

BOOK II

Nature: An Internal Origin of Change

THE DIFFERENCE BETWEEN NATURAL AND
192^b ARTIFICIAL OBJECTS

I

Among things that are, some are natural, others are due to other causes. Those that are natural are animals
10 and their parts, plants, and the simple bodies, such as earth, fire, air and water; for we say that these things and things of this sort are natural. All these things are evidently different from things not naturally constituted; for each of them has in itself an origin
15 of change and stability, whether in place, or growth and decay, or alteration.

Compare with these a bed or a cloak, or any other such kind of thing [i.e. any artifact]. So described [as bed etc.] and to the extent that they are products of a craft, they have no innate impulse to change. But
20 insofar as they are coincidentally made of stone or earth or a mixture of these, they have such an innate impulse, and just to that extent. This is because nature is a sort of origin and cause of change and stability, in that to which it primarily belongs in itself and not coincidentally.

(By 'not coincidentally' I mean the following: Someone who is a doctor might come to be a cause of health in himself. But still, it is not insofar as he is being healed that he has the medical science;
25 rather, it is coincidental that the same person is a doctor and is being healed, and that is why the two [functions] are sometimes separated from each other.)

The same applies to everything else that is produced; for none of them has in itself the origin of

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production. In some—e.g. a house and each of the other products of handicraft—their origin is in other, external things. In others, i.e. those that might come
30 to be coincidental causes for themselves, the origin is in them, but is not in accord with what they are in themselves.

WHATEVER HAS A NATURE IS A SUBSTANCE

Nature, then, is what we have said; and things have a nature whenever they have this sort of origin. And all these things are substance; for [substance] is a sort of subject, and nature is always in a subject. The things that accord with nature are both these, and
35 whatever belongs to them in themselves, as travelling
193^a upwards belongs to fire—for this neither is nor has a nature, but is natural and accords with nature. We have said, then, what nature is and what is natural and accords with nature.

THERE IS NO DOUBT OF THE EXISTENCE OF NATURE

An attempt to show that there is such a thing as nature would be ridiculous. For it is evident that there are many things of this sort; and to prove what is evident from what is not is a mark of an inability to discriminate between what is known because of itself and
5 what is not. (It is clearly possible to suffer from this inability; someone blind from birth would [have to] make inferences about colours.) And so such people are bound to argue about [mere] names, and understand nothing.

SOME THINK THAT NATURE IS MATTER

Some people think that the nature and substance of
10 a natural object is the primary constituent present in it, but lacking any order in itself—in a bed, e.g., it will be the wood, in a statue the bronze.

It is a sign of this, according to Antiphon,¹ that if

1. [Antiphon (c. 479–411 B.C.) was an Athenian orator.—S.M.C.]

you were to bury a bed, and the rotting residue were to become able to sprout, the result would be wood, not a bed; this, he thinks, is because the conventional arrangement, i.e. the craft [making the wood into a bed], is a [mere] coincident of the wood, whereas the substance is the wood that persists continuously while it is affected in these ways.

And if each of these things is related to something else in the same way (bronze and gold, e.g., to water; bones and wood to earth; and so on with anything else), that thing will also be their matter and substance.

This is why some say fire or earth or air or water is the nature of things that are; some say it is some among these, others that it is all of them. Whatever anyone supposed to persist in these cases—one thing or more than one—he takes this or these to be all the substance there is, and all the other things to be affections, states, and conditions of them; and these things are held to be everlasting, since they do not change from themselves, but the other things come to be and are destroyed an unlimited number of times.

This, then, is one way in which we speak of nature—as the primary matter that is subject for each thing that has in itself an origin of change and variation.

BUT FORM IS NATURE TOO

In another way nature is the shape, i.e. the form, that accords with the account. For just as we speak of craftsmanship in what accords with craft and is crafted, so also we speak of nature in what accords with nature and is natural. But we would not yet speak of craftsmanship or of a product in accord with craft, if something were only potentially a bed and still lacked the form of a bed; nor would we say anything of the sort about whatever is naturally constituted. For what is only potentially flesh or bone neither has its nature nor is by nature until it acquires the form that accords with the account by which we define flesh or bone and say what it is.

In another way, then, nature is the shape and form of things having in themselves an origin of change; this form is not separable except in account. (What is composed of form and matter, e.g. man, is not nature, but is natural.)

Indeed, the form is nature more than the matter is.

(1) For something is called whatever it is [e.g. a bed or flesh] when it is actually so, more than when it is only potentially so.

(2) Further, a man comes to be from a man, but not a bed from a bed. Indeed, this is why some say that the nature of the bed is not the shape but the wood, because if it were to sprout the result would be wood, not a bed. But if this shows that the wood is nature, then the shape is also nature, since a man comes to be from a man.

(3) Further, nature spoken of as becoming is a road towards nature; for it is not like medical treatment, which is a road not towards medical science but towards health. For it is necessary that medical treatment proceeds from medical science, not towards medical science. But nature [as becoming] is not related to nature in this way; what is growing, insofar as it is growing, proceeds from something towards something. What is it, then, that grows? Not what it is growing from, but what it is growing into. Therefore, shape is nature.

Shape and nature are spoken of in two ways. For the privation is also form in a way. But we must consider later whether or not there is privation and a contrary in unqualified coming to be.

THE STUDENT OF NATURE, UNLIKE THE MATHEMATICIAN, STUDIES MATTER

2

We have distinguished, then, the different ways in which we speak of nature. Next we should consider how the mathematician differs from the student of nature. [The difference is not obvious.] For natural bodies certainly have surfaces, solids, lengths, and points; and these are what the mathematician studies.

We should also consider whether astronomy is different from the study of nature, or a part of it. [Apparently it is a part of it;] for it would be absurd if the task of a student of nature were to know what the sun or moon is, but not to know any of the intrinsic coincidents—especially since students of nature evidently also discuss the shape of the sun and moon, particularly whether or not the earth and heaven are spherical.

Now these things are the concern of the mathematician as well as of the student of nature. But the mathematician is not concerned with them insofar

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as each is the limit of a natural body. Nor does he study the coincidents of a natural body insofar as they belong to a natural body. Hence he also separates them. For they are separable in thought from change, and his separating them makes no difference, since
35 no falsehood results.

Those who say there are ideas do not notice that they also do this; they separate natural objects, though
194a these are less separable than mathematical objects. This would become clear if one tried to state the definitions of both [ideas and mathematical objects]—of the things themselves and of their [intrinsic] coincidents. For odd and even, straight and curved, and also number, line, and point will not involve change, whereas flesh, bones, and man will—
5 we speak of them as we speak of the snub nose [as including matter], not as we speak of the curved.

This is also clear from the parts of mathematics more related to the study of nature—e.g., optics, harmonics, and astronomy. These are in a way the reverse
10 of geometry; for geometry investigates a natural line, but not insofar as it is natural, whereas optics investigates a mathematical line, but insofar as it is natural, not insofar as it is mathematical.

LIKE THE CRAFTSMAN, HOWEVER, HE STUDIES FORM AS WELL AS MATTER

But since we speak of nature in two ways—both as form and as matter—we should study it as though
15 we were investigating what snubness is, and hence we should study natural objects neither without their matter nor [simply] in accord with their matter. For indeed, since there are these two natures, there might be a puzzle about which one the student of nature should study. Perhaps the compound of the two? If so, then each one of them. Then is it the same or a different discipline that knows each one?

Judging by the early thinkers, the student of nature
20 would seem to study matter, since Empedocles² and Democritus³ touched only slightly on form and essence. Grant, however, that craft imitates nature; and

2. [Regarding Empedocles, see Plato's *Meno*, n.6.]

3. [Democritus (c. 460–c. 370 B.C.) was a Greek philosopher who held that all things were composed of unchangeable atoms.]

grant that [in the crafts] it is the same science that knows the form and the matter up to a point—e.g. the doctor knows health, and also its constituents, bile and phlegm; and similarly the housebuilder knows both the form of the house and that its matter
25 is bricks and wood; and the same is true in the other cases. It follows that it is also a task for the study of nature to know both sorts of nature.

Moreover the same discipline studies both what something is for—i.e. the end—and whatever is for the end. Now nature is an end that something is for; for whenever a continuous change has some end, this
30 sort of terminus is also what the change is for. This is why it was a ludicrous remark when the poet said [of someone's death], 'He has reached the end he was born for.' It was ludicrous because what we mean by 'end' is not every terminus, but only one that is best.

For crafts [study both end and means, since they] produce their matter, some simply producing it, others making it suitable for their work; and we use all things as though they were for our sake, since we are
35 also an end in a way. (For the end that something is for is of two sorts, as we said in *On Philosophy*.)

There are two crafts that control the matter and involve knowledge: (a) the craft that uses [the matter],
194b and (b) the craft that directs this productive craft. Hence (a) the using craft also in a way directs, but with a difference, in that (b) the directing craft knows the form, whereas (a) the craft that directs by being productive knows the matter. For instance, (b) the
5 pilot knows what sort of form the rudder has, and he prescribes [its production], whereas (a) [the boat-builder] knows what sort of wood and what sorts of changes are needed to make it. With products of a craft, then, we produce the matter for the sake of the product; with natural things, the matter is already present.

Further, matter is relative to something; for each
10 form has a different matter.

How much, then, must the student of nature know about form and essence? As much, perhaps, as the doctor knows about sinews, or the smith about bronze—enough to know what something is for. And he must confine himself to things that are separable in form, but are in matter—for a man is born from
15 a man and the sun. But it is a task for first philosophy [not for the study of nature] to determine what is separable and what it is like.

Cause and Chance

THE FOUR CAUSES

3

Now that we have determined these points, we should consider what sorts of causes, and how many, there are. For our inquiry aims at knowledge; and we think we have knowledge only when we find why something is so—i.e. when we find its primary cause. Clearly, then, we must also do this for becoming, destruction, and every sort of natural change, so that when we know their origins we can try to refer to these in answering each of our questions.

THE MATERIAL CAUSE

In one way, then, that from which, as a constituent, an object comes into being is said to be its cause—e.g. the bronze and silver, and their genera, are causes of the statue and bowl.

THE FORMAL CAUSE

In another way, the form—i.e. the pattern—is a cause. The form is the account [*logos*] of essence, and the genera of the account (e.g. of an octave, the ratio [*logos*] two to one; and in general number), and the parts that are in the account.

THE EFFICIENT CAUSE

Again, the source of the primary origin of change or stability is a cause; e.g. the adviser caused [the action], and a father his child, and in general the producer causes the product and the initiator of the change causes what is changed.

THE FINAL CAUSE

Again, something's end—i.e. what it is for—is its cause, as health is of walking. For why does he walk? We say, 'To be healthy'; and in saying this we think we have provided the cause. And the same is true of all the intermediate steps that advance the end, where something else has initiated the change, as slimming, purging, drugs, or instruments, e.g. advance health; all of these are for the end, though they differ in that some are actions, some instruments.

We may take these, then, to be the ways we speak of causes.

THE SAME THING MAY HAVE MORE THAN ONE CAUSE

Since causes are spoken of in many ways, it follows that there are many noncoincidental causes of the same thing. Both the sculpting craft and the bronze, e.g., are causes of the statue, not insofar as it is something else, but insofar as it is a statue. But they are not causes in the same way; the bronze is a cause as matter, the sculpting craft as the source of the change. Some things are causes of each other—labour, e.g., is the cause of fitness, and fitness of labour. But they are not causes in the same way; fitness is the cause as end, and labour as the origin of change. Further, the same thing is the cause of contraries. For sometimes whatever is the cause of something by its presence is also held to be the cause of the contrary by its absence; e.g. we hold the absence of a pilot to have caused the wreck of the ship, when his presence would have caused its safety.

All the causes just mentioned are of four especially evident types: (1) Letters are the cause of syllables, matter of artifacts, fire and such things of bodies, parts of the whole, and the assumptions of the conclusion, as that out of which. In these cases one thing—e.g. the parts—is cause as subject, while (2) the other thing—the whole, the composition, and the form—is cause as essence. (3) The seed, the doctor, the adviser and, in general, the producer, are all the sources of the origin of change or stability. (4) Other things are causes as the end and the good of other things. For what the other things are for tends to be the best and their end (it does not matter whether we call it the good or the apparent good). These, then, are how many kinds of causes there are.

WAYS IN WHICH CAUSES MAY BE CITED

Though there are many types of causes, they are fewer when they are arranged under heads. For causes are so called in many ways, and even among causes of the same kind some are prior and others posterior. For example, the cause of health is the practitioner of the medical craft and the practitioner of a craft; the cause of an octave is the double and number;

and in every case the inclusive [and less specific causes are posterior] to the particular.

Further, some things and their genera are coincidental causes. Polycleitus⁴ and the sculptor, e.g., are causes of the statue in different ways, because being
 35 Polycleitus is coincidental to the sculptor. What includes the coincident is also a cause — if, e.g., the man, or, quite generally, the animal, is a cause of the statue. Some coincidental causes are more remote or more
 195b proximate than others; e.g. if the pale man or the musician were said to be the cause of the statue [they would be more remote causes than Polycleitus is].

We may speak of any cause, either proper or coincidental, either as having a potentiality or as actualizing it; e.g. we may say either that the housebuilder, or
 5 that the housebuilder actually building, is causing the house to be built.

Similar things may also be said about the things of which the causes are causes. For example, [we can speak of the cause] of this statue, or of a statue, or of an image in general; or of this bronze, or of bronze, or
 10 of matter in general. The same is true of coincidents.

Further, we may speak in the same way of combinations [of proper and coincidental causes, and of proper and coincidental things caused]; e.g., instead of Polycleitus or a sculptor, Polycleitus the sculptor.

Still, all these ways amount to six, each spoken of in two ways. For there is (1) the particular and (2) the genus; (3) the coincident and (4) the genus of the coincident; and these may be spoken of either
 (5) in combination or (6) simply. And each of these
 15 may be (i) actually or (ii) potentially operating. The difference is the following. (i) Causes that are actual and particular are and are not in being simultaneously with the things they cause — e.g. this one practising medicine with this one being made healthy; and in the same way, this one housebuilding with this thing
 20 being built into a house. (ii) But this is not true of every cause referred to as potentially operating — for the house and the housebuilder are not destroyed simultaneously.

Here as elsewhere, we must always seek the most precise cause. A man, e.g., is building because he is a builder, and he is a builder insofar as he has his
 25 building craft; his building craft, then, is the prior

4. [Polycleitus was a fifth-century B.C. Greek sculptor.]

cause, and the same is true in all cases. Further, we must seek genera as causes of genera, and particulars as causes of particulars; a sculptor, e.g., is the cause of a statue, but this sculptor of this statue. And we must seek a potentiality as the cause of a potential effect, and something actualizing a potentiality as the cause of an actual effect.

This, then, is a sufficient determination of the number of causes, and of the ways they are causes. 30

LUCK AND CHANCE

4

Luck and chance are also said to be causes, and many things are said to be and to come to be because of them. We must investigate, then, in what way luck and chance are among the causes we have mentioned; whether luck is or is not the same as chance; and, in general, what they are. 35

DOUBTS ABOUT THE EXISTENCE OF LUCK

Some people even wonder whether there is any such thing as chance and luck. For, they say, nothing results from luck; everything said to result from
 196a chance or luck has some definite cause — e.g. when as a result of luck someone comes to the marketplace and finds there the person he wanted to meet but did not expect, the cause is his wishing to go to market. The same is true of other things said to result
 5 from luck; in every case, they say, it is possible to find some cause other than luck. For if there were such a thing as luck, it would appear truly strange and puzzling that none of the early philosophers who discussed the causes of coming into being and destruction ever determined anything about luck; in
 10 fact they also would seem to have thought that nothing results from luck.

THESE DOUBTS ARE UNCONVINCING

But this too is surprising. For many things that come
 15 into being and are in being result from luck and chance. Though people know perfectly well that everything that comes into being can be referred to some cause, as the old argument against luck says, still they all say that some of these things result from luck, and others do not.

Hence the early philosophers should have mentioned it in some way. But they certainly did not think

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luck was any of the causes they recognized—e.g. love or strife or mind or fire or any other such thing. Their position is strange, then, whether they supposed there was no such thing as luck, or thought there was, but omitted it—especially strange considering that they sometimes used it. Empedocles, for example, uses it when he says that air is separated out on top, not always, but as luck has it; at least, he says in his cosmogony that it happened to run that way at that time, but often otherwise. And he says that most of the parts of animals result from luck.

BELIEFS ABOUT CHANCE

25 There are some who also make chance the cause of our heaven and of all worlds. For they say that the vortex, and the motion that separated out and established everything in its present order, resulted from chance. And this is especially amazing. For animals and plants, they say, neither are nor come into being from luck, but rather, nature or mind or something of that sort is the cause, since it is not just any old thing that comes to be from each type of seed, but an olive tree from one type, and a man from another; and yet they say that the heaven and the most divine of visible things result from chance, and that there is no cause of the sort that animals and plants have.

Now if this is so, it deserves attention; and something might well have been said about it. For in addition to the other strange aspects of what they say, it is still stranger to say all this when they see that nothing in the heavens results from chance, whereas many things result from luck in the cases where [they suppose] nothing results from it. Surely the exact opposite would have been likely.

5 Some indeed suppose that luck is a cause, but take it to be godlike and superhuman, and therefore obscure to the human mind.

So we must consider chance and luck—what each is, whether they are the same or different, and how they fit into the causes we have distinguished.

THE NATURE OF LUCKY EVENTS

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10 First, then, we see that some things always, others usually, come about in the same way. Evidently neither luck nor the result of luck is said to be the cause

5 [The reference is to Democritus.]

of these—neither of what is of necessity and always nor of what is usually. But besides these classes of things that come to be there is a third class, which everyone says results from luck; evidently, then, there is such a thing as luck and chance, since we know that this third class results from luck, and that the results of luck belong to this class.

Further, some of the things that come to be come to be for something (some in accord with decision, others not, but both classes are for something), and some do not. Clearly, then, it is possible even for some members of the third class—the neither necessary nor usual—to be for something. What is for something includes both the actions that result from thought and also the results of nature. This, then, is the sort of thing that we regard as a result of luck, whenever it comes about coincidentally.

['Coincidental' must be explained.] Just as some things are something in themselves, and others are something coincidentally, so also it is possible for a cause to be of either sort. For example, the cause of a house is in itself the housebuilder, but coincidentally the pale or musical thing. Hence the cause in itself is determinate, but the coincidental cause is indeterminate, since one thing might have indefinitely many coincidents.

As has been said, then, whenever things that come to be for something have this coincidental cause, they are said to result from chance and luck. The difference between these should be defined later; we may take it as evident for the moment that both are found in things that are for something.

AN EXAMPLE OF A LUCKY EVENT

[Suppose, for instance, that A wants to collect a debt from B; one day A comes to the market for some other reason, and meets B collecting subscriptions.] A would have come when B was collecting subscriptions, to recover the money from B, if A had known [B would be there]. In fact, however, A did not come to do this; it was a coincidence that A came [when B was there], and did this [i.e. met B] to collect [the money]. And this is so when A frequents the place [for that purpose] neither usually nor from necessity.

The end, the collection, is not a cause [of A's action] in A, but it is something he decides to do as a result of thought. And in this case A's coming is

said to result from luck; but if A always or usually frequented the place because he had decided to and
5 for the purpose of collecting the money, it would not result from luck.

HOW LUCK IS A CAUSE: EXPLANATION OF CURRENT BELIEFS

Clearly, then, luck is a coincidental cause in things that are for something and in accord with decision. Hence thought—since decision requires thought—and luck concern the same things.

Now the causes whose results might be matters of luck are bound to be indeterminate. That is why luck also seems to be something indeterminate and obscure to a human being, and why it might seem
10 in one way that nothing results from luck. For, as we might reasonably expect, all these claims are correct.

(1) For in one way things do result from luck, since they are coincidental results, and luck is a coincidental cause. But luck is not the unqualified [and hence noncoincidental] cause of anything. The [unqualified] cause of a house, e.g., is a housebuilder, and
15 the coincidental cause a flute-player; and the man's coming and collecting the money, without having come to collect it, has an indefinite number of coincidental causes—he might have come because he wished to see someone, or was avoiding someone, or was going to see some sight.

(2) It is also correct to say that luck is something contrary to reason. For rational judgement tells us
20 what is always or usually the case; but luck is found in events that are neither.

(3) Hence, since causes of this sort are indeterminate, luck is also indeterminate.

Still, in some cases one might be puzzled about whether just anything might be a cause of luck. [Apparently not. Suppose someone's haircut exposes him to wind and sun, which are good for his health;] the wind or the sun's warmth, but not the haircut, might
25 be the cause of his health—for some coincidental causes are closer than others to what they cause.

HOW LUCK MAKES SOMEONE LUCKY OR UNLUCKY

Luck is called good when something good results, bad when something bad results; we speak of being lucky and unlucky when the results are great. Hence

one who just misses great evil or good is lucky or unlucky. For [though in fact he is no better or worse off than he was, he seems to be], because we think of him as already having [the great evil or good he just misses]—the short distance seems to us to be no distance. Further, it is reasonable that being lucky is unstable; for luck is unstable, since no result of luck can be either always or usually the case. 30

Both luck and chance are coincidental causes, then, as we have said, within the class of events that are capable of being neither exceptionless [i.e. always] nor usual, and specifically within the subclass of these that might be for something.

LUCK IS CONFINED TO RATIONAL AGENTS

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Chance, however, is not the same as luck, since it is
broader; for results of luck are also results of chance, but not all chance results result from luck. For luck and its results are found wherever it is possible to be lucky, and in general to act, and that is why luck must concern what is achievable by action. A sign of
5 this is the fact that being lucky seems to be the same, or nearly the same, as being happy, and being happy is a sort of action, since it is doing well in action. Hence what cannot act cannot do anything by luck either.

Hence neither an inanimate object nor a beast nor a child does anything by luck, because they do not have decision [which is needed for action]. Nor are they lucky or unlucky, except by a similarity—as Pro-
10 tarchus⁶ said that the stones from which altars are made are lucky, because they are honored, while their fellows are trodden underfoot. Still, even these things are affected in a way by the results of luck, when an agent affects them by some lucky action; but otherwise not.

CHANCE, HOWEVER, IS ALSO FOUND IN NATURAL OBJECTS

Chance, on the other hand, belongs to other animals than man and to many inanimate objects—e.g. we
15 say the horse came by chance since it was saved

6. [Protarchus was a student of Gorgias, regarding whom see Plato's *Meno*, n.2.]

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it did not fall in order to be sat on, although it was
set up in order to be sat on.

Hence it is evident that if an event is of the sort
20 that, speaking without qualification, is for something,
(a) we say that it results from chance if it has an
external cause and is not for the sake of its actual
result; and (b) we say it results from luck if it results
from chance and is an object of decision for an agent
that makes decisions.

A sign of this is the fact that we say an event is
pointless [*maten*] if it is [of the sort that is] for some
result, but [in this case] is not for that result. If, e.g.,
25 walking is for evacuating the bowels, but when he
walked [on this occasion] it was not for that reason,
then we say that he walked pointlessly, and that his
walking is pointless. Here we assume that an event
is pointless if it is naturally for something else, but
does not succeed in [being for] what it is naturally
for. For if someone said that his washing was pointless
because the sun was not eclipsed, he would be ridicu-
lous, since washing is not for producing eclipses.

So also, then, an event happens by chance [*automa-
tôn*], as the name suggests, whenever it is pointless
[*maten*]. For the stone did not fall in order to hit
someone; it fell, then, by chance, because it might
30 have fallen because someone threw it to hit someone.

The separation of chance from luck is sharpest in
natural events. For if an event is contrary to nature,
35 we regard it as a result of chance, not luck. But even
this is different from [other cases of chance; the other
cases] have an external cause, but [the natural cases]
an internal.

HOW LUCK AND CHANCE ARE RELATED TO THE
FOUR CAUSES

We have said, then, what chance and luck are, and
198a how they differ. Each of them falls within the sort of
cause that is the source of the origin of change. For
they are in every case either among natural causes
or among those resulting from thought; and the num-
5 ber of these is indefinite.

Chance and luck are causes of events that mind
or nature might have caused, whenever they have
some coincidental cause. Now nothing coincidental
10 is prior to anything that is in itself; hence clearly no

coincidental cause is prior to a cause in itself. Chance
and luck are therefore posterior to mind and nature.
And so however true it may be that chance is the
cause of the heavens, still it is necessary for mind and
nature to be prior causes of this universe and of many
other things.

CONNECTIONS BETWEEN THE FOUR CAUSES

7

It is clear, then, that there are causes, and just the
number we say there are; for that is the number of 15
answers to the question 'Why?'. For ultimately we
refer the why (1) in the case of unchanging things,
e.g. in mathematics, to the essence—for we refer
ultimately to the definition of straight or commensu-
rate or something else; or (2) to what first initiated
change (e.g. why did they go to war?—because the 20
other side raided them); or (3) to what something is
for (e.g. to be the rulers); or (4) with things that come
to be, to the matter.

It is evident, then, that these are the causes, and
that this is their number. Since there are four of them,
it is a task for the student of nature to know them
all. His answer to the question 'Why?' will be suitable
to the study of nature if he refers to all of them—to
the matter, the form, the initiator of change, and what
something is for.

The last three often come to one; for what some- 25
thing is and what it is for are one, and the first source
of the change is the same in kind as these—for man
gives birth to man; and the same is true generally of
things that initiate change by being changed.

Things that are changeless are outside the scope
of the study of nature. For although they change
things, they do not change them by having change
or an origin of change within themselves, but they
are unchanged. Hence there are three inquiries: one 30
about what is changeless; one about what is changed
but imperishable; and one about what is perishable.

And so the why is given by referring to the matter,
and to the essence, and to the first initiator of change.
For in cases of coming to be, this is the normal way
of examining the causes—by asking what comes to
be after what, and what first acted or was affected,
and so on in order in every case.

There are two sorts of origins that initiate change 35
naturally. One of these origins is not itself natural,

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since it has no origin of change within itself; this is true of whatever initiates change without itself being changed—e.g. what is completely changeless (i.e. the first of all beings) and also the essence (i.e. the form), since this is the end that something is for. So since nature is for something, this cause too must be known.

The why should be given in every way—e.g. this from this necessarily (from this without qualification [i.e. always] or usually); and if this is to be (as the conclusion from the premises); and that this is the essence; and because it is better thus—not unqualifiedly better, but better in relation to the substance of each thing.

Teleology and Necessity in Nature

OBJECTION: APPARENT TELEOLOGY IN NATURE IS ONLY A CHANCE RESULT OF NECESSITY

8

10 We must first say why nature is among the causes that are for something, and then how necessity applies to natural things. For everyone refers to this cause, saying that since the hot, the cold and each element are naturally so, these other things are and come to 15 be from necessity. For indeed if they mention any other cause than necessity—as one thinker⁷ mentions love or strife, and another⁸ mentions mind—they just touch on it, then let it go.

Here, then, is a puzzle: why not suppose nature acts not for something or because it is better, but from necessity? Zeus's rain does not fall in order to make the grain grow, but from necessity; for it is necessary that what has been drawn up should cool, 20 and that what has cooled and become water should come down, and it is coincidental that this makes the grain grow. Similarly, if someone's grain is spoiled on the threshing floor; it does not rain in order to spoil the grain, but it is coincidental that the rain spoils the grain.

Why not suppose, then, that the same is true of the parts of organisms in nature? It will be from necessity, e.g., that the front teeth come up sharp and

7. [The reference is to Empedocles.]

8. [The reference is to Anaxagoras, regarding whom see Plato's *Apology*, n.7.]

[coincidentally] suitable for biting, and the back ones 25 broad and useful for chewing food—since this [useful] result was coincidental, not what they came about for. And the same will be true of all the other parts when they seem to be for something.

On this view, then, whenever all the parts came about coincidentally as though for something, these animals survived, since their chance constitution 30 made them suitable for survival. Other animals, however, were differently constituted, and so were destroyed—indeed they are still being destroyed—as Empedocles says of the man-headed calves.

REPLY TO OBJECTION: NOT ALL NATURAL REGULARITIES HAPPEN BY CHANCE

This argument, then, and others like it, might puzzle someone. In fact, however, it is impossible for things to be like this. For these [teeth and other parts], and all natural things, come to be as they do either always 35 or usually, whereas no result of luck or chance does. For we do not regard frequent winter rain or a summer heatwave, but only summer rain or a winter heatwave, 199a as a result of luck or coincidence. If, then, these [teeth, etc.] seem to be either coincidental results or for something, and they cannot be coincidental or 5 chance results, it follows that they are for something. Now surely all such things are natural, as even those making these claims [about necessity] would agree. We find, then, that things are for something when they come into being and remain in being naturally.

ARGUMENTS FROM CRAFT TO NATURE SUPPORT NATURAL TELEOLOGY

Further, whenever a sequence has an end, the earlier action and the next in order are done for the end. Surely what is true for action is true for nature, and 10 what is true for nature is true for each action, if nothing prevents it. Now an action is done for something; what is natural, therefore, is for something. For example, if a house came into being naturally, it would do so just as it actually does by craft; and if 15 natural things came into being not only naturally but also by craft, they would come into being just as they do naturally; one thing, then, is for the other. In general, craft either completes the work that nature is unable to complete or imitates nature. If, then, what accords with craft is for something, then clearly

what accords with nature is also for something; for there is the same relation of earlier stages to later both in sequences that accord with craft and in those that accord with nature.

20 This is most evident with animals other than man, since they use neither craft nor inquiry nor deliberation in their production [but nonetheless act for some end]—indeed this is why some are puzzled about whether spiders, ants, and other such things operate by understanding or in some other way. If we advance little by little in this way, it is evident that even in 25 plants things come to be that promote the end—leaves, e.g., grow for the protection of the fruit. If, then, it is both naturally and for some end that a swallow makes its nest and a spider its web, and if plants grow leaves for the sake of the fruit, and send roots down rather than up for nourishment, it evidently follows that this sort of cause is found in things 30 that come into being and remain in being naturally. And since nature is of two sorts, as matter and as form, and the form is the end, and since everything else is for the end, the form must be the cause that the other things are for.

THESE ARGUMENTS EXPLAIN APPARENT IRREGULARITIES IN NATURE

Errors occur even in what accords with craft—e.g. the grammarian writes incorrectly, and the doctor 35 gives the wrong medicine. And so clearly errors are also possible in what accords with nature.

Now in some cases that accord with craft, the correct action is for something, and when errors occur, the attempt is for something, but misses the mark. It will be the same, then, in natural things; freaks will be errors missing the end they are for. Hence in 5 [Empedocles'] original formations of things, a defective origin would also have brought the [man-headed] calves into being, if they were unable to reach any definite term and end—as [freaks] come into being now when the seed is defective.

Further, it is necessary for the seed to come into being first, and not the animal right away; and in fact [Empedocles'] 'all-natured first' was seed.

Further, what is for something is present in plants as well as in animals, though it is less articulate. Then 10 what about plants [in Empedocles' beginning]? Did olive-headed vines keep coming into being, as he

says [man-headed] calves did? Surely not—that is absurd—but surely [mixed plants] would have to have come into being, if [mixed] animals did.

Further, [on Empedocles' view] coming into being would have to be mere luck among seeds also. But whoever says this entirely does away with nature and natural things. For things are natural when they are moved continuously from some origin in themselves and so arrive at some end; and from each origin 15 comes, not the same thing in each case, but not just any old thing either, and it always proceeds to the same [end] if nothing prevents it.

Now certainly the end that a process is for and the process that is for the end might also result from luck. We say, e.g., that the friend in the foreign country came by luck and paid the ransom and then went 20 away, if he does the action as though he had come to do it, but that was not in fact what he came to do. This [end is achieved] coincidentally—for luck is one of the coincidental causes, as we also said before. But whenever this [end] comes about always or usually, it is neither coincidental nor a result of luck. And 25 in natural things it is always so, unless something prevents it.

NOR DOES TELEOLOGY REQUIRE DELIBERATION

Besides, it is strange for people to think that no process comes about for something unless they see an agent who by deliberating has initiated the change. Even a craft does not deliberate. Moreover, if the shipbuilding craft were in the wood, it would produce a ship in the same way that nature would; and so if one thing is for another in craft, it is so in nature too. This 30 is clearest when a doctor applies medical treatment to himself—that is what nature is like.

It is evident, then, that nature is a cause as the end that something is for.

A COMMON MISCONCEPTION OF NATURAL NECESSITY

9

Is what is necessary necessary only given an assumption, or can it also be unconditional?

The current view is that there is [unconditional] 35 necessity in things that come to be. It is as though someone supposed that a wall has come into being

from [unconditional] necessity, because heavy things naturally move downwards, and light things to the surface, so that the stones and the foundations are below, while the earth is above because of its lightness, and the wooden logs are on the very top because they are lightest of all.

THE REAL RELATION OF NECESSITY TO TELEOLOGY

In fact, however, though the wall certainly requires these things, it did not come into being because of them—except in the way something comes into being because of its matter—but to give shelter and protection.

The same is true in all other cases where something is for something; though they require things that have a necessary nature, they do not come about because of these things, except in the way that things come about because of their matter, but for something. For instance, why is a saw this sort of thing? In order to do this, and for this [i.e. sawing]. But this end that the saw is for cannot come into being unless the saw is made of iron; it is necessary, then, for it to be made of iron if there is to be a saw performing its function. What is necessary, then, is so given the assumption [that the end is to be achieved], but not necessary as an end; for necessity is in the matter, whereas the end that the process is for is in the account [containing the function of the saw].

NECESSITY IN NATURE AND IN MATHEMATICS

Necessity is found both in mathematics and in things that come into being in accord with nature; and to some extent the two cases are similar. For instance, since the straight is [defined as] this, it is necessary for a triangle to have angles equal to two right angles. It is not true that since the triangle is so, the straight is so; if, however, the triangle is not so, the straight is not so either.

In things that come to be for something, it is reversed; if the end is or will be, then the previous things are or will be too. Just as, in the mathematical case, if the conclusion [about the triangle] is not so, the origin [about the straight] will not be so either,

so also in nature if the previous things are not in being, the end that the process is for will not come about either.

[The analogy with mathematics is quite close.] For the end [like the mathematical origin] is also an origin; it is an origin not of action, but of reasoning [about how to achieve the end], and in the mathematical case, the origin is the origin of reasoning, since there is no action.

And so, if there is to be a house, it is necessary for these things to come to be or to be present or, in general, for the matter that is for something to be there—bricks and stones, e.g., if there is to be a house. However, the end is not because of these things, except in the way something is because of its matter; nor will it come about because of them. In general, however, the end—the house or the saw—requires them—the stones or iron. Similarly, in the mathematical case, the origins require the triangle to have two right angles.

BOTH MATTER AND TELEOLOGY CONCERN THE STUDENT OF NATURE

Evidently, then, what is necessary in natural things is what is spoken of as matter, and the changes of matter. The student of nature should mention both causes, but more especially what something is for, since this is the cause of the matter, whereas the matter is not the cause of the end. The end is what something is for, and the origin is from the definition and the account [saying what something is for].

It is the same with things in accord with craft. For instance, since a house is like this, these things must come to be and be present from necessity; and since health is this, these things must come to be and be present from necessity. In the same way, if a man is this, these things must [come to be and be present, from necessity]; and if these, then these.

But [we must not suppose that the account stating the end excludes necessity;] presumably necessity is also present in the account. Suppose, for instance, we define the function of sawing as this sort of cutting; this sort of cutting requires a saw with teeth of this sort; and these require a saw made of iron. [Hence a saw is defined as being made of iron.] For some parts in the account are in it as matter of the account.