

Nature, Change and Agency in Aristotle's *Physics*

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Doctorate of Philosophy

UNIVERSITY OF EDINBURGH

1978

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My thanks are due to Mr. A.H. Coxon of the Ancient Philosophy
Department, University of Edinburgh, for supervising this thesis.

C O N T E N T S

	Page
Abstract of Contents	(i)
CHAPTER I Nature as Inner Principle of Change	1
Appendix to Chapter I	61
CHAPTER II What Things Have Natures?	63
CHAPTER III The Definition of Change	119
CHAPTER IV Agent and Patient	191
CHAPTER V Self-Change and the Eternal Cause	248
Appendix to Chapter V	320
Bibliography	325

Abstract of Contents

(The bracketed numerals refer to paragraphs within each chapter.)

Chapter I. Nature as Inner Principle of Change

The concept of "nature as inner principle of change" is fundamental to Aristotle's theory of the physical world; it is the object of the present thesis to substantiate this claim by tracing the effects of this idea in Aristotle's rejection of materialism, in his doctrine of "natural places", in his definition of change and process in general, and (*via* the latter) in his notion of agency in general and the supreme Unmoved Mover in particular ((1)). Aristotle elucidates "natural" by contrast with "artificial" ((2) - (3)), holding that natural substances not merely collectively ((4) - (5)) but as individuals each possess an 'innate impulse of change'. But this must be explained so as to allow for the fact that no change is entirely independent of external conditions ((6) - (7)). If, however, change were totally dependent on external conditions, its occurrence would be inexplicable ((8) - (9)), and the very concept of "change" would be incoherent. This latter conclusion emerges from an examination of the ancient paradox of becoming and Aristotle's treatment of it ((10) - (33)). The paradox is expounded ((11) - (14)). Aristotle answers it by showing that language assumes a continuing subject of change ((15) - (21)). But this assumption meets the problem only if the metaphysical category of substance is also assumed, and along with it some distinction between substance-constitutive and non-substance-constitutive characteristics ((22) - (27)). The former mark off their subject as a thing of a certain causal type; thus change, in presupposing a substantial subject (see also Appendix to Chapter 1), presupposes one that makes some causal contribution to its own changes ((28) - (33)). But Aristotle means more than this by 'nature as inner principle'. He holds a natural substance to be (like a craftsman) the autonomous determinant of certain changes; these therefore (by contrast with changes not so determined) are "natural", as manifesting the substantial nature ((34) - (36)). This problematic notion is taken for granted by Aristotle in the *Physics* ((37) - (39)), but can be seen to rest on his metaphysics of substance. It is a consequence of this that the natural change of a given substance be of one kind and display a

unitary pattern reflecting the unity of the substance ((40)). This view cripples scientific method as we understand it ((41)), but Aristotle's idea of substance anyway cuts him off from the approaches successfully operated in later mechanics and chemistry ((42) - (45)). A summary of the ground so far covered ((46)) introduces a further sense in which Aristotle's natures are "inner" principles of change: the subject of change is not (as in artifice) external to the being which is the source of change ((47) - (54)).

Chapter II. What Things Have Natures?

Aristotle begins *Physics* II 1 with a list of organic and inorganic things 'manifestly' possessing "natures" in the sense explained. But our explanation has left open the question of the extension of this concept, and supplies as yet no theoretical justification for his choice of items on the list ((1)). Aristotle's inclusion of complex objects such as organisms raises a problem. Whatever has a "nature" is a substance, and a substance is a *per se* unity; but how can something complex and composed (as are organisms) of simpler substances be such a unity ((2) - (7))? Aristotle is entitled to count organic creatures as substances (and for him they are so *par excellence*) only if, as against the "materialists", he can show them to be more than mere arrangements of components ((8) - (9)). In *Physics* II 1 he presents (without distinguishing) two materialist positions: one (i) identifies an object's "nature" with its proximate matter; the other (ii) asserts the simple bodies to be 'the whole of substance' ((10) - (11)). In II 1 he argues against (i) alone, with varying success ((12) - (20)). But it is (ii) that poses the graver threat to his view of organisms as *per se* unities ((21)). This view, which Aristotle at no point abandons, connects closely with his doctrine of necessity and his teleology ((22) - (25)). But has it any firmer ground than a presumed analogy between nature and artifice ((26) - (27))? Aristotle's reasoned defence comes in *Physics* II 8, where he argues against Empedocles' version of the second materialist position as applied to organic structure and development ((28)). Aristotle's argument has apparent flaws ((29) - (33)), but is effective in the context of the view that the simple bodies are substances that express their natures through locomotion in diverse directions ((34) - (41)). On this premiss, neither mechanical ((35) - (36)) nor chemical

((37) - (39)) combination could account for organic phenomena. Hence Aristotle has a rational basis (a) for regarding organisms as *per se* unities endowed with substantial "natures", and (b) for his teleology ((41)). Despite their close connection, (a) and (b) are not to be equated ((42)). Aristotle's theory of organic substance is (*pace* A. Gotthelf) fundamentally metaphysical ((43)).

Chapter III. The Definition of Change

In *Physics* III 1 ff. Aristotle undertakes to elucidate 'change' ('μεταβολή') and 'process' ('κίνησις'). Although the terms are not synonymous he treats them here as interchangeable, *i.e.* as if all change were process. This tacit restriction of the meaning of 'change' is due (it is argued in this chapter) to his preoccupation with "natural" change, although "nature" (as he himself makes clear) is only one type of source of change ((1) - (3)). Under the general concept "change" we may distinguish (a) that of the "emergence" of some new property and (b) that of "process", which includes conditions leading up to an "emergence" ((4)). The concept here sketched of "process" leaves open the question of mathematical continuity; it also allows a subject to be regarded as 'in process' on account of imminent causal activity in some other subject. This entails that there is no contradiction in predicating (as Aristotle occasionally does) the term 'process' of a subject which passes all at once from an old to a new state ((5) - (6)). Many phenomena can be described either as emergences or as processes, although locomotion has to be regarded as process ((7)). But in *Physics* III Aristotle assumes that all change-phenomena are to be approached *via* the concept of "process". This is because he cannot otherwise preserve the metaphysical connection between "change" and "natural substance" ((8) - (9)). This is easily shown for organisms ((10) - (11)). The simple inanimate bodies can be accommodated to his scheme by supposing an absolute difference between "upwards" and "downwards" (*i.e.* the doctrine of "natural places") ((12) - (14)). Change, on this view, is necessarily directed to a *terminus*; thus it may be regarded as "incomplete", which for Aristotle is what fundamentally distinguishes it from conditions of non-change ((15)). This "self-terminating" character of Aristotelian change is what makes it especially puzzling, more so than Plato's "becoming" ((16) - (17)). We now consider in detail the account of

III 1 ((18) ff.) Since change or κίνησις expresses substance, it too must be real and actual; hence not only must every characteristic changed from and to fall into some definite category, but so must change itself. Aristotle puts it into the category of "Relation" for want of a better, thereby committing himself to the view that all change involves an agent-patient relationship ((19) - (20)). Although obscure, the formal definition of κίνησις in III 1 is not circular; this is clear once its reference to 'potentiality' is correctly interpreted ((21) - (24)). It permits adequate distinctions between actual change, the actual subject, and the actual condition in which a change terminates ((25) - (26)). It entails a fundamental type-difference between change and non-change ((27) - (28)), and shows why earlier thinkers were so mystified by this topic ((29)). Aristotle's own doctrine of substance and the Categories turns out to depend on his conception of change as self-terminating ((30) - (32)). The III 1 definition can be interpreted in two ways; according to one of these the subject need not undergo perceptible transition ((33) - (35)). But this definition covers only natural and purposed change or κίνησις ((36) - (38)). However, in *Physics* VI Aristotle attempts another account (not that he ever appears to renounce that of *Physics* III); the metaphysics of nature and substance is now in abeyance and the central concept is the inclusion, by any one change, of infinitely many temporally (and in some cases spatially) smaller changes ((39) - (42)). Change is now distinguished from non-change in a way requiring the former to be temporally intermediate between its *termini* (which was not necessary on the account of Book III) ((43)). But qualitative change is made to fit this scheme only by a bad argument, whose force Aristotle himself refuses to acknowledge in another context ((44) - (50)). Still worse problems are generated by his continuing assumption that change is directed to a *terminus* ((51) - (52)). The attempt to combine this with the analysis in terms of mathematical continuity produces paradoxes ((53) - (55)), as Aristotle realised when he came to work out the cosmology of *Physics* VIII. Thus in VIII 8 he argues against the Book VI view that a change consists of infinitely many shorter changes, and there he also abandons the associated view that change necessarily occupies a period of time between its *termini* ((56) - (59)).

Chapter IV. Agent and Patient

In the *Physics* the notion of "agent"/"patient" (κλυοῦν/κλυοῦμενον, "changer"/"changed") is more closely linked than any other to the concept of change. In III 3 Aristotle reformulates his definition of the latter in terms of agent and patient. His grounds are obscure, like much else in his treatment of agency ((1) - (3)). But clearly he holds that (i) for every change (κίνησις) there is a changer (κλυοῦν); (ii) the changer is distinct from the changed (or subject of change); (iii) to act as a changer is not to change (intransitive) ((4)). The first position may have seemed plausible because 'κλυεῖν' has to be put in the grammatical passive to express intransitive change. Thus rules of grammar prescribe that for every κίνησις there is a κλυοῦμενον; but this alone does not validate an inference from 'κίνησις' to 'κλυοῦν' ((5) - (6)). In III, Aristotle identifies the "changer" as that which confers the form typifying the change. But in natural change the substance whose nature dictates the form is also the subject of change. Aristotle can only preserve position (ii) above while continuing to hold (i) universally by shifting the meaning of 'changer' so that it no longer implies 'that which confers the form'. This he does in VIII 4, where the "changers" responsible for the natural motions of the simple bodies are now identified with the generators of those substances and with whatever releases them from hindrance ((6) - (11)). Here Aristotle shows that he takes κίνησις as such to be a form of "suffering", not on account of its dependence on external circumstances (this holds too for non-passive conditions) but simply because it is κίνησις ((12)). After a summary of the positions that have so far emerged ((13)), we consider the difference between "real" and relational change. This may seem to support Aristotle's principle that all change has an agent, for "real" change must be referred to a cause standing in a particular relation to the subject ((14) - (17)). But the same is true of "real" (as opposed to relational) non-change properties ((18)). Attention now shifts to Aristotle's position (iii) above, and centres on paradigmatic agent-patient cases where one distinct individual substance acts upon another ((19)). In considering these we have to bear in mind the question (inevitable since Hume) whether the language of 'agent'/'patient' ought not to be altogether discarded, as misleadingly suggesting some occult process of "acting upon" ((20) - (21)).

Meanwhile we follow Aristotle's argument for (iii) in *Physics* III 3, where he principally relies on the insight that in any given case agency and patiency are one concrete event ((22) - (25)). This argument falls short of demonstrating (iii) ((26)), but the latter proposition can be further supported by means of the ἐνέργεια/κίνησις distinction of *Metaphysics* θ 6. From one point of view the exercise of transitive agency is ἐνέργεια as opposed to κίνησις ((27) - (33)). Is it some occult "extra" transaction ((34))? Aristotle's treatment of cases such as heating shows this idea to be as alien to him as to Hume, although for Aristotle, unlike Hume, this implies no paradox ((35) - (36)). But not all cases are so simple, and transitive agency sometimes involves changes in the agent ((37) - (39)). But these are not distinct and conceptually self-sufficient; they are "parts" of one change, whose subject is the patient ((40) - (42)). The upshot is that although for Aristotle agency is no kind of extra occult transaction, the language of agency performs an indispensable function ((43)). However, problems about the status of agency disappear on one interpretation of Aristotle's insight that acting and being acted upon are the same concrete event. Theoretically this could be taken to imply that there is no actual agent and patient. But this view (which goes beyond any of Aristotle's) allows no purchase for the notion of executing an intention ((44) - (46)).

Chapter V. Self-Change and the Eternal Cause

The notion of something's changing (transitive) itself is baffling but vital to the cosmology of *Physics* VIII ((1)). "Self-change" is a species of "natural change", applying (in the sublunary world) only to organisms ((2) - (3)). It is not independent of external conditions; its special feature is a logically complex subject comprising a distinct agent and patient ((4) - (5)). In this Aristotle's concept of "self-change" differs from Plato's ((6)). But does Aristotle's make sense? He offers no explicit justification and ignores the metaphysical problems ((7) - (9)). He lists the criteria for "self-change", apparently identifying the agent-element with soul, the patient with body ((10)). But what is the point of introducing the concept anyway ((11))? Sometimes a live creature as an organic whole acts contrariwise to the natural tendency of some physical part: 'self-change' is an appropriate term for this situation, but Aristotle,

puzzlingly, also applies it even when no subordinate tendency is overridden ((12) - (13)). His failure in *Physics* VII to discuss the difficulties of "self-change" is due (it is suggested) to the fact that he employs it only as a step in a wider discussion, now to be examined, concerning the eternity of change ((14)). Is change eternal? On this depends the validity of the concept of natural substance developed in Book II ((15) - (17)). In considering objections to his own affirmative answer ((18) - (19)), Aristotle acknowledges a difficulty in reconciling it with the fact that some changes begin and cease ((20) - (21)). For the eternity of change presupposes an absolutely changeless cause, whose effect must resemble it in endlessness ((22) - (23)). Temporally finite changes cannot therefore be immediate effects of the ultimate changeless cause. Hence Aristotle postulates an intermediary consisting in an eternal change, which is suitable (because eternal) to be the effect of the changeless, and (because a change) to be the cause of transient change. The eternal change has an eternal body for its subject. Thus for Aristotle, (a) the fact of temporally finite change, and (b) the doctrine that change as such is eternal, jointly entail that there exists something absolutely changeless and something else always changing ((24)). The weakness of this position lies not (*pace* F. Solmsen) in any clash between the doctrine of an ultimate cause and the concept of nature as inner principle of change ((25) - (26)); but rather in the absence of proof that the subject of eternal change might not itself be the change's ultimate source ((27) - (28)). But cover for this logical gap is tacitly provided by the concept of "self-change", introduced to uphold a distinction between subject and agent of eternal change ((29); see also Appendix to Chapter V). However Aristotle fails to prove this concept applicable in the eternal realm ((30) - (33)). "Self-change" can be explained so as to make sense in connection with sublunary organisms, but in ways that do not touch the eternal case ((34) - (37)). Nonetheless, Aristotle tries to demonstrate a universally applicable distinction between agent and patient in self-change by means of the Law of Non-Contradiction; this involves modelling "change" on "acquiring", a move which lends colour to the charge that he indulges in "occult causes" ((38) - (41)). Why need he separate the ultimate source from the subject of eternal change. The reasons are not only theological ((42)), but also derive from the concept of

change and κίνησις as "incomplete actuality". His only ground (it is argued) for regarding eternal change as "incomplete" is its passive status, *i.e.* its dependence on an agent distinct from the subject. Thus in maintaining this distinctness in *Physics* VIII, Aristotle ensures conformity of eternal change to the *Physics* III definition of κίνησις ((43) - (51)).

CHAPTER I

Nature as Inner Principle of Change

- (1) 'The physical doctrines of Aristotle are a disappointing chapter in the history of science ... The science of the Renaissance period was obliged to shake off the fetters of Aristotle's authority before it could return to the paths of fruitful and progressive research.'

These remarks of Theodor Gomperz¹ voice a common verdict on Aristotle's philosophy of nature. It is not my purpose here to endorse this verdict, nor to challenge it, but to show how the characteristically Aristotelian doctrines on which it has been passed stem from one fundamental idea. This is the conception of a natural substance as characterised above all by an "inner principle of change and stasis". This notion of "the nature of a thing" links Aristotle's metaphysics of substance to his physical system, and it determines almost every one of that system's distinctive doctrines. It will be the object of the present work to support and illustrate this claim in detail. It will be shown, for instance, how Aristotle's concept of natural substance issues in a theory of living things as irreducibly organic unities, and hence in the rejection of materialism in favour of teleology. The same concept will be seen to generate his doctrine of the simple bodies' "natural movements" and "natural places". Not only Aristotle's cosmology but his chemistry too can be traced back to this principle, and on a more general level it shapes his entire conception of change and process. This in turn dictates Aristotle's denial of change to agents of change; and from the same source, finally, come the culminating doctrines of eternal motion and an eternal unmoved mover.

1. *The Greek Thinkers*, vol. IV, p. 108.

'The least initial deviation from the truth is multiplied later a thousandfold ... The reason is that a principle is great in power rather than extent; hence that which was small at the start turns out a giant at the end.' (*De Caelo* I 5, 271b8ff.)

The words with which Aristotle prefaces his own attack on the notion of infinite body could be aptly quoted back at him by critics such as Gomperz, with reference, this time, to the Aristotelian concept of natural substance. But whether or not that concept is an 'initial deviation from the truth', I hope here to show that for good or ill in Aristotle's system it 'turns out a giant at the end'.

(2) Let us then turn to the passage where Aristotle introduces this concept, at the beginning of *Physics* II 1:

'Of things that exist, some exist by nature and some through other causes. By nature there exist animals and their parts and plants and the simple bodies such as earth, fire, air and water. For these and similar things we say exist by nature. All these things manifestly differ from those not constituted by nature. For each of them has within itself a principle of change and stasis, some in respect of place, some in respect of growth and decline, some in respect of alteration. But a bed and a cloak and any similar kind of thing, so far as such a description holds of it, and to the extent that it exists through artifice, possesses no innate impulse of change. But so far as they happen to be made of stone or earth or mixtures of these, they possess such an impulse, and just to that extent. This suggests that nature is a principle and cause of change and stasis in the thing in which it primarily subsists, being in this thing of itself and not *per accidens*.' (192b8 - 23)

Now, apart from "nature", Aristotle recognises two other types of "cause": artifice, and "the spontaneous" (or coincidence).² The latter, which we might well hesitate to count as a cause at all (for

2. On this triple division of causes and its Platonic antecedents, see A. Mansion, *Introduction à la Physique Aristotélicienne* pp. 94 - 97.

reasons of which Aristotle was aware), receives no attention in this opening passage. The reason is simple: whether or not "the spontaneous" is rightly called a "cause", it is a secondary concept, defined in terms of the concurrence of causally independent factors, which factors have their causes either in human intention or in the nature of a natural substance. Assuming that in the present passage Aristotle is loosely using 'artifice' to cover all the cases in which a new state of affairs comes about as the intended result of human intervention in the natural course of events, we can say that he is here making an exhaustive dichotomy of the primary types of cause. However, the products of "artifice" in this wide sense that here most focus his attention, are artifacts in the ordinary sense, *i.e.* objects produced by skill. Although skill produces not only physical objects, such as beds and clothes, but conditions, such as the health of a sick person or the domestication of an animal, and activities such as dancing, Aristotle here fastens on artificial objects as providing him with the contrast he needs in order to explain his concept of "nature".

(3) That the products of "nature" and "artifice" form mutually exclusive classes, is a datum of common sense which Aristotle does not question. He does not for instance speculate here on possible reasons for regarding natural beings as the artifacts of some supernatural agent like Plato's Demiurgus. This accords with Aristotle's general insistence, evident in the *Physics* as elsewhere, that every type of enquiry be conducted in terms of concepts and methods appropriate to its subject matter, and confine itself to the questions that fall within its scope. Even if nature could be looked upon as an

artifact or system of artifacts (which Aristotle has good reason to hold that it cannot)³, such a point of view would lie outside the province of natural science. For the super-artificer himself, his purpose, and the "materials" he may be supposed to have used, are all, *ex hypothesi*, factors outwith the world of nature. It is not therefore to be expected that either the scientist or the philosopher seeking to clarify the concepts essential to science, should do otherwise than take it for granted that water and earth, animals and plants, are not artifacts; it not being their business to question this on theological grounds, any more than it is their business to discuss the Eleatic Theory 'that Being is one and motionless' (*Physics* I 2, 184b26 - 185a3).

(4) Leaving aside, then, the metaphysical possibility that human artificers are themselves (divine) artifacts and therefore similar or at least analogous to the artifacts which they themselves construct, we can say that the artifacts of ordinary experience differ radically from natural objects as regards both their causes and their power to cause other things. For artifacts are made by the skill of beings not artifacts like themselves, whereas natural beings come into existence only from other natural beings. Artifacts moreover are not in turn artificers, and nor do they need to be for further artifacts to be produced, whereas natural beings generated by other natural beings must in turn possess the power to generate others, since apart from natural beings themselves there is no source from which further

3. Cf. *Metaphysics* A 9, 991a20 - 23. Also *v.i.* Chapter II, paragraphs (4) and (27), and footnote 22.

natural beings could continue to come into existence. And if the production of natural beings depends not on the activity of an agent or agents outside the order of nature, but only on other natural beings, the same must be true of the changes necessarily involved in production. A new substance comes into existence through processes of change in substances already existing, and unless these changes can be accounted for from within the world of nature, the new substance itself cannot be so accounted for either. Thus the world of nature, unlike the "world" of artifacts, is self-contained as regards production and the changes necessary for production.

(5) It is plain then that natural substances collectively speaking contain within themselves a principle or principles of change. This follows from the self-sufficiency of the natural order to keep and have kept itself going. The concept of principles that are "inner" in this collective sense is quite uncontroversial, at least for any believer in the very possibility of science, *i.e.* in the possibility of explaining (in some sense of 'explain') natural phenomena in terms of natural phenomena. However, Aristotle's inner principles are also supposed by him to be "inner" in the stronger and by no means so obviously acceptable sense of "intrinsic to each individual substance". The notion of the self-sufficiency of nature as a whole appears to be quite compatible with the view that any change in any object results from the action of external factors happening to stand to that object in the appropriate spatial and temporal relations. On this view, the cause of change, in any given case, is as much external to the object changed as the artificer to the artifact. It is precisely this that Aristotle is denying when he speaks of an 'innate impulse' (ὄρμη)