

# Book I, II.1-3: Beginnings and Causes

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## The anti-Platonic background: mere appearance vs. the reality of change

Plato is an anti-realist or at least a reductionist about change: change is, or even must be, wholly explainable in terms of unchanging things and is, at least to this extent, only apparent. Aristotle’s world, on the contrary, is fundamentally dynamic: he takes the actuality of qualitative change (from red to non-red), intensification (from slower to faster), growth (from thinner to fatter) and of substantial change (coming to be, ceasing to be) as a datum; on the other hand, he also accepts “ex nihil nihilo fit”: all change is change of something, something happening to something else, i.e. in all change, something must ‘underlie’.

His hylomorphic account of change in terms of an underlying matter changing its form between opposites aspires to reconcile these opposing tendencies by providing a middle way between (i) the atomists who have unchanging things and cannot explain how change emerges from their interaction because they falsely suppose that all change is qualitative and (ii) the Platonists who admit only opposites, and nothing underlying and hence are committed to construe all change as either extrinsic or existential (and hence, given further Parmenidean assumptions, impossible). We are thus drawn into different directions: to satisfy the incompatibility condition on change, we need a succession of two different things; to satisfy the proper subject condition, we need an unchanging thing. If we have only one of them, we do not have change. But do we have change if we have both? We call the first “form”, the latter “matter”. Crucial question: in what sense does changing form + unchanging matter result in changing compound? Two subquestions:

- (i) what are the relations between (i-a) form and the compound, (i-b) matter and the compound, (i-c) form and matter? they must be of the type that underwrites our epistemic right to infer what happens with the compound from (and, more ambitiously, explain it by) what happens with matter and form;
- (ii) in what sense is the situation asymmetric enough to ascribe change to the compound? why do we privilege the change in the form over the constancy in the matter?

“Parthood” as an answer to the first two questions of (i) has problems with (ii). This has to do with it’s not directly answering (i-c), i.e. it’s not giving us a real, direct, relation between the form and the matter. But if the form is not part of compound, in what way is it its form?

Aristotelian dynamics operates with a crucial, but unfortunately quite opaque, distinction between two modes of being: potentiality, power or ground of possibility – *dunamis* – on the one side, and actuality, realisation or reality – *energeia* – on the other. Though the distinction is supposed to have a much more general application (and its difficulty is partly due to its very high degree of generality), perhaps the clearest case of the *dunamis/energeia* distinction is the relation between a capacity for change and the changes to which it gives rise. All change is due to a capacity for change, a *dunamis*: what there is constrains what must have been possible. Conversely, some *dunamis* also explains the *energeia* it is a *dunamis-for*: what can be constrains what there is. Even in this perhaps simplest case, however, the distinction is *not* the one we are perhaps more familiar with between a disposition (dispositional property, ‘potentiality’, ‘power’) like *fragility* and its manifestation, the shattering of a particular glass. *Dunamis* and *energeia* are correlative, and the *dunamis* by itself explains or grounds its actualisation. Neither does Aristotle have a simple counterfactual analysis: the *dunamis* is not what a thing would be under such-and-such circumstances, but a way the thing is in the here and now.<sup>1</sup>

## Overview of the first two books

In his introduction to the *Clarendon Aristotle Series* edition of the first two books, Charlton (1992) gives the following overview of what is, according to him, a dialectical investigation of the things that are subject to change (as such, i.e. insofar as they are subject to change).

**I.** What is there / what is in the world? (ti to on?), more specifically: what must there be if there is coming to be, passing away and alteration?

**I.1** intro

**I.2+3** there is becoming (against the Eleatic monists)

**I.4** review of the Presocratics

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1. As with the matter/form distinction, the issue is further complicated by the fact that this distinction too is relative: something may, e.g., have a *dunamis* to have another *dunamis*.

- I.5 among the principles of any physical thing are a pair of opposites
- I.6 among the principles of any physical thing is a third thing
- I.7 an analysis of becoming: if physical things have a form and are constituted by a underlying thing, we can accept the results both of I.5 and I.6
- I.8+9 this analysis explains the mistakes and the difficulties of the alternative theories

## II. What is explanation in the natural sciences?

- II.1 its objects are natural things, distinguished from artefacts: things that have a nature = a source of their behaviour in themselves
- II.2 natures can be form, but it can also be matter
- II.3+7 fourfold classification of causes / types of explanatory factor
- II.4-6 chance and luck can be fitted into this classification
- II.8 validity of teleological explanation (= explanation by form)

## Book I

I.1 When we want to know a thing, we are interested in a thing's "primary causes" (*archai*), its "principles" (*aitia*) and its "elements" (*stoicheia*). We should start with "what is clearer and more knowable to us" and proceed, by analysis, to "what is more knowable and clear by nature". This transition is from the compound to the elements and from the universal to the particular.

I.2 There are four possibilities:

1. There is just one primary cause (*arche*) and it does not change [Parmenides, Melissus].
2. There is just one primary cause and it does change ['physicists', *physikoi*].
3. There are a finite number of primary causes.
4. There are an infinite number of primary causes.

With (1), this one unchanging primary cause cannot be a quality or a quantity, but must be a thing (*ousia*); but then it cannot have any qualities and cannot have any parts.

I.3 Ad (1). If there is just one primary cause, nothing can be predicated of it, and it cannot even be said to be. This is absurd.

I.4 Ad (2). To explain the change in an underlying one, the physicists need notions of 'mixture' and of 'separation'. But these notions only apply to things that have parts, i.e. are complex. But if there is just one primary cause, it cannot have parts.

I.5 Ad (3). If primary causes are finite in number and are to explain change, we must assume that at least some of them come in pairs of opposites.

[Ad (4): why assume there is an infinite number if we can 'get by' with a finite number?]

I.6 If there were just two primary causes, they would have to be opposites. But "we never see opposites serving as the reality of anything, and yet a principle ought not to be something said of some underlying thing" / "we do not find that the contraries constitute the substance of any thing[; b]ut what is a first principle ought not to be the predicate of any subject": οὐθενὸς γὰρ ὀρώμεν τῶν ὄντων οὐσίαν τάναντία, τὴν δ' ἀρχὴν οὐ καθ' ὑποκειμένου δεῖ λέγεσθαι τινος (189a29-30).

I.7 Aristotle presents his own account: in one sense, there are two principles (form and matter), in another sense there are three (for the matter is "two in account", and the form is "one in account").

I.8 That the matter is "two in account" and that there is change between opposites, i.e. from what is not towards what is (e.g. from cold, which is a privation, to hot) explains how we must qualify "ex nihilo nihil fit": the lack of hot, out of which something becomes hot, is something which is not, but it is also not a constituent.

I.9 The Platonists rightly see that change is between opposites, but because they do not have an underlying thing, have to say that they 'yearn for their own destruction', i.e. have an inner dynamic principle.

## "Better known by nature"

That the aim of science is to uncover what is "more intelligible by nature" is first stated in the *Posterior Analytics* (*APo* 71b33–72a5). Whatever else it is, the epistemic characterisation serves as an adequacy criterion for *scientific* arguments: they not only have to be valid syllogisms, but their premisses have to be better known-by-nature than their conclusions. Science (*episteme*) is said to be characterised by this aim: it not only reports the facts but *explains* them by displaying their priority relations (*APo.* 78a22–28). The criterion also restricts the proper objects of science: Only what is necessary can be known, properly speaking: whatever is known without qualification cannot be otherwise (*APo.* 71b9–16).

This characterisation recurs at the beginning of the *Physics*:

And the path is by nature ( ἡ ὁδὸς . . . πέφυκε) from things more knowable ( γνωριμωτέρον) and clear to us to the things that are by nature ( φύσει) clearer and more knowable; for what is clear to us and what is clear without qualification are not the same. (184a16–18)

## Hylomorphic change

When presenting his own account of change in I.7, Aristotle first distinguishes between comings-to-be of simple things and coming-to-bes of complex things:

ἔστι γὰρ γίγνεσθαι ἄνθρωπον μουσικόν, ἔστι δὲ τὸ μὴ μουσικὸν γίγνεσθαι μουσικὸν ἢ τὸν (190a.) μὴ μουσικὸν ἄνθρωπον ἄνθρωπον μουσικόν. ἀπλοῦν μὲν οὖν λέγω τὸ γιγνόμενον τὸν ἄνθρωπον καὶ τὸ μὴ μουσικόν, καὶ ὃ γίγνεται ἀπλοῦν, τὸ μουσικόν· συγχείμενον δὲ καὶ ὃ γίγνεται καὶ τὸ γιγνόμενον, ὅταν τὸν μὴ μουσικὸν ἄνθρωπον φῶμεν γίγνεσθαι μουσικὸν ἄνθρωπον.

“We can say (1) ‘man becomes musical’, (2) what is ‘not-musical becomes musical’, or (3), the ‘not-musical man becomes a musical man’. Now what becomes in (1) and (2) – ‘man’ and ‘not musical’ – I call simple, and what each becomes – ‘musical’ – simple also. But when (3) we say the ‘not-musical man becomes a musical man’, both what becomes and what it becomes are complex.”

“A man can come to be knowing music, and also the not knowing music can come to be knowing music, or the not knowing music man a man knowing music. I call the man and the not knowing music simple coming-to-be things, and the knowing music a simple things which comes to be. When we say that the not knowing music man comes to be a knowing music man, both the coming-to-be thing and that which comes to be are compound.” (Charlton 1992: 15)

Changes of type (2) are changes out of something: musical comes out of non-musical, and the man becomes musical. So another simple change (of type (1)) does *not* happen. This underlying thing is ‘one in number’, but not ‘one in form’:

οὐ γὰρ ταῦτόν τὸ ἀνθρώπων καὶ τὸ ἀμουσῶ εἶναι. καὶ τὸ μὲν ὑπομένει, τὸ δ’ οὐχ ὑπομένει· τὸ μὲν μὴ ἀντικείμενον ὑπομένει (ὃ γὰρ ἄνθρωπος ὑπομένει), τὸ μὴ μουσικὸν δὲ καὶ τὸ ἀμουσον οὐχ ὑπομένει, οὐδὲ τὸ ἐξ ἀμφοῖν συγχείμενον, οἷον ὃ ἀμουσος ἄνθρωπος.

“For ‘to be man’ is not the same as ‘to be unmusical’. One part survives, the other does not: what is not an opposite survives (for ‘man’ survives), but ‘not-musical’ or ‘unmusical’ does not survive, nor does the compound of the two, namely ‘unmusical man’.”

“The being of a man is not the same as the being of ignorant of music[; a]nd the one remains and the other does not. That which is not opposed remains – the man remains – but the not knowing music and the ignorant of music do not remain, and neither does the compound of the two, the ignorant of music man.” (Charlton 1992: 16)

In any change, there is something composite that comes to be:

ὥστε δῆλον ἐκ τῶν εἰρημένων ὅτι τὸ γιγνόμενον ἅπαν ἀεὶ συνθετόν ἐστι, καὶ ἔστι μὲν τι γιγνόμενον, ἔστι δὲ τι ὃ τοῦτο γίγνεται, καὶ τοῦτο διττόν· ἢ γὰρ τὸ ὑποκείμενον ἢ τὸ ἀντικείμενον.

Thus, clearly, from what has been said, whatever comes to be is always complex. There is, on the one hand, (a) something which comes into existence, and again (b) something which becomes that—the latter (b) in two senses, either the subject or the opposite.

“From what has been said, then, it is clear that that which comes to be is always composite, and there is one thing which comes to be, and another which comes to be this, and the latter is twofold: either the underlying thing, or the thing which is opposed.” (Charlton 1992: 16)

## Matter as the subjectum / hupokeimenon of change

Shields 2015 reads I.7-8 as an “argument for matter and form”:

Encapsulating Aristotle’s discussions of change in Physics i 7 and 8, and putting the matter more crisply than he himself does, we have the following simple argument for matter and form: (1) a necessary condition of there being change is the existence of matter and form; (2) there is change; hence (3) there are matter and form. The second premise is a phainomenon; so, if that is accepted without further defense, only the first requires justification. The first premise is justified by the thought that since there is no generation ex nihilo, in every instance of change something persists while something else is gained or lost. In substantial generation or destruction, a substantial form is gained or lost; in mere accidental change, the form gained or lost is itself accidental. Since these two ways of changing exhaust the kinds of change there are, in every instance of change there are two factors present. These are matter and form.

How do we argue in favour of (making) a distinction? By making it and showing the benefits of doing so; these benefits are cashed out in terms of explanation: it has to be shown that the explanation of some phenomenon,  $p$ , is better, other things being equal, if it is given in two parts, i.e. with respect to  $p$ -under-the-aspect- $F$  and to  $p$ -under-the-aspect- $G$ . For this to work, there must be such things as ‘ $p$ -under-the-aspect- $F$ ’, and the two must be different. That they are, i.e. that the distinction is not empty, is something *presupposed*, not *shown* by such an explanation.<sup>2</sup>

Even granting that this is an ‘argument for’ the distinction, the problem with it is that the crucial premiss – that there is no generation ex nihilo – requires an analysis of substantial change (the coming or ceasing to be of substances, i.e., in Aristotelian terminology, of generation and corruption) that seems to presuppose the matter/form distinction. Within the broader category of change,  $GC$  distinguishes alteration and other types of non-substantial change from generation in terms of what underlies:

Since there is something which underlies, and the affection whose nature is to be predicated of this is something else, and since either of these can change, it is alteration when the underlying thing remains, being perceptible, but changes in its affections (whether they are opposites or intermediate) ... But when the thing changes as a whole, without anything perceptible remaining as the same underlying thing (for example, when the seed as a whole becomes blood, or water air, or air water), a case of that sort is generation. (319b8–18)

When the change of opposites is in quantity, we have increase or decrease; when it is in place, we have locomotion; when it is in an affection and a quality, we have alteration. But when nothing remains of which the other is an affection, or any kind of accident, then we have generation or destruction. (319b32–320a2)

A substance  $x$  comes into being not from nothing, but from another substance  $y$ . But to distinguish generation from non-substantial change,  $x$  has to be *new*, i.e.  $x$  and  $y$  have to be different, which is expressed as there being nothing *perceptible* remaining (first quote) or there being nothing *at all* remaining (second quote). The thing which does not remain (or at least is not seen to remain), but underlies, is matter.

## There cannot be genesis ex nihilo

According to Bostock (1995: 6), in 190a31–b10 “Aristotle is arguing that any case of coming to be is a case of coming to be *from* something, so that there is always something that forms the starting point of the change”, and any case of coming to be is a case of becoming:

...considering now the mere concept of becoming we may argue that if one thing is properly said to become another then obviously there must be something which does not persist throughout the change, for otherwise there would be no change; but equally there must be something which does persist throughout the change, for otherwise the change would merely consist in one thing coming to be where another had ceased to be, and there would be no reason to say that the one *became* the other. (1995: 6)

Again, what there is ‘reason to say’ depends very much on the example: it is perfectly appropriate, e.g., to say that when there was light, the world became illuminated, but it is much less clear that ‘the world’ is the kind of thing that underlies, that the coming-to-be of light was a change in something (air, presumably). That it is is a substantial claim about light, not something to be read off the grammar of the description.

## Generation from opposites

It is a curious fact that when reviewing the theories of his predecessors in fundamental physics, Aristotle is more interested in the *number* of principles they ‘used’ to ‘generate’ things than in their *nature*. He criticises the Eleatics, who ‘use’ just one (chapters I.2 and I.4) and Anaxagoras, who ‘used’ infinitely many (I.4), concludes (I.5) that the one thing they got right is to use opposites (*enantia*) and argues that one pair of opposites will suffice (I.6). But which one? As Bostock (1995: 3–4) notes, Aristotle shows no interest in the question, but rather offers, in I.7, a *typology* of opposites, in terms of “form” (*eidōs*) and “privation” (*sterēsis*), which must be ‘added’ to the underlying thing (*hupokeimenon*) to account for change. While form and privation are not, in general, opposites,<sup>3</sup> they need to be predicated of some subject which, according to the *Categories* must always (ultimately) be a substance.

Talk of the *hupokeimenon* of change thus plays a double role: it may designate that of which we say that it changed, the logical subject of change, always a substance; and also that within which the change takes place, which typically is not a substance but matter, *hulē*.

2. Perhaps an example helps. We are all familiar with the talk of ‘motives’ or of actions being ‘motivated’, done ‘on purpose’ or ‘intentionally’. Suppose we want to explain what motives are, what it is for an action to be done ‘for the sake of something’. At this point, many philosophers will want to distinguish between reasons and causes. Whether or not this is helpful then of course depends on whether there is such a distinction and whether both reasons and causes, at least potentially, fall within the remit of “motive”.

3. Quantitative properties and their relative lacks are (e.g. hot and cold), but properties in the category of substance are not (e.g. a tree, a house, a statue, vinegar), because substances have no opposites (cf. e.g. *Cat.* 3b24–32).

## Book II.1-3

A central conclusion of the whole of the *Physics* is that nature, *phusis*, itself is a final cause. “Nature” is used in two ways: as a subject of predication – nature is an internal source of movement and rest – and as a predicate, “...is natural” or “...has a nature”: nature (in the first sense) is, according to some, the matter (and, according to others and Aristotle himself, the form) of things that have natures, i.e. things that are substances.

II.1 Nature is a principle of change in things in which it inheres (a) primarily (not in virtue of inhering in something else) and (b) per se, i.e. not per accidens (192b21–23). Both conditions distinguish natural things from product of craft: (a) artefacts, such as a bed or a coat, have inner principles of change, but only indirectly so, because their matter has them; (b) while healing of the doctor by herself also has an ‘inner’ principle, this is only accidentally so. Artefacts and natural beings are contrasted in terms of the efficient cause involved in their production: “None of them [that is, artefacts] has in itself the principle of its own production” (192a27–28).

Can we then conclude that a thing is natural iff it has an inner principle of change? Yes, if we understand “principle” in a broader sense than “efficient cause”: while natural things may rely and depend on things external to them for exercising their natural capacities (as e.g. nutrition, perception, locomotion), the change is still appropriately ‘internal’ to them (and not to its external efficient cause) if the ‘good of’ the change (its *telos*) is internal to them.<sup>4</sup>

This is so even in substantial changes, i.e. where an animal or a plant ‘brings forth’ / produces an animal or a plant of the same kind. In such cases, “the nature of an entity is the element common between it and what generated it” (Stavrianeas 2015: 58) and is transmitted – this last feature is what distinguishes natural generation from the generation of artefacts, where the form is typically changed (medicine, e.g., brings about health, not medicine): Even though its efficient cause is the form of the parent, the coming-to-be of the child still has a principle that is ‘in it’, because it shares its form with the parent.

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4. Because the *telos* is not necessarily realised (and may even always fail to be realised), this must be modified: the principle of change is internal (at best) insofar as its *telos* *would* be realised in the thing changing, even if the efficient cause of the change is external. Two further modifications are then still necessary, as Stavrianeas (2015: 57–58) points out: Because not all change is even potentially good for the changing thing, its principle is internal at most in the sense that the change is constrained by the changing thing’s “formal nature”. Also, the effect produced in the changing thing must stand in a per se, i.e. non-accidental relation to the change.