain animal reproduces itself always as an animal of the same species, and always behaves in a certain way, etc. And all these kinds of changes cannot be explained only by the matter a substance is made of: the capacity of barking of the dog and the capacity of meowing of the cat, for example, are not due simply to the material constituents and parts of a dog or a cat: the fact that they have a tongue, a mouth, lungs, and the fact that these parts are made of a certain material, for example, do not explain why the dog barks and why the cat meows. Rather, this capacity is due to their specific anatomical structure, the form under which these material parts and constituents are organized.

Nature, then, is not a homogeneous field. There is something that introduces a difference among natural changes. And this difference is not found in the elements that compound natural substances in general: both inanimate substances and living things, in fact, are compounds of form and matter in the same way. Rather, the difference is that the changes performed by inanimate things are due to the material that constitutes them whilst in the case of living things these changes are produced by the way in which their matter is organized, that is, by their specific forms.

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<sup>40</sup> *Phys.* II 2, 194 a 12 – 13.

### 1.7 – Conclusions

Aristotle's main effort in his account of nature in *Phys.* II 1 is aimed at giving order and structure to our experience of natural changes without prejudice to the original variety and diversity present in it. On the one hand, when we speak about 'natural things' or 'things due to nature' we show that we consider nature as a fundamental field of our world, a unitary field of things which possess a distinctive characteristic that distinguishes them from other things that are not natural or due to nature. And it is through the analysis of this characteristic that Aristotle establishes that what gives unity, order and structure to our experience of nature is that all changes performed by what we call 'natural substances' are caused by an internal disposition or power. But on the other hand our experience of nature displays a heterogeneity, multiplicity, variety and diversity of changes. Anything in nature has an internal principle to move up or downwards. But while this is the only kind of change performed by inanimate objects, living things also have a tendency to nourish, grow, decay and reproduce themselves. This distinction, then, marks the difference between two large kinds of changes: on the one hand upward and downward movements of inanimate objects, and on the other hand the changes proper of any form of life. But although it is important to establish the difference between these two kinds of change, it is no less important also to preserve the variety and diversity that our experience displays even among living things. Animals, for example, can move by their own and can perceive whilst plants cannot. Furthermore, also among animals we can find different kinds of changes that can be performed by substances of a certain kind and not by others: dogs, for example, bark, but cats do not, and birds fly, but snakes do not. And it is in order to preserve this original diversity that Aristotle comes to establish that different kinds of natural change are originated by different internal factors. Thus, according to Aristotle, the changes shared by all natural substances, such as upward and downward movements, are due to the stuff of which a certain substance is made of. But, on the other hand, all the changes proper of living things are due to the way in which the matter of a certain substance is organized, that is, to their form.

## *Chapter 2 – Ends in Nature*

At this stage of the inquiry we are finally able to start the investigation about the presence and the scope of the *τέλος* in nature. Since the *τέλος* is reckoned by Aristotle as a factor that is responsible for natural changes, and since there are different kinds of changes, what kind of changes can be explained recurring to ends? The problem that we will try to solve in the present chapter, then, is whether the *τέλος* is responsible for all natural changes, which means that the *τέλος* is present in a substance simply because it possesses an internal source of change, or whether it is responsible only for a limited range of changes, which means that it is present only when a substance has a source of change of a certain kind. In order to answer this question we shall first of all see how Aristotle introduces his notion of *τέλος*, then we shall look into the definition of the term *τέλος*, and finally we shall argue – by means of a distinction between two ways in which the word *τέλος* is used – that in nature the end is present only with regards to the formation, structure and functioning of biological entities.

### *2.1 – Organized Substances and Ends*

The world of nature, as we have seen, is a world of substances that have in themselves a source of their change. This is the subject matter of the study of nature, and since in each inquiry the search of the kind of causes finds an ontological basis in the subject of inquiry, it is obvious that, according to Aristotle, there are three kinds of causes that must always be known by the student of nature. On the one hand, the student of nature must know the form and the matter of a certain substance, since these two elements are what primarily constitute any substance. But on the other hand, the student of nature must know the internal cause of a substance in the sense of “source of change”. This is properly what nature is, and this is the main subject matter of the *Physics*. But this internal source of change is not identical in all substances. The upward and downward movements of natural substances, for example, are due to the matter they are made of, independently of their form. According to Aristotle, in fact, different kinds of natural changes are due to different kinds of internal principles:

on the one hand the downward and upward movements of inanimate objects originate from the matter of those substances, independently of their form; on the other hand the changes proper of any form of life originate rather from the way in which the material parts and constituents of those substances are organized, that is, their form<sup>1</sup>. Thus, matter and form must not only be studied as factors responsible for a certain thing's constitution, but they must also be studied as factors able to produce and originate a change in the same substance which they constitute. Now, as we have seen, the causal role of matter as a source of change has been recognized since the first thinkers who studied nature, and the way in which matter can originate a change does not seem a problematic issue. Rather, it is the causal role of form as source of change that constitutes the real novelty in Aristotle's account of nature, and thus it is the way in which form is able to produce a change that must be explained.

For it is certainly a problem if there are two sorts of nature, which of them the student of nature is concerned with. Perhaps with that which consists of the two together. In that case he will be concerned with both. Will both, then, fall under the same study, or each under a different? If we had regard to the early thinkers, it might seem that the study of nature is the study of matter. [...] But if art imitates nature, and it belongs to the same branch of knowledge to know the form and to know the matter up to a certain point (thus the doctor has knowledge of health, and also of bile and phlegm, the things in which health resides; and the builder knows the form of a house, and also the matter – that is bricks and beams; and it is the same with other arts), then it belongs to the study of nature to know both sorts of nature.<sup>2</sup>

The thinkers who first studied nature, according to Aristotle, have identified it only with matter. This does not mean that Aristotle's predecessors failed to recognize form as a kind of cause, namely, as what is responsible for the constitution of a certain substance. Rather, they did not recognize form as a source of change present in natural substances<sup>3</sup>. This was the case of Antipho, who thought that form was a simple accidental outcome of the

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<sup>1</sup> Cfr. Charlton, W., p. 91.

<sup>2</sup> *Phys.* II 2, 194 a 15 – 27.

<sup>3</sup> Among the criticisms that Aristotle advances in *Metaph.* A against Plato, who nevertheless is reckoned by him as the discoverer of forms, is that these cannot explain the change in sensible things. Cfr. *Metaph.* A 9.



interaction between two independent processes: the action of external forces and a power intrinsically present in matter. However, this kind of explanation is appropriate only for a limited range of natural substances, namely, those substances whose form or constitution is not an internal source of change and that owe their change only to matter. But this kind of explanation cannot be generalized to all natural substances, and this is the case of living things. Flesh and bones, for example, are not able *by their own* to give birth to an animal; nor to give rise to the proper functions of an animal, like growing, breathing, locomotion, eating, perceiving; nor to be responsible for the specific behaviors of a certain kind of animal. Flesh and bones are able to grow, run, breathe, and perceive only when they actually are organized in a certain way, that is, as an animal. These kinds of change are possible only when matter and its proper dispositions are *organized* in such a way as to promote some proper changes. Thus, with regard to living things we have to study the form not only as a factor responsible for the constitution of the living thing, but also as the internal factor responsible for all the proper changes performed by the living thing. This power, present in some kinds of form must not be thought of as something “obscure” which acts in a not well-known way within a substance. Rather, it must be thought of as having an analogous causal role to that of the coming into being of artificial objects. Even in the field of art, in fact, the dispositions present in matter are not able *by their own* to produce a certain object, nor are they able *on their own* to perform certain actions, works or functions; rather, there is *something else* that must be present, a form able to organize matter and its disposition in order to produce an object and to allow the object to work and function in a certain way. And the same applies to the case of living things: even here it is the *organized matter* which gives place to some actions that matter alone is not able to perform. The difference between things due to art and things due to nature is that in the first case the form that determines a certain art, like the art of house-building, does not have by itself the power to give rise to a change but it must take this power from an external substance, the artisan: the form of a house in the builder’s mind cannot, by itself, dispose and arrange bricks and posts in order to produce a house, but it needs the activity of the builder. On the other hand, the form that determines the nature of a certain substance, like the form of a man, has by itself the power to produce an activity - the form of a man gives him the

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capacity of walking, perceiving, growing, etc. The explanation in terms of external actions over matter, then, is insufficient to explain the proper changes of living things because there is *something else* in those substances. And this “something else” is a capacity or a disposition present in a substance by virtue of the way in which its matter is organized.

Thus, Aristotle concludes, if these are the objects of the study of nature, then it belongs to the same branch of study “to know the form and to know the matter *up to a certain point*”. Here form and matter are regarded not in their causal role as factors that simply constitute a certain substance, but they are regarded as what constitute the *nature* of a substance, that is, in their causal role as “source of change” of a certain substance. Thus, since the internal tendency to change present in natural substances is not only matter, but in some cases it is also the way in which matter is organized, then the student of nature must look for the organization of the substance and to its matter insofar as it is organized in a certain way. Even here the analogy between art and nature helps us understand the point “up to which” matter must be studied.

Up to what point, then, should the student of nature know the form of things and what they are? Perhaps he should be like the doctor and the smith, whose knowledge of sinews and bronze extend only to what they are for.<sup>4</sup>

Here the matter and the form, with regard to their being internal sources of change of natural substances, correspond to what stands in artificial substances in the relation of means to ends. But in this relation the form has the role of the end and “what something is for”, and matter that of the means. Thus, according to Aristotle, “it belongs to the same study to know the end (τὸ τέλος) and ‘that for the sake of which’ (τὸ οὐδ’ ἕνεκα), and to know whatever is for that end”<sup>5</sup>. As the builder must know the structure or the form of the thing that is going to be built - the house - as well as the means necessary to allow the realization of that form – bricks and posts -, in the same way, according to Aristotle, the student of nature must know the form of a natural substance – the man - and the material parts and constituents of that substance up to the point in which it allows the realization of that form – flesh, bones, organs, etc. Thus, concludes Aristotle, the student of nature must know “a

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<sup>4</sup> *Phys.* II 2, 194 b 9 – 12.

thing's form (*μορφή*) or what it is (*τὸ τί ἐστίν*), for that is its end (*τέλος*) and what it is for (*οὐ ἕνεκα*)”<sup>6</sup>.

The notion of *τέλος*, as the analogy with a process of manufacture shows, is introduced by Aristotle in his discussion about nature through the consideration of the causal role of form as source of change internal to a substance. Furthermore, the *τέλος* is explicitly identified with the *μορφή*, the form of a substance, and more precisely with the realization of the form. And these considerations would be sufficient to argue that, according to Aristotle, the ends are present in nature only in those substances whose nature is form *and* matter – living things -, not in those substances whose nature is only matter – inanimate objects. It is only when form *and* matter have the capacity of producing a change that, according to Aristotle, the form produces the change as the end and matter as ‘whatever is for that end’. Furthermore, this conclusion would have the support of all Aristotle’s biological works, which, as Ross points out, adhere to the program of knowing the form of a living thing as an end, and its material structure, parts, and constituents and functions insofar as they allow the realization of that end<sup>7</sup>.

However, the mere claim that the form of a natural substance is its *τέλος* is not yet sufficient to understand the basis on which Aristotle grounds this identification and how he intends this relation. There is no doubt that, according to Aristotle, form and end are strictly bound together, but they continue to be different. This is clear, for example, in the case of an artifact. Here the form of a thing is certainly bound together with its end: a house, as we have seen, can shelter primarily by virtue of its form, and matter in this case is an instrumental factor that allows the realization of that end. But the two items continue to be different things: the form – the arrangement of parts that makes a certain thing a house -, and the end – sheltering -. How, then, can Aristotle bind together the form and the end in nature so as to identify them?

Aristotle gives a first indication in his introduction of the term *τέλος* as seen above. Here Aristotle states that the student of nature should study the form of something as its *τέλος* exclusively in those cases in which the form is not only the constituent of a substance, but also an internal source of change of that substance. And that means that the end is not

<sup>5</sup> *Phys.* II 2, 194 a 27 – 28.

<sup>6</sup> *Phys.* II 7, 198 b 3 – 4.

<sup>7</sup> Cfr. Ross, W. D. [1936], p. 35.

identical with the form in all natural substances, but only with the form of those natural substances in which form has also a capacity of producing and originating a change. Thus, according to Aristotle the form is identical with the end only in the case of what we have defined as organized substances. But this indication gives us only a clue to understand *in which cases* the form and the end are identified, not *why* they are identified. Again, in organized substances the notion of εἶδος and the notion of τέλος remain distinct: the εἶδος explains the constitution of a certain substance as what the substance is, whilst the τέλος explains a certain substance's change as what the change is for. How, then, do these two different notions converge together, in organized substances, in the same thing? According to our study as an ontological inquiry, we will try to see what there is in an organized substance that identifies its form with its end. To achieve this point, we have first to see what the τέλος is, and which are the characteristics that identify it with the form of an organized substance.

## 2.2 – The Definition of End

As we have seen in the introduction, the τέλος is considered as one of the four kinds of αἰτία, that is, as a factor or element in reality that can explain something. For example, Aristotle says, 'health' might be what a walk is for. If we are asked on account of what a man walks, we may answer 'to keep fit' and with this answer we have given a cause, that is, an explanation of the man's walking pointing to what the walk is for.<sup>8</sup> In a first approach, then, the τέλος is a form of explanation of something by means of something else that is chronologically posterior to the thing explained, its result or outcome. But not any result or outcome of a process can be considered the τέλος of a process. For example, if the man walks down a street and he is robbed, we do not say that the man's walk is 'for the sake of being robbed'. The robbery, in this case, is what we can call an 'accidental result', that is, an outcome or result of the man's walk that nevertheless is not the state of affairs that the man wanted to achieve with his walk. In this sense, then, the result does not have any causal role in the action and thus it cannot be 'that for the sake of which' the man

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<sup>8</sup> Cfr. *Phys.* II 3, 194 b 32 – 35.

walks. Hence the outcome of the action, in order to be responsible for an action as ‘that for the sake of which’, must be something present, in a certain way, since the very beginning of the action, a principle that orients, guides and determines the behavior and that must, in a certain way, produce and originate the change.

This mode of causation, as the example shows, characterizes human actions: here the *τέλος* – the result or outcome - explains a certain person’s change, action, or behavior as ‘that for the sake of which’ insofar as this *τέλος* is embodied in desires and purposes, which are motives, motors and originators of change. However, according to Aristotle, this mode of causation regards also natural changes. But there is a problem: how can this mode of causation enter in the natural world, as in the development and behaviors of living things, where actions take place through no desire or purposes?

Actually in the second book of the *Physics* the notion of *τέλος* is introduced and defined before the distinction of the four kinds of *αἰτία*. And what is more important is that here the term *τέλος* is defined in relation to nature. Here Aristotle says:

Now nature (*φύσις*) is an end (*τέλος*) and what something is for (*οὐ ἕνεκα*). For whenever there is a definite end to a continuous change, the last thing (*τὸ ἔσχατον*) is also what it is for (*τὸ οὐ ἕνεκα*); whence the comical statement in the play ‘He has reached the end for which he was born’ - for the end should not be just any last thing, but the best (*τὸ βέλτιστον*).<sup>9</sup>

The notion of *τέλος* here is defined through three concepts. First of all, Aristotle introduces the term *τέλος* claiming that it is *φύσις*, nature; second, the *τέλος* is defined as the last term (*τὸ ἔσχατον*) of a process and, finally, it is characterized as the best term (*τὸ βέλτιστον*) of a process. Let us proceed with the last two characterizations.

The *τέλος*, Aristotle says, is the last thing or term (*τὸ ἔσχατον*) in a process of change, that is, its result or outcome, the situation in which something arrives at the end of the process, or the state of affairs in which something stays in the conclusion of its growing, changing, or moving. But Aristotle observes that not any last condition of a change is the *τέλος*, but only the best (*τὸ βέλτιστον*). In this way, Aristotle is claiming that we cannot simply establish what a change is for by observing where or how it ends; we

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<sup>9</sup> *Phys.* II 2, 194 a 27 – 33.

must know if there is a ‘best’ or a ‘good’ term of that change. Thus, Aristotle is here identifying the *τέλος* of a process with its good (*ἀγαθόν*), which is explicitly stated in a later passage, where Aristotle claims that “there are things which stand as the end (*τέλος*) and the good (*ἀγαθόν*); for what the other things are for tends to be the best (*τὸ βέλτιστον*) and their end”<sup>10</sup>. We will see later on what he intends precisely as ‘good’; for the moment it is sufficient to say that the term ‘good’ must not be understood in a moral sense, but rather as the perfection reached by the process itself, a state of completeness and full realization of an action. For example, when we say that the end of the art of building is the house, we mean that the action performed by the builder is ‘complete’, ‘finished’ or ‘perfect’ only when it has produced a house; in this sense, the action of a house builder is ‘good’ when it realizes a house.

However, these two characterizations are not yet able to explain in which way and in which cases the *τέλος* – as the last and best term reached by a natural process – plays a causal role in the process as ‘that for the sake of which’ and why, on the contrary, it is not a mere accidental result. In the case of human deliberated actions, in fact, the result is considered a *τέλος* when, in a certain way, it acts since the very beginning of the action through beliefs, desires, and purposes, which produce and orient the action; but natural substances do not owe their changes to desires or purposes. How, then, can the result of a natural change determine and orient the change since its very beginning?

To solve this problem, the most important characterization present in the definition of the term *τέλος* is the first one, that is, the identification of the end of a process performed by a substance with the *φύσις*, the internal source of change of the process performed by that substance. In the natural world, then, the outcome of a process performed by a substance is not a simple accidental result but plays a causal role as *τὸ ὄν ἕνεκα* only when it is identical with the nature of that substance, that is, when it is the same state of affairs that produces and originates the change in that substance. It is only through this identity, then, that something that is chronologically posterior to a process – its outcome – can produce, determine, and orient the process since its very beginning.

According to Aristotle, then, all changes performed by natural substances have a termination, an outcome or a ‘last term’; but this does not mean that every termination or

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<sup>10</sup> *Phys.* II 3, 195 a 23 – 25.

'last term' is the *τέλος* of the change. The result or outcome of a process undergone by a natural substance can be regarded as a *τέλος* only when it possesses two characteristics: first, it must be something 'good', that is, something that represents the completion and perfection of the change, and second, it must be identical with the nature of the substance that undergoes the change.

In this respect we cannot say, as the comical remark, that death or disease is 'that for the sake of which' living things grow, live, and reproduce. Even if death is always the conclusion or termination of that process that we call life, it does not represent the 'good' of that process, that is, we do not say that life reaches its completeness or perfection when it is over. But this condition is not yet sufficient to guarantee that the state of affairs that constitutes the result of the process is 'that for the sake of which' and not a mere accidental result. In order to be responsible for a change the *τέλος* must be present since the very beginning of the process, and this is possible only when it coincides with the same state of affairs that has the capacity to produce and originate the process. When this second condition is lacking - when the result of a process does not coincide with the *φύσις* of the thing that performs the process -, even the 'good' and 'best' term must be considered as an accidental result, that is, a result that does not play any causal role in the process. For these reasons, then, the *τέλος* is excluded from playing a causal role in the movement of inanimate objects, natural substances that owe their changes to the matter that constitutes them. The proper movements of inanimate objects, in fact, have a direction or a last term, which is represented by their natural places, but this last term, the achievement of a spatial position, is not identical with the internal source of change of that substance.

Rather, these two conditions show that the only result or state of affairs that can be regarded as the *τέλος* of a natural process is the form or constitution of living things. On the one hand, in fact, the outcome or result of the good functioning and operating of some activities - like growth, nutrition, reproduction, and all other activities that are necessary for these changes, like breathing, perceiving, etc. - is the realization and preservation, both in the individual and in the species, of the form of a living thing. A certain activity like nutrition, for example, is 'good' when it gives a substance - a living thing - the nourishment necessary to survive and preserve itself, that is, to realize and conserve its form, and analogously in all other activities. But on the other hand, as we have seen, the

form or structure of a living thing is not only the result or outcome of these processes, but it is also the internal factor that gives the living thing the capacity of producing and originating these changes. The result of the process, in these cases, has a causal role since the very beginning of the process, it produces and originates the process and thus must be regarded as ‘that for the sake of which’ the processes take place.

We can now understand why, according to Aristotle, the student of nature must study the form of living things as their end, and thus why, only in living things, these two different notions are bound together until their identification. In a living thing, in fact, the *εἶδος* of a substance, the factor that defines what a certain substance is, is identical with the *τέλος* of the activity performed by that substance because (1) it is the result, the last and best term of that activity and because (2) it is the same element or factor that produces and originates that activity.

In organized substances, then, the *εἶδος* - apart from its causal role as “what a thing is” -, also plays a causal role in the changes undergone by that substance in two senses: on the one hand it is what stands at the beginning of the change, the “mover”, that is, the factor that produces and originates the change, and on the other hand it is what stands at the end of the change, the “τέλος”, that is, that for the sake of which the change happens. This point is well illustrated at the end of *Phys. II 1*, by means of a confrontation between the way in which the end is present in nature and in art.

Nature (*φύσις*) in the sense in which the word is used for a generation (*γένεσις*) proceeds towards nature (*εἰς φύσιν*). It is not like doctoring, which has as its end not the art of medicine but health. Doctoring must proceed from the art of medicine, not towards it. But the process of growth does not stand in this relation to nature: that which is growing, as such, is proceeding from something (*ἐκ τινός*) to something (*εἰς τι*). What, then, is it which is growing? Not the thing it is growing out of, but the thing it is growing into. So the form is nature.<sup>11</sup>

Here Aristotle is inquiring the meaning of the word ‘nature’ from an etymological point of view. Under this respect the word ‘nature’ means *γένεσις* - generation -, since the term *φύσις* comes from the verb *φύεσθαι* - to be born, to grow -, which is a synonym of the verb



γίγνεσθαι - to generate -. Now, the process of generation, as well as the process of manufacture, proceeds from something (ἐκ τινός) to something (εἰς τι). It is clear that, on the one hand, the term from which (ἐκ τινός) a process proceeds means the thing from which the process is originated, that is, its source of change; and on the other hand, it is clear that the term or condition towards which (εἰς τι) it proceeds, is its last and best term that Aristotle identifies with its τέλος or τὸ οὐ ἔνεκα. Now, as we have seen, in a process of generation, growth, or birth of a substance, the term ‘from which’ it proceeds is the ‘nature’ of the substance in the sense of its form. But in these kinds of processes, as Aristotle observes, ‘nature’ in the sense of form is also the term ‘towards which’ the process proceeds. The process of generation, as well as any other manifestation of life, proceeds εἰς φύσιν, towards nature itself. The anatomical structure of an animal, in fact, is the internal factor that gives the animal the capacity to produce some proper changes and, at the same time, it is also the outcome or result of these changes<sup>12</sup>. In organized substances, and only in them, the form of a thing is both what originates a change and the good term of that change. And this is not the case of a technical process. In the process of ‘doctoring’, for example, the term towards which it proceeds – its last and best term – is health, not the art of medicine from which it proceeds. Here the form that constitutes the τέλος of the process

<sup>11</sup> *Phys.* II 1, 193 b 12 – 18.

<sup>12</sup> It may be objected that this is not always true, especially in the cases of the growth of a living thing from a seed. For example, in the process of growth of a rose we may say that the term ‘from which’ the growth proceeds is the seed, and the term ‘towards which’ it proceeds is a rose. In this case, then, the two terms do not coincide, and thus we may conclude that the rose is not the τέλος of the process. And this kind of objection may be extended to all the processes proper of life: actually, as Aristotle points out in *Phys.* I 5 – 7, in order to have a change there must be a difference between ‘that from which’ and ‘that towards which’: an animal too, for example, has changed before and after eating since it has assimilated food, and thus the term ‘from which’ and the term ‘towards which’ are not identical. But Aristotle’s point is that in this way the animal has changed with regards of its matter, whilst its form persists from the beginning to the end of the process, since it remains the same kind of animal throughout the process. Thus, the animal can change its size, shape, quality, or surface configuration during its existence, but not its *form*, which is identical at the beginning or at the end of the process. The form or εἶδος that is identical from the beginning to the end of a process, then, is ‘what it is to be a living thing of that kind’, or the living thing’s specific difference within its genus. And this is what happens in the case of the growth of a seed into a plant: “what, then, is it which is growing? Not the thing it is growing out of, but the thing it is growing into. So the form is nature”. In this way, Aristotle is pointing out that the seed ‘from which’ the growth starts is a seed of something determined, that is, a substance of a certain kind: it is, for example, a ‘rose-seed’, that is, a living thing with a specific nature or form. According to Aristotle, then, what is responsible for the seed’s growth as its τέλος is not the fully developed organism, but the *form* of the developed organism, which “in some way” (*Phys.* II 1, 193 b 20), that is, potentially, is present since the very beginning of the process. Regarding this point Cfr. Ross, W. D. [1936], pp. 505-506; Berti, E. [1958], pp. 477-505; Nussbaum, M. C. [1978], pp. 67-74; and Furley, D. [1996], pp. 69-70.

is *present* in the source of change of the process, but *it is not identical* with it. Thus, according to Aristotle, we can say that art *has* an end, but that only nature *is* an end.

### 2.3 – Ends and Organized Substances

Only the form of an organized substance, then, can be considered a *τέλος* in nature since it is the ‘good’ of the changes performed by the substance and since it is the outcome of the changes produced by the same form of the substance. According to Aristotle’s account, then, the *τέλος* of a natural change is only and always the realization and conservation of the form of the same substance that performs the change, and thus it is only and always something *internal* to the substance that undergoes the process. On the contrary, as the quote above shows, the *τέλος* of a technical activity is always something *external* to the person who performs that activity: the art of building performed by the builder is good and complete when it produces a certain thing – the house – which is external and different from the builder, while the natural behavior of an animal is good and complete when it allows the survival and reproduction of the animal itself, that is, the realization and conservation of its own form.

However, Aristotle is aware that even in the field of nature we occasionally speak of ends meaning something external and different from the substance that performs the change. For example, when we say that the sun and its heat allow the growth of animals<sup>13</sup>, that the rain makes the corn grow<sup>14</sup>, or that plants and animals, which constitute the nourishment of men, allow their growth, survival, reproduction, etc.<sup>15</sup>, we are tempted to attribute a *τέλος* to these substances. Thus the sun would heat for the sake of animals’ growth, the rain would fall for the sake of the corn, and plants and animals would come into being for men’s survival. In all these cases, as we can see, the *τέλος* would be the realization of a form which is different and external to the substance that performs the actions, and furthermore this kind of end would regard indistinctly both inanimate objects (as in the case of rain) and living things (as in the case of plants and animals).

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<sup>13</sup> *Phys.* II 2, 194 b 12.

<sup>14</sup> *Phys.* II 8, 198 b 16 – 19.

<sup>15</sup> *Pol.* I 8 1256 b 15 – 20.

In order to give an account of this way of speaking about the end in nature, Aristotle recalls in *Phys.* II 2 a distinction, introduced for the first time in his lost dialogue *De Philosophia* and frequently present in other Aristotelian treatises, according to which “there are two sorts of things that may be called ‘that for the sake of which’ (τὸ οὖ ἔνεκα)”<sup>16</sup>. Again, this distinction results from the analogy between art and nature: in a technical process, for example, the end is represented by the work (ἔργον)<sup>17</sup>, as when we say that the end of the art of building is the house; but in the field of art, Aristotle adds, “we use all things as if they were for us”<sup>18</sup>, and thus Aristotle concludes, “we too are ends of a sort”<sup>19</sup>, as when we say that the end of the art of building is the man who is going to live in the house.

As Aristotle says in *De Anima*, then, the term ‘end’ – both in art and in nature – is an ambiguous one, and it may mean (a) the result for the sake of which something is done (τὸ μὲν οὖ)<sup>20</sup> and (b) the person or the thing that is benefited by this result (τὸ δὲ ᾧ)<sup>21</sup>, that is, the beneficiary of the result of a process. And in the first sense, Aristotle specifies in the *Metaphysics*, we speak about τέλος as (a) the end or the good of something (τινός)<sup>22</sup>, whilst in the second sense the same term means (b) the end or the good for something (τινί)<sup>23</sup>.

Thus, when we speak about external ends in nature, as when we say that the sun is for the sake of living organisms, that the end of the rain is to make the corn grow, or that plants and animals are for men, we are using the term τέλος in this second sense, that is, we are speaking about the mere beneficiary of a process. But in this sense we are using the term τέλος in an improper way, probably derived from our ordinary speech<sup>24</sup>, since in this sense it does not correspond to the definition of τέλος as the φύσις of the substance that performs the process. As we have seen, the τέλος is responsible for a natural process as ‘that for the sake of which’ only when it coincides with the factor that produces and originates

<sup>16</sup> *Phys.* II 2, 194 a 35 – 36.

<sup>17</sup> *Phys.* II 2, 194 b 8.

<sup>18</sup> *Phys.* II 2, 194 a 34 – 35.

<sup>19</sup> *Phys.* II 2, 194 a 35.

<sup>20</sup> *De An.* II 4, 415 b 2.

<sup>21</sup> *De An.* II 4, 415 b 2 – 3.

<sup>22</sup> *Metaph.* A 7, 1072 b 3.

<sup>23</sup> *Metaph.* A 7, 1072 b 2. Regarding this distinction Cfr. Ross, W. D. [1936], p. 509; Berti, E. [1977], p. 311-312; Berti, E. [1989-1990], p. 15-18, and Kullmann, W. [1985], p. 169-175.

<sup>24</sup> Cfr. Berti, E. [1989-1990], p. 16.

that process. Otherwise the ‘last term’ of a process is a simple accidental result, that is, a result that hasn’t any causal role in the process.

Thus, when we say that the heat emanated from the sun is for the sake of organisms we are using the term *τέλος* in an improper way, we are saying that the sun is good *for* an organism, which is the mere beneficiary of a process; but this beneficiary is an accidental result of the process, not a factor responsible for it. Organisms, in fact, have no causal role in producing the heat in the sun, since the sun would shine even if there weren’t any organisms in Earth. Analogously, the process of growth of animals and plants is something good *for* men, but it would take place even if there weren’t any men since man is not the *φύσις* of plants and animals, that is, is not the internal factor that produces and originates plants and animals. For this reason, then, the man is the external beneficiary of the growth of plants and animals but he does not play any causal role in this process, and thus he cannot be ‘that for the sake of which’ plants and animals grow<sup>25</sup>.

When we speak about external ends in nature, then, we are not speaking about a *real τέλος* present in natural substances. In the example above, in fact, Aristotle says that “we too are ends of a sort”, that is, as beneficiaries of the result of certain processes, because “we use all things *as if* they were for us”. For example, we use the wood of trees to make the rudder, and we use stones to make the house, but trees and stones do not exist and come to be for our own sake. It is we who interpret these substances *as if* they came into being for us because we ‘use’ them, that is, because we take benefit and advantage from them. But that means that when we speak about an external end in nature - with which we are denoting the mere beneficiary of a certain process - we are speaking about an *apparent τέλος*, not something really present in nature. It is we who ‘import’ external ends in nature because we see a benefit, an advantage, or a good *for* something, but this sort of end is not a factor responsible for a certain process since it does not correspond with its internal source of change. It is ‘we’ who regard the rain as falling for the sake of the corn’s growth because the corn takes benefit from the rain; but actually, in nature, the corn’s growth is in no way

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<sup>25</sup> According to these considerations we can agree with Sedley, D. [1991] that man is the ultimate beneficiary of natural actions. However, since man is an external beneficiary, and thus an accidental result, according to our view we cannot agree with his anthropocentric interpretation of Aristotle’s teleology: although a beneficiary, man is not the aim for the sake of which natural changes take place.

responsible for the rainfall, but is it a mere outcome that follows the pure necessary connections between antecedents and consequences.

The term *τέλος*, then, is used in its proper sense – as a factor responsible for a certain change – not when it means the mere beneficiary of a process, but when it means the result or state of affairs for the sake of which a process takes place, and that Aristotle defines as the end or good *of* something. In order to have a causal role in the process, as we have seen, the *τέλος* must be a state of affairs that acts since the very beginning of the change, and that is possible only when it is the *φύσις* of something, that is, same state of affairs that *produces* the change in a substance. And in this sense, as we have seen, the *τέλος* in nature can be present only among living things and it can be only the form of those substances. The form or organization of a living thing, in fact, is the result of the process undergone by the living thing, and this process is produced by the way in which the living thing is organized, that is, the same form of the substance. Here the end is *internal* to the substance that performs the actions, and by virtue of its identification with the ‘nature’ of that substance it is something *real*, that is, a principle that directs and organizes the changes since the very beginning of the process.

But the identification of the form of an organized substance with its end and the discussion about the two senses in which the word *τέλος* is used highlights another important aspect of living things, which helps us understand what there is, in nature, that grounds an explanation in terms of ends.

The fact that the survival of a living thing is the outcome or result of the changes performed by the living thing itself implies that these processes are good *for* the living thing. In this sense, then, the living thing is the beneficiary of the result of the growth of its parts or the right functioning and operation of its organs, and thus it is a *τέλος* in what we call an ‘improper sense’.

But in this case the organism is not the beneficiary of an accidental result of the process. The state of affairs that constitutes the result of the process is the same state of affairs that produces the process. In other words, living things are substances that owe their proper changes to the way they are organized. And this organization does just only produce any change, but a change that allows the realization and conservation of the organization of the substance. And it is by means of this *self-organization* that the organism is the

beneficiary of the result of the process. Living things, then, are *self-organized substances*, substances that by virtue of their organization perform a process that benefits themselves.

To sum up, both inanimate and animate substances can have external beneficiaries. With this expression we mean that the result of natural changes – whether it is a *τέλος* as in the case of living things or a simple termination as in inanimate objects – can be something that *as an external source of change* can help the production and realization of the form of another substance. All natural things, as we have seen, need in fact external factors in order to give rise to a change on their own. Here the external beneficiary is a mere result of an external source of change over a certain thing. But in addition to an external beneficiary living things and only living things have an ‘internal beneficiary’. And with this expression we mean that the result of a change performed by a living thing, which is a *τέλος* in the proper sense of the word, is something that benefits the same substance that performs the change. As we shall see in the next chapter, this does not mean that if a substance performs an action that benefits itself, then the action is for the sake of something, but rather that if in nature an action is due ‘for the sake of something’, which is possible only in living things, then this action benefits the same substance that performs the process.

What constitutes the ontological basis for the use of explanation in terms of ends, then, is the presence in nature of self-organized substances. This seems to be the meaning of Aristotle’s remark that in nature often (*παλλάκις*) “what a thing is (*τί ἐστὶ*), and what it is for (*τὸ οὗ ἕνεκα*) are one and the same”<sup>26</sup>. In nature, in fact, there are substances whose form or constitution is the *τέλος* of the processes performed by that substance because often, that is, in the case of living things, this form or constitution is also the nature, the internal source of change of the processes performed by that substance.

#### 2.4 – Conclusions

Aristotle nowhere maintains that everything that is due to nature is for an end. All natural substances, according to Aristotle, under certain circumstances and with the intervention of

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<sup>26</sup> *Phys.* II 7, 198 a 25 – 26.

external actions, respond by a change of their own. This change is due to the 'nature' of a substance, that is, an internal factor that gives them the capacity to realize a specific ἔργον, a specific work, a state of affairs, a result or outcome. Inanimate substances, when unsupported, have the capacity of realizing a locomotive movement that makes them reach their natural places. Animate substances, under the action of heat, air, nourishment, etc., have the capacity of performing certain activities that make them realize and preserve their proper form, structure, or constitution. In both cases 'nature' is, on the one hand, a capacity or tendency present in a substance to be changed by other things, and, on the other hand, a capacity or tendency present in a substance to respond to these changes by a change of their own – to change its spatial position or to realize and preserve its proper form. But it is only when the nature of a certain substance responds to external changes with an activity that realizes, preserves, and reproduces itself, that Aristotle sees the presence of ends in nature. Only in these cases, in fact, the ἔργον, the result or outcome of a certain process, is also what has the power of producing and originating the process. Thus, the presence of the τέλος in nature is not extended to all natural changes. The simple fact that a change reaches a certain outcome or result, in fact, is not sufficient to conclude that this outcome is 'that for the sake of which' the change takes place. Rather, the presence of the τέλος in nature is a conclusion reached by Aristotle from the observation of a special kind of change, namely, the change proper of any form of life, the activity of those substances that have in themselves a capacity of realizing, preserving, and reproducing δι' αὐτοῦ, by themselves.

### Chapter 3 – The Defense of Ends in Nature

Having demonstrated that, according to Aristotle, the *τέλος* is present only in the biological realm, we have now to take into consideration a possible objection to our conclusions. As we have seen in the introduction, the scope of Aristotle's natural teleology is a very controversial issue: according to some authors, in fact, it would embrace not only the field of living things, but the whole natural world. This conclusion, according to these authors, would be supported by some passages of *Phys.* II 8, where Aristotle defends the presence of ends in nature against the objections of opponents who claim that 'all things that come to be due to nature are the result of necessity', that is, of undesigned processes. Here, according to those authors, Aristotle would reject the rival thesis showing that 'all things that come to be due to nature are the result of end-directed processes', that is, showing the truth of the *contrary* proposition<sup>1</sup>. However, I shall argue that Aristotle refutes the rival thesis only by showing that 'some things that come to be due to nature are the result of end-directed processes', that is, showing the truth of the *contradictory* proposition<sup>2</sup>. Thus, I shall show that Aristotle's rejection of the opponent's thesis is compatible with the view that only the changes proper of living things are due to an end, whilst some other things – the movements of inanimate substances – are not due to a *τέλος*.

#### 3.1 – The Mechanistic Account

*Phys.* II 8 is one of the most notorious chapters in the Aristotelian *Corpus* entirely devoted to the defense of the presence of ends in nature. For this purpose, Aristotle sets up three lines of argument in order to refute the position held by all the physicists (*φυσιολόγοι*) that had previously investigated nature – especially Democritus, Anaxagoras, and Empedocles – according to whom all natural changes result from necessity, that is, from the interaction of

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<sup>1</sup> Cfr. *De. Int.* 7, 17 b 20 – 22: "Propositions are opposed as contraries when both the affirmative and the denial are universal, as in the sentences 'every man is white', 'no man is white', 'every man is just', 'no man is just'".

<sup>2</sup> Cfr. *De. Int.* 7, 17 b 16 – 20: "An affirmation is opposed to a denial in the sense which I denote by the term 'contradictory', when, while the subject remains the same, the affirmation is of universal character and the



material elements and their qualities<sup>3</sup>. I shall refer to this as ‘the mechanistic account’, according to which there is no place for ends in nature, but all natural phenomena are the result of undesigned processes. The objection of the ‘mechanistic’ opponents to the thesis of the presence of ends in nature is sketched as follows:

The problem thus arises: why should we suppose that nature acts for something (ἐνεκά του) and because it is better? Why should not everything be like the rain? Zeus does not send the rain in order to make the corn grow: it comes of necessity (ἐξ ἀνάγκης). The stuff which has been drawn up is bound to cool, and having cooled, turn to water and come down. It is merely concurrent that, this having happened, the corn grows. Similarly, if someone’s corn rots on the threshing-floor, it does not rain for this purpose, that the corn may rot, but that came about concurrently. What, then, is to stop parts in nature too from being like this – the front teeth of necessity growing sharp and suitable for biting, and the back teeth broad and serviceable for chewing the food, not coming to be for this, but by coincidence? And similarly with the other parts in which the ‘for something’ seems to be present. So when all turned out just as if they had come to be for something, then the things, suitably constituted as an outcome of chance (τοῦ αἰτομάτου), survived; when not, they died, and die, as Empedocles says of the man-headed calves.<sup>4</sup>

If the mechanistic account were right, then we could explain all natural changes – from the movements of inanimate things, as the rainfall, to the changes proper of living things, as the growth of teeth in an animal – as the result of undesigned processes. In this way, then, what we call an ‘end’ would be only the result of accidental interactions of the necessary behavior of matter and its dispositions. According to this account, then, the rain does not fall to make the corn grow, but it follows from necessity from previous conditions, like the action of the cold over air: clouds, when cooled, must fall as rain, and the corn’s growth is the accidental result or outcome of the falling of the rain. And the fact that the corn’s growth is an accidental outcome would be proved by the fact that when the corn is on the

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denial is not. The affirmation ‘every man is white’ is the contradictory of the denial ‘not every man is white’, or again, the proposition ‘no man is white’ is the contradictory of the proposition ‘some men are white’.”

<sup>3</sup> *Phys.* II 8, 198 b 12 – 14: “For everyone brings things back to this cause [the necessary], saying that because the hot is by nature such as to be thus, and similarly the cold and everything of that sort, therefore these things of necessity come to be and are”. Regarding this position Cfr. Owens, J. [1968], Gotthelf, A. [1976], and Meyer, S. [1992].

threshing floor, it just happens that the rain spoils it, but it clearly does not fall for the sake of spoiling it. In the same way the growth of the parts of animals - that are so well adapted to their functions that they seem to be for the sake of the animal's growth and survival -, actually is an outcome of an undesigned process, and the animal's survival is a mere accidental result of this process as well as the corn's growth is of the rainfall. Again, the fact that the survival due to the growth of parts must be considered as an accidental outcome would be proved by the presence of 'monsters' in nature, that is, by the fact that sometimes – as in the case of the man-headed calves mentioned by Empedocles - animals grow parts that are not so suitably constituted, and that do not allow an animal's survival: in this case we do not say that these parts come into being for the sake of the animal's death, but only that death is an accidental outcome.

In order to refute this account, Aristotle sets up three different arguments, which we shall examine in the following three parts of the present chapter: the first is based on the regularity present in nature, the second on the analogy between art and nature, and the third on the observation of the behavior of living things. The most interesting point of Aristotle's arguments with regard to our work – an inquiry about the scope of the presence of ends in nature – is that they have traditionally been taken (especially the first of the three) as proof that the *τέλος*, according to Aristotle, is a principle that works in all natural changes, from inanimate objects to living things. This interpretation has a very long tradition, starting from the commentary of Simplicius<sup>5</sup> and Aquinas<sup>6</sup>, but also present in a recent paper by David Furley has claimed that Aristotle's refutation of the 'mechanistic account', particularly with the argument based on the regularity in nature, shows that the *τέλος* is a principle that applies to all natural substances<sup>7</sup>. I shall refer to this interpretation as 'the traditional interpretation', according to which Aristotle would prove the falsity of the whole mechanistic account showing that *both* the changes that involve inanimate things – as the rainfall – *and* the changes proper of any form of life – as the growth of organs in animals – are for the sake of something.

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<sup>4</sup> *Phys.* II 8, 198 b 16 – 32.

<sup>5</sup> Simplicius, *In phys.* 347.18ff.

<sup>6</sup> Aquinas, *De physico auditu*, ii, lectio XII.

<sup>7</sup> Furley, D. [1985], pp. 177 – 182.

In the following section, I shall highlight that this interpretation is built upon two misleading assumptions; in this way, I shall propose an alternative interpretation of Aristotle's refutation, showing that the falsity of the mechanistic account is proved not by the fact that *all natural changes* – both the changes of inanimate and animate substances – are for the sake of something, but only by the fact that *some natural changes* – the changes proper of any form of life – are for the sake of something. In this way, then, I shall argue that Aristotle's object of refutation is not the 'whole' mechanistic account, but the generalization of this account, which holds for the movements of inanimate objects, to the behavior of living things.

### 3.2 – On Chance and Regularity

The first line of argument that Aristotle advances in order to show the falsity of the mechanistic account, according to which what we call an 'end' in nature actually is a mere result of accidental interactions of the necessary behavior of matter and its dispositions, is based on a reflection upon the regularity with which everything or almost everything in nature comes to be.

This, or something like it, is the account which might cause a difficulty. It is impossible, however, that this should be how things are. The things mentioned (*ταῦτα*), and all things which are due to nature, come to be as they do always or for the most part, and nothing which is the outcome of luck (*ἀπὸ τύχης*) or chance (*ἀπὸ ταῦτομάτου*) does that. We do not think that it is the outcome of luck or coincidence that there is a lot of rain in winter, but only if there is a lot of rain in August; nor that there are heatweaves in August, but only if there is a heatweave in winter. If, then, things seem to be either a coincidental outcome or for something, and the things we are discussing cannot be either a coincidence or an outcome of chance, they must be for something. But all such things are due to nature, as the authors of the view under discussion themselves admit. The 'for something', then, is present in things which are and come to be due to nature.<sup>8</sup>

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<sup>8</sup> *Phys.* II 8, 198 b 32 – 199 a 8.

This is the argument that, according to the traditional interpretation, would prove that Aristotle's use of teleological explanation embraces the whole natural world. According to this interpretation, in fact, Aristotle's argument must be read as follows: Aristotle offers only two alternatives for things that come to be by nature: things come into being either by chance or for the sake of something. But the fall of the rain in winter, as well as the growth of teeth in animals, cannot be an outcome of chance, since they are regular events and nothing that comes to be regularly can be an outcome of chance. Therefore, according to the traditional interpretation, Aristotle concludes that both the rainfall – a change undergone by an inanimate substance – and the growth of teeth in animals – a change performed by living things – are for the sake of something. Even if at first sight this interpretation may be attractive, I believe that it is misleading in two points.

First of all, the traditional interpretation does not distinguish between the dialectical demonstration of the contradiction to which the mechanistic account leads- and thus the demonstration of its falsity -, and Aristotle's own position with respect to this issue. The falsity of an universal proposition like "all things are due to undesigned processes", in fact, does not imply that "nothing is due to undesigned processes" (or, what is the same, that "all things are due for the sake of something"), but only that "not all things are due to undesigned processes" (or, what is the same, that "some things are due for the sake of something"). Under this respect, then, the demonstration of the falsity of the mechanistic account by means of showing the contradiction to which it leads, cannot be, by its own, the demonstration of the *contrary* proposition, but only of its *contradictory* one.

Thus, the dialectical refutation of the mechanistic account can be sketched as follows. First of all, the main premise of Aristotle's argument is that (i) "everything that comes to be by nature is either an outcome of chance or for the sake of something". Now, the fact that Aristotle takes this disjunction as the main premise of his argument does not necessarily imply that he thinks that this proposition is true. Rather, this proposition is taken as the main premise of his argument because it is implied by the opponent's thesis: the mechanistic opponent, in fact, holds that nothing in nature is for the sake of something but that "everything that comes to be is an outcome of chance", and thus he must accept the disjunction that "everything that comes to be by nature is either an outcome of chance or for the sake of something". Second, the opponent must agree that (ii) "everything (or

almost everything) in nature comes to be regularly in the same way”. This is what our experience of natural phenomena displays and what both parties must accept: rain, for example, falls regularly in winter and animals regularly grow teeth. Third, the opponent must also agree that we do not call a thing the outcome of chance if it comes to be regularly in the same way. We do not say that it is an outcome of chance if there is abundant rain in winter. Rather, it is in the nature of chance events to be exceptional. Thus, both parties must also accept that (iii) “nothing which is regular is an outcome of chance”. It would be ridiculous if the opponent, in order to save his account, denies an opinion so widely accepted. Thus, Aristotle argues, since (ii) “everything in nature comes to be regularly in the same way” and since (iii) “nothing which is regular is an outcome of chance”, then (iv) “nothing in nature is an outcome of chance”. But then, he concludes, since (i) “everything that come to be by nature is either an outcome of chance or for the sake of something” but (iv) “nothing in nature is an outcome of chance”, therefore (v) “everything that comes to be by nature is for the sake of something”.

Thus, according to Aristotle, who claims that “nothing in nature is for the sake of something but everything is an outcome of chance” must conclude that “nothing in nature is an outcome of chance but everything is for the sake of something”, but in this way he is contradicting himself and thus, he is wrong. But the fact that the opponent’s claim is false, does not imply that the contrary proposition (v) “everything that comes to be by nature is for the sake of something” is true, but only that “some things that come to be by nature are for the sake of something”.

We must then distinguish the dialectical refutation of the mechanistic view from the truth of (v). The proposition (v), in fact, is the valid conclusion of the premises (i), (ii), and (iii), but this does not imply that (v) is true. The proposition (v) is true only if premises (i), (ii), and (iii) are true. Now, the mechanistic opponent must accept *all* these three premises: particularly, as we have seen, he must accept the disjunction (i) “everything that comes to be by nature is either an outcome of chance or for the sake of something”, because he holds that “everything that comes to be by nature is an outcome of chance”. Thus, *if* we accept (i), (ii), and (iii), *then* we have to conclude that (v); and since the mechanistic opponent *must* accept (i), (ii), and (iii), *then* he must conclude that (v). But the question is then: does Aristotle also accept the disjunction (i)?

This is, then, the crucial question in order to understand if, through the refutation of the mechanistic account, Aristotle proves that everything in nature is for the sake of something. According to the traditional interpretation, in fact, Aristotle himself would conclude (v) because he also accepts (i). But why would Aristotle accept the disjunction (i) that “everything that comes to be by nature is either an outcome of chance or for the sake of something”? These considerations lead us to the second error made by the traditional interpretation. According to this interpretation, in fact, just as the opponent agrees to this disjunction because he accepts the first disjunct, so too Aristotle himself would agree because he accepts the second disjunct, that is, that “everything that comes to be by nature is for the sake of something”<sup>9</sup>. Particularly, according to the traditional interpretation, Aristotle would treat both the processes undergone by inanimate substances - as the case of the rain - and processes performed by living things - as the case of the growth of teeth in an animal -, as two instances of end-directed processes<sup>10</sup>. But this conclusion is based on the assumption that, according to Aristotle, the mechanistic opponent would be giving an inadequate explanation both in the example of the rainfall and that of living things, which is a mistaken assumption.

According to the distinction between the two ways in which we use the word *τέλος*, in fact, the rainfall is an example of something that Aristotle himself takes as due only to an undesigned process. Here the rain is a substance that performs a process which realizes a form of another, different substance, the corn. The growth of the corn by means of the action of rain, then, is an example of an external end, and in this sense the corn is merely an external beneficiary of the falling of the rain, not its real *τέλος*. A result of a certain process, in fact, is the *τέλος* of that process only when it coincides with the ‘nature’ of the substance that performs the process, that is, with its internal source of change. It is only through this identity that we can say that the result is a principle that has a causal role in the production of the process. But the corn’s growth plays *no causal role* in the production and falling of the rain - which is proved by the fact that it can rain even if the corn is on the threshing floor, or even if there were no corn on Earth. Thus, Aristotle agrees with his opponent that the corn’s growth is a mere ‘concurrent’ result of the rainfall, since it is something that

<sup>9</sup> Cfr. Code, A. [1997], p. 129.

<sup>10</sup> Cfr. Furley, D. [1985], p. 177.

happens by virtue of the rain but that cannot have any causal role in the production of the rain, and therefore he agrees that rain does not fall ‘for the sake of something’.

Thus, according to Aristotle rainfall in winter is neither ‘for the sake of something’ - since its outcome is not the same state of affairs that produces its falling - nor ‘an outcome of chance’ - since it is a regular event. But then the regularity of the changes undergone by inanimate substances, as the case of meteorological phenomena, proves that, according to Aristotle, “some things are neither an outcome of chance nor for the sake of something”. And hence Aristotle does not accept the premise (i) “everything that comes to be by nature is either an outcome of chance or for the sake of something” that leads to conclude that “everything that comes to be by nature is for the sake of something”.

The argument based on the regularity present in nature leads only to demonstrate the falsity of the mechanistic account. But from the falsity of the claim that all things come to be from undesigned processes we can only conclude that “some things are for the sake of something”, not that “all things are for the sake of something”. Aristotle, in fact, agrees with his opponent that there are processes due to undesigned results. If we look carefully at the structure of his argument, we shall see that the real controversial issue between Aristotle and his opponent is given by the question “why should not *everything* be like the rain?”, that is, by the attempt to explain *everything* that happens in nature according to the same pattern that is correct only for a limited range of changes, namely, changes proper of inanimate objects. What constitutes the object of refutation of Aristotle’s argument, then, is not the whole ‘mechanistic’ account of natural changes, but the generalization of this account from the behavior of inanimate substances to the behavior of living things. Thus, it is the attempt to explain not only the changes of inanimate objects, but also the changes proper of living things, as the growth of teeth in animals, that constitutes the real controversial point between Aristotle and his mechanistic opponents. The mechanistic opponent is in fact asking: if we agree that rain does not fall in order to make the corn grow but that it comes from necessity, what, then, is to stop those “parts in nature”, like teeth, from coming into being in the same way?

The problem thus arises when we try to generalize this pattern of explanation to the behavior of living things which, according to Aristotle, is a very different kind of change. Here the process realizes and preserves the organization, structure, or form of the same

substance that performs the process. It is in this particular field that the mechanistic account “might cause a difficulty”. Here the survival of an animal by means of the growth of its parts, like the growth of teeth, is not a simple accidental result, as the corn was in the case of the rainfall; the animal is also the substance that produces and originates the growth of teeth. And it is through the consideration of these kinds of changes, as we shall see in the following two sections of the present chapter, that Aristotle concludes that the *τέλος* is present in nature.

### 3.3 – Art and Nature

The second line of argument followed by Aristotle to refute the mechanistic position held by Empedocles is based on the analogy between the process by which art and nature respectively produce their products. In *Phys.* II 1, Aristotle used this analogy in order to show that in both fields, art and nature, the form is what primarily defines the process and the result of the process. The word “art”, as well as the word “nature” were defined as a principle of change intrinsically determined and structured by the form.

However, in Chapter I Aristotle merely asserted the analogy, without explaining the elements on which it is based. This seems to be the novelty that Aristotle offers in *Phys.* II 8; and it is properly upon this basis that the analogy can count as an argument in favour of the presence of ends in nature.

Again, where there is an end, the successive things which go before are done for it. As things are done, so they are by nature such as to be, and as they are by nature such as to be, so they are done, if there is no impediment. Things are done for something. Therefore they are by nature such as to be for something. Thus if a house were one of the things which come to be due to nature, it would come to be just as it now does by the agency of art; and if things which are due to nature come to be not only due to nature but also due to art, they would come to be just as they are by nature. Art activity, then, is for the sake of what is



natural. In general, art either imitates the works of nature or completes that which nature is unable to bring to completion.<sup>11</sup>

The first line of the argument recurs to the definition of the term “end” as given in 194 a 28-30, that whenever there is a definite end to a continuous change, the last (τὸ ἔσχατον) and the best (τὸ βέλτιστον) thing is also that for the sake of which the process takes place (τὸ οὗ ἕνεκα). This is manifest in the case of processes of manufacture. There is no doubt, in fact, that the actions of craftsmen, peasants, physicians etc. are for the sake of something. In this field, where “the things are done”, there is a precise terminus to a course of action, which is represented by a certain work (ἔργον). Now, as we have seen, this work represents not only the ‘last’ term, the result, but also the ‘best’ term of the action or its ‘good’; for example, the cures of a physician are ‘good’ – in the sense of ‘complete’, ‘finished’ or ‘perfect’ – only when they produce health in a body. Health, in this case, is the τέλος of the cures of the physician, that is, the state of affairs for the sake of which all the earlier stages of his actions are. But, according to Aristotle, “as things are done, so they are by nature”. And that means that the course of nature, according to him, corresponds to the course of a process of manufacture. Thus, concludes the argument, the course of nature also is for an end.

Aristotle illustrates this analogy with an example: if a house were a natural substance, it would be produced in the same stages by which it is actually constructed by the art of building; and conversely if a natural object were produced by an artisan, it would be produced in the same stages by which it is produced by nature. Therefore nature, like art, is a process in which all the earlier stages are for the sake of an end.

At first sight the parallel between the stages of the production of an artifact and of a natural thing refers to the chronological priority and posteriority in which the process takes place. In this sense the earlier stages of a process were thought as a preparation or precondition for the next<sup>12</sup>. Aristotle, then, would be asserting that if a house were a natural object, its parts would be formed in the same chronological order in which they are formed by the action of a builder: in this case, the order would be foundations, walls, roof etc. And conversely, if a tree were an artifact, its parts would be formed in the same temporal order

<sup>11</sup> *Phys.* II 8, 199 a 8 – 17.

in which they are naturally formed, for example, first roots, then trunk, branches, leaves and lastly fruits. But as Charlton points out, even if in his biological works Aristotle is certainly interested in the order in which the parts of living things are formed, nonetheless he does not think that the parts of a man or of a tree develop precisely in the same chronological way as the parts of houses or ships do under the action of a craftsman. Rather, Aristotle seems to be concerned with the causal or logical priority and posteriority present in the subordination of means to end. As we have seen, the result of a process – which is chronologically posterior to the process – can have a causal role in the process only if it acts since the very beginning, producing, orienting and determining all of its stages. But in this case, then, the earlier stages of an action are not thought of as simple preparations or preconditions for the last term of an action, but rather as means necessary to the full realization of the last and best term.

From this perspective the relation between the parts and the whole stand in opposite order: in the chronological order of the production of an artifact, for example, the complete realization of the form of an object is certainly posterior to the realization of its parts: a house is completely realized only after all its parts are built. But from a logical point of view the form of the house is what is previous to all the stages of the process. It is the form, in fact, which is present since the very beginning of the process, which organizes and directs the craftsman's movements, dictating what parts are to be built and in which order they must be built. Seen from the logical subordination of means to end, then, the parts are posterior to the form that is to be realized.

It is this logical order, not the chronological one, which traces the correspondence between the productions of art and those of nature. In this case, in fact, the point would be that if nature were the cause of the coming into being of a house, that is, of a shelter preventive of destruction by wind, rain etc., it would select and organize its parts in the same way as the builder does; thus, it would construe foundations, walls, roof in such a way and with such stuff as to allow the protection and preservation of men and their possessions from the action of wind, rain, etc. In that case, nature would build solid foundations and walls with bricks *in order to* prevent the destructive action of wind, and a roof for the sake of the prevention of the destructive action of stark sun or of storms. And conversely, if a

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<sup>12</sup> This is the opinion, for example of Apostle, H. G. [1980], p. 219.

craftsman were to make a tree, he would make roots *to allow* the tree to take nourishment from earth, a strong wooden trunk *to prevent* the destruction of wind, leaves *to protect* fruits etc.

Thus, when Aristotle claims that the course of nature corresponds to the course of a technical process, his point is that both processes follow the same pattern of action, the same logical order of activities, not the same chronological stages. And this is just what Aristotle means when he claims that “art imitates the works of nature”. Here the relation of *μίμησις* that art sets up with nature does not mean that the products of art imitate those of nature, as if a house were an imitation of a natural shelter. The point of this relationship is rather that the structure of a technical process is identical to the structure of natural generation. In both cases the activities are performed in order to realize a certain form in a certain matter. And in both cases art, or nature, select matter and organize it in a certain way for the sake of the realization of that end. But the relation of *μίμησις* implies not only that the structure of the two processes is identical, but also and mainly that the end-directed structure of natural generation is ontologically prior to the structure of technical production. If art imitates nature, then art tries to follow a pattern of action that is already present in *φύσις*. Aristotle, then, considers nature not as a form of art, but on the contrary he thinks that nature precedes art and is the ontological foundation of it.

If, then, that which is in accordance with art is for something, clearly so is that which is in accordance with nature. The relation of that which comes after (*τὰ ὕστερα*) to that which goes before (*τὰ πρότερα*) is the same in both.<sup>13</sup>

Aristotle’s argument, then, which starts from the consideration of the presence of ends in technical activities to conclude the presence of ends in nature, follows the prescription of the methodological rule of any good inquiry, namely, starting from what is clearer and more knowable to us, to what is more knowable and clear by itself. And what is clearer and more knowable for us is the presence of ends in our technical activities, because we carry them out and are aware of them. But this is only the methodological order that must be followed by our arguments, which does not imply that we are imposing a technical structure on the operations of nature. On the contrary, according to Aristotle, from an

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<sup>13</sup> *Phys.* II 8, 199 a 17 – 20.

ontological point of view what is first and prior by itself (*τὰ πρότερα*), is the presence of the *τέλος* in natural processes: the teleology present in nature precedes art and is imitated by the conscious activity of men, which is ontologically derived and posterior (*τὰ ὕστερα*).

But the relation of *μίμησις* is justified and finds its reasons in another, more fundamental relation. Art, Aristotle says, “either imitates the works of nature or *completes* that which nature is unable to bring to completion”. Art and nature, according to Aristotle, are two different sources of change that can divide the world in which we live in two different fields; but these two fields are not thought of as absolutely distinct and incommunicable, without any possibility of relation<sup>14</sup>. Nature, first of all, is the structure, constitution, or *εἶδος* of a certain substance which has in itself an internal power of originating a change. There is hence no incompatibility in claiming that the natural constitution of a certain substance needs some complementation in order to bring about the full realization of its functions. These complements are given through certain activities (e.g. medicine, agriculture) or certain instruments (houses, cups, ships, etc.), but they are always relative to the needs and functions related to a natural constitution. In the same notion of complement there is the idea that there is already a given constitution; and it is this previous constitution that requires help to bring to completion what it is unable to bring. The field of technical activity, then, depends and is determined by the natural constitution of the producer<sup>15</sup>; it is a continuation or prolongation of the activity already given with his natural structure. This is the meaning of the claim that “art activity is for the sake of what is natural”; art is not in opposition with nature, but it emerges from it, continuing and complementing those activities that are already performed by certain substances according to what is natural in them, imitating the same structure of actions performed by natural substances. But we clearly know that what is in accordance with art is for something, and thus, concludes Aristotle, we have to admit that nature, which comes first (*τὰ πρότερα*), is for something.

There is no doubt, and Aristotle is aware of it, that there is a big difference between technical activities and natural changes. The teleological activity of art entails

<sup>14</sup> Cfr. Repellini, F. F. [1996], p. 142.

<sup>15</sup> Cfr. Repellini, F. F. [1996], p. 143.

consciousness and intentionality, but these things are absent in nature. However, according to Aristotle, this is not a good argument to deny the presence of purposiveness in nature.

It is absurd not to think that a thing comes to be for something unless the thing which effects the change is seen to have deliberated. Art too does not deliberate. If the art of shipbuilding were present in wood, it would act in the same way as nature; so if the 'for something' is present in art, it is present in nature too. The point is clearest when someone doctors himself: nature is like that.<sup>16</sup>

It is completely absurd, then, to argue that in nature nothing is for the sake of something because we do not find any deliberation there. Aristotle, in this passage, reconfirms the priority of natural teleology over that present in art: art, when it is well developed, can imitate so well the activity proper of nature in such a way as not to require any deliberation, just as nature does. The grammarian, for example, does not deliberate about how to spell a certain word<sup>17</sup>: the process of deliberation, we have to suppose, is something happening during the formation and the learning of the art, not during the activity of the art already possessed. If we deny purposiveness because of the absence of deliberation, then we have to exclude much that is exercise of art, since art too does not deliberate. A technical process consists in the execution of certain operations able to realize a certain form: but the presence of the form is the condition of the process itself, not a deliberated consequence of it. Art, then, is the production of certain forms that are previously constituted by the mind, that is, that exist before the activity, not within the activity, and this is what makes art something internal to nature, not against it.

The main difference between art and nature, then, is not in the presence or in the lack of deliberation, but in the fact that art is a principle of change present in some substances – men – which produce changes in other substances, whilst nature is a “source and cause of change and remaining unchanged in that to which it belongs primarily of itself”<sup>18</sup>, that is, a power present in a thing that effects certain changes in itself. Art, then, differs from nature in that the mover or the source of change is not in the thing moved or

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<sup>16</sup> *Phys.* II 8, 199 b 26 – 32.

<sup>17</sup> *Eth. Nic.* III 3, 1112 b 2.

<sup>18</sup> *Phys.* II 1, 192 b 21 – 22.

affected by the change. The art of shipbuilding, for example, is present in a certain agent – the carpenter – who effects changes on a patient different from himself – the wood. But if this capacity or disposition were present not in the carpenter’s mind but in wood, that is, if the agent and the patient were conjoined in one individual, its activities would be like those of nature.

The working of nature, then, is something like a technical disposition present in the same substance that is affected by the activity of that disposition, as when a doctor heals himself. Nature is like an internal physician who instinctively, without deliberation, and without a specific knowledge, heals himself. It is a principle of change present and performed by certain substances, that returns over itself, preserving the health of the same substance that performs the activity, preventing the bad operation of its organs and functions.

Even here, then, we have the confirmation that Aristotle does not deny the whole mechanistic account about all natural substances, but only the generalization of this account from inanimate objects to a special kind of substances, namely, substances that have in themselves a disposition of giving a benefit to themselves, a capacity of producing ‘health’ to themselves realizing and preserving their forms. But this confirms, once again, that the end is present in nature only among living things, that is, only among those substances that manifest a self-organization, an internal structure that gives the substance the capacity of realizing, preserving, and reproducing this structure.

### 3.4 – The Behavior of Animals

Finally, the argument that most clearly shows that Aristotle’s polemic with Empedocles regards the generalization of his mechanistic account to living things, and not the whole account, is the third, where Aristotle argues from the observation of some kinds of animals.

The point is most evident (*μάλιστα φανερόν*) if you look at those animals other than men, which make things not by art, and without carrying out inquiries or deliberation. Spiders, ants, and the like have led people to wonder how they accomplish what they do, if not by mind. Descend a little further, we observe that even in plants convenient things appear

(*φαίνεται*) to be generated for the sake of an end, for instance leaves for the protection of fruit. If, then, the swallow's act in making its nest is both due to nature and for something, and the spider's in making its web, and the plant's in producing leaves for the sake of its fruit and send their roots not up but down for nourishment, it is evident (*φανερὸν*) that this sort of cause is present in things which are and come to be due to nature.<sup>19</sup>

The decisive argument in favour of the presence of ends in nature, then, comes just from the observation of the behavior of animals and plants, which do not make things by art, nor by inquiry or deliberation. But nevertheless their works and operations are so closely similar to the technical operations made by men that we are led to believe that they do it by mind. Art, in fact, is always determined by the natural form of its producer, men, and it is aimed at complementing needs and functions associated to his natural structure. From this point of view, then, the nests made by swallows or the webs made by spiders are not so far from the houses made by men. But even if they do not make things by art, knowledge, or deliberation, it is evident (*φαίνεται*) that the movements of these animals are for the sake of something. But ends in nature are present not only among animals like spiders, bees, ants, and swallows, that is, among animals able to produce things (nests, webs, shelters, etc.) that are similar to those produced by men's art, but "descending a little further" we observe that even in plants the useful parts come to be for the sake of an end. According to Aristotle, then, the end in nature is present not only among some special kinds of living beings, but it is present wherever we can speak of forms of life.

In plants, for example, it is manifest (*φανερὸν*) that leaves come to be for protecting fruits and roots for nourishment, and similarly spiders and swallows manifestly do things for something. But all these things, which clearly are for something, are due to nature, and thus the 'for something' is clearly present in things that are and come to be due to nature. And this end is the growth of a certain substance (as the nourishment of the plant given by its roots); its preservation (as in the case of the swallow's nest or of the spider's web); and its reproduction (as in the case of the plant's fruits), that is, the full realization of the form and its preservation through time.<sup>20</sup>

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<sup>19</sup> *Phys.* II 8, 199 a 20 – 30.

And since nature is twofold, nature as matter and nature as form, and the latter is an end, and everything else is for that end, the cause as that for the sake of which must be the latter.<sup>21</sup>

The most evident (*μάλιστα φανερόν*) point in favour of the presence of the *τέλος* in nature, then, is the experience of the behavior and movements of plants and animals, such as the physiological function of nourishment and reproduction, or any other adaptive behavior present in living beings. And all these behaviors clearly result in the survival of the individuals and species, that is, the realization and conservation of the form. But this form is also the “nature” of living things, that is, the factor or element that originates the changes in living things. Thus, the form is not the simple result of the behavior of living things, but it is the *τέλος*, that for the sake of which the plant or the animal behaves as it does. Thus the *τέλος* in nature is responsible only when there is self-organization, that is, a capacity of some forms of preserving and reproducing themselves through time. But not all natural changes are of this kind. The spatial movements of inanimate objects, for example, are due to the matter of which they are made of, and the result of these movements is the simple achievement of a certain spatial position, the natural place of a certain substance. But then, in this case, the form of the substance is neither the result of the process nor the source of change of this process, and thus, in this case, the form cannot be considered the *τέλος* of the process.

These considerations lead Aristotle to return – in this last part of *Phys. II 8* – to an aspect considered in his first argument, namely, the regularity present in natural phenomena. Both processes that are due to form and processes due to matter give rise to regular outcomes: heavy things always fall into the ground and seeds of a certain sort always grow into things of a certain sort “if there is no impediment”<sup>22</sup>. With this expression Aristotle is pointing out that there might be exceptions to the regularity present in nature. As we have seen, Empedocles based his account of nature – in terms of undesigned processes – on the consideration of these exceptions: the corn’s growth, for example, is an accidental result of the rain because sometimes, when the corn is on the threshing floor, the

<sup>20</sup> Cfr. Berti, E. [1989-1990], p. 25.

<sup>21</sup> *Phys.* II 8, 199 a 30 – 32.

<sup>22</sup> *Phys.* II 8, 199 b 26.



rain makes the corn rot. Analogously, according to Empedocles, the parts of animals do not grow for the sake of survival but they are accidental outcomes because sometimes animals grow parts that are not so suitably constituted and make them die, as in the case of man-headed calves.

However, according to Aristotle, the presence of exceptions is not the proof that a certain outcome is an ‘accidental result’. Rather, what makes a certain outcome, like the corn’s growth, a mere accidental result of the falling of the rain is the fact that the corn has no causal role in the production of the rain, since the rain would fall even if there were no corn on Earth. But the same argument cannot be applied in the case of living things, like in the growth of teeth in an animal. Here the outcome – the animal – is the same substance that produces the teeth, and thus it does play a causal role in the growth of teeth. The corn’s growth and the animal’s survival, then, are the results of two absolutely different kinds of change. But then, in the same way, the corn’s rotting and the monster’s death must be considered as two absolutely different kinds of exceptions. The corn on the threshing floor has no causal role in the production of the rain whilst the ‘man-headed calve’ does have a causal role in the production of its deformed parts. These kinds of exceptions that occur in living things, then, are not simple ‘accidental results’, as the corn’s rotting is an accidental result of the rain; rather, these exceptional outcomes are called “errors”, and the presence of errors in nature cannot be accounted for as a lack of ends, but rather as the confirmation of the presence of end-directed processes.

Errors occur even in that which is in accordance with art. Men who possess the art of writing have written incorrectly, doctors have administered the wrong medicine. So clearly the same is possible also in that which is in accordance with nature. It sometimes happens over things which are in accordance with art, that that which goes right is for something, and that which goes wrong is attempted for something but miscarries, it may be the same with things which are natural, and monsters may be failures in that which is for something. When things were originally being constituted, man-headed calves, if they were unable to reach a certain limit and end, came to be as a result of a defect in some principle, as they now do as the result of defective seed.<sup>23</sup>

Exceptional outcomes or errors, then, can occur even in nature, and the presence of mistakes cannot be accounted for as a lack of ends in nature as well as mistakes in the field of art cannot be accounted for as a lack of end in the artist. Aristotle cites the example of the grammarian who writes incorrectly the dictated word, or of the physician who gives the patient a wrong medicine. In both cases, according to Aristotle, the mistake or error (*ἀμαρτία*) occurs only when there is a definite *τέλος* that is aimed at (the correct word, the health in the patient) but the artist fails to reach it. In the same way, Aristotle admits that errors can happen in the field of nature, where there is a definite end but some external impediments, like some material conditions, do not allow its realization. It is not a surprise, then, that the example cited by Aristotle refer to living beings, like animals born with deformities or big disabilities. It is only within the field of living beings, in fact, that nature operates for the sake of something, and thus it is only within this field that errors, like a certain corruption in the seed, can occur. And this is further confirmed by the following passage.

Again, the 'for something' is present in plants too, though it is less articulate. Was it the case, then, that as there were man-headed calves, so there were olive-headed vinelets in the vegetable kingdom? It would seem absurd, but there should have been, if that is how it was with animals.<sup>24</sup>

The presence of monsters among animals, like the man-headed calves mentioned by Empedocles, but in general all animals born with deformities, anomalies, or big disabilities, offer evidence of the presence of errors in nature. But these phenomena cannot count, as Empedocles holds, as a proof that in nature all comes into being by chance. In general, animals come to be regularly in the same way: men come to be from men and calves come to be from calves, which excludes that they come to be by chance. But monsters, like the man-headed calves, do not come to be with the same frequency as men or calves. The presence of these exceptional beings only attests the presence of errors in the work of nature. Now, since errors occur where there is a definite end but we fail to reach it, then we have to admit errors or monsters within all the things in nature in which the for something

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<sup>23</sup> *Phys.* II 8, 199 a 33 – 199 b 7.

is present, that is, among living things. Errors can be present not only among animals, regarding which we possess evidences, but also among plants, although it might seem absurd because we don't have evidence of it.

The idea of the presence of monsters among plants, then, is not an impossibility, but only something that seems absurd or paradoxical. And its paradoxical character derives from the fact that our thought explores the limit of the logical consequences of the presence of ends in nature, even in absence of empirical evidence. Reasoning "in principle", then, we have to admit that errors in nature occur in all phenomena that happen "for the sake of something"; not only in those about which we have the testimony of experience, animals, but even where this testimony is lacking. And this is the inferior limit, the field of plants, where the self-organization that attests the presence of an end is present although "less articulated", that is, simpler and easier to reach, and where errors are consequently more difficult to make. There is a limit to the presence of ends in nature - the field of things and processes of life -, and this is the same limit to the presence of errors in nature. We cannot speak about errors where nature does not act 'for the sake of something': it would be nonsensical to claim that the exceptional rain that falls in summer is an "error".

Again, even this third line of argument, based on the observation of the behavior of living things and on the exceptions present in these kinds of behavior, shows that the object of refutation of Aristotle is not the whole account of nature given by the mechanistic opponent, which holds for the changes proper of inanimate substances, but rather the generalization of this account to the behavior of living things. Thus, according to Aristotle, Empedocles is wrong in thinking that no change is 'for the sake of something'. However this does not mean that all changes are 'for the sake of something', but only that some changes are for something, and these changes are the changes proper of any form of life.

### 3.5 – Conclusions

Both Aristotle and Empedocles agree that phenomena that involve inanimate objects, like the rainfall, happen only by virtue of external actions over matter, and not 'for the sake of

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<sup>24</sup> *Phys.* II 8, 199 b 9 – 13.

something'. Basing his argument on this agreement, then, Empedocles tries to convince his opponent that *also* phenomena that involve living things happen as the result of undesigned processes. Empedocles, in fact, thinks that, *if* phenomena that involve inanimate objects happen by virtue of an undesigned process, *therefore* also the phenomena that involve living things must happen in the same way. What licenses Empedocles' generalization of an explanation in terms of undesigned processes from a limited range of changes to the entire field of nature is, then, the assumption that the field of nature is something homogeneous, and that all natural changes must be caused by the same kind of principles. In his defense of the presence of ends in nature Aristotle shows Empedocles that the assumption on which his argument is based is wrong. According to Aristotle, *it is true* that phenomena that involve inanimate objects happen by virtue of an undesigned process, *but it is false* that phenomena that involve living things happen in the same way. Therefore, according to Aristotle, the assumption held by Empedocles "if phenomena that involve inanimate objects happen by virtue of an undesigned process, *therefore* also the phenomena that involve living things must happen in the same way" is false<sup>25</sup>. Empedocles, then, is considering only the aspect of nature according to which it is a unitary field, something that possesses a distinctive characteristic, something with an internal order and structure. But in this way he is harming the original variety, diversity, and multiplicity that our experience of nature displays.

<sup>25</sup> We can formalize the argument in this way:

A: "phenomena that involve inanimate objects happen by virtue of an undesigned process".

B: "phenomena that involve living things happen by virtue of an undesigned process".

1	(1)	$A \rightarrow B$	Assumption
2	(2)	A	Assumption
1, 2	(3)	B	(1), (2) MP
4	(4)	$\neg B$	Assumption
1, 2, 4	(5)	$B \wedge \neg B$	(3), (4) I $\wedge$
2, 4	(6)	$\neg(A \rightarrow B)$	(1), (2), (4) RAA

The proposition (1) is Empedocles' assumption that "if phenomena that involve inanimate objects happen by virtue of an undesigned process, *therefore* also the phenomena that involve living things happen in the same way", based on the principle that all natural changes must be caused by the same kind of principles. Then, Empedocles shows in (2) that the antecedent is true, and thus, *via Modus Ponens* he concludes that (3) also the consequent is true. Aristotle does not deny the proposition (2), since he also thinks that "phenomena that involve inanimate objects happen by virtue of an undesigned process". Rather, with his arguments he shows in (4) that the consequent of the implication is false. But then there is a contradiction in (5), which, according to Aristotle, shows in (6) that Empedocles' assumption in (1) is false.

## Conclusions

The present work has concentrated on the problem of the scope of the *τέλος* in the second book of Aristotle's *Physics*. It may be due to this restricted area of study that it becomes difficult – if not impossible – to draw conclusions of a certain generality regarding the *τέλος*. The notion of 'end', in fact, may be the notion spanning the whole of Aristotle's philosophy, rightly defined by Düring as "the philosophy of the *τέλος*". Discussions regarding the end are found, in fact, in the treatises on ethics; in different books of the *Physics*; the end is the central concept in all the biological works, and up to the highest summits of the *Metaphysics*.

Nevertheless, despite the impossibility in drawing general conclusions regarding the *τέλος* in Aristotle's philosophy, the present work has been guided, from the beginning, by the desire to understand certain general aspects of the ways in which Aristotle conducts and understands philosophical work. In other words, is it possible, after treating a very particular aspect of Aristotle's philosophy, to learn something of the way in which Aristotle himself approaches the philosophical enterprise? With this, the present work does not mean to give an original response to this question, but only to give a small contribution in the reaffirmation of all that has already been concluded by other scholars of Aristotle's philosophy<sup>1</sup>.

Upon conducting a retrospective view of the work developed in the preceding pages, I believe that certain fundamentally relevant aspects in understanding the Aristotelian investigations of the *τέλος* in nature can be highlighted. First of all, it seems to me that the main result we have achieved is that, for Aristotle, the concept of *τέλος* is not an a priori elaborated principle, beyond the realm of experience, that we impose on it in order to understand it. On the contrary, the presence of the *telos* in nature is a conclusion at which Aristotle arrives through the observation of a special kind of natural change, namely, the change that takes place in living things. According to Aristotle, nothing is more evident than that natural substances change, in other words, that they are – in a certain way –

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<sup>1</sup> I am alluding in particular to Prof. E. Berti and Prof. F. Chiereghin, whose research has guided my readings on philosophy in general and the philosophy of Aristotle in particular.

different at different moments. And what binds them all and distinguishes them from other types of substances is that they all change in virtue of an internal principle, which is the proper *φύσις* of each natural substance. And nature, Aristotle says, “is in the same genus as *δύναμις*”<sup>2</sup>, and inasmuch as it is a kind of *δύναμις*, it is a capacity which conjoins the characters of passivity – the power to be changed by something<sup>3</sup> – and activity – the power to respond with a change of their own<sup>4</sup>. Inanimate things, under certain external circumstances, possess in virtue of their nature the capacity to change into each other reciprocally and to move themselves from one place to another: air tends to move upwards, and there, once cooled, turns into water and falls. In the same fashion, living things, under the action of heat, air, water, etc. have the capacity to grow, obtain nourishment, and reproduce themselves. It is this mixture of passivity and activity given by the nature of each substance, this possibility of being different at different times, what characterizes the natural world.

Nevertheless, while simple bodies, under certain external circumstances, constantly and reciprocally change into each other – air, when cooled, turns to water -, living things manifest a particular type of change. Through the movements owed to its own nature, a living thing is capable of elaborating and organizing material aspects – both the material aspects proper of its condition (flesh, bones, blood, organs) and the external material aspects acting on it (air, heat, nourishment) -, in such a way as to promote and maintain its specific organization, and perpetuating it beyond the individual through its reproduction. At any point of the process of a living thing, therefore, there is something that does not change, an organization that resists – within certain limits – the transformations of matter, and that overcomes – within certain limits – the passivity given by its nature. It is only this type of change, where a certain form or organization is present without changing throughout the entire process, from the beginning until the “last term”, that, according to Aristotle, the end is present as a causal factor. It is only in these types of change, in fact, that the outcome of the efforts and activities proper of a living thing – the form shared by individuals with other members of their species – has the capacity to produce, direct, and orient a change.

<sup>2</sup> *Metaph.* Θ 8, 1049 b 8. Regarding this passage, Cfr. Chiareghin, F. [2000], p. 122.

<sup>3</sup> Cfr. *Metaph.* Δ 12, 1019 a 20.

<sup>4</sup> Cfr. *Metaph.* Δ 12, 1019 a 15.

Therefore, Aristotle's claim that this type of change, in the effort to maintain and generate a being in likeness to itself, is what brings living things closer to the divine and eternal, does not seem to be a mere metaphor. The form of living things – their nature – is for Aristotle a particular kind of *δύναμις*, a capacity to produce the full realization of the same form, an activity that turns on itself. And nevertheless, this divine aspect does not get rid of the intrinsic passivity and the limits given by the forms of living things inasmuch as *δύναμις*, which is witnessed in the experience of the individual's death. The simple presence of a capacity to realize themselves does not imply a full self-sufficiency on behalf of living things, this is, it is not enough to produce the same activity, rather, it requires a prior *ἐνέργεια*, a previous and pre-existing activity<sup>5</sup>.

If we now cast a comprehensive look at the way in which Aristotle deals with the problem of the telos in nature, I believe it is not an exaggeration to claim that there has probably not been another philosopher in the history of human thought that, like Aristotle, has been able to give sense, structure, and organization to our experience while preserving its most original and irreducible aspects. For Aristotle, in fact, philosophy is born as a question that looks to investigate into experience in its totality and complexity, an experience that originally manifests multiplicity, diversity, variety, and with them, fluidity, variability and mobility. All these aspects should not be denied, according to Aristotle, nor reduced to a forced, static, and outwardly imposed unity, but should rather be appreciated, preserved, understood, and made intelligible. And it is properly in order to preserve and appreciate this richness and to understand it in its most original aspects, that Aristotle tries to give a certain flexible order, a versatile unity, not a rigid, but an "open" structure to our experience<sup>6</sup>. It is thus, that Aristotle refuses to forcefully impose upon our experience concepts, structures, and categories that are elaborated a priori, but rather tries to integrally accept experience in order to obtain from it the concepts, categories, and structures with which to interpret it.

It is, therefore, because of the desire to understand experience in all of its complexity that we must understand the careful distinction between the different ways in which we use the word 'being' – in regards to the categories, or in regards to the distinction

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<sup>5</sup> Cfr. *Metaph.* Θ 8.

<sup>6</sup> Berté, E. [1992], p. 261.

between 'potency' and 'actuality' -, among the four different ways in which something is responsible for something else, and the two different ways in which we use the word *τέλος*. All this reflects the variety of kinds of change displayed in nature – in quality, quantity, place, or in regards to generation and corruption -, but also the diversity of outcomes to which the changes give rise – ends or accidental results -, or the kind of regularity that derives from the material necessity or the regularity that derives from an end -, or, finally, the different kinds of exceptions or novelties – chance, errors -.

All this is part of the richness nature displays to our experience, in other words, upon all we see, hear, and say. And it is precisely because it is considered in its totality, originality, and complexity that experience manifests, together with its more divine aspects, its limits, its lack of self-sufficiency, its inability to be explained entirely from within itself. And it is, again, in order to preserve, appreciate, and understand these limits as an integral and original part of our experience, that philosophy must, at a certain point, inquire into a transcendental principle, an *ἐνέργεια* which is previous and pre-existing to change and multiplicity.



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