Aristotle's Physics (Written 350 B.C.E) Book II.
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Chapter 1

Of things that exist, some exist by nature, some from other causes. "By nature" the animals and their parts exist, and the plants and the simple bodies (earth, fire, air, water)–such things we say exist "by nature". All of them present a feature in which they differ from things which are not constituted by nature. Each of them has within itself a principle of motion (*kinêsis*) and of rest (*stasis*) in respect of place, or of growth and decline by way of change. In contrast, a bed and a coat and anything else of that sort, considered just in the light of receiving these designations i.e. in so far as they are products of art (*technê*), have no innate tendency to change (*metabolê*). But in so far as they happen to be composed of stone or of earth or of a mixture of the two, they do have such an impulse, and just to that extent which seems to indicate that its nature (*physis*) is a source or cause of being moved and of being at rest in virtue of what it is primarily, in itself, and not in virtue of adventitious attributes.

To illustrate what I mean by "adventitious attribute": although a man who is a doctor might cure himself, nevertheless it is not in so far as he is a patient that he possesses the art of medicine: it merely has happened that the same man is doctor and patient, and that is why these attributes are not always found together. So it is with all other artificial products. None of them has in itself the source of its own production. But while in some cases (for instance houses and the other products of manual labor) that principle is in something else external to the thing, in others (like that of the patient who happened to be also a doctor) it may chance to lie in the things themselves but it will not lie in them in virtue of the kind of thing that they are.

Since the "nature" of anything is what has been stated, things "have a nature"which have a principle of this kind in virtue of what they are. Each of them is a substance (*ousia*); for it is a subject, and subjects always have inherent natures. The term "according to nature" is applied to all these things and also to the attributes which belong to them in virtue of what they are, for instance the property of fire to be carried upwards is not "nature" nor does it "have a nature" but it occurs "by nature" or "according to nature".

This, then, is nature and the meaning of the terms "by nature" and "according to nature". That nature exists, it would be absurd to try to prove; for it is obvious that there are many undemonstrable things, and to try proving what is self-evident by what is not is the mark of someone who is unable to distinguish the two–just as someone blind from birth might reason about colors. Presumably, such people are talking about words without having any thoughts correspond to them.

Some identify the nature or substance (*ousia*) of a natural object with that immediate constituent of it which taken by itself is without arrangement, e.g. the wood is the "nature" of the bed, and the bronze the "nature" of the statue. In support of this, Antiphon points out that if you planted a bed and the rotting wood acquired the power of sending up a shoot, it would not be a bed that would come up, but wood, which presumably shows that the arrangement of material in accordance with the rules of the bed-making is merely a adventitious feature, whereas the real nature (*ousia*) is whatever persists continuously through the process of change. Extending this view, others might say that the alleged "real nature", of every object is the material of which it is made up, and this material has itself the same relation to something else in turn, say bronze (or gold) to water, bones (or wood) to earth and so on, and these other [bottom-level] things (they say) would be their nature and essence. Consequently some assert earth, others fire or air or water or some or all of these, to be the nature of the things that are. And whatever anyone of them supposed to have this character–whether one thing or more than one thing–this or these will be declared all that really has substance, all else being its affections, states, or dispositions. Every such thing will be held to be eternal (for it could not change), but other things to come into being and cease to be times without number.

This then is one account of "nature", namely that it is the material substratum (*protê hylê*) persisting through changes in things which evidence a principle of motion or change. But another

account is that "nature" is identified with the *eidos* (form, shape, or idea that typifies a kind of thing) of something, with its *morphê* (what it morphs into) by definition. For the word "nature" is applied to what is according to nature and the natural in the same way as "artificial" is applied to what is crafted or a work of artifice. We should not say in the latter case that there is anything artificial about a thing, if it is a bed only potentially, not yet having the form of a bed; nor should we call it a work of artifice. The same is true of natural compounds. What is potentially flesh or bone has not yet its own "nature" and does not exist until it receives the form specific to its *logos*, the intelligible ordering of its characteristics determining what it is, which we enumerate when defining flesh or bone. Thus in the second sense of "nature" it would be the shape (*morphê*) or form (*eidos*) of a thing (not actually a separate thing from its material but distinguished for the sake of definition) which has in itself a principle of change (*kinêsis*). . . .

On this view, the form is "nature" rather than the matter; for a thing is more properly said to be what it is when it has reached its fulfilment than when it exists potentially. Looking at the issue another way, we reach the same conclusion; man is born from man, but not bed from bed. That is why people say that the visible figure (*schêma*=typical arrangement of parts) is not the nature of a bed, but the wood is–because if the bed sprouted, wood would come up and not a bed. But if the shape that does not come up in the case of the bed is artificial [and the wood is natural], by the same token, the shape of a human being, a form capable of producing itself, is nature, because a human being produces the form of humanity.

We also speak of a thing's nature as being exhibited in the process by which its nature is attained. "Nature" in this sense is not like "doctoring", which leads not to the art of doctoring but to health. Actual doctoring stands behind what it aims at and does not have doctoring as its outcome. But it is not in this way that nature (in the sense of an inherent process of growth) is related to nature (in the sense of acquiring the appropriate defining characteristics). Considered as something changing, a thing admittedly grows from something into something else. But into what does it grow? Into that from which it arose, which is also that to which its matter tends. The shaping up (*morphê*) then is its nature. . . .

Chapter 2

. . . Since "nature" has two senses, the attained form (*eidos*) and the matter (*hylê*), we must investigate its objects as we would the essence of snubness. Form is neither independent of matter nor can be defined in terms of matter only. Here too indeed one might raise a difficulty. Since there are two natures, with which is the student of nature concerned? Or should he investigate the combination of the two? But if the combination of the two sorts of nature, then also each individually? And if the latter, does it belong then to the same or to different sciences to know each individually? If we look at the ancients, physics would seem to be concerned only with the matter. (It was only very slightly that Empedocles and Democritus touched on the form and the enduring essence.) But if we admit that art imitates nature, it is the part of the same discipline to know the form and the matter up to a point (e.g. the doctor has a knowledge of health and also knowledge of bile and phlegm–the bodily humors–and the builder both of the form of the house and of the matter, namely of bricks and beams, and so forth): if this is so, it would be the part of the study of nature also to know nature in both its senses.

Again, "that for the sake of which", or the end, belongs to the same department of knowledge as the means. But the nature is the end or "that for the sake of which" [in things with an internal principle of change]. For if a thing undergoes a continuous change and there is a stage which is last, this stage is the end or "that for the sake of which". That is why the poet was carried away into making an absurd statement when he said "he has the end for the sake of which he was born". For not every stage that is last claims to be an end, but only that which is best [in the sense of *normative* of its species-character, its *eidos*, at which stage its proper capacities are fully developed]. The arts make their material (some actually "make" it, others make it serviceable), and we use everything as if it was there for our sake. . . . The arts, therefore, which govern the matter and have knowledge are two, namely the art which uses the product and the art which directs the production of it. That is why the using art also is in a sense directive; but it differs in that it knows the form, whereas the art which is directive as being concerned with production knows the matter. For the helmsman knows and prescribes what sort of form a helm should

have, the carpenter from what wood it should be made and by means of what operations. [A contrast should be observed, however, between art and nature in relation to knowing materials.] In the products of art, we make the material with a view to the function, whereas in the products of nature the matter is there all along.

Again, matter is a relative term: to each form there corresponds a special matter. How far then must the student of nature know the form or essence (*ti esti*) of things? Up to a point, perhaps, as the doctor must know sinew or the smith bronze (i.e. until he understands the purposes to which shaped or structured materials may be put): For the student of nature is concerned with things whose forms are distinguishable from matter but do not exist apart from it. . . . If there are things that can exist apart from their matter, they are the study of basic philosophy.

Chapter 3

Now that we have established these distinctions, we must proceed to consider causes (*aitia*), their character and kinds. Knowledge is the object of our inquiry, and men do not think they know a thing till they have grasped the "why" of it, which is to grasp its pertinent cause (*protê aition*). So clearly we too must do this as regards both coming to be and passing away and every kind of physical change, in order that, knowing their principles, we may try to refer them to particular cases.

In one sense, then, (1) that out of which a thing comes to be and which persists, is called "cause", e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species. In another sense (2) "cause" refers to the form or the pattern (*paradeigma*), i.e. the statement of what it is essentially. Its genera, too, are called "causes", as, for example, the relation of 2:1 enters into the formal determination of the octave. Generally speaking, number and the parts involved in the definition of something make up its formal cause. Again (3) the cause of something is the initiating source of its changing or coming to rest; e.g. the man who gave advice is a cause, the father is cause of the child, and generally what makes anything that is made and what changes any part of what is changed. Finally (4) there is cause in the sense of end or "that for the sake of which" a thing is done, e.g. health is the cause of walking about. ("Why is he walking about?" we say. "To be healthy", and, having said that, we think we have assigned its cause.) The same is true also of all the intermediate steps which are brought about through the action of something else as means towards the end, e.g. reduction of flesh, purging, drugs, or surgical instruments are means towards health. All these things are "for the sake of" the end, though they differ from one another in that some are activities, others instruments.

This, perhaps, exhausts the number of ways in which the term "cause" is used. As the word has several senses, it follows that there are several causes of the same thing, and not merely in virtue of features adventitious to its character, e.g. both the art of the sculptor and the bronze are causes of the statue. These are causes of the statue *qua* statue [that is, in connection with what makes it count as a statue], not in virtue of anything else that it may be–bearing in mind, of course, that these are not causes in the same way, the first being its productive cause, the second its material cause. Some things cause each other reciprocally, e.g. hard work causes fitness and vice versa, but again not in the same way, but the one as end, the other as the origin of change. Further the same thing may be the cause of contrary results. For that which by its presence brings about one result is sometimes blamed for bringing about the contrary by its absence. Thus we ascribe the wreck of a ship to the absence of the pilot whose presence was the cause of its safety.

All the causes now mentioned fall into four familiar divisions. The letters are the causes of syllables, the material are causes of artificial products, fire and such like are causes of bodies, the parts causes of the whole, and the premisses of the conclusion, in the sense of "that from which". In each of these pairs, the initial item is a cause in the sense of substratum, e.g. the parts, the other item in the sense of the essential character–the whole, or combination or form. Just so, the seed and the doctor and the adviser, and generally the maker, are all propelling factors originating change or cessation, and finally there are causes in the sense of the end (*telos*) or the good which things tend to; for "that for the sake of which" means what is normative and the end of the things that lead up to it. (Whether we say the "good itself" or the "apparent good" makes no difference.)

Such then is the number and nature of the kinds of cause. Now the modes of causation are many, though they can be reduced to a few main types. For "cause" is used in many senses and even within the same kind one may be prior to another, where one sort of cause is more inclusive in meaning than the other. For example, the cause of health may be the doctor or the more general type, the expert, the octave is determined by the ratio of 2:1 or by "a numerical characteristic", and so on. Again, Another mode of causation is the adventitious and its genera, e.g. in one way "Polyclitus", in another "sculptor" is the cause of a statue, because "being Polyclitus" is adventitious to "being a sculptor", so far as the statue is concerned. Also the classes in which the adventitious characteristic is included; thus "a man" could be said to be the cause of a statue or, generally, "a living creature". An adventitious characteristic too may be more or less pertinent, e.g. suppose that "a pale man" or "a musical man" were said to be the cause of the statue. Yet again, all causes, both proper and adventitious, may be spoken of either as potential or as actual; e.g. the cause of a house being built is either "the house-builder" in the sense of the appropriate craftsman or "the house-builder" in the sense of the person who is actually building the house. . . .

In investigating the cause of each thing it is always necessary to seek what is most precise (as also in other things): thus man builds *qua* builder, and a builder builds in virtue of his art of building. This last cause then is prior[1] [because it accounts for the builder being a builder]: and so generally. Further, generic effects should be assigned to generic causes, particular effects to particular causes, e.g. statue to sculptor, this statue to this sculptor; and powers are relative to possible effects, actually operating causes to things which are actually being effected.

This must suffice for our account of the number of causes and the modes of causation.

Chapter 4

But both luck (*tychê*) and mere chance (*automaton*, meaning "what just happens without any regular sort of causation") are also reckoned among causes: many things are said both to be and to come to be as a result of luck and chance. We must inquire therefore in what manner they are present among the causes enumerated, and whether they are the same or different, and generally what we take to be luck and chance.

Some people even question whether they are real or not. They say that nothing happens by chance, but that everything which we ascribe to luck or chance has some definite cause, e.g. coming into the market and "by luck" finding there a man whom one wanted but did not expect to meet is due to one"s wish to go and buy in the market. Similarly in other cases of luck having its way, it is always possible, they maintain, to find something which is the cause; but not luck, for if luck were real, it would be strange indeed. In support of this view, they raise the question why on earth none of the wise men of old in speaking of the causes of generation and decay took account of it; and they conclude that this omission indicates that the philosophers did not believe in it.

There is something odd about this view. Although people believe that everything can be ascribed to some cause (as in the old argument which denied luck), nevertheless they do speak of some of these things as happening by luck and others not, and the wise men of old ought to have at least referred to the popular indecision in this matter, but still they found no place for luck among the causes which they did recognize–love, strife, mind, fire, or the like. This is equally strange, whether they supposed that there is no such thing as chance or whether they thought there is but omitted to mention it–stranger, too, that some of them did use luck in explaining things, as Empedocles did when he said that the air is not always separated into the highest region, but "as chance may have it". At any rate, he says in his cosmogony that "it happened to run that way at that time, but it often ran otherwise." He tells us also that most of the parts of animals came to be by chance.

There are some, too, who ascribe this heavenly sphere and all the worlds to mere chance. They say that the vortex, i.e. the motion that separated and arranged in its present order all that exists, arose by

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[1]"prior" = A term of art in philosophy, designating a principle or concept that is more comprehensive than others that might seem also to do.

itself (*to automaton*). This statement might well cause surprise. For they assert that while luck is not responsible for the existence or generation of animals and plants, nature or mind or something of the kind being the cause of them; for it is not anything that comes from a given seed but an olive from one kind and a man from another [whereas, if some of the things that belong to particular kinds just came about by accident, anything might be caused by anything], yet just the same, the heavenly sphere and the divinest of visible things arose spontaneously, having no such cause as is assigned to animals and plants. Now, if this is so, it is a fact which deserves to be dwelt upon, and something might well have been said about it. For besides the other absurdities of the statement, it is the more absurd that people should make it when they see nothing coming to be spontaneously in the heavens, but much happening by chance–e.g., human events–among the things which as they say are not due to chance; whereas we should have expected exactly the opposite.

Others there are who, indeed, believe that chance is a cause, but that it is inscrutable to human intelligence, as being a divine thing and full of mystery. Accordingly, we must inquire what luck and chance, whether they are the same or different, and how they fit into our division of causes.

Chapter 5

First then we observe that some things come to pass in the same way, either always or for the most part. It is clearly of neither of these that luck is said to be the cause: a stroke of luck cannot be identified with any of the things that come to pass by necessity and always, or for the most part. But as there is a third class of events besides these two–namely, events which everyone calls "lucky", so it is plain that there is such a thing as luck and chance; for we know that things of this kind are due to chance and that things due to chance are of this kind.

But, secondly, some events serve a purpose (*heneka tou*), others do not. Again, some of the former class are in accordance with deliberate intention, others not, but both are in the class of things which are serviceable. Hence it is clear that even among the things which are neither regular or normal [in the way of causation], there are some in connection with which the phrase "serving something" is applicable. Events that may be done as a result of thought or of nature, [but not intentionally or as a matter of regular occurrence in nature] may be included among things that serve a purpose. Things of this kind, then, when they are either adventitious to intention or out of the usual order of events are said to be matters of luck. For just as a thing is something either in virtue of itself or adventitiously, so may causes have a two-fold aspect. For instance, the housebuilding faculty [in the builder] is in virtue of itself the cause of a house, whereas the builder's complexion or musical ability is adventitious [but might possibly prove serviceable in ways that cannot be anticipated]. That which is inherently cause of the effect is determinate, but the adventitious cause is indeterminable, for the possible attributes of an individual are innumerable. To resume then; when a thing of this kind comes to pass among events which are for the sake of something, it is said to be by luck or by chance. . . .

Example: A man is engaged in collecting subscriptions for a feast. He would have gone to such and such a place for the purpose of getting the money, if he had known that the contributor he was seeking was there. He actually went there for another purpose and it was only adventitiously that he got his money by going there; and this was not due to the fact that he went there as a rule or necessarily, nor is the end effected (getting the money) a cause present in himself–it belongs to the class of things that are intentional and the result of intelligent deliberation. It is when these conditions are satisfied that the man is said to have got his money by a stroke of luck. If he had gone of deliberate purpose and for the sake of this payment, or if he always or normally went there when he was collecting payments in general, expecting to find some contributors about, he would not be said to have had a stroke of luck.

It is clear then that luck is an adventitious cause in the sphere of those actions for the sake of something which involve purpose. Intelligent reflection, then, and luck are in the same sphere, for purpose implies intelligent reflection. . . .

Chapter 6

Luck and chance differ in that "chance" is the wider term. Every case of luck is a case of chance but not vice-versa.

Luck and what results from luck are appropriate to agents that are capable of good fortune and of ethical action generally. Therefore necessarily luck is in the sphere of ethical actions. This is indicated by the fact that good fortune is thought to be the same, or nearly the same, as happiness, and happiness to be a kind of ethical action, since it is well-doing. Hence what is not capable of ethical action cannot do anything by luck. Thus an inanimate thing or a lower animal or a child cannot do anything by luck, because it is incapable of deliberate intention; nor can "good fortune" or "ill fortune" be ascribed to them, except metaphorically, as Protarchus, for example, said that the stones of which altars are made are fortunate because they are held in honor, while their fellows are trodden under foot. Even these things, however, can in a way be affected by luck, when one who is dealing with them does something to them by luck, but not otherwise.

Mere chance, on the other hand, is found both in the lower animals and in many inanimate objects. We say, for example, that it was mere chance that the horse went to a place of safety, because, though his going saved him, he did not go for the sake of safety. Again, the tripod fell "of itself", because, though when it fell it stood on its feet so as to serve for a seat, it did not fall for the sake of that. Hence it is clear that events which (1) belong to the general class of things that may come to pass for the sake of something, (2) do not come to pass for the sake of what actually results, and (3) have an external cause, may be described by the phrase "from mere chance". Chance events are said to be "from luck" if they have the further characteristics of being possible objects of deliberate intention and affect agents capable of that mode of action. . . . The difference between chance and luck is greatest in considering the processes of nature; for when anything comes to be contrary to natural processes, we do not say that it came about by luck, but by chance. Yet strictly speaking, this too is different from chance; for the cause of chance is external, that of an irregularity in internal, natural processes.

We have now explained what luck is and what spontaneity is, and in what they differ from each other. Since they are sources of change, both belong to the mode of causation, change always has a cause, either natural or intellectual; but in this sort of causation the number of possible causes is infinite.

Spontaneity and luck are causes of effects which, though they might have resulted from intelligence or nature, have in fact been caused by something adventitiously. Now since what is adventitious presupposes something [inherent] that it is adventitious to, it is clear that what is merely an adventitious cause presupposes something inherent that is [usually] a cause [of that kind of result]. The existence of luck and chance, therefore, always presupposes the existence of intelligence and [the regularities of] nature. However true it may be that the heavens are chance productions, it will always be true that intelligence and nature are prior[2] causes of the universe and of many things in it besides.

Chapter 7

It is clear then that there are causes, and that the number of them is what we have stated. The number is the same as that of the things comprehended under the question "why". . . . Now, the causes being four, it is the business of the student of nature to know about them all, and if he refers his problems back to all of them, he will assign the "why" in the proper way–the matter, the form, the mover, and the end. The last three may often coincide; for the "what" [i.e., the form] and the end are often one, and the initiating source of motion may be of the same in kind as these two, as in the case of human beings, where man generates man. [We may also cite examples from the realm of art, as particular skills through apprenticeship have their cause in the practice of the master and as wisdom produces wisdom in others, even as it produces good advice.] These connections hold in all things where the initiating source is something that changes; and such as are not of this kind are no longer inside the province of natural studies. . . . Of the latter kind is whatever causes movement while not being itself moved, such as that which is completely unchangeable, the primary reality. Of the former kind is the essence of that which is

[2]Cp. footnote 1.

coming to be, i.e. the form; for this is the end or goal, "that for the sake of which". Hence since nature is essentially goalful, it is the province of natural studies to deal with this aspect of things. We must explain the "why" in all the senses of the term, namely, (1) that from this, that will necessarily or normally result [initiating causes]; (2) that "this must be so if that is to be so", as the conclusion presupposes the premisses [material causes as preconditions of something existing as what it is]; (3) that this manifests the essence of the thing [formal cause]; and (4) why it is better for something to be thus–not without qualification, but with reference to the essential being (*ousia*) of the thing [the *telos* or final cause, a source of normative judgements, as when we say, "Now, *that* is what I call baseball!"].

Chapter 8

We should examine the view that Nature belongs to the class of causes which act for the sake of something, that is, goalfully, towards an end; and we also should say something about necessity and its place in the study of nature, for all writers ascribe things to it, arguing that since the hot and the cold, and other qualities, are of such and such a kind, therefore all things characterized by them are as they are and come to be as they are of necessity . . . .

In this connection, a difficulty presents itself: why should not nature work, not "for the sake of something" or because it is better so but just as the sky rains, not in order to make the corn grow, but of [material] necessity? What is drawn up must cool, and what has been cooled must become water and descend, the result of this being that the corn grows. Similarly if a man's crop is spoiled on the threshing-floor, the rain did not fall for the sake of this–in order to spoil the crop–but that result just followed. Why then should it not be the same with the parts in nature, for example, that our teeth should come up of [material] necessity–the front teeth sharp, fitted for tearing, the molars broad and useful for grinding down the food–presuming that they did not arise for this end, but their function was merely a coincident result; and so with all other parts in which we suppose that there is purpose? Wherever, then, among all the parts that came about, some came about fortuitously just as they would have done *as if* they had come about for an end, these things would survive, being organized by mere chance in a fitting way; whereas those which grew otherwise perished and continue to perish, as Empedocles says his "man-faced ox-offspring" did.

Such are the arguments (and others of the kind) which may cause difficulty on this point. Yet it is impossible that this should be the true view. For teeth and all other natural things either invariably or normally come about in a given way; but of not one of the results of chance is this true. We do not ascribe to random happenstance the frequency of rain in winter, but frequent rain in summer we do; nor heat in summer, but only if we have it in winter. If, then, it is agreed that things are either the result of what just happens by chance or else for an end, and these cannot be the result of what just happens, it follows that they must be for an end; and that such things are all due to nature even the champions of chance would agree. Therefore action for an end is present in things which come to be and are by nature.

Further, where a series of human actions has a completion, all the preceding steps are for the sake of that. Now surely as in intelligent action, so in nature; and as in nature, so it is in each action, if nothing interferes. Intelligent action is for the sake of an end; therefore natural processes are too. Thus if a house, e.g. had been a thing made by nature, it would have been made in the same succession of steps as it is now by art; and if things made by nature were made also by art, they would come to be by the same series of steps as in nature. Each step in the series in both art and nature is for the sake of the next; and generally art either finishes what nature cannot complete, or else imitates her. If, therefore, artificial products are for the sake of an end, so clearly also are natural products. The relation of the later to the earlier terms of the series is the same in both.

This is most obvious in the animals other than man: they make things neither by art nor after inquiry or deliberation [but by nature]. And yet people discuss whether it is by intelligence or by some other faculty that these creatures work–spiders, ants, and the like. By gradual advance in this direction we come to see clearly that in plants too that is produced which is conducive to the end: leaves, e.g., grow to provide shade for the fruit. If then it is both by nature and for an end that the swallow makes its nest and

the spider its web, and plants grow leaves for the sake of the fruit and send their roots down (not up) for the sake of nourishment, it is plain that this kind of cause is operative in things which come to be and are by nature. And since the "nature" of things refers not only to the matter of its composition but also to the way it morphs, and since the second of these is the end, the form at which processes arrive and for the sake of which they occur, the form must be the cause in the sense of "that for the sake of which".

Now mistakes come to pass even in the operations of art: the grammarian makes a mistake in writing and the doctor pours out the wrong dose. Hence clearly mistakes are possible in the operations of nature also. If then in art there are cases in which what is rightly produced serves a purpose, and if where mistakes occur there was a purpose in what was attempted, only it was not attained, so must it be also in natural products, and monstrosities will be failures in the purposive effort. Thus in the original combinations the "ox-progeny" if they failed to reach a determinate end must have arisen through the corruption of some principle corresponding to what is now the seed. . . .

Moreover, [if Empedocles were right after all, then] anything might come up at random from seeds. But one who asserts this entirely does away with "nature" and what exists "by nature". For those things are natural which, by a continuous movement originating from an internal principle, arrive at some completion: the same completion is not reached from every principle; nor any chance completion, but always the tendency in each is towards the same end, if there is no impediment. . . . .

It is absurd to suppose that purpose is not present in nature because we do not observe the active causes deliberating. The reason is that artifice, too, may proceed without deliberating. But no one would suppose from this that the art (say, ship-building) must therefore be in the wood. If it were, of course, it would produce the same results by nature that it does now–which shows that just as purpose is inherent in each of the arts, so it is present also in nature.

The best illustration of the processes of nature is a doctor doctoring himself: nature is like that.

It is plain then that nature is a cause (*aition*), a cause that operates goalfully.

Chapter 9

As regards to necessity (*anangnke*), we must ask whether it is dependent upon other factors or independent of them. Some people actually suppose that necessity is inherent in processes with a regular outcome, which is like supposing that the wall of a house necessarily comes to be simply because what is heavy is naturally carried downwards and what is light rises to the top, so that the stones and foundations simply fall to the lowest place, the earth stays above them because it is lighter, and the wood of the roof rises to the top because it is lightest. But, of course , although a wall does not come to be without the materials possessing such properties [and this is the sense in which they are *necessary*], it is not due to these, except as its material cause: rather, it comes to be for the sake of sheltering and guarding certain things. Similarly in all other things which involve production for an end; the product cannot come to be without its materials having properties necessary for its function, but it is not due to these conditions; it comes to be for an end. Why is a saw such as it is? To serve a certain task and for the sake of so-and-so. This end, however, cannot be realized unless the saw is made of iron. It is, therefore, necessary for it to be of iron, it we are to have a saw and perform the operation of sawing. What is necessary in this case, then, is necessary only as a *pre*-condition. Necessity is in the matter, while the form of the saw, "that for the sake of which", the *telos* of its being, is in the *logos* [the ordered characteristics enumerated in defining what a thing is]. . . .

The necessary in nature, then, is plainly both the various matters of things and the changes appropriate them. Both must be noted by the student of nature, but especially the appropriateness of the changes; for the outcome may demand the changes, but the matter may not; and the end is "that for the sake of which", and this is found in its *logos* and definition (*horismos*). In artificial products, since a house is of such-and-such a kind, certain things must necessarily be obtained or be there already, or since health is this, these things must necessarily to secure it. Similarly in nature, if man is to be a certain sort of something, then some preconditions must be present; and if these, then others are presupposed also.

And then again, perhaps we may say that certain elements are necessary in the definition of a thing. For if one defines the operation of sawing as being a certain kind of dividing, then this cannot come

about unless the saw has teeth of a certain kind; and these cannot be unless it is of iron. Just like the physical object, the definition too requires parts that are, so to speak, its matter.