D 85459 / 89

Please use block capitals.

Surname	JUDSON
First names (in full)	RICHARD LINDSAY
Faculty board	LITERAE HUMANIORES
Title of thesis	ARISTOTLE ON NECESSITY, CHANCE AND EXPLANATION

N.B. The title stated here must be precisely the same as that stated on the title page of the thesis submitted.

A candidate wishing to amend the title previously approved by the faculty board must apply to the faculty board for permission to do so.

Declaration by the candidate as author of the thesis.

1. I understand that I am the owner of the copyright of this thesis and that the copyright rests with me unless I specifically transfer it to another person.
2. I understand that the University requires that if I am granted leave to supplicate I shall deposit one copy of my thesis in the Bodleian Library where it shall be available for consultation and that photocopies of it may be made available to those who wish to consult it elsewhere. I understand that the Library, before allowing the thesis to be consulted either in the original or in a photocopy, will require each person wishing to consult it to sign a declaration that he recognises that the copyright of the thesis belongs to me and that no quotation from it and no information derived from it may be published without my prior written consent.
3. I agree that my thesis shall be available for consultation in accordance with paragraph 2 above.

Signed RLDson *Date* June 5, 1986

MS. Bodl. c. 6789

Notes

(a) If, for good reason, you do not wish your thesis or part of it to be made available for consultation or to be photocopied, you may apply to the relevant faculty board for dispensation from this requirement. Any such application should state, with full reasons, both the nature and the period of the dispensation requested, and should be sent with this form to the Graduate Studies Office. *If you are applying for dispensation, please tick this box:* ☐

(i) Dispensation for a period will always be granted in cases where confidentiality has been made a condition of access to material which is subsequently incorporated in a thesis.

(ii) Where confidential material forms only a small part of a thesis and the force of the thesis will not be seriously impaired by the removal of such material, the faculty board may grant permission for the confidential material to be deposited separately from the thesis, on the understanding that the thesis will be available for consultation or photocopying but access to the confidential material will be restricted.

(b) You may discover the names of persons who have consulted your thesis by writing to the Keeper of Western Manuscripts at the Bodleian Library requesting this information.

(c) You are requested to sign the declaration above even if you are applying for dispensation from the consultation requirement. If dispensation is granted, your thesis will *not* be made available for consultation or photocopying before the expiry of the dispensation period.

Do not forget to sign under Section 5 opposite.

S024 88281

ARISTOTLE ON NECESSITY, CHANCE AND EXPLANATION

R. L. Judson, Christ Church

Submitted for the Degree of Doctor of Philosophy, Trinity Term, 1986.

Abstract

Aristotle endorses a very striking doctrine connecting necessity with what seems to be a non-modal notion -- that of 'being or happening always'. He also forges a connection between the idea of 'happening by chance' and 'happening neither always nor for the most part'. These two connections form the subject of this essay. My guiding aim is to provide an account of what the 'always/necessary' doctrine involves and of why Aristotle might have held it. Reflection on the nature of the connection between 'by chance' and 'neither always nor for the most part' throws light on what Aristotle means by 'happening always', and, in consequence, on the nature of the link between 'always' and 'necessary'; it also suggests that the basis of this link is to be found in Aristotle's general conception of the natural world as the object of explanation and knowledge.

The primary texts upon which discussion of these connections must focus are De Caelo I. 12 and the analysis of chance in Physics II. 4-6. I discuss these two texts in turn, after a opening chapter which surveys the evidence for Aristotle's acceptance of the 'always/necessary' doctrine and considers the nature of the restrictions which he places on it. Chapter 2 comprises a translation of and commentary on Cael. I. 12, together with a translation and discussion of its companion chapter, I. 10. In Chapter 3, I examine the nature of Aristotle's argument in I. 12, and criticise various interpretations which see it as evidence that Aristotle's 'always/necessary' doctrine rests on a distinctive conception of possibility. The translation of and commentary on Phys. II. 4-6 (Chapter 4) are followed in Chapter 5 by a discussion of issues relating to the association of chance with 'neither always nor for the most part'. The final chapter returns to the question of the connection between 'always' and 'of necessity'.

ARISTOTLE ON NECESSITY, CHANCE AND EXPLANATION

BODLEIAN LIBRARY OXFORD
DEPOSITED
THESIS
10-XII-87.

Lindsay Judson

Christ Church, Oxford

[MT 1986]

PREFACE

Aristotle endorses a very striking doctrine connecting necessity with what seems to be a non-modal notion -- that of 'being or happening always'. He says little about this doctrine directly, and nothing (I shall argue) to explain or justify it; yet it pervades his writings in a way which makes it hard to dismiss as a mere eccentricity. He also forges a connection between the idea of 'happening by chance' and 'happening neither always nor for the most part'. These two connections form the subject of this essay. My guiding aim is to provide an account of what the 'always/necessary' doctrine involves and of why Aristotle might have held it. Reflection on the nature of the connection between 'by chance' and 'neither always nor for the most part' throws light on what Aristotle means by 'happening always', and, in consequence, on the nature of the link between 'always' and 'necessary'; it also suggests that the basis of this link is to be found in Aristotle's general conception of the natural world as the object of explanation and knowledge.

The primary texts upon which discussion of these connections must focus are De Caelo I. 12 and Physics II. 4-6. These texts pose many problems, are full of interest in their own right (I would claim), and have been relatively neglected; in consequence, I shall devote a large part of this essay to commenting on them. My treatment of each text is divided into two parts: a commentary and a discussion of more general issues relating to 'always/necessary' or to 'by chance/neither always

nor for the most part'. The final chapter returns to the question of the connection between being or happening always and being or happening of necessity.

The Greek texts of Aristotle cited in this essay without further reference are the Oxford Classical Texts, except for: Topics I-IV (Brunschwig); De Generatione et Corruptione (Joachim); Meteorologica (Fobes); Historia Animalium (Dittmeyer); De Partibus Animalium (Peck); De Motu Animalium (Nussbaum); Eudemian Ethics (Susemihl); Rhetoric (Kassel). Translations are my own, except where noted.

Much of the material in chapters 1 and 3 derives from a paper read to the Southern Association for Ancient Philosophy in New Hall, Cambridge, in 1982, and from my article 'Necessity and eternity in De Caelo I. 12' in Oxford Studies in Ancient Philosophy I (1983). I am grateful to all the participants in the discussion in Cambridge, and to Julia Annas for suggesting that I write the article. Simon Blackburn, David Bostock, Cynthia Freeland, Edward Hussey, Christopher Kirwan, Malcolm Schofield and Richard Sorabji offered helpful comments and criticisms on a number of issues. For their help with the preparation of the typescript I should like to thank Jane Hardie, Rissa de la Paz, Graham Shipley and, especially, Jenny Tyler. I should also like to thank the Governing Body of Christ Church for providing me with ideal conditions in which to complete this work. By far my greatest debt is to John Ackrill, for his patience and encouragement, and for the searching criticisms and invaluable advice which he has given throughout the writing of this essay.

CONTENTS

Preface

Abbreviations

Chapter 1: 'Always' and 'necessary' 1

Chapter 2: De Caelo I. 12: translation and commentary 19

Chapter 3: De Caelo I. 12: discussion 81

Appendix to Chapter 3: The 'Principle of Plenitude' 134

Chapter 4: Physics II. 4-6: translation and commentary 157

Chapter 5: Rarity, chance and causation 252

Chapter 6: 'Always' and 'necessary' again 304

Bibliography 339

ABBREVIATIONS USED

Categories	Cat.
De Interpretatione	Int.
Prior Analytics	An. Pr.
Posterior Analytics	An. Post.
Topics	Top.
Sophistici Elenchi	Soph. El.
Physics	Phys.
De Caelo	Cael.
De Generatione et Corruptione	GC
Meteorologica	Meteor.
De Anima	De An.
Historia Animalium	HA
De Partibus Animalium	PA
De Motu Animalium	MA
De Generatione Animalium	GA
Metaphysics	Met.
Nicomachean Ethics	EN
Eudemian Ethics	EE
Politics	Pol.
Rhetoric	Rhet.

Chapter 1: 'Always' and 'necessary'

'Of necessity' and 'always' go together . . . so if [something] is of necessity, it is eternal, and if it is eternal, it is of necessity. If, therefore, the coming to be of something is of necessity, its coming to be is eternal, and if eternal, then of necessity (GC II. 11 337b35-338a3).

Aristotle holds that, when certain further conditions are met, something's being or happening always is sufficient for its being or happening of necessity. We could put this by saying that Aristotle endorses some version of:

(P1) If something is or happens always, it does so of necessity.

This entails some version of:

(P2) If something is possible, it is or happens at some time.

Although it is undeniable that Aristotle does hold some version of (P1) and (P2), it is a matter of controversy as to precisely what version he holds, what his grounds are for these beliefs, and how important a role they play in his thought.

The ascription of (P1) and (P2) to Aristotle, and the claim that they are of fundamental importance to him, were first argued for at any length by Jaakko Hintikka, in his work on Aristotelian modality.[1] A fresh interpretation of these doctrines has recently been offered by Sarah Waterlow.[2] Both Hintikka and Waterlow regard these beliefs about 'possible' and 'always' as deriving from a special conception of the

nature of possibility.[3] Other commentators, unimpressed by Hintikka's arguments, have regarded any endorsements of these seemingly implausible doctrines as occasional and unimportant lapses on Aristotle's part.[4] While Hintikka and Waterlow are right, I think, to hold that Aristotle's commitment to (P1) is central to certain areas of his thought, the attempt to see this commitment as stemming from a distinctive conception of modality is highly implausible; in chapter 6 I shall try to show that it properly belongs within Aristotle's philosophy of nature, and that it rests upon his conceptions of φύσις and of our knowledge of its workings. The subject of the present chapter is the question of the <u>evidence</u> for Aristotle's commitment to (P1) and (P2), since this has often been poorly assessed,[5] and since the nature of the restrictions which Aristotle imposes on these beliefs is still controversial.

I

(P2) rarely appears in any explicit form in Aristotle's writings. I shall discuss the evidence alleged for it by Hintikka in the Appendix to chapter 3. Waterlow claims to find evidence of it in seven passages (Waterlow, p. 2, n. 1). Three of these passages offer no evidence whatsoever for this belief, however, while another three present fairly dubious support -- and support which would be at best extremely weak.

(i) <u>Met.</u> Θ. 3. 1047a11-14: Waterlow claims that this supports both (P1)

and (P2) 'if "ἐσήμαινεν" implies mutual entailment'. But 'ἐσήμαινεν' does not usually imply this, and if it did here, it would commit Aristotle to the view that all past events are impossible (since they neither are nor will be). (ii) Met. Θ. 8. 1049b17ff. is said to entail 'a version of [(P2)]'. But the most that this passage shows is that Aristotle thinks that (for a restricted range of cases) if a possibility is realised, then a possibility of the same type was realised earlier; it does not follow from this that there cannot be possibilities which are never realised.[6] (iii) Phys. IV. 12 222a8-9 supports (P2) 'if "ὅσων" is read as "of all and only those"'; yet Waterlow offers no reason to suppose that 'ὅσων' does mean this here.

The other three passages are all ones where for one reason or another Aristotle is likely to be thinking only in terms of possibilities which are in fact realised. Thus at (iv) Top. II. 11 115b17-19 (ὁμοίως δὲ καὶ ποτὲ μὲν ἐνδέχεται τῶν φθαρτῶν τι μὴ φθαρῆναι, ἁπλῶς δ' οὐκ ἐνδέχεται μὴ φθαρῆναι) Aristotle is only concerned to illustrate the relative/without qualification distinction in the case of possibility, and in consequence it is hardly surprising that he is thinking of something which actually will perish; indeed, as Barnes suggests in his review of Hintikka's Time and Necessity, he is probably using 'phtharton' in the dispositional sense of 'being such as to perish'.[7] (v) Phys. IV 12 221b28-29: ὅσα μὲν οὖν φθαρτὰ καὶ γενητὰ καὶ ὅλως ὅτὲ μὲν ὄντα ὅτὲ δὲ μή. . . . The context does not demand rigorous use of

terminology, and again Aristotle is probably just thinking of things which do actually come to be and perish (or, as Barnes suggests, he may be using the terms '_genêta_' and '_phtharta_' in the dispositional sense mentioned above [Barnes, review of _Time and Necessity_, p. 185]).[8] (vi) At _Met._ Θ. 10 1051b13-17 Aristotle does say that one and the same opinion concerning τὰ ἐνδεχόμενα 'comes to be false and true'; so there is perhaps some support for (P2) here. But once again Aristotle's mind is on drawing a particular contrast, which makes it likely that he is simply ignoring opinions concerning ἐνδεχόμενα which _never_ become true. Moreover, the remark is cast in perfectly general terms, and so if we did take it at face value it would be in conflict with Waterlow's _restricted_ version of (P2).

This leaves the argument in _De Caelo_ I. 12, where Aristotle argues that if the cosmos exists always it does so of necessity, and where he also employs the corollary that, if it is possible for the cosmos to fail to exist, then at some time it actually _will_ fail to exist. So there is direct evidence for Aristotle's belief in _some_ version of (P2), but it is only for this highly restricted version: the _De Caelo_ argument does not mention possibilities in general, but only deals with the possibility for being in various states which attaches _to the cosmos as a whole_ (or rather, as I shall argue, with the capacity of the cosmos' elemental components to be organised _as_ a cosmos: see chapter 2, notes on 281a28-b2).

The evidence for some form of (P1) is much firmer. As Cael. I. 12 shows, Aristotle is certainly convinced that individuals which are F throughout all time are F of necessity; the precise nature of the claim argued for in Cael. I. 12 will be discussed in chapter 3. (P1), as applied to the properties of eternal individuals, also appears at Int. 9 19a9-18, GC II. 9 335a33-b3, PA I. 1 639b23-4, Met. Θ. 8 1050b6-30 and N. 2 1088b23-25;[9] to these we should perhaps add the opaque remark at Phys. III. 4 203b30, that there is no difference between possibility (or potentiality?) and actuality 'in everlasting things'.[10]

It is clear from a number of passages that events which 'happen always' happen 'of necessity' in some sense. Thus at Top. II. 6 112b1ff., Aristotle distinguishes three classes of πράγματα; 'of necessity', 'for the most part', and 'whichever happens to occur' (or 'as chance has it'). This is quite obviously intended to be the same division as the familiar 'always/for the most part/neither always nor for the most part', and indeed Aristotle uses 'always' and 'of necessity' quite interchangeably in this passage. We find a similar use of 'necessary' instead of 'always' in the same sort of context at An. Pr. I. 13 32b4ff.:

> 'To be possible' is used in two ways. In one it means to happen for the most part and fall short of necessity . . . .[11]

If the class of things which happen always can be labelled τὸ ἐξ

ἀνάγκης, then Aristotle must think that there is a very close link between happening always and happening of necessity.[12]

The most general statement of (P1) is made in the last chapter of the De Generatione et Corruptione, quoted above. Here too it is clear that Aristotle is only concerned with eternal motions and perpetually recurrent events.[13] No texts provide evidence that Aristotle extended this claim to any further cases.[14]

II

The texts which I have surveyed support the ascription to Aristotle of a belief in some version of (P2) as it applies to eternal individuals, and in a version of (P1) as it applies to the eternal properties of eternal individuals and to events which 'happen always'.[15] Aristotle clearly rejects (P1) and (P2) in completely unrestricted forms, however: in the De Interpretatione he maintains that some possibilities will never be actualised (Int. 19a9ff.) and in Met. Θ. 3-4 he vigorously attacks those who hold that only what is happening is truly possible and thus make 'possibility and actuality the same' -- a position which is entailed by an unrestricted application of (P2).[16] In fact, as Richard Sorabji has pointed out, there is positive evidence that Aristotle restricts (P1) and (P2) precisely to the case of eternal things (and eternally recurrent events).[17] Thus at Int. 19a9-18, he

specifies the things which are not 'of necessity', and to which never-to-be-realised possibilities may attach, as τοῖς μὴ ἀεὶ ἐνεργοῦσι. Again, at Phys. III. 4 203b30 Aristotle endorses some sort of coincidence of possibility and actuality with the explicit qualification, 'in everlasting things'.

Waterlow agrees that Aristotle does not believe in the unrestricted forms of (P1) and (P2), and thinks that the De Caelo argument for (P1) and (P2) can only apply to everlasting subjects; but in her view Aristotle does not base his restriction of (P1) and (P2) on the distinction between individuals/events which are F always or which happen always, and things which are/do not:

> [(P2)] in De Caelo I. 12 has limited scope. The assumptions from which it follows are postulated only for predicates under the categories. Aristotle does not imply that the corresponding possibilities and capacities are the only ones. Hence he does not imply that there might not be possibilities for which [(P2)] does not hold (p. 61; italics mine).

Waterlow takes (P2) to be restricted to possibilities which relate to predicates in one or other of the categories; she appeals to the reference to the categories at Cael. 281a29-33, quoted above.

This interpretation involves serious difficulties. The restriction to the categories is supposed to explain how Aristotle can affirm (P2) but insist that the cloak's capacity to be cut up may never be exercised:

> The capacity for being cut up is not for a mode of categorizable <u>being</u>, but for a sort of change or ceasing. [(P2)] itself presupposes such capacities, but they do not fall under it (p. 61; italics original).

Yet as Waterlow concedes (p. 61, n. 14), 'being cut' is given as an example of the category πάσχειν (<u>Cat.</u> 4 1b25ff.). Although as Waterlow says, Aristotle only mentions Substance, Quality and Quantity <u>by name</u> at 28la 30-33, she omits to say that he adds 'or any other category' (ἢ ἄλλ' ὁτιοῦν τῶν τοιούτων), and has just stated that the predicates in question are καθ' ὁποιανοῦν κατηγορίαν.[18] Since 'being cut' is thus in a category of being, it is included in the scope of (P2); Waterlow's view of the restriction on (P2) is thus incompatible with the <u>De Interpretatione</u> claim.

This problem also arises in a more general form. Given that, on Waterlow's interpretation, Aristotle acknowledges the existence of possibilities and capacities which do not correspond to predicates in any of the categories, it appears to be quite arbitrary for him to restrict (P2) to possibilities which do involve categorizable predicates. Waterlow might argue that items outside the categories are in some way not 'strictly real',[19] because they are not in a category of being. This reply faces two major difficulties. (1) The extra-categorial items concerned here are <u>changes</u> -- becoming/ceasing to be <u>F</u>. But elsewhere, at least, Aristotle does regard these as real: they are <u>actualities</u>.[20] Indeed, it would be odd to hold that a cloak's being cut

up is not 'strictly real'. (2) If Aristotle were nonetheless to reject the 'strict reality' of changes here, as the ground for the exclusion of the corresponding possibilities of change from the scope of (P2), then how could those possibilities themselves be sufficiently real to provide the basis of the sort of genuine contingency which Aristotle insists upon in Int. 9? Waterlow's Aristotle cannot have it both ways: either non-categorial possibilities are fully real, and thus their exclusion from the scope of (P2) is arbitrary, or they are not, and the contingency which they introduce is equally shadowy.

Waterlow looks to the categories to provide the basis for the restrictions set upon (P1) and (P2) for the following reason, I think. Aristotle's argument in Cael. I. 12 involves the claim that, for certain states, if the matter which forms the cosmos -- i.e. the elements -- can be in a given state, then it will at some time actually be in that state.[21] Aristotle is of course especially interested in the state of being-a-cosmos, but Waterlow takes his reference at 281a30ff. to being and not being 'with respect to any category' to indicate that the argument will apply to any categorial states of matter, such as being a man (or a cloak), being pale, and so on. But now (P1) and (P2) threaten to lose their restriction to things which are F (or which happen) eternally: for any possibility which attaches to a finite individual can be construed as a possible state of the individual's matter. (Thus if the elements can form a man -- or a golden mountain -- then they will.)

The threat of a wholly unrestricted range for (P1) and (P2) can thus only be met by an insistence that the argument only applies (mysteriously) to possibilities involving categorial predicates.

Actually, no such threat exists. As I shall argue later, Aristotle is not concerned here with possibilities in general, but rather with the natural capacities of the elements which make up the cosmos (see the notes on 281a28-b2 in chapter 2). Now whatever Aristotle might think of the idea of reconstruing the possibilities attaching to a man as possibilities attaching to his matter, he insists that a man's natural capacities are not reducible to those of his matter; indeed, almost the whole of his philosophy of nature depends on this insistence, as Phys. II makes plain.[22] The elements do have a natural capacity for being formed into a cosmos, because the structure of the cosmos is fully explicable in terms of the operations of the natures of the four elements.[23] By contrast, the structure and functioning of natural organisms (or even of inorganic μίξεις, for that matter) are not fully explicable in such terms; we cannot adequately view an organism's proper functioning as the exercise of the elements' natural capacities. If this account of Aristotle's general position is correct, he would have no reason, from his own perspective, to see the inclusion of the elements' natural capacities in the scope of (P2) as committing him to the inclusion of the capacities of finite individuals.[24]

III

There is very clear evidence, then, that Aristotle believes in some version of (P1) (and some evidence that he believes in a version of (P2)). These propositions appear to be restricted in scope to individuals which are always F, and to events which happen always. Further extensions of (P1) and (P2) lack any direct support from the texts (and indeed any evidence for such extensions would have to outweigh the indications of the passages in Phys. III. 4 and Int. 9).

Any enquiry into precisely what version of these doctrines Aristotle holds, and why he holds them, must start with his argument for the eternity of the cosmos in Cael. I. 10-12, and in particular with the attempt to prove that what exists eternally does so of necessity: this is undertaken in I. 12 in the course of an attack upon the Platonic picture of a generated but unperishing cosmos. Cael. I. 12 is the only place where Aristotle offers an argument for anything like (P1) or (P2); if any single passage does reveal the grounds of Aristotle's endorsement of these propositions, it is likely to be this one.[25] Waterlow, in fact, regards this argument as the main evidence for her view of Aristotelian modality. Her confidence that Cael. I. 12 reveals Aristotle's grounds for (P1) has been shared, albeit in a different form, by an earlier commentator, C.J.F. Williams. He maintains that Aristotle is fooled in this chapter by a logical fallacy, and that it is

the argument in I. 12 which leads Aristotle to believe in the truth of (Pl).[26] My own view, however, is that Cael. I. 12 yields no such explanation of Aristotle's beliefs, and that it is difficult to avoid a more modest view of the chapter. The structure of Aristotle's argument implies that he commits a striking error -- an error of a kind which suggests that he is antecedently convinced of his conclusion. If this is correct, we should look elsewhere for the grounds of his belief in the necessity of what is eternal.

Aristotle's belief that what is or happens always does so of neccessity finds some form of expression in at least twelve passages, from Int., An. Pr. I, Top. II, Phys. II and III, Cael. I, GC II, PA I, and Met. E, Θ, and N. In the face of this, it is hard to dismiss Aristotle's belief in (Pl) as an occasional aberration which plays no significant role in his thinking. Moreover, the association of the 'always/necessary' doctrine with the threefold classification of πράγματα, 'always/for the most part/neither always nor for the most part', suggests that (Pl) is in some way part of Aristotle's general world-picture -- a part of his metaphysics. And since, as Met. E. 2-3 and other texts show, the threefold classification is also associated with the distinction between καθ' αὐτό and κατὰ συμβεβηκός, the 'always/necessary' doctrine promises to be closely connected to at least one indubitably central element in Aristotle's philosophy. I hope to

show (in part through an investigation of Aristotle's analysis of a special class of τὰ κατὰ συμβεβηκός, namely 'what happens by chance') that this promise is fulfilled.

Chapter One: Notes

1. Jaakko Hintikka, Time and Necessity: studies in Aristotle's theory of modality (Oxford: Clarendon Press 1973), especially chs 5, 8 and 9. Hintikka presents here a revised version of his original argument, in 'Necessity, universality and time in Aristotle', Ajatus 20 (1957) 65-90. See also Aristotle on Modality and Determinism, Acta Philosophica Fennica, Vol. 29, No. 1, 1977 (in collaboration with Unto Remes and Simo Knuuttila). Hintikka's interpretation of Aristotle is strongly endorsed (with some modification) by C.J.F. Williams (see below, n. 26); it is also to be found in S. Sambursky, Physics of the Stoics (London: Routledge and Kegan Paul 1959), pp. 73-5.

2. Sarah Waterlow, Passage and Possibility: a study of Aristotle's modal concepts (Oxford: Clarendon Press 1982). References to this (both in this chapter and in chapter 3) will be by author's name and page number alone.

3. For Hintikka, of course, this is the conception expressed in the Principle of Plenitude, according to which no genuine possibility remains unactualised throughout an infinite time. Waterlow differs from Hintikka in ascribing a new conception of possibility to Aristotle, and in holding that (P1) and (P2) do not stem from this modal conception alone, but from a combination of this with a set of assumptions drawn from Aristotle's metaphysics of nature. On Hintikka's view, Aristotle needs no such further assumptions, since (if time is infinite) the Principle of Plenitude is logically equivalent to the unrestricted versions of (P1) and (P2).

4. See, for example, Martha Kneale's review of Time and Necessity, Philosophical Quarterly 24 (1974) 369-70, and Jonathan Barnes's review of the same book, Journal of Hellenic Studies 97 (1977) 183-6, at p. 184.

5. A notable exception is Barnes's review of Time and Necessity (see previous note), which is the best survey in the field. See also the

remarks in Richard Sorabji, Necessity, Cause and Blame: perspectives on Aristotle's theory (London: Duckworth 1980), pp. 128-37.

6. Waterlow also cites this passage in connection with the alternative set of grounds for (P1) and (P2) which she outlines in ch. 7 of Passage and Possibility: this will be discussed below, in chapter 6, Section II.

7. Barnes, Review of Time and Necessity, p. 185; see the Appendix to chapter 3, passage 2(b).

8. See also the discussion of 221b25-222a9 in the Appendix to chapter 3 (passage 2(a)).

9. (1) Int. 9 19a9-18: see especially a9-10: καὶ ὅτι ὅλως ἔστιν ἐν τοῖς μὴ ἀεὶ ἐνεργοῦσι τὸ δυνατὸν εἶναι καὶ μή . (2) GC II. 9 335a33-b3: τὰ μὲν γὰρ ἐξ ἀνάγκης ἔστιν, ὃιον τὰ ἀΐδια, κ.τ.λ. . (3) PA I. 1 639b23-4: ὑπάρχει δὲ [ἀναγκαῖον] τὸ μὲν ἁπλῶς τοῖς ἀιδίοις . . . . (4) Met. Θ. 8 1050b6-30, and (5) Met. N. 2 1088b23-25: see the Appendix to chapter 3 (passages 2(c) and 2(d)).

10. This remark will be discussed in chapter 6, Section III.

11. An. Pr. 32b4-6; the translation is taken from Jonathan Barnes (ed.), The Complete Works of Aristotle: the revised Oxford Translation, Bollingen Series LXXI.2, 2 vols (Princeton: Princeton University Press 1984). This work will be referred to hereafter as CWA.

12. See also Phys. II. 5 196b10-13 and 20, Met. E. 2 1026b 27-37 = K. 8 1064b32ff.. In chapters 5 and 6 I shall return to this association of the 'always/necessary' doctrine with the 'always/for the most part/ neither always nor for the most part' classification.

13. Mention should also be made here of the slightly obscure remark at Int. 13 23a2-3: τὸ πῦρ οὐ δυνατὸν θερμαίνειν καὶ μή, οὐδ' ὅσα ἄλλα ἐνεργεῖ ἀεί. I shall discuss this in chapter 6, Section III.

14. None of the passages cited by Hintikka beyond those mentioned here provides any evidence even for restricted versions of (P1) or (P2) -- still less does any text suggest that Aristotle believed in the truth of (P1) because he held the Principle of Plenitude. These texts are discussed in the Appendix to chapter 3.

15. It is not clear quite what extension of (P2) is entailed by the application of (P1) to perpetually recurring events. For instance, does the failure of an event of type E ever to occur count as a case of not-E's 'happening always'? If not, this extension of (P1) will not entail that (types of) events which never happen are impossible, and hence will not entail that if an event is possible it will at some time occur. (I return to this point in chapter 6, Section III.)

16. We can frame a true, dated, present-tense proposition for any present event or state of affairs. These propositions are clearly possible (in the wide sense of possibility, at any rate). No false proposition of this kind, on the other hand, can be possible. Take the false proposition, 'Judson is in Calcutta at 10:15 a.m. on January 1st, 1986': if this were possible, then by our unrestricted (P2), it would at some time be true. But the only time when it could be true, if at all, is at 10:15 a.m. on January 1st, 1986. Since it is not true then, it can never be true, and so cannot be possible. Thus only what actually happens is possible.

17. Necessity, Cause and Blame, pp. 128-135.

18. Thus her reference to the appearance of πάσχειν at 283a7ff. is something of a red herring, and her claim that Aristotle may not be using it there to denote a category of being is irrelevant to the main difficulty.

19. Cf. Sarah Waterlow, Nature, Change, and Agency in Aristotle's 'Physics': a philosophical study (Oxford: Clarendon Press 1982), p. 111.

20. As Waterlow rightly argues, Aristotle's phrase 'imperfect actuality' does not indicate lack of full reality, but the idea that

changes are processes towards an end (Nature, Change, and Agency, p. 106). Waterlow in effect acknowledges the point behind this difficulty in Nature, Change, and Agency. She suggests there that Aristotle, while right to exclude κίνησις from the categories, cannot then say that κινήσεις are actualities of any sort, nor can they be 'strictly real' (Nature, Change, and Agency, pp. 110-111). She sees Aristotle as pressured into taking changes to fall under the category of Relation (between agent and patient): 'the only alternatives would be to deny that change is strictly real or else to admit realities not covered by any category' (p. 111).

21. I explain the introduction of the matter of the cosmos into the argument, and the sense in which this matter is everlasting, in the next chapter (notes on 281a28-b2).

22. Waterlow rightly emphasises the importance for Aristotle of the irreducibility of an organism's nature to the natures of its constituent parts (see Nature, Change, and Agency, especially ch. II). Her interpretation of the argument which Aristotle gives against any such reduction in Phys. II. 8 is unconvincing, however; see my review of Nature, Change, and Agency, Classical Review 33 (1983) 231-3.

23. There are of course notorious problems over how the rotation of the heavenly bodies is to be explained in this context; but this issue does not affect the substance of my present point.

24. On this view, the range of predicates for which the Cael. I. 12 argument holds is restricted to those which are involved in the elements' natural capacities. 'Man', 'pale', etc. at 281a32 are to be seen as familiar illustrations of each category, rather than as examples of the predicates covered by the argument (cf. Cat. 4 1b25-29 and Top. I. 9 103b20-35).

25. None of Aristotle's other arguments for the ungenerability and imperishability of the cosmos, for instance, moves to necessity via eternity (see De Philosophia, frr. 16-20 Ross). When versions of (P1)

do appear elsewhere, their truth seems to be presupposed rather than argued for (see the Appendix to chapter 3).

26. C.J.F. Williams, 'Aristotle and corruptibility', Religious Studies 1 (1965) 95-107 and 203-15. I discuss Williams' claims in chapter 3.

Chapter 2: De Caelo I. 12: translation and commentary

PRELIMINARY: DE CAELO I. 10

Translation

Note: the translation follows Allan's text, except for a change in the punctuation at 280a5: 'οὐ ταὐτόν·' instead of 'οὐ ταὐτόν,'.

279b4 Having made these distinctions, let us discuss next whether
5 <the cosmos is> ungenerable or generable, and imperishable or perishable; and let us first go through the views of others. For with opposing <views>, demonstrations of the one constitute difficulties for the other. At the same time what we are about to say would be all the more persuasive if our listeners have first heard the pleas of those who dispute <with us>, since it would
10 seem less that we had gained a verdict against them by default; indeed, those who are to give an adequate judgment about the truth must be arbitrators in the dispute, not adversaries in it.

All, then, say that <the cosmos> came to be. But some say that, having come to be, it is eternal, some that it is perishable, like any other composite thing, while others <say>
15 that it alternates: sometimes it is like this and at other times it perishes and is otherwise, and it is always like this (this is the view of Empedocles of Acragas and Heraclitus of Ephesus).

To say that it came to be, but is nonetheless eternal, is an impossibility. For only those things should reasonably be posited which we see holding in all or most cases, but here the opposite turns out to be the case; for all generated things are seen to be perishing as well. Moreover, that which has no beginning of being like this, but was unable to be otherwise for the whole of past time, is unable also to change. For there will be some cause <of the change>; and if this had held earlier, that which was unable to be otherwise would have been able to be otherwise. If the cosmos was put together from things which earlier were otherwise, then if <these things> were always like this and were unable to be otherwise, <the cosmos> would not have come to be; if, on the other hand, it has come to be, it is clearly necessary that those things too are able to be otherwise and not always to be like this. Thus having been put together they will be dissolved, and from a prior state of dissolution they were put together -- and this either would or could be the case an unlimited number of times. And if so -- if it was otherwise at some time, or could have been otherwise -- <the cosmos> could not be imperishable.

Some of those who say that it is imperishable, although it came to be, try to help themselves out with a claim which is not true. For they say that, just as those who draw diagrams <speak>, so they too spoke of coming to be: not <meaning> that at some time

280a it did come to be, but for the sake of instruction, to make things easier to understand -- just as <it is for> those who saw the diagram coming to be. But this, as we say, is not the same thing. For in the construction of diagrams, when all the steps have been made, at the same time the same thing results; but in these people's demonstrations, <what results is> not the same thing -- but <this is> impossible, since the things which are taken earlier and those <taken> later are contradictory: for they say that from disordered things ordered things at some time came to be, but it is impossible for the same thing to be disordered and ordered at the same time -- rather it is necessary that they are separated by a coming to be and <by> time. In diagrams, however, nothing is separated by time.

That it is impossible, therefore, for it at the same time to be eternal and to have come to be, is plain. But to put it together and dissolve it alternately is no different from making it eternal but changing its form -- as if someone were to think that when a man comes to be from a child and a child from a man, that at one time he perishes and at another he is. For it is clear that when the elements come together with each other it is not just any arrangement and putting together which comes to be, but the same one (especially according to the view of those who have given this account: they make contrariety the cause of each

arrangement). Consequently, if the whole body, being continuous, is arranged and ordered now like this, now like that, and the formation of the whole is a cosmos and heaven, it is not the cosmos which would come to be and perish, but its arrangements.

If, however, <the cosmos> is one <in number>, it is impossible for it to come to be and perish as a whole without returning. For before it came to be there existed always the formation which preceded it: and since that is ungenerated, we say that it could not change. If they are unlimited <in number>, on the other hand, <this generation-destruction view> is more possible. But whether this <view> is indeed impossible or possible will be clear from what <we say> later; for there are some who think that it is possible both for something which is ungenerable to perish and for something which came to be to endure imperishably, as <we find> in the Timaeus: for there he says that the heaven came to be, but that it will nevertheless exist for all future time. We have discussed these <thinkers> only from a physical point of view, in connection with the heaven; but <the truth> about this too will be clear if <we> consider <the matter> in a general way, with respect to everything.

Commentary on the arguments against the Platonic position in Cael. I. 10

In Cael. I. 10 Aristotle presents two arguments against the Platonic view that the world is generated but imperishable.[1] He contrasts these arguments with those in I. 12:

> πρὸς οὓς φυσικῶς μὲν περὶ τοῦ οὐρανοῦ μόνον εἴρηται, καθόλου δὲ περὶ ἁπάντος σκεψαμένοις ἔσται καὶ περὶ τούτου δῆλον (280a32-34).[2]

The first argument is given at 279b17-21. Experience tells us that everything which is generated also perishes, so that it would not be εὔλογον to deny this of a generated world:

> μόνα γὰρ ταῦτα θετέον εὐλόγως ὅσα ἐπὶ πολλῶν ἢ πάντων ὁρῶμεν ὑπάρχοντα, περὶ δὲ τούτων συμβαίνει τοὐναντίον· ἅπαντα γὰρ τὰ γινόμενα καὶ φθειρόμενα φαίνεται (279b18-21).

As a claim about the methodology of explanation, Aristotle's assertion is sound enough, as far as it goes. But Aristotle ignores the fact that this sort of 'projection' of observed regularities is constrained by the rest of one's physical theory; this theory may well rule out some 'regularities' as not reasonably projectable in this sense at all -- and may also rule out as unreasonable some particular projections of regularities which are, in general, legitimately projectable. Indeed, if we do ignore these constraints, Aristotle's argument would equally

well show that we should not say that the world is eternal, since experience tells us that everything else perishes.

The second argument (279b21-31) is more complex. Aristotle clearly has in mind the Timaeus picture of the cosmos coming to be out of eternally existing (chaotic) elements (279b24-5), and not ex nihilo (this is also true of I. 12, I shall argue, though Aristotle makes no mention of it there). Since the world has come to be from these elements, Aristotle claims, they must have always been able to change into an ordered state of this sort, for they could not simply acquire this possibility of change:

> εἰ δὲ γέγονεν, ἀνάγκη δηλονότι κἀκεῖνα δυνατὰ εἶναι ἄλλως ἔχειν καὶ μὴ ἀεὶ οὕτως ἔχειν (279b26-28).

He immediately concludes:

> ὥστε καὶ συνεστῶτα διαλυθήσεται καὶ διαλελυμένα συνέστη ἔμπροσθεν, καὶ τοῦτ' ἀπειράκις ἢ οὕτως εἶχεν ἢ δυνατὸν ἦν. εἰ δὲ τοῦτ', οὐκ ἂν εἴη ἄφθαρτος, οὔτ' εἰ ἄλλως ἔσχε ποτὲ οὔτ' εἰ δυνατὸν ἄλλως ἔχειν (279b28-31).

279b26-28 is ambiguous. οὕτως ἔχειν might refer to the precosmic state of chaos; in that case the sentence would neatly complete the antithesis signalled in the preceding sentence (εἰ μὲν ἀεὶ οὕτως ἐχόντων καὶ ἀδυνάτων ἄλλως ἔχειν, οὐκ ἂν ἐγένετο), but Aristotle would be

presenting his conclusion that the world will perish as following immediately from the claim that the elements were always able to form a world. The gap between premiss and conclusion is too great (and too obscure), and we should therefore adopt the other reading, on which οὕτως ἔχειν refers to the elements' present state of organisation into a cosmos.[3] On this reading, Aristotle's argument becomes much clearer, though it still contains two large gaps. If the elements had previously been incapable of changing into an ordered state, then they would still be incapable of so changing; since there <u>is</u> a cosmos, therefore, <the elements always were (and by parity of reasoning, always will be) so capable, and therefore> they are both now and always capable of changing into a disordered state; and so the cosmos will at some time cease to be -- indeed, the process will be cyclic.[4]

The two gaps in this argument are readily apparent: why does the fact that the elements can change into a cosmos mean that it must be able to change back into a state of disorder? And even granted that they are so able, how does it follow that they actually will change back? I shall deal with these in turn.

It might be tempting to bridge the first gap by claiming that by 'ability' here Aristotle means <u>logical possibility</u>; his argument would then be that since no logical possibility comes to be or ceases to be possible as time passes, and since the elements were once actually in

chaos, it must still be logically possible for them to be so. This argument gives the Platonist an easy response, however. He can justifiably deny that by 'imperishable' he meant 'logically necessary hereafter'; his claim was merely that the destruction of the cosmos was physically impossible (indeed, at Tim. 41a-b Plato's Demiurge does claim that he could destroy the cosmos, but that nothing else could). Moreover, this reading of Aristotle's argument makes all his preceding argumentation irrelevant: all that Aristotle would need for his conclusion on this reading would be the fact that the elements were once chaotic. Similarly, the argument at 279b21-25, with its appeal to a τι αἴτιον triggering the change, reads most naturally as an argument concerning natural capacities rather than logical possibilities. Furthermore, there is on this reading nothing in the argument as a whole to mark it as a 'physical' argument rather than a 'general' one; indeed, even if we take 'ability' to refer to a natural capacity rather than a logical possibility, we still require something extra to mark the argument as physical, for in I. 12 (unless the text is even more severely dislocated than has been thought[5]) Aristotle contrasts arguments in which he is very probably talking in terms of natural capacities with 'physical arguments' (283a11ff.: see notes ad loc.). Thus the feature of the present argument which makes it a physical one must be provided by whatever Aristotle took to licence one or other of the two inferences which we are examining.

This consideration lends support to Guthrie's suggestion that Aristotle's first aim is to prove that the elements are susceptible to change (for otherwise the cosmos would not have come to be), and that he then thinks that this is sufficient to show that it is possible for them to change again ('On the Heavens', p. 96, n. d.). Guthrie does not make it quite clear why he thinks that Aristotle took this to be sufficient; he may, perhaps, see Aristotle as simply thinking that if the elements were once susceptible to change, they must still be (since, by the argument at 279b21-24, abilities do not change over time).[6] This would require Aristotle to equivocate fallaciously upon 'susceptible to change', since two different changes are in question, and would once again lend no 'physical' character to the argument. We can avoid these problems, however, if we take Aristotle to be thinking that a natural capacity for change in one direction is, as a matter of natural fact, always or usually accompanied by a capacity for change in the opposite direction as well. This makes an essential step of the preceding argument for the elements' permanent natural capacity for forming a cosmos; for this is now just what is required in order to establish their permanent natural capacity for being in chaos.[7] The argument may now count as a 'physical' one, if the claim about the relationship between the two capacities is meant to be based upon observation of nature.[8] For a closely related thought, we may compare the physical argument presented at the end of I. 12:

τὰ γὰρ φθαρτὰ καὶ γενητὰ καὶ ἀλλοιωτὰ πάντα·
ἀλλοιοῦται δὲ τοῖς ἐναντίοις, καὶ ἐξ ὧν συνίσταται
τὰ φύσει ὄντα, καὶ ὑπὸ τῶν αὐτῶν τούτων
φθείρεται (283b19-21).[9]

The second gap in the argument at 279b21-31 is the move from 'able to be disordered' to 'will be disordered'. Aristotle concludes his argument sensibly enough:

εἰ δὲ τοῦτ', οὐκ ἂν εἴη ἄφθαρτος, οὔτ' εἰ ἄλλως ἔσχε
ποτὲ οὔτ' εἰ δυνατὸν ἄλλως ἔχειν (279b30-1).

In the previous sentence, however, he has made the much stronger claim that the cosmos (is not only perishable but) will actually perish.[8] I do not think that we can recover Aristotle's thought here: it could be that he is inferring 'will perish' from 'can perish' (and is thus taking for granted the Principle of Plenitude); or he may be thinking that all natural capacities are realised in a regular fashion (and this might have nothing to do with the Principle of Plenitude); or again he may be saying more than he is yet entitled to under the influence of his own conviction of the eternal and cyclic nature of the cosmos. (Of these I think the first is the least likely, because (pace Hintikka) Aristotle never elsewhere uses anything like the Principle so casually and in this unannounced way: see the Appendix to chapter 3 below.)

DE CAELO I. 12

Translation

Note: the translation follows Allan's text, except at 283a10, where I read εἰ μὴ εἴη ἀεί for Allan's εἰ μὴ ἀεί.

28la28 Having made these distinctions, we must deal with the next question. If there are things which are able both to be and not
30 to be, there must be some definite maximum time both of their being and of their not being -- I mean for which the thing is able to be and for which it is able not to be -- with respect to any category (such as 'man', 'pale', 'three cubits long', or any other category). For if the time is not of a certain length, but is always greater than any given time and there is no time than which
28lb it is less, one and the same thing will be able to be for an unlimited time and not to be for another unlimited time; but this is impossible.

Let this be our starting point. 'Impossible' and 'false' do not signify the same thing. And both in the case of 'impossible' and 'possible' and in that of 'false' and 'true' there is the
5 conditional <use> (I mean, for instance, that it is impossible for the triangle to have <the sum of> two right angles if such and such, and for the diagonal to be commensurate if such and such), and things can be both possible or impossible and false or true

without qualification. Now it is not the same thing for something to be false without qualification and for it to be impossible without qualification. For to say of you when you are not standing that you are standing is false, but not impossible. Similarly, to say of a man who is playing the lyre but not singing that he is singing, is false but not impossible. But to stand and to sit at the same time, and for the diagonal to be commensurate, are not only false but impossible. It is not the same thing, then, to posit <what is> false and <what is> impossible. But an impossibility results from an impossibility. Thus <a man> has at the same time the ability to sit and to stand, because when he has the former <ability>, he has the latter; but not so that <he has the ability> at the same time to sit and to stand, but at another time. But if something has for an unlimited time an ability to do more than one thing, it is not possible <for the second to be exercised> at another time, but this <must be done> at the same time. Consequently if something which is for an unlimited time is perishable, it would have an ability not to be. Now if it is for an unlimited time, let its ability be exercised; at the same time, then, it will be and not be in actuality. A falsehood would result, therefore, because a falsehood was posited; but unless <what was posited> was impossible, what resulted would not have

been impossible as well. Everything, therefore, which always is is without qualification imperishable.

Similarly it is also ungenerable; for if it is generable, it will be able for some time not to be (for that which formerly was, but now is not or can at some later time not be, is perishable; and what can have not been earlier is generable). But there is no time for which that which always exists is able not to be -- neither an unlimited nor a limited time; for it is able to be for the limited time, of course, if <it is> for the unlimited <time> as well.

It is impossible, therefore, for one and the same thing to be able always to be and always not to be. But neither is <it able to possess> the contradictory -- I mean <u>not always to be</u>. Therefore it is impossible for something always to be, but to be perishable; similarly, neither <can it be> generable. For if the second of two terms is impossible unless the first holds, and it is impossible for the first to hold, then <it is impossible for> the second also <to hold>. Consequently, if it is impossible for that which always is, at some time not to be, it is also impossible for it to be generable. Since the contradictory of that which is always able to be is that which is not always able to be, and its contrary is that which is always able not to be --

and the contradictory of that is that which is not always able not to be -- it is necessary that the contradictories of both belong to the same thing, and that, intermediate between that which always is and that which always is not, there is that which is able to be and not to be. For the contradictory of each will belong <to it> at some time, if it does not always exist. Consequently, both that which not always is not will be at some time and will not be <at another>, and, clearly, that which is not always able to be (but is at some time, and consequently also is not <at another>). The same thing, therefore, will able to be and not to be, and this is intermediate between the two.

The general argument is this. Let A and B be unable to belong to the same thing, and <let> either A or C and B or D <belong> to everything. It is necessary, then, that C and D belong to everything to which neither A nor B belong. Let E be the middle between A and B. For that which is neither of <a pair of> contraries is intermediate. It is necessary that both C and D belong to this. For either A or C belongs to everything, so that <either one or the other> also <belongs> to E; since it is impossible for A <to belong to E>, C will belong <to it>. The same argument applies in the case of D. Neither that which always is, then, nor that which always is not, is either generable or perishable. And it is also clear that if <something> is generable

or perishable, it is not eternal. For at the same time it will be able always to be and able always not to be; and it has been shown above that this is impossible.

Must it not also be true, therefore, that if it is ungenerable, and exists, it is necessary for it to be eternal -- and similarly also if it is imperishable, and exists? (I am speaking of the ungenerable and imperishable strictly so called: the ungenerable <being> what is now, and earlier would not truly have been said not to be; the imperishable <beings> what is now and later would not truly be said not to be.) Again, if these things are entailed by each other, and what is ungenerable is imperishable and what is imperishable is ungenerable, is it necessary that being eternal is entailed by each, and that if
282b <something is> ungenerable, <it is> eternal, and if imperishable, eternal? <This> is clear even from their characterisation. For it is in fact necessary that if <something is> perishable, <it is> generable; for it is either ungenerable or generable, but according to the premiss, if it is ungenerable, <it is> imperishable. And it is also necessary that if <something is> generable, <it is> perishable; for it is either perishable or imperishable; but according to the premiss, if it is imperishable, <it is> ungenerable. If, on the other hand, imperishability and ungenerability do not entail each other, it is not necessary for

either the ungenerable or the imperishable to be eternal. But that it is necessary that <each> entails <the other> is plain from what follows. For generability and perishability entail each other. This is also clear from what was said earlier; for there is an intermediate between what always is and what always is not, which entails neither -- this is the generable and perishable. For it is able both to be and not to be, each for a limited time (by 'each' I mean both to be for a certain length of time and not to be). If, therefore, there is something generable or perishable, it is necessary for this to be intermediate.

For let A be that which always is, B that which always is not, <let> C <be> generable, and D perishable. It is necessary that C is intermediate between A and B: in their case, there is no time, in the direction of either limit, in which either A is not or B is. For that which is generable, however, it is necessary that there be <such a time> either in actuality or in potentiality -- but not for A and B in either way. C, therefore, will be for a certain and definite length of time, and again will not be; and similarly in the case of D. Each, then, will be generable and perishable. Therefore generability and perishability entail each other. Now let E be ungenerable, F generable, G imperishable, and H perishable. Now F and H have been shown to entail each other. Whenever <terms> are arranged as these are -- such that F and H

entail each other, E and F never belong to the same thing, but one or the other to everything, and similarly for G and H -- it is necessary for E and G to entail each other as well. For let it be the case that G does not entail E; therefore it will entail F, since E or F belongs to everything. But now, H belongs to anything to which F belongs; so G will entail H. But this is impossible ex hypothesi. The same argument shows that E entails G. But the ungenerable (E) has the same relation to the generable (F) as the imperishable (G) to the perishable (H).

Thus to say that there is nothing to prevent something which comes to be from being imperishable, nor to prevent something which is ungenerable from perishing -- genesis in the one case, and destruction in the other, occurring <only> once -- is to do away with one of the things <already> given. For everything is able to do or to suffer, or to be or not be, either for an unlimited time or for some definite length of time; and for an unlimited <time>, because the unlimited is defined, in a way, as that than which there is nothing greater. But that which is unlimited in one direction is neither unlimited nor definite.

Moreover, why at this moment rather <than some other> should something perish which earlier has always been (or something come to be which has for an unlimited <time> not been)? For if there is

no reason, and the moments are unlimited <in number>, it is clear that for an unlimited time there was something which was generable and perishable. Therefore it will be able not to be for an unlimited time (for at the same time it will have the ability not to be and to be), in the one case earlier, if it is perishable, and in the other case later, if it is generable. Consequently, if we suppose its abilities to be exercised, both opposites will belong <to it> at the same time. Moreover, this will also hold in the same way at every moment, so that it will have the ability not to be and to be for an unlimited time; but it has been shown that this is impossible. Moreover, if the ability belongs <to it> earlier than the actuality, it will belong for all time, even when it was ungenerated and did not exist, but was able to come to be. At the same time, then, it was not and had the ability to be, to be both at that time and later; for an unlimited time, therefore.

It is plain on other grounds too that it is impossible for <something> which is perishable never to perish. For it will always be at the same time both perishable and imperishable in actuality, so that it will at the same time be able always to be and not always <to be>; what is perishable, then, perishes at some time. And if <it is> generable, it has come to be; for it is able to have come to be, and <able>, therefore, not always to be.

And it is possible to see in this way also that it is impossible either for something which has at some time come to be to persist, imperishable, or for something which is ungenerable and which always existed earlier to perish. For nothing from chance can be either imperishable or ungenerable. For chance and 283b what is from luck are outside what is or comes to be always and for the most part; but what <is> for an unlimited time -- either without qualification or from some time -- exists either always or for the most part. It is necessary, therefore, that by nature such things are at one time and are not at another. But in such things the same ability <is also the ability> to be in the contradictory state, and their matter is the cause of their being and not being. Consequently, it is necessary for opposites to belong <to it> in actuality at the same time.

Nor, however, is it true to say now that <something> is last year, nor <to say> last year that it is now. It is impossible, then, for something which once was not to be eternal later. For later it will still have the ability not to be; but not to be at the time when it is (for it exists in actuality), but <not to be> last year and in the past. Now let that of which it has the ability hold in actuality: it will be true, therefore, to say now that it is not last year. But that is impossible: for there is no ability to have come to be, but <only> to be now or in the future.

Similarly also if it was eternal earlier, but later is not: for it will have an ability to do something which is not in actuality. Consequently, if we suppose what is possible to be the case, it will be true to say now that this exists last year, and, generally, in the past.

And to those looking at the matter from a physical point of view and not from the general one, <it will appear> impossible either that <something which> was eternal earlier should perish later or that <something which> earlier was not should later be eternal. For generable and perishable things are all subject to alteration; and they alter through the opposites, and things which are by nature perish by the action of the very things from which they are constituted.

DE CAELO I. 12: COMMENTARY

281a28-b2. Aristotle begins the chapter by stating:

> If there are things which are able both to be and not to be, there must be some definite maximum time both of the being and of the not being . . . [This applies to being and not being] with respect to any category -- e.g. 'man', 'pale', 'three cubits long', or any other category.

Aristotle clearly means the period of time to qualify the capacity itself, rather than to qualify the possession of the capacity -- that is, '_X_ is able _to ϕ for n years_', rather than '_X_ is for _n_ years able _to ϕ_'. This is supported by the way in which Aristotle talks about the qualification of capacities in the previous chapter (281a7ff.). It is also confirmed by 282b12-14: 'For it is able both to be and not to be, each for a limited time. By 'each' I mean both to be for a given time and not to be.'

This reading gives us an argument in the next sentence (281a33-b2) which is less obviously hopeless than it would be on the alternative reading. The argument seems to be:

> Let _X_ be something which can be and not be. Then there must be a defined time for which it can exercise these respective abilities; for if there is not, then _X_ will be able _to be for an infinite time_, and _not-to-be for another infinite time_; but this is impossible.

The claim that the infinite times must be different is not so immediately implausible as it would be if X's being for an infinite time able to be (and being for an infinite time able not to be) were in question. Nonetheless, it still does not follow that the infinite times must be different times: I shall discuss later why Aristotle thought that they must be.

Aristotle's claim that, in the case of things which can be and not be, these capacities for existence and non-existence must be qualified by limited times raises a difficulty. If a thing has the capacity to exist for a limited time only, how can its capacity for non-existence be for a limited time also? What does the thing do when both its capacities have been fully exercised? Yet Aristotle not only says that the capacity for non-existence is also limited, but will prove that it must be: for if the thing has a capacity to be non-existent always, then by the argument given in the next section it cannot have any capacity to exist; nor can it have a capacity to be non-existent for a period which is infinite but limited in one direction, for Aristotle will later insist that there are no such capacities.[12] Aristotle thus appears to be in complete confusion over temporally qualified capacities. If this were so, we could perhaps reasonably despair of any reconstruction of his argument.

I do not think that 281a28-32 is indicative of any such confusion on Aristotle's part, however. What this sentence shows is that when Aristotle speaks in this chapter of things being able to be, and of their capacity to be, etc., he is not speaking about the capacities of finite individuals at all: for such individuals, the limited times claim is clearly absurd. By the same token, he cannot be thinking about individual cosmoi, and their capacities for existence and non-existence. What is he thinking about, then? We can see the answer to this if we recognise that Aristotle still has in mind, as at 279b21-31, the general scheme which he takes to be common to all the alternative world-views listed at 279b12-17 (and which of course is present in his own as well). According to this scheme, as Aristotle sees it, the cosmos is composed of elements or other constituents which themselves exist eternally (in some form or other). If the cosmos does have a genesis, it is not, and presumably cannot be, ex nihilo; rather it is a matter of those previously existing elements coming to form an orderly arrangement as a cosmos; similarly, the passing away of a cosmos is merely the destruction of this arrangement, and not the destruction of the component elements.[13] When Aristotle speaks of the cosmos' capacity for existence, he means its components' capacity for orderly, cosmic arrangement.[14]

If read in this light, 281a28-32 makes good sense. The range of the quantifier ἔνια is now not universal, but restricted to the

eternally existing elements or cosmic components, and of course εἶναι καὶ μή at 281a29 and 30 is not to be taken existentially but predicatively (and thus the categories are introduced at 281a31-33 as categories of predication, not as categories of subject).[15] Aristotle's line of thought, then, is essentially this:

> If there are elemental things which are able to be arranged as a cosmos, and are also able not to be so arranged, then some definite maximum time must be set for their possible existence as a cosmos and for their possible disarray, for if there is no maximum, then, etc. . . .

Thus the contrast which Aristotle has in mind in the opening conditional clause is with a world-view like his own, according to which the elements are incapable of lacking arrangement as a cosmos; and he intends to argue that if the elements possess both capacities, then they must be able to exercise them only for a limited period of time each. Now we can see that Aristotle is not committed to the absurdity of such a cosmos having to violate the law of excluded middle once it has exercised both capacities: a period of cosmic disorderliness is limited by the onset of a period of order; this too is limited by a <u>new</u> period of disorder, which is in turn limited by a new period of order, and so on. Thus every period of 'being' and of 'not being' is limited in both directions.[16]

It is thus quite clear that from the start Aristotle restricts himself to everlasting (elemental) things, and to what is possible and

impossible for them; the limited-capacities claim at 281a28-32 is quite evidently not intended to apply to finite individuals.[17] The absurdity of such an application removes any temptation to see Aristotle's argument as entirely general, or as concerned with possibilities tout court. I shall follow Aristotle in speaking of the capacities of the cosmos to exist and to fail to exist; but these are to be taken merely as abbreviations for the corresponding capacities of the everlasting elemental components.

281b2-25. Aristotle here presents his main argument in support of the conclusion that a Timaean cosmos is impossible. How this argument is to be interpreted is a difficult and controversial matter, and discussion of it will occupy chapter 3. I shall argue that it has two main components. (1) The first is the claim that natural capacities cannot be capacities for ϕ-ing for a time which is infinite but limited in one direction -- they must be capacities either for ϕ-ing for a finite time, or for ϕ-ing for a time which is infinite in both directions. I shall try to make this claim plausible in Aristotelian terms in chapter 3, Section IV. (2) The second is a thoroughly fallacious argument which I shall call the 'insulated realisation manoeuvre', or the 'IR manoeuvre' for short. Aristotle here tests an alleged possibility to see if it really is possible, by supposing it to be true and then seeing if anything impossible results; the fallacy lies in applying the test to a

candidate for possibility without regard to whether the supposition of its holding requires changes in what else is being taken to be true. I shall discuss this further in Sections I-III and V of chapter 3.

28lb27-9. It has been clear from the outset that Aristotle is concerned to show that things which last for ever cannot not be, and not merely to show that they will not at some time fail to exist (which is of course a trivial task). Terms like aphtharton and agenêton, then, are intended modally -- 'imperishable' and 'unable to come into existence', rather than 'unperishing' and 'ungenerated'. Aristotle here explicitly tells us that this is how he intends the terms (cf. 280b31-33). Aristotle continues to use these terms in the modal sense throughout the chapter, as 283a24-25 makes clear.[18] His statement at 282a27-30 is thus very startling:

> λέγω δὲ τὸ ἀγένητον καὶ ἄφθαρτον τὰ κυρίως λεγόμενα, ἀγένητον μὲν ὃ ἔστι νῦν, καὶ πρότερον οὐκ ἀληθὲς ἦν εἰπεῖν τὸ μὴ εἶναι, ἄφθαρτον δὲ ὃ νῦν ὂν ὕστερον μὴ ἀληθὲς ἔσται εἰπεῖν μὴ εἶναι.

I shall argue below that this statement is not to be taken as a definition (as Hintikka and Williams take it): see notes on 282a4-25.

28lb29: οὐκ ἔστιν ᾧ χρόνῳ, κ.τ.λ.. This is discussed in chapter 3, Sections I and III.

281b31-2: καὶ γὰρ τὸν πεπρασμένον, κ.τ.λ.. This clause is added to justify the οὔτ' ἄπειρον clause, since the original argument only showed that if X exists always it cannot have the ability not to be for a finite time. It does this by means of the point concerning lesser abilities which Aristotle made in ch. 11 (281b12-14): thus if X can not-be forever, it can not-be for a finite time; and now the original argument applies. Thus if a thing lasts forever, not only does supposing it briefly to exercise a capacity for not-being involve us (in Aristotle's view) in contradiction, but so does supposing it never to have existed.

281b32-282a4. Aristotle rehearses the position which he has reached so far. Once again there are scope ambiguities arising from the use of 'δύνασθαι' together with a temporal qualifier: . . . τὴν ἀπόφασιν, οἷον λέγω μὴ ἀεὶ εἶναι (281b33-34) suggests that in b32-33 we should read 'able (not) to be always' rather than 'always able (not) to be'. This is moreover, what Aristotle ought to say, since the claim construed in the other way only follows on the assumption that if something is always able to be, it is able to be always.[19]

282a4-25. Williams claims that up to and including this passage, Aristotle's argument has been quite irrelevant to his avowed purpose of establishing against the Timaeus that whatever is imperishable (or

ungenerable) is eternal: see 'Aristotle and corruptibility', pp. 209-10. Hitherto Aristotle's argument is designed to demonstrate two entailments in opposite direction -- viz. that what is eternal is ungenerable, and that what is eternal is imperishable. It is only at 282a25ff., Williams claims, that we are given any argument which can be taken as intended to establish the impossibility of the Timaean view.[20] Williams can find no satisfactory explanation for Aristotle's insertion of this first, irrelevant argument. He suggests that Aristotle had already composed this proof of the necessity of what is eternal (which, in Williams' view, might well have been composed independently not only of Cael. I. 10-12, but also of the cosmological works as a whole -- though, of course, this speculation does not count as evidence for Williams' and Hintikka's claim that Aristotle endorsed the necessity of what is always the case in a quite general fashion, and not just in this special cosmological context). Having this proof ready to hand, Aristotle uses it here because the square of opposition which it introduces will be handy for showing the incompatibility of genêton and aphtharton. It would be more plausible, I think, to suppose that what Aristotle had to hand was a proof of the relevant biconditional, and that he simply inserted the whole proof, rather than just the second half. Even this, however, is hardly a satisfying explanation of the presence of 281a28-282a4; perhaps it might be better to suppose that Aristotle, for whom

the necessary existence of the eternal cosmos was clearly a cherished doctrine, could not resist the opportunity to include a proof of it.

None of these rather desperate measures is in fact necessary; for the passage in question, 281a28-282a4, is not concerned, I think, with proving the necessity of what exists eternally, except (as Aristotle would say) incidentally. Aristotle is concerned with demonstrating the impossibility of a Timaean cosmos <u>throughout</u> this passage; and proving that what is eternal is ungenerable and imperishable is in fact a step in this demonstration. I shall return to this claim briefly at the end of the notes on the present passage, and shall explain and defend it further in chapter 3, Section III.

One of the main interpretative problems of this section (282a4-25) arises, once again, out of scope ambiguities in Aristotle's formulations. Stocks and Guthrie take the temporal qualifier to govern the <u>possession</u> of the capacity (or the holding of the possibility); thus they read τὸ ἀεὶ δυνάμενον εἶναι as 'always able to be'. Williams and Moraux[21] take the modality to have the wider scope -- 'able to be always'. The introduction of a negation sign (τὸ μὴ ἀεὶ δυνάμενον εἶναι) provides a further ambiguity: all of these interpreters take the negation with the ἀεί; Verbeke, however, takes it with δυνάμενον (so 'not capable of being always' rather than 'capable of not always being', etc.; 'La preuve du Premier Moteur', p. 141). Verbeke's reading is not

impossible, but it is quite harsh, and has no special advantages to outweigh this; I shall, therefore, leave it out of account, and confine myself to the other two readings. These give rise to two 'squares of opposition':

(1)	Always capable of being	Always capable of not being
	Not always capable of not being	Not always capable of being
(2)	Capable of always being	Capable of always not being
	Capable of not always not being	Capable of not always being

Aristotle's (almost) consistent use hitherto of the temporal qualifiers with narrow scope very strongly favours the second square (Williams/Moraux).[22] The first square (Stocks/Guthrie) has the obvious merit that its apophaseis, unlike those of the second square, are genuine contradictories; the weight of this point is, however, diminished by the fact that the enantia do not form a pair of genuine contraries. Moreover, we can explain very economically how Aristotle could take the spurious second square to contain genuine apophaseis and enantia (see below).

Although I follow Williams, therefore, in preferring to adopt the second square, the arguments which he uses to support this conclusion

are unsatisfactory; Aristotle's earlier usage of narrow scope temporal qualifiers (which Williams does not mention) is the only firm evidence in its favour. One of the ways in which Williams argues for the second square presupposes a general conception of Aristotle's position in I. 12 which I wish to dispute. Williams regards it as positive support for the second square that Aristotle would be right to hold it to be a genuine square if the Principle of Plenitude were true: for the effect of the Principle is to enable us simply to drop the modal operators, thus yielding a perfect square of opposition:

(3)

Always being	Always not being
Not always not being	Not always being

Williams writes, a little later on,

> The conclusion seems to be forced upon us, that after about 282a7 Aristotle simply forgot that he was dealing with modal expressions and substituted assertoric ones ad libitum (p. 105).

But his argument for the second square which I have just mentioned requires a much stronger claim than that Aristotle forgot the modal/assertoric distinction for a while; it requires the claim that we have good reason, independently of his entanglements in this chapter, to suppose that Aristotle endorsed the Principle of Plenitude, and hence denied, and not merely forgot, the modal/assertoric distinction. For if that were so, then we could see the logical structure of the second

square as being positive evidence in its favour: for it would be (for Aristotle) a perfect square. Williams himself does believe that Aristotle endorsed the Principle of Plenitude quite generally (see part II of 'Aristotle and corruptibility', pp. 209-214); I shall argue later that this view is unjustified (see the Appendix to chapter 3).[23]

We can, however, show how the spurious square (2) presents no interpretative difficulty. This we can do by appeal to the 'insulated realisation' manoeuvre, on which, as we have seen, Aristotle's argument relies very heavily: if Aristotle has the use of this manoeuvre in mind here, we can see how he could treat square (2) as if it had the logical properties and structure of square (3). Thus, for instance, 'Capable of always being' and 'Capable of not always being' become contradictories, for, thanks to the 'insulated realisation' manoeuvre, they are equivalent to contradictories.[24]

We can see the pressure of this manoeuvre on Aristotle's thinking elsewhere in the section, as Williams points out. It seems to be a good explanation, for instance, of the sudden appearance of non-modal forms instead of modal ones at 282a10-12, where Aristotle is still talking about the components of the square. This is also, I think, the explanation for the κύριος 'definition' of agenêton and aphtharton in the following section ((282a27-30, quoted above in notes on 281b27-9). As we saw earlier, this is a very startling redefinition, which flies in

the face not only of Aristotle's two earlier definitions, but also of his own usage throughout the chapter. It is inadequate to say, with Williams, that Aristotle confuses the two forms of the definition; it is much more reasonable to suppose that Aristotle thinks that he has an argument (namely the one which involves the IR manoeuvre) which shows that the two definitions are co-extensive: anything which can be said in modal terms can (at least in the present context) be properly, and indeed more perspicuously, said in non-modal terms.

What conclusion is Aristotle arguing for in this section (282a4-25)? Simplicius thought it a fresh argument for the imperishability and ungenerability of what exists always; Alexander thought it the start of the argument for the theses that what is imperishable is eternal and what is ungenerable is eternal (see n. 20). Aristotle seems to me to be seeking both Alexander's and Simplicius' conclusions. His final goal is Alexander's:

> ἀνάγκη τὰς ἀποφάσεις[i.e. of the two upper components of the square] τῷ αὐτῷ ὑπάρχειν, καὶ εἶναι μέσον τοῦ ἀεὶ ὄντος καὶ τοῦ ἀεὶ μὴ ὄντος τὸ δυνάμενον εἶναι καὶ μὴ εἶναι (282a7-9).

The λόγος καθόλου (282a14ff.) suggests that Aristotle's strategy is to establish the existence of three exclusive and exhaustive classes:

> Able to be always
> Able not to be always
> Able to be sometimes and able not to be sometimes

(Compare 282b10ff.) This of course involves showing both Simplicius' and Alexander's conclusions to be true. The first (that what exists always exists of necessity) comes at 282a21-22, and the second (the anti-Timaean thesis) at 282a23-25.[25] The latter is supported by an appeal back to 281a28ff.. This does not mean, however, that in the present section Aristotle has moved on to a new thesis, and is now merely reminding us of an old one: the earlier conclusion is necessary to complete the proof of the three exhaustive and exclusive classes, as I shall try show in Section III of chapter 3.

It is very difficult to pin down exactly how Aristotle regards himself as arguing for this conclusion -- in part, at least, because of the pervasiveness of the IR manouevre. Williams suggests that Aristotle takes the square as central to the argument, and that he then goes on not only to confuse the various squares but also (very strangely indeed) to identify 'generable' and 'perishable' at 282a23-4 with the two subcontraries of the square (that is, with the I and O components of square (3) respectively). I do not find this plausible, and my own guess is that Aristotle has at the centre of his argument a triangle rather than a square: the three classes which I described above. This makes his introduction of genêton and phtharton at 282a23-24 perfectly in order, granted what has gone before: for anything belonging to the third class (able to be sometimes and able not to be sometimes) will be generable or perishable, and vice versa (see chapter 3, Section III).

282a25-b7.[26] Aristotle restates (in question form) the conclusion he wishes to establish, interrupting himself to give the 'redefinition' of aphtharton and agenêton which we discussed earlier. Since the paragraph break must be at a25, and not at a21 (see n. 25), Williams must be right in taking ἤ at a30 as signalling Aristotle's intention to pursue the stated thesis via the mutual entailment of genêton and phtharton, and not as heralding a fresh, alternative proof: Aristotle has not yet given us a proof to contrast with this one.[27]

Stocks and Guthrie take the strategy thus introduced to commence immediately, with δῆλον δέ (282b1); they are obliged in consequence to take ὑπόκειται (b3) and ὑπέκειτο (b5) to refer to 281b25ff..[28] 'ὑποκεῖσθαι', however, does not signal a reference to a proof, but to a premiss, as Williams points out ('Aristotle and corruptibility', p. 203, n. 3);[29] 281b25ff., moreover, does not (pace Guthrie) establish the mutual implication of agenêton and aphtharton (although it is used as part of the argument for this), nor is it taken by Aristotle to do so. Williams is therefore right to see ὑπόκειται and ὑπέκειτο as referring to the antecedent of the conditional at 282a30-31, and to take δῆλον δέ . . . οὔτε τὸ ἄφθαρτον ἀΐδιον εἶναι (282b1-7) as further remarks about the strategy to be deployed, rather than as the commencement of the strategy itself, which begins with ὅτι δ' ἀνάγκη ἀκολουθεῖν, ἐκ τῶνδε φανερόν (282b7ff.).

Williams' own account of 282b1-7 is itself unsatisfactory, however:

> He then (282a30-b1) shows that his thesis follows necessarily from the convertibility of ἀγένητος and ἄφθαρτος. The additional premiss that is necessary in order to secure this inference, namely, that that which is both ungenerated and incorruptible is eternal, is clear from the definition of the terms ('Aristotle and Corruptibility', p. 203).

Aristotle, however, makes no mention of this 'extra premiss' as being that which is 'clear from their definitions' -- in fact he does not mention it at all. Without an indication to the contrary, δῆλον naturally refers back to the preceding sentence. Moreover, Williams has to construe the καὶ γὰρ ἀνάγκη at 282b2 as continuing the <u>apodosis</u> of the conditional which began at 282a30 (see 'Aristotle and corruptibility', p. 203, n. 3). This seems an impossible stretch for the conditional, with the δῆλον δέ clause interrupting to make a quite distinct point (both logically and grammatically).[30] What is said to be clear at 282b1 is, I think, the truth of the preceding conditional (εἰ μὲν ταῦτα ἀλλήλοις ἀκολουθεῖ . . . ἀνάγκη καὶ τὸ ἀΐδιον ἑκάτερῳ ἀκολουθεῖν); the καὶ γὰρ clause introduces an explanation of why the ὁρισμός makes this truth δῆλον. On this reading, however, τοῦ ὁρισμοῦ αὐτῶν cannot mean 'the definition of these terms'; for it is hard to see how the explanation which follows (καὶ γὰρ ἀνάγκη, εἰ φθαρτόν, γενητόν) arises simply from the <u>definitions</u> of <u>aphtharton</u> and <u>agenêton</u>. τοῦ ὁρισμοῦ αὐτῶν must rather refer to the characterisation, or logical constraints, imposed on <u>aphtharton</u> and <u>agenêton</u> in the

antecedent of the conditional (εἰ ταῦτα ἀλλήλοις ἀκολουθεῖ); this is answered by ὑπόκειται and ὑπέκειτο in the subsequent explanation. So b1-3 read:

> It is clear that this [i.e. the preceding conditional, that 'if aphtharton and agenêton are entailed by each other, then it is necessary that each entails aidion'] is so just from the conditions taken to hold of aphtharton and agenêton; for <on these conditions> it is also necessary that if X is phtharton it is also genêton. For it is either agenêton or genêton[31]; but according to the premise, if it is agenêton it is aphtharton, etc..

In this way the καὶ γὰρ ἀνάγκη clause is conditional in import; but this is due to the reference to τοῦ ὁρισμοῦ αὐτῶν, and not to Williams' impossibly stretched conditional.

282b7-283a3. Williams regards Aristotle in 282b9ff. as once again primarily concerned with the square of opposition as such. Thus ad 282b22-23 he writes:

> At this point it becomes evident that Aristotle has identified I^3 and O^3 [the subcontraries of square (3)] with γενητόν and φθαρτόν. The symbolism which precedes this sentence represents γενητόν by Γ and φθαρτόν by Δ, and treats them as subcontraries of a square of opposition formally identical with that of 282a14-21. It is on this confusion of γενητός and φθαρτός with I^3 and O^3 that the argument for their convertibility depends. There has so far been no other argument in favour of the thesis ('Aristotle and corruptibility', p. 204).

Once again, however, this does not seem to be a true account of the nature of Aristotle's argument. Aristotle's concern again appears to be with the three exhaustive classes discussed earlier. The argument at b22-23 gives no appearance of proceeding _via_ the formalisation of subcontraries and their mutual implication, but rather _via_ the exclusivity of the 'always exists' and 'can exist and can not-exist' classes, _together with_ the claim about capacities and unlimited and limited times, which Williams rejects as irrelevant to the argument. As I shall argue in chapter 3, this claim in fact helps to underpin the _whole_ of Aristotle's argument, from the beginning of the chapter.[32] I shall discuss below how Aristotle might think that times limited in only one direction can be ruled out when it comes to qualifying capacities.[33] Meanwhile, the use to which he puts this claim here is fairly obvious: being 'only sometimes' entails being for a limited time, and this entails being for a time which is limited in both directions.

Aristotle's argument in this passage is thus as follows. It is clear that _genêton_ and _phtharton_ entail each other from the earlier argument (i.e. that concerning intermediates); for the intermediate between what always is and what never is is that which entails neither: this is the _genêton_ and _phtharton_. "That which entails neither' is ambiguous: does Aristotle mean 'which does not entail (at least) one of these', or 'which does not entail either of these'? 'This the generable and perishable' is correspondingly ambiguous: is the phrase intended to

be conjunctive or disjunctive? In the argument which follows, he certainly does not rely on the strong (conjunctive) reading -- to which he is not, of course, entitled; but he may nonetheless be anticipating his conjunctive conclusion. Now if a thing is genêton, it must be intermediate, because there is no time in either direction in which what always is is not, or in which what never is is, whereas if a thing is genêton, there must be a time <when it is not>, either actually or potentially (there is no such time, either actually or potentially, for eternal things, by Aristotle's argument at 281b2-32). The same argument holds for what is phtharton. Thus what is genêton or phtharton is both phtharton and genêton. What this final and critical move clearly requires is the extra claim that nothing can be an intermediate 'in one direction': if anything which is a member of the intermediate class has to (have the capacity to) exist only for a time which is limited in both directions, then Aristotle's strategy of showing genêton and phtharton in turn to be members of this class will establish their mutual entailment. This requirement is met by the subsequent claim that capacities cannot be qualified by a time limited in only one direction. That this is how Aristotle intends the argument to go through is quite clear from the repeated references to the capacities of the intermediates -- both for existence and for non-existence -- being for limited times (for this use of ποσὸν τινὰ χρόνον compare the opening paragraph of the chapter). There is no sign of Aristotle filling this

gap in his argument by a confused identification of genêton and phtharton with the subcontraries of the earlier square of opposition, as Williams claims.

Having thus established that genêton and phtharton entail each other, Aristotle goes on to show how this result proves that agenêton and aphtharton also entail each other (282b26-283a3).[34]

283a7-10. Aristotle's precise argument here is difficult to recover, not least because it is so compressed.[35] The structure of the argument is ambiguous, and it could be meant to instantiate either of the following two patterns:

[A] Capacities are qualified either by a wholly unlimited time period or by a limited one, because:

<(1) Only capacities which are qualified by a period which has the feature F are possible.>

(2) <Limited periods are obviously F and> a wholly unlimited period <is F> because such a period is defined, etc. . . . .

<(3) These are the only two sorts of period which are F.>

(4) One-limit infinities are neither wholly unlimited periods nor limited ones.

[B] There are no capacities qualified by a one-limit infinity of time, because:

(1) The only possible capacities are those qualified either by a limited time-period or by a wholly unlimited one.

(2) <Someone might object that capacities cannot be qualified by an unlimited time because . . . .> But they can be qualified by an unlimited period because such a period is defined, etc. . . . .

(3) One-limit infinities are neither wholly unlimited nor limited periods.

Williams and Waterlow both see the argument here as conforming to pattern [A], although they give different values to '<u>F</u>'. Williams takes Aristotle to be thinking of the 'rule' concerning the qualification of capacities which is stated at I. 11 281a17-18 ('Aristotle and corruptibility', p. 205). Williams understands this rule to be that the quantity by which a capacity is qualified must be <u>limited</u>, and thinks that at 283a7-10 Aristotle is trying to square the eternity of the universe with the ch. 11 rule by a fallacious equivocation on 'ὡρισμένον': the cosmos can have a capacity to exist for an unlimited period, because this period <u>is</u> limited in a way -- i.e. is, in a way, <u>defined</u>. The rule which Williams ascribes to Aristotle in ch. 11, however, is not only invalid, but is an especially implausible one for Aristotle to advert to in the context of a proof of the existence of the cosmos for an unlimited period. It seems much more plausible to take 'ὡρισμένον' in the ch. 11 rule as meaning 'definite', and to take the rule as stating merely that the proper description of a capacity which has a quantitative qualification is in terms of the relevant maximum or minimum amount of the quantity -- the maximum weight which a man can lift, or the minimum noise which he can hear.[36]

Waterlow's translation of 283a7-10 differs from mine:

> 'All things capable of acting or suffering, of being or not being, are capable of these for a determinate (ὡρισμένον) time, either infinite or of a specifiable amount (ποσόν). This applies to infinite time because infinite time is in a way determinate (ὥρισται πως) in so far as it is that than which none is greater. But what is infinite in one direction only is neither infinite nor determinate' (Passage and Possibility, p. 70).

She takes the predicate 'F' in pattern [A] to be 'determinate' instead of 'limited', and explains the argument as follows:

> . . . the one-way infinite is not determinate in the standard sense which entails 'finite'. But nor is it infinite in the sense of being lesser than none; hence it is not even 'in a way determinate'. Thus it is not (given the premiss) a possible duration for a categorizable F-state (p. 70).[37]

Waterlow's translation of the 'premiss' at a7-8 is hard to accept. She takes 'ὡρισμένον' as applying to 'ἄπειρον' as well as to 'ποσόν' (see p. 70, n. 19), but this reading is at odds with the fact that at a10 Aristotle explicitly contrasts 'ὡρισμένον' with 'ἄπειρον'. It might seem that Waterlow's interpretation of the line of argument here stands or falls with her translation, since the latter has an explicit mention of determinateness as the crucial property. But the compression of Aristotle's presentation of his argument is such that it is reasonable to take the relevant value of 'F' to be only implicit in the text: thus even without an explicit mention of determinateness, Waterlow's

interpretation of the argument remains still a plausible reconstruction.[38]

Another interpretation is also plausible; this is offered by W.J. Verdenius, who takes the argument to conform to pattern [B]:

> The transmitted text may be explained as follows: "It might be objected that 'infinite-limited' is no proper dilemma, because 'infinite' is not something definite. But 'infinite' actually is defined in a way, namely as something that cannot be exceeded. So the dilemma 'infinite-finite' is a legitimate assumption. That which is infinite in one direction, however, falls outside of this dilemma and should therefore be rejected".[39]

It is unclear whether or not Verdenius means 'definite' here to be equivalent to 'definable'; I would prefer to see the claim that the 'infinite' is definite as supported by an appeal to the content of the definition, rather than by an appeal to the fact that it <u>has</u> a definition. Verdenius' interpretation has the advantage over Waterlow's that pattern [B] involves fewer suppressed steps than pattern [A]; on the other hand, as an argument against the existence of capacities qualified by one-limit infinities, Waterlow's has more substance than Verdenius'. These considerations apart, however, the text does not appear to support either of the two accounts over the other.

If Aristotle's argument is the one which Verdenius suggests, we should obviously like to know why Aristotle takes the 'infinite-limited' dichotomy to be an exhaustive division of the sorts of periods which can

qualify a capacity. That it is exhaustive is hardly self-evident, especially in the face of the Timaean thesis; and the argument which Verdenius detects here clearly cannot be what persuades Aristotle that capacities cannot be qualified by one-limit infinities. Again, if Waterlow's account of the argument is correct, we should like to know why Aristotle thinks that no-limit infinities are determinate but one-limit infinities are not; or, if this is a straightforward 'logical point', as Waterlow maintains (p. 70; cf. Sorabji, Time, Creation and the Continuum, p. 279), we should like to know why Aristotle thinks that the periods which qualify capacities must be determinate in this sense. On either interpretation, then, some further explanation is required (beyond the argument which Aristotle presents here) for his conviction that one-limit capacities are impossible. In Section IV of chapter 3 I shall sketch a line of argument which supports the ruling out of 'one-limit' capacities and which would, I think, provide an answer to both the questions raised by Verdenius' interpretation and by Waterlow's. It is, moreover, an argument which Aristotle might reasonably endorse, and which is in line with the general approach of Cael. I. 10-12.

283a11-24. A group of three arguments. (1): a11-17. Aristotle does not, after εἰ γὰρ μηθὲν μᾶλλον, κ.τ.λ.(a12), go on to consider what follows if the Platonist holds that there is a reason why the cosmos came to be (or perished) 'just then'. This, together with the

elliptical γάρ at a12, suggests that the force of all-12 is meant to be something like this:

> Why did the cosmos perish (come to be) just <u>then</u>, having existed (failed to exist) throughout all previous time? <This question leads to another objection to the Platonist position; for there clearly can be <u>no</u> reason why it happened just then, and> if there is no reason why, etc..[40]

Why should Aristotle think that there can be no reason why it happened just then? Here is a possible argument, which owes something to the one at I. 10 279a21-4. If there were a reason, it would have to take the form of a cause which triggered this change just then. But why did this triggering itself occur just then? Aristotle (unlike Democritus, perhaps) would not find acceptable the infinite regress which threatens.

From a14 on the argument is an application of that at 281b15-25 to the Timaean case of an infinite time which is limited in one direction: during this 'infinite' period <u>X</u> always exists, and yet at every moment it has the capacity not to exist;[41] but, by the insulated realisation move, there is no time in this infinite period in which this supposed capacity could be exercised without contradiction, and so it is not a genuine possibility.

It is not clear how Aristotle is able to discount the period of time <u>beyond</u> the single limit which bounds a Timaean infinity. It may be that Aristotle here not only has natural capacities in mind (rather than logical possibilities), but additionally thinks that the time before or

after the thing exists can be discounted since then the natural capacity does not exist to be exercised either. This would involve Aristotle in some confusion. For then his argument at 283a11-14 would not show that something which is generated but allegedly unperishing has a capacity for non-existence; for if natural capacities do not exist to be exercised when their possessors do not exist, then the earlier non-existence of a Timaean cosmos cannot have been due to the exercise of any of its capacities. Alternatively, Aristotle may be thinking (more simply) that that period of time, beyond the single limit, is irrelevant: whatever may be true of that period, the Platonist is still committed to incompatible capacities in this infinite period. The only point of importance here is that on either view (most clearly on the second) it remains true that Aristotle only applies the insulated realisation manoeuvre in the case of something which exists for the whole of an infinite period -- that is, which is eternal, whether absolutely or from/to a limit.

(2): a17-20. What the argument concerning σημεῖα has shown is that the thing in question has for an infinite time the ability to be and the ability not to be; but this has only been shown to be impossible in the argument which we have just considered, and which immediately precedes this one. Why does Aristotle regard this argument as a fresh one (ἔτι) if this is what he intends? Perhaps it is the change to ἐν

ἅπαντι σημείῳ which is new, rather than any difference in the structure of the argument.[42]

(3): a20-24. The last argument of this group of three, like the preceding one, seems to present no fresh argument against the Platonist; but again it arrives at the familiar impossibility from a different angle.

283a24-29. An argument to show that if the Platonist accepts that the world, being genêton, is also phtharton, he must accept that it will actually cease to be. If it did not, it would always be ἄφθαρτον ἐντελεχείᾳ,[43] while also being φθαρτόν. Thus it would be at the same time able to be always and able always not to be. The perishable will, therefore, at some time perish (and correspondingly, the generable has been generated). Despite the καὶ ἄλλως (283a24), this is quite obviously a repeat of the familiar argument.

283a29-b6. For a discussion of the rearrangement proposed by Moraux of the final sections of the chapter, from 283a29 onwards, see below. I shall argue that there is no reason to make any changes to the order of these sections.

The route to the familiar impossibility here might seem to be a 'physical' rather than a 'katholou' one; for it appears to

involve a notion of a natural capacity for something naturally bringing with it a capacity for the appropriate opposite which is similar to the one we found at work in the second physical argument of Cael. I. 10 (see notes ad loc., above). But Aristotle here does not infer the possession of a capacity for non-existence from the possession of a capacity for existence. Rather he infers the possession of both capacities from the fact that a 'Timaean' cosmos both exists and fails to exist for period of time which is infinite: thus neither state can be due to chance: ἀνάγκη τοίνυν φύσει τὰ τοιαῦτα ὁτὲ μὲν εἶναι ὁτὲ δὲ μή .[44] There is nothing in the argument, so construed, to make it qualify as physical rather than katholou.

283b6-17. At 283allff. Aristotle argued that cosmic things do not change their δυνάμεις, but only change (if at all) from the actualisation of one to that of another. Here he seems to be responding to someone who claims that the unchanging δύναμις of a generated but imperishable cosmos is not the capacity for non-existence without qualification, but that of non-existence before t,[45] where t is a particular time, the time of the genesis of the cosmos (say, 4004 B.C.). This capacity could be possessed for the whole of time, it seems, without being open to Aristotle's familiar objection. I hesitate to interpret Aristotle's opponent here in this fashion, for the response which Aristotle makes is badly misconceived if aimed at this target; I cannot find another interpretation, however, on which Aristotle's

response is any more commendable, without making his opponent's position too inept to be worth setting up.

If this is the objection which Aristotle has in mind, then, his responses are poor ones. His claim that there are no past-directed δυνάμεις appears to be simply beside the point: as the πέρυσιν argument itself shows, the Platonist's move does not proceed by positing backwards-operating δυνάμεις, but temporally specific ones (in the way in which 'grue' could be said to be a temporally specific predicate). Alternatively, Aristotle may be supposing that his opponent is committed to a backwards-operating δύναμις in positing his temporally specified (Timaean) one: if a thing's state is to be explained in terms of the exercising or actualisation of its appropriate δύναμις, then it might seem as if what the present exercise of our temporally specified δύναμις has to explain is the non-existence of the cosmos before 4004 B.C.. If this were so, then there would be a past-directedness to any post-4004 exercise of the δύναμις, which Aristotle might reasonably reject. It is not so, however. The present exercise of this temporally specified δύναμις explains the present existence of the cosmos: its non-existence in 4005 B.C. was due to the exercise of this δυναμις in 4005, just as what explains a grue emerald's being green before 2000 A.D. is the exercise of its grue-δύναμις before 2000. The same point can be made against Aristotle's second response (283b15-17), in which Aristotle takes the exercise of a δύναμις to constitute a thing's state: once

again, the state constituted by the present exercise of the objector's grue-type δύναμις is the present existence of the cosmos, and not, as Aristotle claims, its past non-existence.

Aristotle clearly has natural potentialities in mind in this section, rather than logical possibilities -- otherwise his claim that οὐδεμία δύναμις τοῦ γεγονέναι ἐστίν is absurd. Williams maintains that this claim is inconsistent with the one at 281b28-9 that γενητὸν δὲ ὃ ἐνδέχεται πρότερον μὴ εἶναι; and he appears to see this inconsistency as a symptom of a more general failure by Aristotle in I. 12 to distinguish logical and natural possibility ('Aristotle and corruptibility', pp. 207 and 212). Williams' general accusation rests on his belief that most of Aristotle's argument is officially concerned with logical possibilities: I shall later argue, however, that there is good reason to suppose that Aristotle actually conducts his entire argument in terms of natural possibilities (see chapter 3, Section IV).[46] Williams is also wrong to see an inconsistency in Aristotle's assertions at 281b28-29 and 283b13: I discuss this below.

283b17-22. A 'physical' argument, very reminiscent of the first of the pair in I. 10 (279b18-21). On the <u>phusikôs</u>/<u>katholou</u> distinction, see the end of Section IV of chapter 3 below.

Moraux's reconstruction of 283a29-b22

Moraux argues that the text at the end of I. 12 has been very severely dislocated, and offers an elaborate rearrangement.[47] His thesis falls into two main parts: first, the claim that 283a29-b6 as a whole is out of place; and second, that this passage itself does not form a unity, but is an amalgam of fragments which must be relocated elsewhere.

Moraux claims that the argument at 283a29-b6 seems to interrupt the flow of a series of closely related arguments (283a11-29 and 283b6-17) with one of a quite different character. He also thinks that the πέρυσιν argument must be tied very closely to a24-29, because it offers, on his view, a deliberate correction to the claim which Aristotle allows there (presumably for the sake of argument), that there are past-related possibilities. Similarly, Williams points to past-related possibilities at 281b28-29, and sees Aristotle's denial at 283b13 of any 'δύναμις of having come to be' as evidence that Aristotle is confused over logical and natural possibility. I do not see the justification for either of these claims of inconsistency, however: in the πέρυσιν argument, Aristotle appears to be denying (rightly, though irrelevantly) that the present exercise of a δύναμις can be causally involved in the production of a past state. In the two earlier passages he does not have this sort of case in mind at all; he is not asserting there that there are

capacities to produce past states, but simply speaking of things which are able, as far as their natural capacities are concerned, to have come to be: this use of the past tense with a natural-capacity term carries no suggestion at all of backwards causation. Moraux's claim that 283a29-b6 is awkwardly placed does not warrant moving the passage; nor does this suggestion receive the support he thinks from 283b13.

Moraux goes on to argue that 283a29-b6 does not form a unified whole. He holds that (in its present position, at least) τὰ τοιαῦτα at b3 must obviously refer to things that are by chance (so also Stocks). It is then of course very difficult to see how a31-b2 establish the claim that what is by chance sometimes is and sometimes is not -- and that, too, by nature. Moraux concludes that b3-5 is a fragment of another, heterogeneous argument, and thinks that it should go with 283b19-22, where he claims (implausibly, I think) that it is needed to fill out the argument. As a result of this, a31-b2 is now itself a deficient argument: in order to fulfil the promise of a29-31 it would also need to rule out a cosmos which was generated but imperishable <u>by nature</u> (or, says Moraux, by act of God); these lines, too, must constitute a mere fragment of an argument. Finally, Moraux finds it hard to see how b5-6 can belong to the ἀπὸ τοῦ αὐτομάτου argument; he regards it as a further stray fragment of some argument like those which surround a29-b6, and then deletes it since there is no appropriate place

for it in the text. This analysis of the passage leads to Moraux to offer the following reconstruction of the text:

283a24-29: φανερὸν δέ . . . μὴ ἀεὶ ἄρα εἶναι .
283b6-22: ἀλλὰ μὴν οὐδέν . . . φθείρεται .
283b3-5: ἀνάγκη τοίνυν . . . εἶναι καὶ μή .
[283b5-6: deleted]
283a29-b2: ἔστι δὲ καὶ ὧδε . . . τὸ πολὺ ὑπάρχει ὄν .

Moraux's attacks on the unity of a29-b6 are unconvincing. The key to this passage is the phrase τὰ τοιαῦτα ; the most natural understanding of this is not 'the things that are by chance', nor Guthrie's 'things which exist for an infinite time', but 'things which are generated but imperishable (or ungenerable but corruptible)'.[48] If we adopt this reading, moreover, then a29-b2 makes perfectly good sense: the connection between a31-b2 and b3-6 is clear, and the whole argument does fulfil the promise of a29-31; nor is there any difficulty, on this view, with the connection of b3-5 and b5-6.

Chapter Two: Notes

1. The debate as to whether this view is, in fact, Plato's -- i.e. as to whether the Timaeus' cosmogony is to be taken literally or metaphorically -- began in Aristotle's own day. For an account of the ancient debate, see Proclus, in Platonis Timaeum Commentaria (edited by Ernst Diehl, 3 vols [Leipzig: Teubner 1903-1906]) I. 276.10ff.. In the sixth century, Philoponus championed the literalist position in his De Aeternitate Mundi Contra Proclum: I discuss this in 'God or nature? Philoponus on generability and perishability', forthcoming in Richard Sorabji (ed.), Philoponus and the rejection of Aristotelian science (London: Duckworth 1986). For modern discussions, see Francis Macdonald Cornford, Plato's Cosmology: the 'Timaeus' of Plato translated with a running commentary (London: Kegan Paul, Trench, Trubner 1937), pp. 34ff.; Gregory Vlastos, 'The disorderly motion in the Timaeus', Classical Quarterly 33 (1939) 71-83; reprinted with minor revisions in R.E. Allen (ed.), Studies in Plato's Metaphysics (London: Routledge and Kegan Paul; New York: Humanities Press 1965), and 'Creation in the Timaeus: is it a fiction?', in the same volume; Sorabji, Time, Creation and the Continuum: theories in antiquity and the early middle ages (London: Duckworth 1983), pp. 268-75. Aristotle's attack on the Timaeus in Cael. I. 10-12, of course, takes the genesis of the cosmos literally; but he has little interest here in the question of Plato's own intentions: see chapter 3, Section IV and n. 15.

2. Cf. I. 12 283b17-18; I discuss this contrast below, chapter 3, end of Section IV. For the somewhat different phusikos/logikos distinction, see, for instance, GC I. 2 316a12ff..

3. So W.K.C. Guthrie, Aristotle: 'On the Heavens': with an English translation, Loeb Classical Library (London: Heinemann; Cambridge, Mass.: Harvard University Press 1939), p. 99.

4. One problem for this interpretation is why Aristotle qualifies his conclusion concerning the cyclic process as he does: καὶ τοῦτ' ἀπειράκις ἢ οὕτως εἶχεν ἢ δυνατὸν ἦν (279b29-30). If his argument shows, as

he claims, that the present cosmos will be dissolved (διαλυθήσεται), then it also shows that the elements will not stay in a disordered state for ever afterwards. This qualification of the conclusion would present a similar problem on any view, I think. Perhaps Aristotle expresses himself badly, and means to enter a caveat, not about the actuality, but about the infinity of the process (i.e. if time were not infinite). Alternatively, he may be taking the cycle which he describes to be an orderly one like Empedocles'; a Democritean universe would survive Aristotle's argument, but would only have the potentiality for forming an orderly succession of cosmoi, since the succession could be quite haphazard.

5. See Paul Moraux, 'Kritisch-Exegetisches zu Aristoteles', Archiv für Geschichte der Philosophie 43 (1961) 15-40, at pp. 30-36; I discuss Moraux's argument in the notes on 283a29-b6 below.

6. This is the view of Gérard Verbeke, 'La structure logique de la preuve du Premier Moteur chez Aristote', Revue Philosophique de Louvain 46 (1948) 137-60: '. . . la composition dans laquelle ils ont été incorporés est donc instable et se dissoudra dans l'avenir' (p. 140).

7. It is, of course, a demerit of this interpretation that Aristotle is silent about what would be for us the key move; I think, however, that the harshness of the omission is outweighed by the advantages of this reading.

8. See the discussion of the phusikos/katholou distinction at the end of Section IV, chapter 3.

9. Cf. the remark at 283b4-5: τῶν δὲ τοιούτων ἡ αὐτὴ δύναμις τῆς ἀντιφάσεως, καὶ ἡ ὕλη αἰτία τοῦ εἶναι καὶ μή -- though the capacities in question are for being and not being, rather than for coming to be and perishing. 'ἡ αὐτὴ δύναμις τῆς ἀποφάσεως' here presumably means that to have this δύναμις for being is to have matter of a certain sort, and to have this matter is, in turn, to possess a δύναμις for not being. See also the discussion of Met. Θ. 8 1050b6-30 in the Appendix to chapter 3 (passage 2(c)).

Why does this argument at 279b21-31 fail to apply to Aristotle's own, eternal cosmos? Presumably because its elements do not have to be ascribed any capacity for change from disorder into order. Elsewhere Aristotle denies potentiality, in the sense of a capacity for this sort of change, to the eternal heavenly bodies precisely because he thinks that their existence is necessary (see the Appendix to chapter 3).

10. See n. 4 for a difficulty here.

11. At 281b18-19 Aristotle seems to adopt the other reading; but I think that this is no more than a minor error on Aristotle's part (see chapter 3, Section I).

12. A denial of such capacities is clearly required by the claim that generability and perishability entail each other, for which Aristotle argues at length (282a4f.). I discuss the grounds for Aristotle's denial of these capacities in the notes on 282a4-25 and in Sections III-V of the next chapter.

13. I make no claim, of course, for the historical accuracy of taking this scheme to underlie the cosmogenesis of, say, Anaximander. (I do not think, however, that Aristotle's 'distortions' of his predecessors' views here are the result of either historical incompetence or shallow prejudice; I touch on this issue in connection with his version of the Timaean theory below, in Section IV and n. 15 of chapter 3.)

14. The same presuppositions are made more explicit in the argument at 279b24-31 (note especially κἀκεῖνα at b27). They also underlie the argument at 280a11-14 that an Empedoclean cycle of cosmoi can be regarded as a cycle of phases of a single, eternal cosmos.

15. Contra J.L. Stocks, De Caelo, in The Works of Aristotle Translated into English, edited by W.D. Ross, vol. II, (Oxford: Clarendon Press 1930). On the significance of this reference to the categories, see chapter 1, Section II above.

16. According to Simplicius, Alexander raised the objection outlined above that a thing's capacity for existence and its capacity for non-existence cannot both be for limited times (Simplicius, In Aristotelis De Caelo Commentaria, edited by I.L. Heiberg, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vol. VII [Berlin: G. Reimer 1894]; this reference 343.1-35). Simplicius' answer to the objection, like mine, appeals to the idea of a cycle of existence and non-existence (343.36-344.25). But while I take 281a28-32 as meant to be restricted to the capacities of the cosmic elements, he takes the remark at 281a28-32 to be a general one, designed to include animals and plants. In consequence, he is reluctant to agree with Aristotle that capacities for non-existence must be qualified by limited times, since he is rightly unwilling to see the nature of the four elements as somehow guaranteeing the continuance of the cycle of the genesis of new species-members.

17. In chapter 1, Section II, I dealt with the objection that all possibilities attaching to transient individuals could be redescribed as possibilities attaching to the elemental components which make up the individual.

18. Williams claims that ἄφθαρτον at a26 must mean 'unperishing' rather than 'imperishable'. This is not so: see below, n. 43. But even if Aristotle does intend the word non-modally here, the general point is unaffected: 'φθαρτόν' in the same line must in any case mean 'able to perish', and if 'ἄφθαρτον' here means 'unperishing', this is simply an easily-understood switch in sense for the sake of brevity.

19. Although this entailment can, of course, be 'proved' by means of the IR manoeuvre.

20. Alexander, while agreeing that the argument up to 282a4 is concerned with the imperishability of what exists eternally, thinks that the beginning of Aristotle's direct argument against the Timaeus begins at 282a4; Simplicius himself takes the same view as Williams (330.21ff.)

21. Paul Moraux, Aristote: 'Du Ciel': texte établi et traduit (Paris: Les Belles Lettres, 1965).

22. My only reservation is that Aristotle is sufficiently muddled in this chapter to cast doubt on the value of relying on such consistency; this consideration would not undermine the second square in favour of the first, however, but would rather support the view that Aristotle's meaning here is indeterminate between the two readings.

23. Williams' other two arguments are: (1) ἀεί and μὴ ἀεί must go with εἶναι and not with δυνάμενον at 282a23-24: this is true, but tells us nothing about the earlier formulations, since Aristotle has in the meanwhile introduced into the discussion the terms genêton and phtharton, whose definitions ensure the propriety of the formulations at a23-24. (2) If the second square is the right one, then δέδεικται πρότερον can refer to 282a5, and Aristotle will just be repeating that A^2 and O^2 are contradictories; this is much neater, Williams thinks, than if it refers to 281b18ff. (so Stocks and Guthrie). 'δέδεικται', however, must refer to a proof, which we do have at 281b18ff., but not at 282a5 (where Aristotle simply lays down that they are contradictories).

24. 'X always is' obviously entails 'X is capable of always being', while the reverse entailment holds by Aristotle's earlier argument (thanks to the insulated realisation manoeuvre). The manoeuvre also enables us to show that 'X is capable of not always being' entails 'X is not capable of being always'; the entailment in the other direction is straightforward. Thus, given the IR manoeuvre, the 'contradictories' of square (2) are equivalent to a pair of genuine contradictories.

25. These lines (b21-25) are very closely linked to what precedes; the paragraph break, therefore, should be made at 282a25 (so Allan), and not at a21 (Stocks and Guthrie).

26. Moraux was so impressed by the redundancy of 282a25-283a3 in the light of 282a4-25 that he argued that the latter must be a later addition (Bude introduction, p. lxxxii, n. 1 fin. [pp. lxxxiii-lxxxiv]). This is not the whole truth, however. Aristotle has in effect shown all that he needs to: if these three classes are exclusive and exhaustive, then the Timaeus view is self-contradictory; nonetheless, Aristotle has

not shown in any direct fashion that genêton and phtharton entail each other. Throughout the latter half of the chapter, moreover, Aristotle shows considerable eagerness to approach the same argument from different angles (see, e.g. 283a11-24). See also n. 32 below.

27. Williams, 'Aristotle and corruptibility', p. 203, n. 2. Stocks takes ἢ to introduce an alternative proof, and so perhaps does Moraux, who prints a new paragraph at a30 as well as at a25.

28. Stocks ad loc., n. 1; Guthrie p. 118, n. a.

29. Cf. Moraux's translation:

> En effet, elle est ou ingénérable ou générable. Si elle est ingénérable, elle est, d'après nos prémisses, incorruptible. . . . Elle est, en effet, ou corruptible ou incorruptible. Mais si elle est incorruptible, elle est, d'après nos prémisses, ingénérable (Budé edition, pp. 48-9).

30. Repunctuating this by bracketing δῆλον δὲ καὶ ἐκ τοῦ ὁρισμοῦ αὐτῶν and moving the question mark from b1 to b2 (after καὶ γάρ . . . γενητόν) might ease this slightly; but it would make a very harsh break between the καὶ γάρ clause and the ἢ γάρ clause which follows.

31. It does not matter whether this clause was in the original text, or merely has to be supplied by context. For discussion, see Oddone Longo, Aristotele 'De Caelo': introduzione, testo critico, traduzione e note (Florence: Sansoni 1961), p. 315.

32. The limited-times condition appears here rather than in the immediately preceding section probably because it is here that the question of the convertibility of genêton and phtharton is raised directly (it was established in the preceding section, but only indirectly, as we saw). Alternatively, it is perhaps tempting to see Aristotle's opening argument (281a28-b2) as intended to be programmatic: first Aristotle will argue that the infinite time periods qualifying the capacities cannot be the same; and then he will argue that they cannot

be different. The first claim would then be argued for at 281b2-282a25, and the second at 282a25-283a10. This scheme is very neat, although Aristotle does not, of course, present these two arguments as answering these different purposes, but claims that each of them demonstrates the impossibility of the Timaean view.

33. Taken by itself, this argument might suggest that Aristotle makes a fallacious inference from (i) 'X always is' entails 'There is no time in either direction in which X is not', to (ii) 'X is for some time <only>' entails 'There is time in both directions in which X is not'; but 283a7ff. makes it clear that Aristotle has a different line of argument in mind.

34. If 'ἀκολουθεῖν' does express the notion of of 'being entailed', Aristotle's argument at 282b30-31 is fallacious: if G does not entail E, it need not therefore entail F, since it might entail neither. But Aristotle does not need his fallacious inference, since he can derive an impossible conclusion, and so can employ his reductio strategy, without it. For if G does not entail E, then it must at least be possible that some G is F, since E or F belongs to everything. Now F entails H; so if it is possible for some G to be F, it must be possible for some G to be H -- but this is impossible ex hypothesi.

35. Moraux was so baffled by the remark at b8-10 that he made the rather desperate suggestion that there is a lacuna which has caused a different line of argument to disappear from the text ('Kritisch-Exegetisches', pp. 18-20, and Budé introduction, p. lxxxiv). Moraux's suggestion is apparently, though tacitly, endorsed by Longo (p. 315). He argues that between ἢ μὴ εἶναι and καὶ τὸν ἄπειρον διὰ τοῦτο in lines 7-8 there was originally a clause to this effect:

> Now the Timaean theory does not allow <the capacity to be qualified by> a limited period of time, because the time involved is considered infinite in one direction, and it excludes the infinite time, because . . .

Moraux's supplement presents Aristotle with a valid, though rather trite, argument; but the price of supposing so much lost text is too high. In any case, the text can be made sense of as it stands: see below.

36. I owe this point to John Ackrill.

37. All that this argument by itself shows is that a capacity for being F cannot be qualified by a 'one-way infinity', not that it is impossible for something actually to be F for such a period.

38. Waterlow claims that the premiss that periods which qualify capacities must be determinate is stated earlier, at 281a28-30 (p. 70). This is not so: Aristotle here assumes the truth of this premiss, but does not state it until the present passage (283a7-10): see the notes on 281a28-b2, above (cf. n. 32 above), and chapter 3, Section III.

39. W.J. Verdenius, 'Critical and exegetical notes on De Caelo', in Ingemar Düring (ed.), Naturphilosophie bei Aristoteles und Theophrast, Proceedings of the Fourth Symposium Aristotelicum (Heidelberg: Lothar Stiehm Verlag 1969).

40. Sorabji takes the argument here in a different way:

> I believe Aristotle is asking why Plato's matter should lose some incapacity for organisation. If there is no reason for it to do so at one moment rather than another, then it must instead for an infinite time have had the capacity to be organised, even before it came to be organised into a kosmos (Time, Creation and the Continuum, p. 279).

But if this were Aristotle's argument, then at b11-12 we should expect something like φθαρτὸν/γενητὸν ἦν instead of ἐφθάρη/ἐγένετο.

41. Although Aristotle is applying an argument which uses narrow-scope temporal qualifiers, he can employ wide-scope ones here without inconsistency, since he does not need the cosmos to be able not-to-be

always: all that he needs is that there be some moment in the infinite period in which the cosmos can not-be. (So Aristotle has in fact a much 'stronger' contradiction than he needs, since he can derive the contradiction for every moment.)

I do not quite understand the role of ἅμα γὰρ ἕξει δύναμιν τοῦ μὴ εἶναι καὶ εἶναι (283a14-15): is this just a very weak elucidation -- that is, 'it will have for an infinite time the ability not to be (because at each moment at which it has the ability to be [which since it actually exists], it can also not-be)'?

42. This suggestion is due to John Ackrill.

43. ἄφθαρτον ἐντελεχείᾳ must mean either 'in actuality not perishing' (so Williams), or 'imperishable as far as its actuality goes' (so Guthrie); the latter sense would not involve a reference to an 'actual potency', as Williams thinks, but rather a tacit application of the insulated realisation manoeuvre.

44. I take b4-5 (τῶν δὲ τοιούτων . . . εἶναι καὶ μή) not as a further step in the argument, but as a digression, explaining the physical basis in natural objects of the possession of such capacities.

45. So Moraux, Budé introduction, p. lxxxv.

46. Even if this claim were rejected, moreover, I would hold that the switch to natural possibility does not take place here, in mid-argument, but is introduced by the argument which establishes that the cosmos must have an unchanging δύναμις, at 283a11ff.; the appeal to a reason for the change taking place now rather than at some other time is only pertinent if the possibility in question is a natural one.

47. 'Kritisch-Exegetisches', pp. 30-36 (cf. his Budé introduction, p. lxxxvi).

48. So Verbeke, 'La preuve du Premier Moteur', p. 142, n. 16, and Verdenius, 'Critical and exegetical notes', pp. 276-7.

Chapter 3: *De Caelo* I. 12: discussion

I

At 28lb2-25 Aristotle presents his main argument for the opening claim of the chapter (made at 28la33-b2), which we discussed in chapter 2. He distinguishes the impossible and the false, and says that the hypothetical/without qualification distinction applies to both. It is false to say of a man while he is sitting that he is standing, but what is asserted is not impossible without qualification; whereas to say of someone that he is standing while he is sitting, is to assert what is impossible without qualification. Correspondingly, a man can while he is sitting have the ability to be standing; but he cannot have the ability to be standing while he is sitting. Thus if a man has the ability to sit and the ability to stand, he cannot exercise them at the same time, but only at different times. However, in the case of something which has more than one ability (say, two) for an infinite time, there is no other time in which only the second ability can be exercised while the first is not. As it stands, this is a non sequitur: Aristotle has shifted from one reading of 'being able to ϕ for n years' to the other.[1] This is probably just a slip: given what Aristotle has said in the lines immediately preceding, he ought to infer that if something has two abilities, of which one is to ϕ for an infinite time, then there is no other time in which only the other ability can be exercised. The argument certainly proceeds as if Aristotle had said

this, since he continues, 'ὥστ' εἴ τι ἄπειρον χρόνον ὂν φθαρτόν ἐστι' (281b20): here he is clearly thinking of something which does exercise its ability to ϕ for an infinite time. (Nothing in the argument as a whole hinges on this misformulation.)

Aristotle is now in a position to introduce his major argument -- the argument which is to dominate the rest of the chapter:

> ὥστ' εἴ τι ἄπειρον χρόνον ὂν φθαρτόν ἐστι, δύναμιν ἔχοι ἂν τοῦ μὴ εἶναι. εἰ δὴ ἄπειρον χρόνον [ἐστίν], ἔστω ὑπάρχον ὃ δύναται. ἅμα ἄρ' ἔσται τε καὶ οὐκ ἔσται κατ' ἐνέργειαν. ψεῦδος μὲν οὖν συμβαίνοι ἄν, ὅτι ψεῦδος ἐτέθη. ἀλλ' εἰ μὴ ἀδύνατον ἦν, οὐκ ἂν καὶ ἀδύνατον ἦν τὸ συμβαῖνον. ἅπαν ἄρα τὸ ἀεὶ ὂν ἁπλῶς ἄφθαρτον (281b20-5).

The fallacy here seems obvious to us; indeed, the hypothetical/without qualification distinction which Aristotle has just drawn provides us with precisely the materials required to locate and explain the fallacy. Aristotle is clearly making appeal here to a property of possibility which he states quite formally in Met. Θ. 3 (and which he elaborates in Θ. 4):

> ἔστι δὲ δυνατὸν τοῦτο ᾧ ἐὰν ὑπάρξῃ, ἡ ἐνέργεια οὗ λέγεται ἔχειν τὴν δύναμιν, οὐθὲν ἔσται ἀδύνατον .[2]

This principle is of course perfectly in order, but does not yield Aristotle's conclusion. For all that its application truly shows here is that it is impossible for something to exist always and also cease to be; it does not show that the ceasing to be of something that does exist

always is without qualification impossible, any more than the sitting man's standing is without qualification impossible. Aristotle here seems to think that his test can be applied to a candidate for possibility without regard to whether the supposition of its being realised requires changes in what else can be taken to be true.[3] I call this the 'insulated realisation manoeuvre', because the realisation of the possibility (or the exercise of the capacity) is supposed in complete insulation -- causal and logical -- from anything else which is taken to hold. (I do not, of course, mean to suggest that Aristotle calmly thought out, and took to be a perfectly sound analytical tool, this manoeuvre as I have characterised it; rather, it is simply what his fallacious way of arguing amounts to.)

Of course, the IR manoeuvre is absurd. To suppose that X ceases to exist is already to suppose that it does not exist always; consequently, that X does exist always is something which we must not continue to hold true when we are entertaining the supposition that X ceases to exist: we can only use the IR manoeuvre if we are determined to take 'X always exists' as true whatever supposition we make.[4] This suggests that what may underlie Aristotle's manoeuvre is an antecedent conviction that the cosmos' existence is necessary; if this was an assumption beyond serious question for Aristotle, his fallacious argument here would be more explicable, though of course no more laudable.[5] I shall return to this point later, after defending the claim that this way of arguing, despite

the grossness of the fallacy, is the key element of Aristotle's 'proof' of the necessity of eternal objects, and hence of his rebuttal of a Timaean cosmos.

II

Williams claims that Aristotle arrived at his fallacious conclusion here (and at the 'different times' inference at 281a28-b1) by a very different route: on his view, Aristotle is deceived by a radical confusion in his employment of the hypothetical/without qualification distinction. Williams quite rightly takes the modal form of this distinction to be the same as the purely modal variety of the sensu composito/sensu diviso distinction; let us call this pair of formulations 1C and 1D:

1C: $\neg \Diamond [p \,\&\, \neg p]$
1D: $\neg [p \,\&\, \Diamond \neg p]$

There is however a quite distinct, temporal variety, which has little in common with the purely modal one except the medieval name:

2C: $\neg \Diamond [p_{t1} \,\&\, \neg p_{t1}]$
2D: $\neg \Diamond [p_{t1} \,\&\, \neg p_{t2}]$

(Note that for Aristotle here, t1 and t2 would be used to designate periods of time for which p holds, and not moments of time at which p

holds.) Aristotle here clearly endorses the fact that, as with the first pair of formulations, sentences of the C form are true while sentences of the D form are usually false -- that is, false except when p expresses an impossibility.

Although the homonymy of these two distinctions is a medieval one, Williams thinks that Aristotle mistakenly takes them to be essentially the same. Aristotle certainly -- and correctly -- thinks that when the time period designed by tl is infinite in both directions, sentences of the form of 2D are not false but true; according to Williams, Aristotle confusedly and incorrectly infers that sentences of the form of 1D are also true when p involves something's being F for an infinite time. Thus he infers that in such cases p entails ¬◇¬p. Williams maintains that Aristotle was convinced of the truth of 'p holds always -> necessarily p' by following this fallacious argument through in a serious fashion, and it is mainly on this basis that he concludes, 'it is more probably a case of Logic influencing Metaphysics than of Metaphysics influencing Logic' ('Aristotle and corruptibility', p. 213).

Williams seems to misrepresent the form of Aristotle's argument, however. Firstly, there is no confusion in the move from the plain, modal formulation of the distinction to the temporally qualified version (except for the misformulation at 28lb18-19 discussed above, which is irrelevant to Williams' claim). In the 'hypothetical' statements which

he contrasts with the statements 'without qualification', Aristotle does not, for instance, move in any confused way from a logical 'if' to a temporal 'when': throughout this passage he consistently uses 'hypothetically false (or impossible)' to mean 'false (or impossible) on the supposition that something else is true'. Secondly, it is not true that Aristotle infers the truth of $\neg(p \,\&\, \Diamond \neg p)$, when p involves something which is F always, directly from the truth of $\neg \Diamond$(p holds always & $\neg$ p holds for some time); that is, he does not infer the truth of sentences of the 1D form in the infinite time case directly from the truth of sentences of the 2D form in such a case. For Aristotle produces an argument which is designed to license this conclusion; this is, of course, the argument at 281b20-25 which I quoted earlier, and which employs the insulated realisation manoeuvre. It seems clear that the development of the hypothetical/without qualification distinction does not provide the logical trap for Aristotle which Williams suggests: Aristotle's fallacious conclusion depends entirely and quite explicitly upon the insulated realisation manoeuvre which he uses at 281b20-25 -- together with the identification (in the context of the temporal qualification of capacities) of 'for an infinite time' with 'for all time'. This identification is licensed by Aristotle's denial of capacities to ϕ for a period which is infinite but limited in one direction: I shall try to make this move plausible later on. If this is

in order, the IR manoeuvre appears as the key to Aristotle's line of reasoning.

III

On this reading one puzzling and highly unsatisfactory feature of the chapter disappears. Commentators have taken the first and most important section of the chapter (281a28-283a10) to fall into two quite distinct parts. In the first, Aristotle argues that what exists always is ungenerable and imperishable; while in the second he argues for entailments in the opposite direction -- that is, for the claims that if X is ungenerable then it exists always, and that if it is imperishable then it exists always. Thus construed, however, the argument of the first part is quite irrelevant to Aristotle's avowed purpose of establishing the impossibility of a Timaean cosmos, which is imperishable but not eternal; it is only with the second part that we are given any argument which can be intended to refute the Timaean view. Williams stresses the irrelevance of the first argument, but despairs of a satisfactory explanation of its presence ('Aristotle and corruptibility', pp. 209-10). The problem is made worse by the fact that it is apparently difficult to decide just where the first argument ends and the second begins.[6]

In fact, Aristotle's proof of the necessity of what always exists is not at all irrelevant. It is an essential step in his refutation of the Timaean thesis, since it enables him to show that what <u>can</u> exist always does in fact do so (and of necessity). If we write '<u>P</u>' for 'the cosmos exists always' (i.e. for 'the elements are always arranged as a cosmos'), then Aristotle has shown that,

$$\Box(\underline{P} \rightarrow \Box\underline{P}).$$

It follows from this that

$$\Diamond\underline{P} \rightarrow \Box\underline{P}.$$[7]

Now the Timaean cosmos does not exist always, nor does it exist of necessity (that is, its cosmic components can be, and at some time are, in a state of non-cosmic disarray). So the Platonist must deny that $\Diamond\underline{P}$: he must deny that it is even <u>possible</u> for the cosmos to exist always. This means that, since it is imperishable, it must be possible for the cosmos to exist for a period of time which is <u>infinite, but limited in one direction</u>. If, as Aristotle thinks, there cannot be a possibility qualified in this way (see Section IV), then the Timaean cosmos must be able to exist for a <u>limited</u> period only -- and hence must perish.

This strategy also underlies the almost programmatic argument at the beginning of the chapter:

> If there are things which are able both to be and not to be, there must be some definite maximum time both of their being and of their not being . . . . For if the time is not of a certain length, but is always greater than any given time and there is no time than which it is less, one and the same thing will be able to be for an unlimited time and not to be for another unlimited time; but this is impossible (281a28-b2).

Aristotle speaks here in terms of infinite times rather than in terms of all time. It is clear, however, that the limited/infinite contrast relates to the periods of time which can qualify a capacity, and hence which can be involved in its exercise. Aristotle is anticipating his later argument (285a4-10) that nothing can have a capacity to ϕ for a time which is infinite but limited in one direction. It follows from this that if something can exist for an infinite time, it can exist for all time. Hence Aristotle can take his infinite times here to be wholly unlimited.

We are now in a position to see how this opening argument works. If X can exist and can fail to exist, its capacities must be qualified by limited times. If they were qualified by unlimited ones (the only alternative on Aristotle's view, as I have said), then the unlimited times would have to be different. For suppose that they are the same. Now let X's ability to exist for all time be exercised: X would thus exist always, but also would have the ability not to exist. But the IR manoeuvre will show this to be impossible. So the unlimited times must

be different -- but this too is impossible, since there cannot be two wholly unlimited times.

If this interpretation of Aristotle's strategy against the Timaeus is correct, then the twin pillars of his argument in I. 12 are the claim that there are no capacities to be F only for an infinite time limited in one direction, and the IR manoeuvre. I shall now try to show how Aristotle could plausibly deny the existence of 'Timaean' capacities, as we may call them for convenience; if this is successful, the entire responsibility for Aristotle's woefully erroneous conclusion will rest on the IR manoeuvre alone.

IV

Aristotle does not spell out why 'Timaean' capacities are not possible; when he does raise the issue, at 283a4-10, his treatment is compressed and obscure, as we saw in chapter 2. However we interpret the text there, Aristotle clearly regards the impossibility of such a capacity as relatively obvious. Now this is completely mysterious if the capacities which Aristotle has in mind in the chapter are logical possibilities.[8] One line of argument which might be used to try to rule out any logical possibility qualified in this way is this: any such possibility entails a further one which is qualified by an unlimited infinity of time. In other words, '◇(p is true at t_0 and always

thereafter)' cannot be true unless '◇(p is true always)' is also true. It is of course easy to construct trivial counterexamples to this claim;[9] but a much more important objection is that the argument (if successful at all) would equally rule out possibilities qualified by a finite period. Yet Aristotle clearly thinks here that there can be such possibilities.[10]

This line of thought, however, suggests a more promising one. The claim that Timaean capacities are impossible makes very good sense if we take Aristotle to be arguing in terms of natural capacities -- that is, in terms of the capacities of an object which would figure in the causal explanation of that object's states and activities.[11] Could something have such a capacity to ϕ only for a time which was limited in one direction but infinite in the other? Let us take the case of a cosmos which has the ability to exist forever once it has come into existence.[12] Since it has only a Timaean capacity, it must lack the ability to have existed always in the past (otherwise it would have the forbidden ability to exist always). What prompts the exercise of this cosmos' capacity for existence? It cannot be the mere arrival of a particular moment of time (say, the beginning of 4004 B.C.). Moments of time per se have no causal properties, and while we can make sense of a natural capacity to start ϕ-ing (only) when certain internal or external causal conditions hold, we cannot, I think, make sense of one which is triggered simply by a particular moment in time.[13] But if the ϕ-ing is

triggered off by some other causal change, then -- by the argument which Aristotle himself gives in I. 10 (279b21-4) -- this causal change could have happened at <u>any</u> earlier time. This means that however far back we go, there is no time such that the cosmos with a merely Timaean capacity could not have existed <u>then</u>. Now two problems arise. The first is that no explanation can be given as to why the capacity was activated at the moment it was: if it was caused by some other change, why did <u>this</u> change not happen earlier? (See my notes on the argument at 283a1ff. in chapter 2, and n. 16 below.) The second arises when we recall that the cosmos is unable to exist <u>always</u> in the past. This is logically compatible with there being no time such that the cosmos was unable to exist <u>then</u>; for it might be that, for any time at which the cosmos did exist, there <u>had</u> to be a preceding time when it did not exist.[14] But if this were the case, it would be altogether beyond <u>natural</u> explanation: what could be the physical or natural basis of the necessity that cosmic order had to be preceded by an infinite period of disorder?

Thus without becoming a capacity to ϕ always, a Timaean capacity cannot be a genuine natural capacity, for it requires either a particular, though causally indifferent, moment of time to initiate its exercise, or it requires a mystery as to why it began to exist when it did (and a postulate that infinite cosmic order <u>must</u> be preceded by an infinite period of disorder -- a postulate which seems to go beyond any physical explanation). None of these requirements involves a logical

impossibility; but all would violate the conditions that we see the cosmos' existence as due to nature, and that it be wholly explicable in natural terms.

Timaean capacities, then, cannot figure in any account of the physical world which aims to leave nothing inexplicable which should merit explanation, and which appeals at no point to explanations which go beyond nature. We might be prepared to tolerate weaker constraints upon a physical theory, but Aristotle, I think, would not. That he does insist on these constraints in De Caelo I is suggested by his handling of the Timaeus there. Although Aristotle takes quite literally Plato's assertion that the cosmos had a beginning, he ignores the role of the Demiurge entirely: there is no hint of the divine creation of the cosmos, nor of the super-natural transformation of the inchoate elements into fully-formed ones expressing genuine natures. Aristotle argues as if Plato's world-order had come into existence from disorder as a result of entirely natural processes going on in the pre-cosmic elements -- elements which have always had their proper nature. Aristotle can hardly have failed to notice the Demiurge's role in the Timaeus, nor could he have missed the fact that the genesis of Plato's cosmos is not the result of natural processes in the elements. The most satisfactory explanation of this seems to be that Aristotle deliberately transforms Plato's theory into one which would fit the constraints which I sketched above; for the actions of the Demiurge in the Timaeus are incompatible

with an explanation of the cosmogenesis in purely natural terms.[15]

Something very like these constraints, moreover, certainly does underlie Aristotle's argument for the eternity of motion in Phys. VIII; and indeed he deploys there an argument which has some close affinities to the one which I have outlined, against Anaxagoras' theory that an infinite period of motion was preceded by an infinite period of rest:

> Moreover, there is no ratio in the relation of the infinite to the infinite, whereas order always means ratio. But if we say that there is first a state of rest for an infinite time, and then motion is started at some moment, and that the fact that it is this rather than a previous moment is of no importance, and that it involves no order, then we can no longer say that it is nature's work; for if anything is of a certain character naturally, it either is so invariably and is not sometimes of this and sometimes of another character (e.g. fire, which travels upwards naturally, does not sometimes do so and sometimes not) or there is a ratio in the variation. It would be better, therefore, to say with Empedocles and anyone else who may have maintained such a theory as his that the universe is alternately at rest and in motion; for in a system of this kind we have at once a certain order (Phys. VIII. 1 252a13-22, CWA translation).

In discussing Aristotle's argument at 283a4-10 in chapter 2, I concluded that if there is a sensible line of thought here, it is one which presupposes either some prior argument against the possibility of Timaean capacities, or some account as to why the periods which qualify capacities must be determinate (in a sense in which no-limit infinities are determinate but one-limit infinities are not). The line of argument which I have just sketched appears to provide both of these. The brevity and compression of the argument at 283a4-10, moreover, suggests

that Aristotle does not regard the idea of Timaean capacities as worth much attention; if this is so, then the failure of such capacities to fulfil the requirements imposed on natural capacities in a physical theory seems to be the most plausible and the most satisfactory explanation. The line of reasoning which I have suggested has much in common with the one presented in the Physics, as we have seen; and in Cael. I itself Aristotle uses two versions of a central feature of my line of reasoning, the 'why not earlier?' argument.[16] By contrast, we cannot make much sense of Aristotle's claims about (non-trivial) possibilities/capacities qualified at most by limited times if we take him to be thinking in terms of logical possibility; and the same is obviously true of the rule formulated in the previous chapter that abilities to lift weights or to walk a distance must be qualified by a 'definite maximum', such as one hundred talents or one hundred stades (281a7-27).

What, then, is the basis of the traditional view that the I. 12 argument (at least down to 283a10) is conducted in terms of logical possibilities and not in terms of natural capacities? Williams (although speaking of natural tendencies rather than capacities) presents the argument for this view very clearly:

> . . . this kind of consideration is regarded by Aristotle as appropriate to those 'φυσικῶς καὶ μὴ καθόλου σκοποῦσιν' these matters (283b17-18, cf. 280a32-4), and by 'καθόλου' he seems to be indicating arguments of a completely general, topic-neutral,

or, as we should say, 'logical' kind. His argumentation in De Caelo, I, xii, however, is expressly designated as being general in this sense, and accordingly the sense of δυνατός which is here appropriate is concerned with logical possibility and not with natural tendencies ('Aristotle and corruptibility', p. 212).

This argument is not sound, however. It is not true that Aristotle uses 'katholou' in Cael. I to mean 'topic-neutral', or 'logical': katholou arguments in this book are more abstract ones. Correspondingly, 'phusikos' arguments are less abstract ones, either because they appeal to particular observational evidence or because they deal with parts in turn, rather than with the whole.[17] In Cael. I. 10-12, phusikos arguments are characterised by appeals to straightforward empirical evidence such as the commonly observed association of perishability with generability (see 279b17-31; cf. 283b17-22); anything more abstract than these could therefore count as katholou. Indeed, whatever interpretation we give of the main argument, the subsequent arguments at 283a11ff. are most probably cast in terms of natural capacities, and Aristotle counts them as katholou. Thus arguments concerned even with natural tendencies would not have to count as phusikos, and ones concerned with natural capacities can certainly be katholou.

V

If Aristotle does have natural capacities in mind, then, his assumption that the capacities of the cosmos are qualified either by a

fully limited time-period or by a fully unlimited one seems to be quite in order. The whole weight of his argument is thus borne by the IR manoeuvre alone. The importance of this manoeuvre for Aristotle in this chapter is confirmed by its recurrence throughout the rest of the katholou arguments. It reappears explicitly at 281b29-30 and 283a16-17 (cf. the non-fallacious uses of supposed realisation at 283b11 and 15-16). Moreover it is the foundation not just of the first argument of the chapter -- the one which we have been considering (281a28-b25, together with the corollaries argued at 281b25-282a4) -- but it also underlies all the subsequent argumentation, down to 283a29. This is clear enough for 283a11ff.,[18] but is also true, I think, of the intervening arguments, at 282a4-283a10, which employ a bogus 'square of opposition' in the course of proving that generability entails perishability and vice versa. As I noted in chapter 2, Williams suggests that this bogus square is central to Aristotle's strategy. This leads to the claim that Aristotle is 'hopelessly muddled', and that he 'slipped carelessly' into identifying 'generable' and 'perishable' at 282a23-4 with the two subcontraries of the square -- that is, with 'not (able to be) always non-existent' and 'not (able to be) always existent' respectively ('Aristotle and corruptibility', pp. 102-7, 203-4 and 209-10). This reading of the argument does not seem at all plausible. It seems likely, as I said in chapter 2, that Aristotle has at the centre

of his argument a triangle rather than a square. His strategy is to establish the existence of three exhaustive and exclusive classes:

> Able to exist always
> Able not-to-exist always
> Able to exist for some time and able not-to-exist for some time[19]

In order to establish this, Aristotle needs the earlier proof of the necessary existence of what is able to be always, as he acknowledges at 282a25; and of course this proof depends on the IR manoeuvre.[20]

If Aristotle does use this manoeuvre, he is committing a fallacy which seems as obvious as it is absurd: how could anyone be taken in by it? Despite this difficulty, I find it hard to avoid the conclusion that Aristotle's argument does depend crucially on this manoeuvre, and that he commits no other major fallacy to arrive at his result: the use of insulated realisation and of the denial of Timaean capacities, as I have sketched it, seems to reflect exactly the structure of Aristotle's way of arguing in Cael. I. 12. I shall try to palliate this conclusion later by drawing a parallel with two errors which Aristotle makes elsewhere. Before I do so, however, I shall consider Sarah Waterlow's claim that Aristotle's argument depends on a general conception of possibility which is very different from ours; for if her thesis is correct, Aristotle's argument would become rather more respectable than I have maintained. I shall also (more briefly) consider another rival interpretation of Cael. I. 12, which has been offered by Christopher

Kirwan: this interpretation, too, attributes a distinctive conception of modality to Aristotle.

VI

In Passage and Possibility Waterlow examines Aristotle's modal concepts, and argues that his central -- and indeed only -- conception of possibility is a highly distinctive one. According to Waterlow, Aristotle consistently held to the belief that all possibility is of its very nature 'relative to an actual state of affairs in the history of the universe', and thus involves a double relativisation to particular times (p. 158). This is the first major thesis of Waterlow's book, and it is closely involved with the second. In her view, Aristotle endorses certain metaphysical principles of nature which combine with this distinctive conception of possibility to entail some version of the doctrines (P1) and (P2) which I discussed in chapter 1.[21]

Waterlow calls this conception of possibility relative temporalised possibility -- or RT possibility for short. We can characterise RT possibility as follows:

> 'p' is RT possible at t iff the actual state of things at t is such that from a description of this, together with the supposition that 'p' will be true at some later time, there follows no impossible consequence (cf. Waterlow, p. 31).

Correspondingly, RT impossibility is characterised by the formula:

$$\text{Imposs}/\underline{t}\ (\underline{p}) \text{ iff } \underline{q}/\underline{t} \ \&\ [\text{Nec}((\underline{q}/\underline{t} \ \&\ F\underline{p})\ \underline{r}) \ \&\ \text{Imposs}\ (\underline{r})]$$

(Where '$\underline{q}$' is the description of the actual state of affairs at $\underline{t}$, and '$F\underline{p}$' means 'it will be the case that $\underline{p}$'.)[22]

RT possibility involves time in two ways. Firstly, all RT possibilities are related to the actual state of affairs holding at a particular time; this is taken to include the logical principles and also the laws of nature. And secondly, RT possibilities are themselves possibilities at a time -- that is, they each hold at a particular time, and need not hold at other times. Waterlow summarises some of the differences from our 'logical possibility' which this involvement with time creates:

> Firstly, to establish that a false proposition is logically possible, no reference need be made to matters of fact . . . . Whereas the sort of possibility with which Aristotle operates in De Caelo I. 12 applies to '$\underline{p}$' (if false) only in so far as this is considered together with a set of true factual propositions. Secondly, . . . a proposition such as '$\underline{X}$ is standing', if known to be false at $\underline{t}$, can as easily be seen to be logically possible by supposing it true at $\underline{t}$ as by supposing it true at any other time. Thirdly, where logical possibility is concerned, not only is there no need to refer the supposed truth to any particular time, but the possibility itself does not belong in time. The logical possibility of Julius Caesar's having lived to be eighty years old does not belong in the first century BC, nor in any other period of time (pp. 25-6).

Considered as applying to propositions, this conception of possibility sketched by Waterlow has some surprising results. Thus dated present-tense propositions, although (presumably) RT necessary at the time in question, are simply not amenable to the RT criterion at that time, or thereafter; for we cannot make sense of supposing such a proposition -- say, 'Judson is writing at 10:15 a.m. on January 1st, 1986' -- to be true at some later time (Aristotle actually makes this point in another connection towards the end of I. 12: see notes on 283b6-17 in chapter 2).

Much more importantly, no future-tense propositions true at t are RT contingent[23] at t on this view: for they form part of 'the actual state of things at t', and hence their contradictories are RT impossible at t. Yet Waterlow firmly denies that Aristotle endorses the 'RT determinism' which results from this, and also thinks (rightly to my mind) that Aristotle does not deny truth to singular propositions about the future. How are these two claims to be reconciled with the lack of any RT contingency for true future propositions? The answer comes only in the penultimate chapter, where Waterlow claims that Aristotle does not cast the RT criterion in terms of propositions at all, but in terms of actual events/states of affairs.[24] Thus the RT criterion presumably becomes:

> A state of affairs is possible at t iff the actual state of things obtaining at t is such that from a description of this,

> together with the supposition that the state of affairs will hold at some later time, there follows no impossible consequence.

This still means that the future is RT necessary, however. For if there will be a sea battle tomorrow, 'its being true that there will be a sea battle tomorrow' describes a state of affairs which actually holds now. The conditions for RT contingency are violated again: the supposition that there will not be a sea battle tomorrow still leads to an impossible consequence relative to the actual state of affairs, and hence the sea battle's failing to happen is RT impossible. Thus the sea battle's happening remains RT necessary at any earlier time.

Waterlow maintains that Aristotle is not vulnerable to this argument, since for 'metaphysical' reasons he does not regard a statement's present truth as a genuine state of affairs, and hence he does not regard it as a component of 'the actual state of things at t' which the RT test employs:

> the truth [of a given statement] as such . . . was never metaphysically in the running for inclusion in the actual situation relative-to-which (p. 142).

What is the ground for this distinction between genuine and spurious states of affairs? Waterlow rightly thinks that it is that the latter are not causally involved with the world. Its being true now that an event E will happen is neither the cause nor the effect of E's

happening: it is obvious that it is not the cause of E, and although it is dependent upon E's happening, this dependence is not mediated by any causal mechanism.[25]

Waterlow is right, I think, to suggest that Aristotle would endorse this distinction between states of affairs which are causally operative and ones which are not.[26] She is also right to think that only this distinction will save her Aristotle from the RT determinism which he vigorously denies. But it is now clear that it is not 'genuine state of affairs' which is doing the work, but 'causally operative state of affairs'. The upshot is that when we turn back to the RT conception of possibility, we see that 'possible relative to the actual state of things at t' is, as Aristotle uses it, equivalent to 'possible relative to the causally efficacious state of things at t.' Waterlow seems to admit as much when she speaks of '. . . the world of cause and effect, which is the proper locus of Aristotelian relative modality' (p. 144). This means, however, that for Waterlow's Aristotle something is RT contingent at t iff it is neither determined nor ruled out by the causes operating at t.[27]

This result may well seem disappointing; for it is an already familiar fact that Aristotle sometimes uses 'necessary' when he has in mind things which are beyond our power to influence, and from this it seems a small step to talking about possibility in the context of things

which are not beyond our control. Waterlow does not claim merely to be repeating this familiar fact, however: her thesis is stronger than this in at least three ways.

(1) Any future event which is determined at t is RT necessary at t, and hence -- for Aristotle -- beyond our control. This goes beyond the familiar point, since Aristotle could use 'necessary' to mean 'beyond our control' and nonetheless deny that an event's being determined made it necessary in this sense (on the grounds that the causal chain might include our deliberation). The question as to whether Aristotle did take causally pre-determined events to be ipso facto beyond our control is of course controversial; I am not sure, however, that there is any clear evidence relevant to this question which is independent of the present issue.[28]

(2) Waterlow claims that her analysis of Aristotle's theory of modality as having two distinct parts (the metaphysical grounds for applying RT modality to 'the world of cause and effect', and the RT conception itself) reflects the structure of Aristotle's own thought. In other words, she thinks that the RT conception of modality can be discerned at work independently of Aristotle's beliefs about agency and 'necessity'. This claim is crucial to Waterlow's ascription of the RT conception to Aristotle, since if it fails, she will not have advanced any interesting distance from the fact that Aristotle sometimes links

'necessary' with 'beyond our power'. The main evidence which she adduces for this claim is of course the argument in Cael. I. 12; I shall return to this below.

(3) Waterlow maintains that the RT conception is Aristotle's only conception of modality.[29] This is a much stronger and much more startling claim. RT possibility, if taken as relative to causally operative states of affairs holding at a particular time, constitutes something quite close to what the practical man, the deliberator, has in mind when he says that something is possible or impossible.[30] He is interested in which possibilities in the future are still open, and which are not, given the present as it actually is. This 'practical' conception of possibility, however, is of no use to the historian or the juryman: they are interested in what possibilities in the past are left open and which are not, given the present as it actually is. Of course, such possibilities are not open for deliberation; but deliberation is not the only sort of modal thinking in which we engage. Zoologists, astronomers, and cosmologists, moreover, have no reason to be interested in any particular time as the locus of states of affairs back (or forward) to which all possibilities must be traced. I do not mean to suggest that natural science is impossible if the RT conception of modality is the only one available, but rather that we cannot argue from any plausibility and usefulness it may have in the area of deliberation to general plausibility and usefulness.[31] Thus even if we were to

accept that the RT conception might constitute <u>one</u> 'sense' of possibility for Aristotle, this would in itself give us no reason to expect it to be the only sense; equally, we would have no reason to expect it to appear in the rarefied and highly theoretical atmosphere of <u>De Caelo</u> I. We need very good evidence, therefore, of the RT conception's pervasiveness if we are to accept Waterlow's third claim, that this constitutes Aristotle's sole conception of modality. In my view Waterlow does not succeed in providing such evidence. She advances four arguments for her claim, of which the last two concern <u>Cael.</u> I. 12. I shall consider these four in turn.

VII

Firstly, Waterlow points out that Aristotle sometimes says that the past is necessary. A clear case is <u>EN</u> VI. 2 1139b5-9, where Aristotle says that no-one deliberates about what is past, but only about what is future and capable of being otherwise (she also cites <u>Int.</u> 9 and <u>Rhet.</u> III. 17 1418a4-5). It is of course true that both the present and the past are necessary on the RT conception of modality; and Waterlow claims that these statements reflect Aristotle's adoption of that conception. All that he need be asserting in these passages, however, is the familiar point that we can't <u>affect</u> the past, because all causal chains run forwards in time (if some causal processes worked backwards, then of

course we could deliberate about what is past). The fourth passage which Waterlow cites actually tells against her, if anything. This is Cael. I. 12 283b12-14, where Aristotle denies that there are any δυνάμεις τοῦ γεγονέναι. Actually, it is likely that Aristotle is again thinking about the direction of causal processes. In any case he goes on to say that there are δυνάμεις τοῦ εἶναι, as well as τοῦ ἔσεσθαι: but this conflicts with the RT conception, according to which the present is necessary like the past.

Secondly, she appeals to two features of Aristotle's argument in Int. 9.[32] Waterlow maintains that

> . . . in the chapter itself [Aristotle] formulates his thesis in alternative ways that are equivalent in RT-terms but not obviously so on any other hypothesis. He begins by stating that the troublesome logical principle does not in general cover future-tensed statements about particulars, although past- and present-tensed ones fall under it (18a33ff.), and ends by stating that it does not cover what is contingent (19a36-b4). The implication is that contingent statements essentially refer to the future (p. 83; italics original).

But this feature of Aristotle's presentation carries no such implication. If the 'troublesome logical principle' fails to hold for a particular class of contingent statements -- viz. for future contingents -- then Aristotle can quite correctly say that the principle fails to hold for the class of contingent statements as a whole without any implication that the latter class is identical to the former.

Waterlow's next point concerning Int. 9 is this:

> [Aristotle] writes as if his defence of contingency is a sufficient defence of human agency. From the standpoint of someone who views all modality as relative to actual situations this is logical enough, for as ordinarily understood, the statement 'I could have brought about something different' means: 'The actual situation from which I started to act was such that different options were then open' (p. 84; italics original).

Waterlow contrasts this with logical contingency: to say that something is logically contingent is to say nothing as to the possibility of human agency. But mere RT contingency and mere 'logical' contingency, are in fact on a par here. The statement, 'I could have brought about something different', involves more than Waterlow says; for it also involves the claim that I was able to be causally involved in the production of these options. In other words, while the RT conception of contingency does capture the idea of options which are open relative to a given situation, it does not of itself carry the additional idea that any of these options are open to me. However, once we granted this further claim of causal involvement on the part of the putative agent, logical and RT contingency would be equally serviceable for the completion of the notion of agency.[33]

Waterlow's interpretation of the argument in Cael. I. 12 constitutes the third piece of evidence. Waterlow starts from what Aristotle says about possibility in the Prior Analytics (32a18-20):

> I say that the possible is that which is not necessary, but which, if we suppose it to be the case, has no impossible consequences.

We may compare this with the passages in Met. Θ. 3-4 which I mentioned earlier (above, Section I), where Aristotle gives a 'test' of the same form for possibility in the wider sense.

Now of course this test as it stands tells us nothing about Aristotle's view of possibility, since it is valid on any view. On my interpretation of I. 12 it is this very test[34] which Aristotle uses -- or rather which he misuses, creating the IR manoeuvre. Waterlow maintains that the I. 12 argument provides evidence that Aristotle is correctly deploying a special, temporalised, version of the test, which is a reflection of the RT conception of possibility. The crucial passage is 28lb8-18, and especially lines 15-18:

> τοῦ μὲν οὖν καθῆσθαι καὶ ἑστάναι ἅμα ἔχει τὴν δύναμιν, ὅτι ὅτε ἔχει ἐκείνην, καὶ τὴν ἑτέραν· ἀλλ' οὐχ ὥστε ἅμα καθῆσθαι καὶ ἑστάναι, ἀλλ' ἐν ἄλλῳ χρόνῳ.

On my view, Aristotle is simply pointing out here that contrary or conflicting possibilities cannot be realised at the same time. This, though an important step in his line of argument, is a truism with which we would all agree. Waterlow, however, claims that these lines have more to them than this: the subsequent argument concerning the eternal

cosmos shows that Aristotle is actually employing the RT test for possibility here.

But this does not seem to be so. Here is what Waterlow says:

> What emerges is this: firstly we start with the fact, taken as known, that 'p' (an undated proposition in the present tense) is true for a certain time. Secondly, its concurrently false contradictory, 'not-p', is said not to be possible unless there is a time when 'not-p' may be supposed true which does not coincide with the time when it is known to be false. Where it is taken as known that p is always the case, there is no other time, and 'not-p' is automatically rejected as representing an impossibility (pp. 20-1).

So far this merely describes the insulated realisation manoeuvre.

Waterlow continues:

> But now apply this to a case where it is known that p, but not that p always obtains: for instance, Aristotle's example of the man who is sitting. In this case the truth of the supposition that he is not sitting (because, say, standing) may be referred without contradiction to a time beyond that in which he is known to be sitting. Thus we have no reason to say that the not-sitting or the standing is impossible, and are therefore entitled to consider it possible.
>
> Here we have what I have called the temporalized version of the Analytics principle of possibility [this = the version which expresses the RT conception] . . . (p. 21).

Let us call whatever set of facts we still take to hold when we entertain a particular supposition to see if it is possible, an S-set. Now the mere fact that Aristotle holds true some S-set or other in no way shows that he has the RT test in view. For the RT test lays down a

very specific formula for determining what can be admitted to the S-set; indeed, it is precisely this formula which characterises RT possibility as a distinctive conception of modality in its own right. Now Aristotle's argument about the cosmos, as Waterlow correctly sketches it, uses a quite different S-set to that required by the RT test: Aristotle does not entertain the supposition of the cosmos' non-existence relative to the actual state of affairs at some time t, but relative, rather, to the fact that the cosmos always exists.

Thus Aristotle's argument about the cosmos provides no grounds for seeing any more in the preceding lines, 281b15-18, than the truism about contrary possibilities being unable to be realised at the same time. Waterlow's use of epistemic terms in the passage I quoted glosses over the crucial difference in how the S-set is determined in the RT test and in Aristotle's argument respectively. The passage gives the impression that in both cases one puts into the S-set simply whatever one knows to be true at t; but this is clearly not so for the RT test, as we saw in the previous paragraph. Aristotle does use a suppositional method, if you like, but it is not the RT suppositional method.

We could, of course, modify the 'RT method' in order to allow Aristotle's actual argument about the cosmos to be an instance of it. Thus, for instance, we could change 'description of the actual state of things at t' to 'all propositions true at t'. This would just make

matters worse, however; for then Aristotle would be committed to the total collapse of modality into actuality -- a collapse which Waterlow rightly sees him as rejecting. Moreover, Aristotle would then be begging the question if he assumed that 'The cosmos always exists' is true at t (since all that his argument against the Platonist entitles him to is that it might be true[35]). The result would thus be that we would no longer save Aristotle from gross error. The same point would hold if we were to change the RT method so that the S-set includes all propositions known at t, or if we were to leave the method as it is, but allow Aristotle to think that the 'actual state of affairs at t' includes the cosmos being such as to exist always.

Thus if we had independent evidence that Aristotle held the RT conception of modality, we could perhaps suppose this conception to be at work here also, at no greater price than the one to which we are already committed -- namely, the attribution to Aristotle of a very unappealing mistake. The De Caelo argument does not of itself, however, make the ascription of the RT conception any more likely or attractive.

Waterlow's final argument is that if we ascribe the RT conception to Aristotle, we can actually produce a sound argument for the necessity of what is F always -- an argument, that is, which is valid and uses only premisses which Aristotle would accept (pp. 66-75). Waterlow starts from the claim concerning 'definite' times made at 283a7-10 (see

above, Section IV), and suggests that Aristotle also has in mind here the idea of 'whole' or 'complete' periods, and hence of the time which something takes to exercise its capacity to be F to the full. For capacities qualified by limited periods this idea is clear enough (cf. I. 11 281a7-27), while if X can be F always, then the 'maximal exercise' of its capacity would be to be F for all time. It is important to note that these ideas only make sense if put in terms of natural capacities and not in terms of RT possibilities. Thus, Waterlow rightly claims that something which has the capacity to be always F exercises the same capacity at every moment (pp. 72-3); RT possibilities, however, are each tied to a particular time, so that we cannot make sense of the later exercise of the same RT 'ability'. Again, the claim that there are no capacities qualified by an infinite period which is limited in one direction is absurd if applied to RT possibilities, since they are all future-directed; thus at any time t the cosmos has an RT possibility for existing for just such a period -- i.e. from t onwards. Waterlow merely says, '[Aristotle] equates 'possibility' with 'capacity', and we shall often find the latter term more convenient in the subsequent discussion' (p. 57). For the reasons just given, however, this amounts to an admission that Aristotle is not concerned with RT possibility in our argument.[36]

This confusion of natural capacities with RT possibilities reappears in the second stage of Waterlow's reconstruction. She

advances the idea that 'a so-called possibility (or in the abstract sense, capacity)'

> cannot be regarded as existing or obtaining as a genuine possibility when the conditions logically exclude realization .... If the conditions are such that a capacity that is defined by reference to a certain maximal exercise cannot be maximally exercised, then at most there exists only a capacity for some lesser maximum (p. 74).

The argument which she then offers on Aristotle's behalf requires the claim that a thing cannot have a natural capacity to exist always, once it has failed to exist for some period of time; the reason which she gives for this is that it is now impossible for such a capacity to be realised in full. But while it follows from this that the thing in question would not have an RT ability to exist always, it simply does not follow that it thereby lacks the natural capacity to exist always. That seems to me to be like saying that, if it became RT impossible for there to be any more motor cars -- the Earth runs out of metal, etc. -- I would thereby lose my natural capacity to drive one. The point seems to be that if natural capacities are thought of as part of the thing's nature -- its 'inner principle of change and stasis' -- then why should the absence of external prerequisites for the exercise of such a capacity mean that its possessor lacks this inner principle after all? It would be surprising, moreover, if Aristotle thought that a substance could lose (part of) its autonomous nature without itself changing, as Waterlow herself would agree.[37]

Thus if Aristotle's argument did take the route which Waterlow suggests, he would still be guilty of very serious mistakes. Moreover, he would have to be guilty of considerable confusion over his own notion of modality: other difficulties aside, this makes it hard to view I. 12 as evidence for the ascription of that notion to him. There remains little temptation, therefore, to ascribe the RT conception of possibility to Aristotle.

VIII

A fresh interpretation of Cael. I. 12 has recently been offered by Christopher Kirwan in 'Aristotle on the necessity of the present'. Like Waterlow, he ascribes a 'special' conception of possibility to Aristotle, according to which possibilities are, again, doubly relativised to time. This conception of possibility finds expression in the doctrine of the 'necessity of the present':

> $\underline{pt} \supset \Box \underline{tpt}$, or $\Diamond \underline{tpt} \supset \underline{pt}$ (typescript, p. 9)[38]

The essence of Kirwan's account of I. 12 is that he sees Aristotle (1) as correctly inferring, on the basis of this doctrine, that if X always is F, then it is at every moment necessary that it be F at that moment; but (2) as confusing this with the logically stronger claim that if X is always F, then it is at every moment necessary that it be F at

every moment. The first inference is licensed by the 'necessity of the present' conception of possibility (the NP conception), but does not yield the conclusion that X is F of necessity in the sense required for Aristotle's attack on the Timaeus; the second inference, on the other hand, does yield the required conclusion, but is not a legitimate one.

Kirwan's account of this section of Cael. I. 12 (the details of which I shall not consider here) fits Aristotle's text rather better at some points than do those of Williams and Waterlow, and to this extent it is preferable to them; if one has to credit Aristotle with a special conception of modality, moreover, the conception embodied in the 'necessity of the present' doctrine (NP possibility) seems a much more plausible one to ascribe to him than RT possibility. Nonetheless, I am convinced neither by Kirwan's account of Cael. I. 12 nor by his ascription to Aristotle of the 'necessity of the present' doctrine (at least if understood as a doctrine about the very nature of possibility). Here is an outline of the main difficulties which Kirwan's interpretation faces.

(1) On Kirwan's account, as on mine, Aristotle's argument in Cael. I. 12 rests (i) on a fallacious argument, and (ii) on an assumption that capacities for ϕ-ing for (at most) a period of time which is infinite but limited in one direction can be ignored in this context. On the view which I have defended, Aristotle is arguing in terms of natural

capacities, and so (ii) could be made plausible by appealing to plausibly Aristotelian constraints on such capacities. This explanation does not seem to carry over to NP possibilities for ϕ-ing qualified in this way. Nor can I think of a replacement argument which would justify assumption (ii) on Kirwan's account of the chapter. (In fact, if we added the necessity of the past to that of the present, then Aristotelian possibility in Kirwan's sense would positively encourage possibilities qualified in this way: if (by time $\underline{t}$) $\underline{p}$ has never been true, then it can (at $\underline{t}$) be true for a one-limit infinity only.)

(2) The fallacy which Kirwan attributes to Aristotle in (i) looks at first glance much more plausible than the one which I ascribe to him (the 'IR manoeuvre'). I suspect, however, that this is only because we do not share the NP-based conception of possibility, and that what appears to us as an understandable slip would actually constitute a fundamental confusion for a holder of the NP conception. (In the formalisations which I use in explaining this point, I use '$\underline{t}$', '$\underline{t}'$', as variables throughout.) According to Kirwan, Aristotle's conception of possibility is, according to Kirwan, partly characterised by the following pair of propositions:

(T1) '$\Box(\exists \underline{t} pt \rightarrow \exists \underline{t}(\neg \Diamond \underline{t} \neg pt))$' is true.

(T2) '$\Box(\exists \underline{t} pt \rightarrow \forall \underline{t} \forall \underline{t}'(\neg \Diamond \underline{t}' \neg pt))$' is false.

To ascribe the NP conception of possibility to Aristotle involves seeing him as sensitive to the fact that the first entailment holds, but the second does not. Now the fallacy which Kirwan sees at work in Cael. I. 12 amounts to this. Aristotle is considering a particular value for 'p' for which '$\forall t p t$' is true. On the NP conception, he may correctly infer that:

(Infl) $\forall t(\neg \Diamond t \neg p t)$,

but is not entitled to infer the stronger proposition,

(Inf2) $\forall t \forall t' (\neg \Diamond t' \neg p t)$

-- which is the one he needs if he is to show that what is always is of necessity. Kirwan claims that Aristotle confuses these two inferences, or fails to see that (Infl) does not entail (Inf2). In other words, Aristotle relies on the fact that

(T3) '$\Box(\forall t p t \rightarrow \forall t(\neg \Diamond t \neg p t))$' is true,

but fails to realise that

(T4) '$\Box(\forall t p t \rightarrow \forall t \forall t' (\neg \Diamond t' \neg p t))$' is false.

Now it is true that (T3) and (T4) are not the same as (Tl) and (T2); but the structure of each pair is so similar that Aristotle's confusion over (T3) and (T4) no longer looks like an understandable error, if his whole

way of thinking about possibility crucially involves clarity over (T1) and (T2).[39]

This line of thought does not, of course, show that the fallacy which Kirwan ascribes to Aristotle in Cael. I. 12 is, in itself, any worse than the fallacy which I must attribute to him; but it does undermine Kirwan's claim that his interpretation sees Aristotle as committing a more understandable mistake. Moreover, the particular nature of the fallacy which Kirwan's Aristotle commits is directly at odds with that very conception of possibility whose adoption by Aristotle this interpretation of Cael. I. 12 is designed to support -- too directly for comfort, I think.

(3) Kirwan maintains that Aristotle's acceptance of the NP conception of possibility is by no means confined to Cael. I. 12. I cannot discuss in any detail here this more general attribution of the NP conception to Aristotle, and a few brief points must suffice. Firstly, Kirwan's account of Int. 9 would appear to work equally well if we took Aristotle to be endorsing a merely causal version of the NP doctrine. That the present is necessary, on this view, is not a conceptual truth about possibility, but a truth (whether conceptual or not) about the direction of causation -- equivalent to 'you cannot affect the present'.[40] Thus we can apply Kirwan's solution to the difficulties of Int. 9 without deploying the NP conception of

possibility. Secondly, if the NP conception is meant to be Aristotle's most fundamental conception of possibility (or at least, sufficiently fundamental to be appropriate to the Cael. discussion), it is surprising that temporal qualifications of the type essential to the NP doctrine do not figure in Aristotle's most extended discussion of possibility and potentiality -- Met. Θ.[41] Indeed, one natural way to understand Met. Θ. 3 is to see Aristotle as distorting the Megarians' position so as to commit them to an Eleatic world view by means of a neglect of temporal qualifications of possibilities. Thus it is plausible to think that the Megarians claimed, 'What is not actual now is impossible now', and that Aristotle takes them to be saying, 'What is not actual now is impossible simpliciter'. This sort of account of Θ. 3, however, is hard to square with the importance of these same temporal qualifications in Aristotle's own modal position.[42]

IX

We have already seen how the structure of Aristotle's demonstration of the impossibility of a Timaean cosmos in the De Caelo leads to the unpalatable conclusion that the IR manoeuvre is central to his argument, and to his proof that what exists eternally does so of necessity. I do not think that we can avoid this feature of his line of argument except by doing a severe injustice to the text; even then, Aristotle would have

to be seen as committing several gross logical errors, some of which (such as Williams' sensu diviso fallacy), if not perhaps as gross as the IR manoeuvre, are, I think, no easier to explain. Waterlow's attempt, moreover, to interpret Aristotle's suppositional manoeuvre as one which embodies a good argument is entirely unsuccessful, as we have seen. So we should grasp the nettle and accept that Aristotle does commit the error of the IR manoeuvre.

Now if we do this, there can no longer be any temptation to see the argument in Cael. I. 12 as what persuades Aristotle that what exists eternally must do so of necessity: no one could seriously see him as coming to this question with a neutral mind, and then being convinced by this terrible argument. One consequence of this is that the chapter as it stands provides no reliable evidence for the grounds of Aristotle's belief in any more general version of propositions (P1) and (P2) than that for which he actually argues.

It is worth pointing out that eternally-existing objects turn Aristotle's head elsewhere too. Thus in An. Post. I. 8 Aristotle appears to infer '$\underline{p}$ is about eternal objects' straight from '$\underline{p}$ holds eternally'. In Met. Λ. 6 there is a more complex case. At 1071b5ff. he argues that there must be an eternal immovable substance: if all substances are destructible, he says, then all things are destructible; but motion is indestructible, he argues, and therefore some

substance(s) must be indestructible. Now if motion is one of the 'all things' which are destructible (as Ross thinks[43]), then Aristotle's claim that if all substances are destructible, then all things are, is unfounded: why could not motion be sustained by an eternal and necessary series of finite substances undergoing change? On the other hand, Aristotle may mean (as I suspect) to infer the destructibility of motion from the destructibility of everything else: if everything else actually did cease to exist, then so would motion. In that case, he equivocates upon a scope ambiguity (like the one which he actually points out at GC I. 2 317a7-12). The perishability of motion requires the perishability of the totality of things; but all that his premiss will supply is the perishability of each thing, and not the perishability of all together.

In both these places, Aristotle seems to use very bad arguments -- and to us quite obviously bad ones -- in the service of eternally-existing objects; my claim has been that the same is true of the De Caelo argument. It is very hard, however, to believe that Aristotle's use of the IR manoeuvre was the result of an independent acceptance of the idea that it constituted a good way to argue, or that it was this fallacy which convinced him that what exists always does so of necessity.[44] It is much easier to suppose that in Cael. I. 12, the desire to show the Timaean position to be impossible, and to vindicate his antecedent (and deeply felt[45]) belief in the necessity of the

world's existence, led him into constructing a bad argument; the same sort of account seems to be the most plausible explanation of the An. Post. and Met. Λ passages as well.

X

Conclusions

There are two elements in Aristotle's proof that the cosmos must be eternal: the claim that capacities cannot be qualified by a period of time which is infinite but limited in one direction, and the 'insulated realisation' manoeuvre.

The first of these makes sense only if Aristotle is arguing in terms of natural capacities rather than logical possibilities; this is a good reason to take Aristotle to be arguing in such terms. If he is, then he requires a realist conception of nature if he expects the argument to have an ontological conclusion. In addition, he needs the assumption that a generated cosmos must be the result of natural processes (thus no genesis ex nihilo, for example); and (if he is to avoid the possibility of a Democritean universe) the assumption that the formation of a cosmos demands a special explanation: cosmic order cannot be merely one σάρμα εἰκῇ κεχυμένων among countless others. These are all characteristically Aristotelian views.

The second key element in the proof is the insulated realisation manoeuvre. As I said at the end of the previous section, the nature of this fallacy suggests that Aristotle brings with him the assumption that what exists always does so of necessity when he comes to write Cael. I. 10-12.

Moreover, it is quite clear that Aristotle does not come to believe in the Principle of Plenitude as result of the argument in I. 12, as Williams also claims. Whereas the Principle of Plenitude is concerned quite generally with all kinds of possibility, Aristotle restricts his argument to eternally existing things twice over. Firstly, he rejects genesis ex nihilo, and takes for granted a general precosmic scheme of eternally existing cosmic components; and secondly, his application of the insulated realisation manoeuvre is designed only for things which have a natural capacity for eternal existence.

Hintikka agrees that Aristotle brings the assumption of the necessity of what is eternal with him when he writes Cael. I, but maintains that it derives from his endorsement of the Principle of Plenitude as a quite general truth about possibility. I think that Hintikka's view is mistaken (see the Appendix to this chapter), and that the sources of Aristotle's conviction must be looked for elsewhere: I shall return to this question in chapter 6.

Chapter Three: Notes

1. See notes on 281a28-b2 in chapter 2.

2. Met. Θ. 3 1047a24-26; cf. An. Pr. I. 13 32b18-20. For its use in an argument related to the present one, see Phys. VIII. 5 256b10-12, et seqq.. The assertion at 281b15 -- συμβαίνει δ' ἀδύνατον ἐξ ἀδυνάτου -- is presumably intended to express the contraposition of this claim about possibility.

3. Waterlow's interpretation of Aristotle's argument here is very different from mine, as she sees the 'relative temporalized' conception of possibility at work here. I discuss her reading of 281b2-25 below, Section VII.

4. This point could also be put in terms of possible worlds. Aristotle's test for possibility becomes: find a world in which the alleged possibility holds and in which there is nothing impossible. His use of the IR manoeuvre here in deciding whether it is possible for X to cease to exist, however, amounts to an insistence that we restrict our search to only those worlds in which X always exists -- and then it is hardly surprising that we cannot find one in which X also ceases to exist without contradiction.

5. This suggested explanation would carry much less weight if the demonstration of the necessity of what exists always were itself Aristotle's primary purpose here. But in fact it is in this context an intermediate step in his refutation of the Timaeus: see Section III.

6. As Williams points out, Alexander took the second part to start at 282a5, while Simplicius took it to start at 282a25. Williams favours the latter view, 'with the reservation that Aristotle's confusion at this point may be such that even he could not decide which was the correct way of dividing the text' ('Aristotle and corruptibility', p. 97). See also the notes on 282a4-25 in chapter 2 above.

7. This inference seems to be also valid if cast in terms of the sort of physical modalities upon which (as I shall argue) Aristotle is relying in this chapter (see Section IV). In these terms, Aristotle has shown that if the eternal cosmic components exercise to the full a capacity to be organised as a cosmos, then they must be so organised -- that is, it is physically impossible for them to be in disorder. But if the exercise of this natural capacity for cosmic order entails the physical impossibility of disorder, then it seems that the possession of the capacity must also entail it -- or at the very least that why it did not would be inexplicable in terms of nature.

8. As most commentators think: for example, Williams (see, e.g., 'Aristotle and corruptibility', pp. 212, quoted at the end of this section); Friedrich Solmsen (Aristotle's System of the Physical World: a comparison with his predecessors [Ithaca, N.Y.: Cornell University Press 1960], p. 274).

9. Thus,

◇('The generated and unique cosmos exists' is true at t and always thereafter)

is true, whereas,

◇('The generated and unique cosmos exists' is always true)

is false.

10. This shows that there is a quite general problem with regarding Aristotle's argument in I. 12 as concerned with logical possibilities. For Aristotle holds that there could be a natural class of things which can ϕ for a limited time only (cf. the 'maximum rule' laid down at I. 11 281a7-27); if the 'can' is logical, however, the only such class is one trivially generated by constructing tautologies analogous to the one formulated in the previous note.

11. As Sorabji points out, Aristotle appears to reject the view (which we would find natural) that such capacities are to be regarded as functions of the internal structure of the object, but nonetheless maintains that appeal to such capacities is explanatory (Necessity, Cause and Blame, pp. 170-1). This problem does not, however, affect the argument here.

12. I am grateful to David Bostock and Richard Sorabji for help with what follows.

13. A parallel case would be that of a grue emerald. It is logically possible for there to be such a thing; but if we took the stone's grueness to be a natural state, then we would also take it that there were other causal changes involved in the moment of change from green to blue. Aristotle himself insists that the initiation of change must be triggered by other changes: see Phys. VIII. 2-6.

14. This preceding period would itself, of course, have to extend infinitely into the past.

15. This also seems to me to be the explanation of Aristotle's handling of the other cosmologies in chapter 10. Aristotle describes them as if they all fit the common scheme which I outlined in the notes on 281a28-b2 in chapter 2; this is because only if they do fit that scheme will they present the genesis of the cosmos as wholly the result of natural processes, and only such accounts of the cosmos are worth considering in the context of De Caelo I. (It is worth noting that, in a different context and with a different interest, Aristotle writes as if he understood the Timaeus in a way which is incompatible with his understanding of it here. At Phys. VIII. 1 251b17-19 Aristotle ascribes to Plato the view that time had a beginning along with the cosmos. Though not without support from the Timaeus itself (see 37d6-40c2), this interpretation is at odds with Aristotle's account of the Timaeus in Cael. I; for there the chaotic elements are understood to have existed for an infinity of time before the genesis of the cosmos. In both cases Aristotle uses his predecessor's text, not as the object of an

historical inquiry, but as a quarry from which important alternative views to his own can be mined.)

16. 283a11-20 and 279b21-24. In the latter case, the argument is described as 'phusikos', not as katholou; but the 'physical' element is imported not by the 'why not earlier?' question, but by the appeal to the common association of capacities for being in an ordered state and ones for being in a disordered state (see the notes on 279b26-8 in chapter 2).

17. For a good discussion, see Paul Moraux, 'La méthode d' Aristote dans l' étude du ciel: De Caelo I 1 - II 12', in Suzanne Mansion (ed.), Aristote et les Problèmes de Méthode, Proceedings of the Second Symposium Aristotelicum (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1961), at pp. 188-91.

18. See especially 283a14-17, 18-20, 22-4, and 25-7.

19. Cf. 282b10ff. As I argued in chapter 2, this strategy makes his introduction of genêton and phtharton at 282a23-4 perfectly in order, given what has gone before: for anything belonging to the third class (able to be sometimes and able not to be sometimes) will be generable or perishable, and vice versa.

20. For further discussion of this issue, see the notes on 282a4-25 in the previous chapter.

21. In chapter 6, Section II, below, I discuss some of these metaphysical principles in connection with the alternative set of grounds for Aristotle's belief in (P1) which Waterlow sketches in Passage and Possibility, ch. 7. For the argument for (P1) which Waterlow detects in Cael. I. 12, see Section VII below.

22. See Waterlow, pp. 34-5. This conception of possibility is given further elaboration by Storrs McCall in 'Time and the physical modalities', Monist 53 (1969) 426-44.

23. That is, RT possible but not RT necessary.

24. Or, more strictly, in terms of actual states of individual substances (see Waterlow, pp. 144-6). This refinement does not affect the point for which I argue below, that it is the causal operativeness of states of affairs which really constitutes the grounds of their inclusion in 'the actual state of things at t'.

Waterlow presents another argument related to the exclusion of the truth-in-advance at t of future-tense propositions from the actual state of things at t on pp. 91-3. As she says, however, this is an argument concerned only with how far our knowledge of the future renders the test for RT possibility useful or superfluous; from these reflections nothing at all follows concerning the RT criterion considered as a necessary and sufficient condition of something's being possible.

25. Waterlow, pp. 142-4; cf. ch. VI, especially pp. 134-40.

26. Indeed, this distinction seems to me to underlie Aristotle's response to fatalist arguments in Int. 9 (although I do not think that he is employing RT modalities there): see my 'Today's sea battle: De Interpretatione 9', forthcoming in Revue de Philosophie Ancienne, 1987.

27. Together, of course, with the principles of logic. 'Determined by causes operating at t' is meant to be construed as 'determined by causes operating at t together with the laws of nature'. (For these extra ingredients in 'the actual state of things at t', see the beginning of this Section.) The 'not determined' condition is required to exclude those events which are RT necessary at t (and hence are not contingent at t), while the 'not ruled out by causes operating at t' condition excludes things which are RT impossible at t.

28. Thus, for example, if Aristotle uses 'necessary' in Int. 9 to mean 'beyond our power to influence' -- or if he uses it to refer to absolute necessity in the sense mentioned in n. 33 below -- his argument there would have nothing to do with causal determinism.

29. Waterlow, p. 159; cf. pp. 84-5.

30. I am grateful to Edward Hussey for his comments on this point.

31. Its application in the area of natural science is (from our perspective, of course) needlessly complex, and offers no compensatory advantages. (In fact, it has at least one drawback for Aristotelian biology as Waterlow understands that; for on her view, Aristotle is committed to the belief that no non-actual organic species is possible relative to the actual situation in this world at any time. When this view is combined with the RT conception of possiblity, it means that no non-actual species are any more possible than the commensurability of the diagonal. See chapter 6, Section I and n. 9.) Nor are there any obvious metaphysical pressures which might have inclined Aristotle towards it -- indeed, Waterlow sees the notion of RT possibility as quite independent of Aristotle's metaphysics of nature.

32. Waterlow's interpretation of this argument as a whole seems to me to be extremely implausible; it is, however, largely independent of the issue of RT possibility.

33. My own view is that Aristotle at 19a32ff. is thinking, not of freedom from either logical or RT necessity, but rather from the sort of absolute, physical necessity which attaches to the motions of the heavens: see my 'Today's sea battle', Section VI. (In chapter 6, Section III, I shall argue that this sort of necessity attaches to everything which 'happens always' in a certain sense; as I point out there, it is a notion quite distinct from that of the physical necessitation of an effect by its cause.)

34. Though for possibility in the wider sense, I think. (Waterlow argues that Aristotle has the narrower sense of possibility in mind in the chapter [pp. 18-19]; I do not see how this can be so, and find her argument unconvincing.)

35. And, of course his argument does not even entitle him to that if possibility entails (some time) truth.

36. This would be made even worse if we were to accept Waterlow's claim that 'possible' in Cael. I. 10-12 means 'contingent'; for on Aristotle's view no RT contingency is involved in the cosmos' existence at all.

37. See Waterlow, Nature, Change and Agency, passim. (Of course, the substance would 'Cambridge change'; but see Nature, Change and Agency, pp. 171-5.)

38. 'Aristotle on the necessity of the present', forthcoming in Oxford Studies in Ancient Philosophy 4 (1986). This doctrine is to be distinguished from the weaker doctrine that the present is causally ineluctable -- that we cannot affect the present in the way that we can affect the future. As I pointed out in my discussion of Waterlow's interpretation, Aristotle certainly endorses this weaker thesis; I am not convinced, however, that he also holds Kirwan's modal version: see below. Kirwan's NP conception must be taken as involving a claim about the nature of possibility as such, and not just as the weaker causal claim that we cannot affect the present; for otherwise it could not be what underlies the argument in Cael. I. 12 -- the causal doctrine is irrelevant to the doctrine of the necessary existence of what is eternal, and to the alleged impossibility of a Timaean cosmos.

39. To put it another way, suppose that p is true at a particular time T; Aristotle must be clear that, although this is incompatible with $\Diamond T \neg pT$, it is compatible with $\forall t(t \neq T \rightarrow \Diamond t \neg pT)$. Yet the fallacy which Kirwan sees in the De Caelo argument involves Aristotle's not being clear that $\forall tpt$ (although incompatible with $\forall t \Diamond t \neg pt$) is compatible with $\forall t \forall t'(t' \neq t \rightarrow \Diamond t' \neg pt)$.

40. On this view, the fatalist argument becomes:

> We cannot affect the present -- i.e. we cannot affect any present state of affairs. So, if there will be a sea battle tomorrow, we cannot affect the present state of affairs constituted by the proposition, 'There will be a sea battle tomorrow', being true; likewise, if there will not be a sea

> battle, we cannot affect the state of affairs constituted by the proposition, 'There will not be a sea battle tomorrow', being true.

The main line of Kirwan's interpretation of Aristotle's response can be carried over for this causal version of the fatalist argument: Aristotle thinks that the argument is valid, and avoids the conclusion by denying future truth, and hence by denying that the relevant present state of affairs exists. (My own view is that this _is_ the fatalist's (first) argument in _Int._ 9, but that Aristotle responds by denying that propositions' being true constitute genuine states of affairs -- or, at least, that they are not state of affairs in the sense of the phrase which makes the doctrine, 'You can't affect present states of affairs', plausible. I argue for this view in 'Today's sea battle'.)

41. It is a general difficulty with any claim that Aristotle held a distinctive temporally-relativised view of the nature of possibility that no hint of such a conception emerges in _Met._ Θ.

42. Indeed, if this were the Megarian claim, then it would be uncomfortably close to the NP doctrine which Kirwan wishes to ascribe to _Aristotle_; for the NP doctrine _entails_ this very claim, 'What is not actual now is impossible now'.

43. W.D. Ross, _ΑΡΙΣΤΟΤΕΛΟΥΣ ΤΑ ΜΕΤΑ ΤΑ ΦΥΣΙΚΑ : Aristotle's 'Metaphysics': a revised text with introduction and commentary_, 2 vols (Oxford: Clarendon Press 1924), II, 368.

44. The same would be true for the mistake which Sorabji takes to be at work in I. 12: 'Through not allowing that the capacities can _relate_ to the same time . . . , as well as being _possessed_ at the same time . . . , [Aristotle] draws a wrong conclusion about a kosmos which exists at _all_ times' (_Time, Creation and the Continuum_, p. 277; Sorabji traces this mistake, in turn, back to something close to my IR manoeuvre). Aristotle's considered view of the nature of capacities is incompatible with the one Sorabji sees him as adopting here; for if capacities for being _F_ and for not being _F_ cannot relate to the same time, then things

can only have capacities for what they actually do (or, perhaps, only for what they actually will do) -- a position Aristotle clearly rejects (for his explicit rejection of a very closely related position in Met. Θ. 4 see the Appendix to this chapter, passage 6). Thus, if the main error in Cael. I. 12 were this mistake about capacities, it would be hard to see it as the basis of Aristotle's general endorsement of the belief that what exists always does so of necessity.

45. The remains of the De Philosophia make evident the strength and almost religious nature of this conviction: see frr. 16-20 Ross.

Appendix to Chapter 3: The 'Principle of Plenitude'

Hintikka's view of Aristotelian modality changes in various ways in his 'Necessity, universality and time', Time and Necessity, and Aristotle on Modality and Determinism. In all three works, however, his claim that Aristotle believes in the Principle of Plenitude is stronger than the mere ascription to him of some version of (P2) in three respects. (1) Hintikka's Aristotle takes (P2) to express a conceptual truth about the nature of possibility. (2) Aristotle's belief in (P2) is supposed to be a basic presupposition, and not the consequence of reflection upon other principles. (3) Hintikka has a particular view as to which version of (P2) Aristotle endorses: in all three works he ascribes to him a version at least as strong as this:

> if E is a genuine possibility-type, some token of E will occur at some time or other (though other possible tokens of E need not ever occur).[1]

As we saw in chapter 1, some of the evidence to which Hintikka appeals does indeed support the claim that Aristotle held some version of (P2); but none of it, I think, supports any of the further claims (1)-(3) which constitute Hintikka's basic position.[2] This is true even for the most modest version of that position, found in Aristotle on Modality and Determinism, according to which (P2) + (1)-(3) are fundamental to, but represent only one strand in, Aristotle's modal thinking (see, for example, pp. 13-14). I shall examine the evidence

for his view which Hintikka claims to find in particular passages, and also consider a more general line of argument to which he appeals.

I

Hintikka cites a considerable number of passages from Aristotle's writings in support of his claim that Aristotle endorsed the Principle of Plenitude; these are drawn together in Time and Necessity. I shall deal with these in turn (though in a different order to Hintikka's), taking them in groups where appropriate.

1. Passages where Aristotle takes 'always' and 'necessary' to go together.

1(a) PA I. 5 644b21-23. Hintikka claims that this is a passage where Aristotle 'lump[s] together . . . without explicit comment' the terms (or classes) 'necessary' and 'always' (Time and Necessity, p. 105). This is not true, however; here Aristotle simply divides the οὐσίαι φύσει into those which are ungenerable and imperishable, and those which have a share in γένεσις and φθορά. This division presupposes only a belief that there are, as matter of fact, no naturally Timaean things, and implies no thesis about necessity or possibility.

1(b) GC II. 9 335a32-b7. The key sentence here is a33-b3; once again, however, the latter part of the sentence (ὅπερ ἐστὶ τὸ γενητὸν καὶ

φθαρτόν), like the PA passage, merely reflects Aristotle's belief that there actually are no Timaean things. Beyond that all that the passage says is that eternal things exist of necessity.[3]

The other passages in this group do support the ascription of (Pl) to Aristotle; they are all discussed or noted in chapter 1, Section I, with the exception of (g), which is discussed in chapter 5, Sections I-II. They are: (c) Top. II. 6 112b1ff. (cf. (d) An. Pr. I. 13 32b4ff., (e) Phys. II. 5 196b10-13 and 20, (f) Met. E. 2 1026b27-37 ≅ K. 8 1064b32ff.), and (g) the argument in Met. E. 3.

2. We turn now to the passages in which Hintikka claims to find more explicit evidence of Aristotle's belief in the Principle of Plenitude, starting with five passages which form something of a group: Phys. IV. 12 221b25-222a9, Top. II. 11 115b17-18, Met. Θ. 8 1050b6-30, N. 2 1088b23-25, and Λ. 6 1071b13ff..

2(a) Phys. IV. 12 221b25-222a9. Aristotle has said at 221b4 that τὰ ἀεὶ ὄντα, ἢ ἀεὶ ὄντα, οὐκ ἔστιν ἐν χρόνῳ. He does not make it entirely clear whether it is only changeless things like incommensurability which he has in mind, or whether the heavenly bodies (qua eternal, not qua in motion) are also 'not in time'; the subsequent argument that certain things are in time because there is a time greater than that of their

existence, however, suggests that the heavenly bodies do count as not in time. Aristotle now goes on to say:

ὅσα μὲν οὖν φθαρτὰ καὶ γενητὰ καὶ ὅλως ὁτὲ μὲν ὄντα ὁτὲ δὲ μή, ἀνάγκη ἐν χρόνῳ εἶναι (221b28-30).

He rounds off the categorisation by saying that, while some things which are not are nevertheless in time (for example, Homer, or a future event), other things which are not are also <u>not</u> in time; these are of course the opposites (ἀντικείμενα/ἐναντία) of the things which always are.

Hintikka does not explain why he takes this passage to provide evidence for his view. He might merely be thinking of the lines quoted above (221b28-30), in which Aristotle seems to assume that <u>genêta</u> and <u>phtharta</u> do in fact come to be or pass away: these were discussed in chapter 1, Section I. Hintikka is probably thinking of something like this, however: if eternal individuals are not in time (see above), no eternal individual can be <u>phtharton</u>, and no <u>phtharton</u> is eternal. But this line of thought would merely reflect Aristotle's belief that eternal individuals exist of necessity, and would not constitute evidence for Hintikka's particular explanation of this doctrine in terms of the Principle of Plenitude. Of course, if Barnes is right to suggest that 'τὸ φθαρτόν' here means 'that which is such as to perish at some time' (see notes on passage 2(b) below), there is no hint even of the 'eternal/of necessity' doctrine here.

2(b) Top. II. 11 115b17-18. For this passage, see the discussion in chapter 1, Section I. The 'dispositional' sense of 'φθαρτόν' mentioned there is given at Top. VI. 6 145b21ff.:

> ὅταν οὖν λέγωμεν ὅτι ἄφθαρτον νῦν ἐστι ζῷον, τοῦτο λέγομεν, ὅτι νῦν τοιοῦτόν ἐστι ζῷον οἷον μηδέποτε φθαρῆναι (b27-8).

Hintikka himself takes this to be a definition of the modal expression in purely temporal terms, and compares it to the 'kurios' account of aphtharton and agenêton at Cael. I. 12 282a27-30 (Time and Necessity, p. 102).[4] As Barnes points out, however, the emphasis here is on the disposition -- τοιοῦτόν ἐστι ζῷον οἷον. . . -- and not on the mere unfolding of time (Review of Time and Necessity, p. 185).[5]

2(c) Met. Θ. 8 1050b6-30. All that Aristotle strictly commits himself to here is that things whose existence is necessary lack the δύναμις for not-being (and hence lack the δύναμις for being also). Aristotle presents his argument in such a way, however, as to suggest that he thinks that nothing which had the δύναμις for not-being could last for ever; for he begins by saying that eternal (rather than necessary) beings lack this δύναμις. This reflects Aristotle's now-familiar belief that anything which exists always exists of necessity; it does not support any of the claims (1)-(3) to which Hintikka is committed.

We should note that Aristotle uses 'δύναμις' in a rich sense here -- one in which he thinks it to be obvious that the δύναμις for being is (or brings along with it) a δύναμις for not-being also. This must be a stronger sense than we need to give to 'natural capacity'; for Aristotle claims that eternal individuals lack this δύναμις, yet he could hardly deny that in some sense the heavenly bodies do have a natural capacity to exist, since they are natural objects which are in a state of natural activity. Indeed in the De Caelo, as I argued in chapter 3, Aristotle may well be happy to ascribe a natural capacity for existence to the cosmos. For the same reason the relevant sense of 'δύναμις' must also be a richer sense than the dispositional one in Top. 145b21-28. The potentiality for being which Aristotle denies to eternal things here seems to involve the notion of change. We may compare Met. Δ. 12 1019a15-16: δύναμις λέγεται ἡ μὲν ἀρχὴ κινήσεως ἢ μεταβολῆς ἡ ἐν ἑτέρῳ ἢ ᾗ ἕτερον (cf. Met. Θ. 1. 1046a4-11). Aristotle seems to think that eternally existing things lack the potentiality for being because they lack any potentiality which would enable them to come into being. If this is Aristotle's thought, then it already involves the assumption that the existence of the eternal things is necessary.[6] This assumption would in itself explain why they lack any potentiality for not-being: necessary beings cannot be subject to changes which would result in their ceasing to be. Aristotle does not, however, just think that it is only things which have the potentiality for being which can

have one for not-being; he also takes it that everything with the former potentiality must have the latter also (see especially 1050b8-12). Ross seems to approve Aristotle's explanation of the link between the potentiality for being and that for not-being:

> But all potentialities are potentialities for either of two contradictory results. That which can under certain circumstances become or do something can also, if those circumstances be absent, not become or do it.[7]

I am not sure that this explanation is satisfactory; for the potentialities in question are not for being/not-being simply, but are sources of change into or out of existence, and the causal conditions required to trigger a thing's coming into existence may not be required to sustain that existence once it has come about. If this is so, then it seems that something could have the potentiality for being, without having within it any source of passing away.[8] Much more needs to be said about this conception of potentiality; the only suggestion which I can make here is that Aristotle is taking for granted the ontological scheme for which he argues in Cael. I. 10-12 -- a scheme in which anything that comes to be must also pass away, and 'eternal' and 'finite' are the only two possible classes of things.

2(d) Met. N. 2 1088b23-25. The interpretation of this passage depends to some extent on the reference of ἐν ἄλλοις λόγοις. If Aristotle has the De Caelo in mind, as Barnes suggests (Review of Time and Necessity,

p. 185), this would be important evidence that Aristotle was willing to use that argument outside a cosmological context; the passage is still entirely concerned with eternal things, however, and would of course provide no evidence that Aristotle was willing to apply the De Caelo argument more generally. Ross, on the other hand, suggests that the reference is to the Met. Θ. 8 passage which we have just discussed. If this is the case, then τὸ ἐνδεχόμενον μὴ εἶναι will have the rich sense of potentiality employed in Θ. 8, and there will be no question of a direct application of anything even related to the Principle of Plenitude. The same is true if the reference is to Met. Λ. 6 1071b13ff. (passage 2(e) below), which seems to me to be a good candidate. Whichever of these is the intended reference of ἐν ἄλλοις λόγοις, however, Aristotle's claim in N. 2 appears to be underpinned by his belief that the existence of eternal individuals is necessary, since this seems to be at the heart both of the potentiality argument at 1050b6ff., and of the argument in Λ. 6 (see passage 2(e) below); and, of course, it is the conclusion of the argument in the De Caelo as well.

2(e) Met. Λ. 6 1071b12-26. At b12-22 Aristotle argues that if the οὐσία of the eternal mover is potentiality, then the motion will not be eternal, since it is possible for a thing which is F in potentiality to fail to exercise that potentiality. I find it difficult to regard Aristotle here (or in the N. 2 passage) as using 'ἀίδιος' to mean 'necessarily eternal'; Aristotle has just gone systematically through

the various ways in which an eternal mover could fail to account for eternal motion, but does not mention accidental or contingent everlastingness, or complain that it would not amount to eternality.[9] Rather, he once again assumes that nothing which is eternal could be otherwise. The importance of the connection between necessary existence and 'pure actuality' is brought out in the sentence which follows (b22-26). Only eternal and pure actuality will avoid the problem raised by the usual priority of potentiality, for anything which is pure actuality does act if it is able, as well as vice versa. Outside the realm of what exists eternally, Aristotle seems content to allow the priority of potentiality in the sense given here.[10] This seems to amount to a denial of something which the Principle of Plenitude entails, namely that the only things which can happen are the things which actually do happen. We shall note later Aristotle's more explicit denial of this in Met. Θ. 4 (passage 6).

3(a)-(b). The next two passages have been discussed in chapter 1: Phys. III. 4 203b30 and GC II. 11 337b35-338a3 (cf. Int. 19a9-18, a passage not cited by Hintikka). These all support Aristotle's endorsement of some version of (Pl), but not Hintikka's version.

4. Int. 9: 'the sea battle'.[11] Hintikka's interpretation of this famous chapter presents Aristotle as dealing with a difficulty which

arises from his endorsement of the Principle of Plenitude.[12] Take a sentence of the form:

p is (tenselessly) true at time t.

If omnitemporality entails necessity, then any true sentence of this form will be necessarily true. Similarly, a future-tense version would have been true for an infinite past time, and (by the arguments of Cael. I. 12) this itself is sufficient to guarantee necessity.[13] Thus the event or state of affairs which p describes happens or holds in all possible worlds if it happens at all; and since we can find a value of p for every event which happens, it follows that everything happens necessarily.

If this were the problem which Aristotle confronts here, it would be very good evidence that he took seriously the Principle of Plenitude as understood by Hintikka. But Hintikka's interpretation of Int. 9 is unacceptable. Hintikka not only gives Aristotle a foolish problem, but must ascribe to him an even more foolish solution: Aristotle, on this account, is worried by the fatalistic necessity of 'This cloak will be cut up' (and of 'This cloak will be cut up a week from now'), but not by the necessity of 'This cloak will be cut up on January 20, 1986.' Aristotle gives no hint of being concerned with Hintikka's problem,[14] nor does he show any sign of seeing an important difference here between sentences which are temporally relativised and ones which are not.[15]

Hintikka's reading of the crucial passage 19a23-27, moreover, which forms the keystone of his interpretation, is clearly erroneous. He claims that Aristotle is making a distinction between 'necessarily p' and 'necessarily (p at t)'. τὸ ὂν ὅταν ᾖ, however, cannot mean 'what is said to be the case at a specific time', nor even 'what is, at a specific time': it must mean 'what is, when it is'. In that case ὅταν ᾖ at 19a23 has to qualify ἀνάγκη, not τὸ ὄν, and likewise ἁπλῶς at 19a26 qualifies ἐξ ἀνάγκης rather than εἶναι: Aristotle's distinction aims to deny necessity ἁπλῶς to certain events.

5. Met. Θ. 3 1047a12-14. Hintikka claims firstly that Aristotle is here asserting that the Principle of Plenitude is analytic -- that it expresses the meaning of modal terms. This view requires ἐσήμαινεν to indicate strict synonymy; for then Aristotle would be saying that ἀδύνατον is synonymous with 'not (is or will be)', and thus that 'possible' means 'is or will be'. As I said against Waterlow in chapter 1, however, 'σημαίνειν' does not in general indicate strict synonymy, nor could it do so here without committing Aristotle to the view that all events in the past are impossible. Hintikka concedes that 'ἐσήμαινεν might possibly be a weak term here, to be translated in terms of "indicating" rather than "meaning".' (Time and Necessity, p. 104), but claims that in any case the Principle of Plenitude is asserted here 'in no uncertain terms'. All that Aristotle actually asserts,

however, is that what is impossible neither is nor will be; Hintikka needs something like the converse ('What neither is nor will be is impossible'), of which there is no trace in this passage.

6. Met. Θ. 4. According to Hintikka, Aristotle here explicity defends the Principle of Plenitude. Aristotle's intentions in this chapter are not easy to recover, but Hintikka's interpretation once again faces severe difficulties, as Joan Kung has shown.[16] An alternative account of the chapter has been developed in response to Hintikka by G.E.L. Owen and Martha Kneale, and this has been endorsed by a number of other commentators.[17] I do not find either of these interpretations satisfactory (though that of Owen and Kneale is preferable to Hintikka's), and I argue for a different account elsewhere.[18] Aristotle, in my view, is actually attacking the claim that there are no unrealised possibilities; but I cannot defend this interpretation here.

II

Possibilities realised in time

Aristotle quite correctly thinks that possibilities can be supposed to be realised without leading to an impossible consequence. Hintikka claims that Aristotle has, in addition, a special conception of how these suppositions must be entertained:

> [Aristotle apparently assumes] that every moment of time during any course of events that we consider possible must be equated with some moment of time during the actual course of events. This must have seemed a very natural assumption, for how could there be moments of time not identical with some moment of time in the actual history of the universe? (Time and Necessity, p. 208)

It is not clear what this assumption amounts to. Hintikka's elaboration in the second sentence suggests that it is no more than the claim that there is only one real time series; his statement of the assumption itself might suggest the claim that when we think about possibilities, we entertain suppositions that they hold in this world, rather than some other.[19] Hintikka's subsequent use of the assumption in question makes it clear that he has the second of these claims in mind -- the claim that when we entertain a possibility we must suppose it to be realised at some actual moment in the world's history. Since this principle is quite innocuous (and to my mind rather attractive), I shall call it the weak principle.

Hintikka, however, thinks that this principle actually leads to a very strong conclusion, namely that the Principle of Plenitude is true:

> If Aristotle's definition of possibility is combined with the assumption that possibilities can be assumed to be realized only within this gradually unfolding progression of actual nows, it leads straight to the principle of plenitude (Time and Necessity, p. 212).

How does Aristotle's assumption do this? There is no obvious way in which the Principle of Plenitude can be thought to follow from our weak principle (that possibilities must be entertained as holding at some point in the actual time series); nor is there any tricky fallacy to hand which might plausibly lure someone into thinking that it did follow. Hintikka often writes as if the weak principle is all that Aristotle would need (together with the uncontentious 'definition' of possibility given at Met. Θ. 3 1047a24-6) to reach the Principle of Plenitude, but this is clearly not so. Earlier on in Time and Necessity, Hintikka hints at the argument which he thinks fills the gap between the weak principle and the Principle of Plenitude:

> Aristotle's view is probably motivated by the idea that the only way in which we can think of a possibility to be realized is at some moment of time in our actual 'history of the world'. But if other things than those assumed actually take place at that moment, a contradiction does seem to result (p. 109).

This line of argument is presented more fully in Aristotle on Modality and Determinism':

> First let p be possible, where 'p' is a placeholder for a temporally indefinite sentence. If so, we must be able to assume that at some moment of time t_0 it has been, is, or will be true to say that p. But if in fact it is false at t_0 that p, then we have -- or seem to have -- precisely the sort of contradiction Aristotle rules out in his definition of possibility. Hence p can be possible only if in fact true at some moment of time (pp. 32-3).

This passage appears to ascribe to Aristotle an entirely general endorsement of the insulated realisation manoeuvre which we discussed earlier in connection with Cael. I. 12.

Waterlow suggests that Hintikka's line of thought is actually rather different:

> . . . his idea seems to be this: in thinking of a time as a time in actual history, Aristotle identifies it as the locus of whatever events he believes actually do occur in it. Hence if he believes that p will be the case at t, the sentence 'not-p at t' is not merely false, but for him inconsistent (Passage and Possibility, p. 54).

As Waterlow rightly points out, however, this argument would only work if we regarded the events which actually happen at a given time as essential properties of that time, so that 'the time cannot be thought of as a time when something else might have happened' (Passage and Possibility, p. 55). This essentialist thesis is obviously a very unattractive one, and it is one to which Aristotle is certainly not committed by his views on time.

Whichever of these arguments Hintikka wishes to ascribe to Aristotle, he clearly has to do more than show that Aristotle assumes possibilities to be entertained as holding at an actual time. He must additionally show either that Aristotle was prepared to use the argument which I have just quoted from Aristotle on Modality and Determinism, or that he endorsed this radical essentialism about periods of time.

Neither of these stronger arguments flows directly from the original weak principle about realisation. Most of Hintikka's evidence, however, does not even pretend to support either of these stronger conclusions. Indeed, only one passage (Met. Θ. 4 1047b27-30) is even suggestive of the weaker principle, that possibilities must be entertained as holding at an actual moment in the world's history; none of the rest shows anything at all about Aristotle's view of the relationship between possibility and time.[20] There is, moreover, just one passage where Hintikka detects a stronger principle at work, such as might lead to the Principle of Plenitude. This is De Caelo I. 12 (Time and Necessity, pp. 210-13), where Hintikka thinks that if we ascribe a principle of a stronger form to Aristotle, we can explain his fallacious argument in a more satisfactory way than if we simply call him confused, as Williams must do. Hintikka seems to have in mind here the line of argument which he presents in Aristotle on Modality and Determinism, and which was quoted above. As I noted earlier, however, this simply involves a general application of the insulated realisation manoeuvre -- the fallacy which we were trying to explain. In the absence of independent evidence that Aristotle was taken in by this fallacy quite generally, it is worse than useless to try to explain his error here by positing a regularity of such a nature.[21]

III

Conclusions

The evidence cited by Hintikka shows clearly that Aristotle believed that individuals which are F eternally are necessarily F, and that events which happen always do so of necessity. Now these theses are entailed by the Principle of Plenitude, but it would be rash to suppose on that account alone that Aristotle held them because he endorsed the Principle. Conversely, if I am right about De Caelo I. 12, not only is the argument there restricted to (potentially) eternal individuals and to their natural capacities, but it is hard to see that argument as the source of Aristotle's conviction that eternal individuals exist of necessity; these two considerations remove (or at least diminish) any temptation to see Aristotle as feeling committed to the extension of the argument to all possibilities. In neither way, then, does Aristotle's belief in the necessity of what is eternal provide adequate grounds for ascribing to him a belief in the Principle of Plenitude as Hintikka understands it.

On the other hand, Aristotle's writings provide us with some good evidence that he did not endorse the Principle of Plenitude as Hintikka construes it. The weakest evidence is that from silence: in his discussions of possibility, Aristotle makes no reference to the distinctive feature of possibility which the Principle of Plenitude

expresses. Aristotle gives more positive evidence, as we have seen, at Int. 9, where he restricts contingency to the things which are and are not, but also affirms that some possibilities in the contingent sphere go unrealised. Finally, in Met. Θ. 4, Aristotle seems to me to make a direct attack upon the denial of unrealised possibilities.[22]

Hintikka's ascription of the Principle of Plenitude to Aristotle, therefore, should be firmly rejected. This would remain so, even if we could find no other explanation of why Aristotle believes in the necessity of eternal individuals and of events which happen always; nonetheless, any full account of Aristotle's metaphysics (in our sense of the word) must attempt to find some explanation for these beliefs about the coincidence of 'always' and 'necessary'. The prospects for such an explanation will be examined in my final chapter.

Appendix to Chapter Three: Notes

1. Hintikka sometimes ascribes to Aristotle the view that all possible tokens of E will at some time occur. My formulation of the weaker view is rather rough; but the tasks of making it precise, and of ensuring that it is weaker than the view that 'all possible tokens will occur', need not concern us here.

In Aristotle on Modality and Determinism, Hintikka claims that the Principle of Plenitude entails determinism (pp. 31-3); Sorabji likewise calls the principle 'the deterministic account of possibility' (Necessity, Cause and Blame, p. 128). 'Determinism' here must be sharply distinguished from causal determinism; for causal determinism and the principle of plenitude are logically independent. A causal determinist need not claim that any actual state of affairs is necessary (still less that there are no unrealised possibilities), but only that it is causally necessitated by some other state or event; conversely, the principle of plenitude makes no claim at all about the causal relationships of different actual states of affairs -- someone could hold that all actual states were necessary without holding that they were causally necessitated by earlier states. I shall return to this point in chapter 6, Section III.

2. The only passage which lends itself as easily to Hintikka's view as it does to others is Cael. I. 10 279b21-31: see my notes ad loc. in chapter 2. But other interpretations of this passage are possible, and it would by itself be much too weak to serve as the basis of Hintikka's position.

3. Barnes suggests that Aristotle is using 'γενητόν' and 'φθαρτόν' in their 'dispositional' sense here (Review of Time and Necessity, p. 185; on this dispositional sense see the notes on passage 2(b) below). This may be correct (and Aristotle certainly uses this sense elsewhere), but it does not seem to be obligatory here.

4. On the 'κύριος' account of 'ἄφθαρτον' and 'ἀγένητον' see the notes on 281b27-9 and 282a4-25 in chapter 2 above.

5. This sense of 'φθαρτός' does not itself involve a further appeal to the Principle of Plenitude; one can say of a man that his nature is such that he will perish within 120 years without subscribing to the Principle.

6. This is because eternal things could have such a potentiality involving change only if it were possible for them to (have) come to be; but this requires their existence to be contingent, since if it is possible for them to have come to be it must be possible for them to have been non-existent.

7. W.D. Ross, Aristotle's Metaphysics, ad 1050b8 (II, 265).

8. We met an analogous problem in the second 'physical' argument of Cael. I. 10: see notes in chapter 2.

9. Julia Annas makes something like this point about the importance of the necessity of what is eternal for the N. 2 argument (Aristotle's 'Metaphysics' Books M and N; translated with introduction and notes, Clarendon Aristotle Series [Oxford: Clarendon Press 1976], pp. 199-200). She, however, takes the 'necessary' character of eternal existence as being for Aristotle a part of the concept of eternity, rather than a belief of his about eternal existents:

> Aristotle here is applying his own conceptual tools to the Platonist position, in order to claim that Plato's notion of eternity is defective, since he fails to distinguish what merely happens to last for ever from what must as a matter of necessity last for ever (p. 200).

10. Although, of course, Aristotle insists on the general priority of actuality over potentiality in another sense: see, e.g., Met. Z. 7

1032a22-5 and Θ. 8 1049b24ff. (these passages are discussed in chapter 6, Section II, below).

11. The best introduction to this controversial chapter is Ackrill's discussion (J.L. Ackrill, Aristotle's 'Categories' and 'De Interpretatione': translated with notes, Clarendon Aristotle Series [Oxford: Clarendon Press 1963; reprinted with corrections 1966], pp. 132-42). For bibliographies of recent literature on the Sea Battle, see Hintikka, Time and Necessity, pp. 176-8, and Dorothea Frede, 'The sea-battle reconsidered: a defence of the traditional interpretation', Oxford Studies in Ancient Philosophy 3 (1985) 31-87, at pp. 84-7; to the works listed there should be added Malcolm F. Lowe, 'Aristotle on the sea battle: a clarification', Analysis 40 (1980) 55-9, and Sorabji, Necessity, Cause and Blame, ch. 5.

12. See Time and Necessity, ch. 8.

13. Hintikka's appeal to Cael. I. 12 proves too much here, for the arguments there prove that if something has been for all past time, then it will also be for all future time. Thus if Aristotle were willing, as Hintikka thinks, to extend this argument to the case of sentences being true, then the argument shows that if 'There will be a sea battle on October 1st, 1982' was always true in the past, it remains true even after the date in question. Of course, if the De Caelo argument is conducted in terms of the natural capacities of eternal objects, Aristotle would have very good reason not to extend it to the case of sentences being true (see also chapter 6, Section III, below). In any case, the reference to truth throughout all past time need not be construed as a reference to the De Caelo argument -- nor to the Principle of Plenitude; see my 'Today's sea battle'.

14. Indeed, Hintikka is obliged to say that the first fatalist argument which Aristotle presents is of no real concern to him, but only the second, with its mention of truth throughout all past time.

15. In this chapter Aristotle uses both sorts of sentence in a way which suggests that his problem -- and his solution -- applies to both.

In the sea battle examples, 'ἄπειρον' is clearly being used as a designator rather than as a token-reflexive: these examples are thus temporally relativised in the requisite sense. The cloak example, on the other hand, is clearly not temporally relativised.

16. Joan Kung, 'Metaphysics 8. 4: can be but will not be', Apeiron 12 (1978) 32-6.

17. For Owen and Kneale, see Hintikka, Time and Necessity, pp. 107-8, Kneale's review of Hintikka, and Owen's remarks in Myles Burnyeat and others, Notes on Books Eta and Theta of Aristotle's 'Metaphysics', Study Aids Monograph No. 4 (Oxford: Sub-Faculty of Philosophy 1984), p. 102. Their interpretation has been adopted by Kung (see previous note); Suzanne Mansion, Le Jugement d' Existence chez Aristote, Second Edition (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1976), pp. 316-17; and Sorabji, Necessity, Cause and Blame, pp. 135-7.

18. 'Aristotle and the Megarians: Metaphysics Θ. 3-4' (unpublished paper).

19. For the possible significance of such a claim, see Simon Blackburn, Spreading the Word: groundings in the philosophy of language (Oxford: Clarendon Press 1984), pp. 213-7; for the opposing view, see David Lewis, Counterfactuals (Oxford: Basil Blackwell 1973), and On the Plurality of Worlds (Oxford: Basil Blackwell 1986).

20. The other passages cited by Hintikka are: An. Pr. I. 15 34a8-9 (Time and Necessity, p. 190, n. 26), 34b2-6 (p. 190); Cael. I. 11 281a5-7 (p. 109, n. 11); Met. Θ. 4 1047b3-6 (p. 190).

21. Hintikka could, of course, fall back on the argument provided by Waterlow; but there is no evidence for Aristotle's endorsing the requisite essentialism about time, and it is a barely more attractive thesis than the one we wished to avoid.

Hintikka tries to ascribe the same, strong form of the 'realisation at actual moments of time' principle to Diodorus Cronus (see especially pp. 207-210). His argument depends on the claim that from '◇ p' Diodorus was entitled to infer:

◇∃t(p at t)

but was not entitled to infer the conclusion which he needed, namely:

∃t ◇(p at t)

Diodorus confusedly infers the latter (Hintikka claims), because he assumes that all genuine possibilities can be supposed to be realised at an actual moment of time. There is, however, nothing at all wrong with the latter inference if time is infinite in both directions and if (as Hintikka agrees) the first inference is legitimate. The only reason one could have in the present sort of context for doubting the legitimacy of the second inference would be the sort of radical essentialism about moments of time which Waterlow describes; so it is Hintikka, and not Diodorus, who is guilty of the confusion in question here.

22. See passage 6 in the text. This attack would, strictly speaking, be compatible with Hintikka's version of (P2), which allows some possible tokens of a possibility-type to go unrealised; but it would be hard to see Aristotle as endorsing the claim that no possibility-type goes unrealised, and not mentioning this fact, or the crucial type/token distinction, when he inveighs against the more extreme view.

Chapter 4: Physics II. 4-6: translation and commentary

PHYSICS II. 4-6: TRANSLATION

Note: all divergences from Ross's text, except for minor changes in punctuation, are listed at the end of the translation; important divergences are discussed in the commentary.

II. 4

195b31 Now both luck and chance are said to be among the causes, and many things are said both to be and to come to be because of luck and because of chance. So we must consider in what way luck
35 and chance are among these causes, and whether luck and chance are the same thing or different, and the whole question as to what luck and chance are.

For some even raise the question as to whether they exist or
196a not; for they say that nothing really happens from luck, but that there is some determinate cause for all the things which we say come to be from chance or luck -- for example, the cause of going from luck to the market place and meeting <someone> he wished <to
5 meet> but did not expect to, is wishing to go and do business in the market place. And similarly also in the rest of the things which are said <to come to be> from luck: it is always possible to take something as the cause, and not luck. For if luck were something, it would seem truly absurd, and one would be puzzled as to why none of the sages of old, when speaking of the causes

connected with coming to be and ceasing to be, gave no account of luck, but, as it seems, they too thought that nothing is from luck. But this itself is amazing. For many things both come to be and are from luck and from chance, but knowing that they can each be referred back to some cause of the things which come to be, as the argument above says which does away with luck, nevertheless all say that some of these come to be from luck and some do not. For this reason they ought to have made mention of it in some way or other. (It is not that they thought that luck is one of those things such as love, strife, mind, fire, or anything else of that kind.) So it is strange, whether they did not take it to exist, or whether, thinking <that it does exist>, they did not deal with it -- especially since they sometimes used it (as Empedocles says that air is not always separated out towards the highest place, but as it turns out: at any rate he says in his cosmogony, 'Then it met together in this way as it ran, but often in other ways'. He also says that most of the parts of animals came to be from luck).

There are also those who make chance the cause both of the heavens and of all the worlds; for it was from chance, <they say,> that the whirl and the motion which separated out the whole and brought it into this arrangement came to be. Yet this very thing is especially remarkable: for they say on the one hand that

animals and plants neither are nor come to be from luck, but either nature or mind or something else of this kind is the cause (for it is not whatever turns out that comes to be from the seed of each thing, but from something like this an olive, while from something like that a man); but on the other hand, that the heavens and the more divine of the things which we see came to be from chance: there is no cause of the sort which the animals and plants have. Yet if that is so, then this very fact deserves attention, and it would have been better if they had said something about it. For not only is this position strange on other grounds, it is yet more strange for them to hold it when they see nothing coming to be from chance in the heavens, but many things happening from luck among the things which do not <come to be> from luck -- though <on their view> one would have expected the opposite to happen.

There are also those who think that luck is a cause, but obscure to human thought, since it is something divine and supernatural.

Consequently we must consider what each is, and whether chance and luck are the same or different, and how they fall into the types of cause which we have distinguished.

II. 5

First, then, since we see some things always coming to be in the same way, and some for the most part, it is evident that neither luck nor the from luck is said to be the cause of either of these -- either of what is of necessity and always, or of what is for the most part. But since there are also things which happen in addition to these, and all say that these <happen> from luck, it is evident that luck and chance are something. For we know that such things are from luck and that the things from luck are of this kind. Again, some things which come to be do so for the sake of something, and some do not -- of these [i.e. the former], some happen in accordance with choice and some not; but both are among the things which are for the sake of something. Consequently it is clear that in the things which are in addition to what is necessary and what is for the most part there are also some things in connection with which it is possible for the for the sake of something to exist. And all the things which might be performed from thought or from nature are for the sake of something.

Now things of this sort, whenever they come to be incidentally, we say are from luck. (For just as in the case of being also, there is being <u>per se</u> and being incidentally, so it is

possible for something to be a cause; for example, that which can build is the per se cause of a house, but the incidental <cause> is that which is pale or that which is cultured. The per se cause, therefore, is determinate, whereas the incidental cause is indeterminate; for unlimited things might attach to the one thing.) As has been said, therefore, whenever this comes to be among the things which come to be for the sake of something, then it is said <to be> from chance or from luck (we must mark out the difference between these later; for the moment let this be clear, that both are among the things which are for the sake of something).

For example: <a man> collecting subscriptions for a feast would have gone <there> for the sake of getting the money, if he had known; but he went not for the sake of this, but it attached to him to go and to do what was for the sake of collecting -- and 197a <he did> this not frequenting the place either for the most part or of necessity. The end (the collection) is not one of the causes in him -- but is one of the objects of choice and thought. In these circumstances he is said to go from luck, but if <he went> having chosen and for the sake of this, or frequenting <the place> either always or for the most part when collecting, <he is said> not <to go> from luck. It is clear, then, that luck is an incidental cause among the things for the sake of something which

are in accordance with choice. That is why thought and luck are concerned with the same thing; for choice is not without thought.

It is necessary, then, that the causes from which the from luck could come to be are indeterminate. And it is for this reason that luck is thought to be of the indeterminate and obscure to man, and that there is a way in which it might seem that nothing happens from luck. For all these <things> are said correctly, as might be expected. For there is a way in which <things> happen from luck; for they happen incidentally, and luck is an incidental cause. But <it is a cause> without qualification of nothing: for instance, a builder is the cause of a house, but incidentally a fluteplayer <is>. And of the man's going <there> and getting the money -- when he did not go for the sake of this -- <the causes> are unlimited in number; for <he may have gone> wishing to see someone or pursuing someone or avoiding someone or to see a spectacle. And to say that luck is something beyond account is correct: for an account is either of what is always or of what is for the most part, whereas luck is among the things which happen beyond these. Consequently, since the things which are causes in this way are indeterminate, luck too is indeterminate. Nevertheless, in some cases one might be puzzled as to whether it follows that whatever happens could be the cause of luck; for example, of health <the cause could be> either wind

or the sun's warmth, but not having had one's hair cut -- for some of the incidental causes are nearer than others.

Luck is said to be good when something good results, bad when something bad <results>, and <it is said to be> good fortune or bad fortune when these results are of some magnitude. That is why to come very close to obtaining some great evil or good is to have ill or good fortune, because intellect speaks as if <the good or evil> were actually yours (for 'very close' seems as if it is no distance <at all>). Moreover, it is with good reason that good fortune <is regarded as> unreliable; for luck is unreliable -- for none of the things which are from luck can be either always or for the most part.

Both, then, are causes, as has been said, incidentally -- both luck and chance -- among the things which can come to be neither without qualification nor for the most part, and of these <among> those which might come to be for the sake of something.

II. 6

They differ, however, because chance has a wider range. For 197b everything which is from luck is from chance, but not all this is from luck. For luck and the from luck belong to whatever having

good fortune could belong to -- and, generally, <to whatever> deliberated action <could belong to>. That is why it is also necessary for luck to be connected with the things which can be achieved by action (and a sign <of this is> that good fortune is indeed thought to be the same as well-being [eudaimonia], and well-being is a sort of action; for it is doing well). Consequently, whatever is incapable of (deliberate) action cannot do anything from luck. And because of this no inanimate thing, no beast or child, does anything from luck, because they do not have choice; and neither good fortune nor bad fortune belong to these, except metaphorically (as Protarchus said that the stones from which altars <are made> have good fortune, because they are honoured while their fellows are trodden upon). But to suffer <something> from luck will belong in a way even to these things, when the man who is acting does something from luck in connection with them; but it is not possible otherwise.

Chance, on the other hand, <belongs> to the other animals as well, and to many inanimate things -- for example, the horse came, we say, by chance, because its coming saved it, but it did not come for the sake of being saved. And the tripod fell by chance; for it was set up for the sake of sitting, but it did not fall for the sake of sitting. Consequently, it is clear that in the things which come to be for the sake of something without qualification,

whenever <things> of which the cause is external come to be not for the sake of what results, we say that <they come to be> from chance; but from luck, all the things of this class which come to be from chance, are among the objects of choice, and <happen> to those who have choice. A sign <of this is> is the phrase 'in vain', because it is applied whenever that which is for the sake of another thing does not result in it. For example, if walking is for the sake of the evacuation of the bowels, but if it did not come to be for the one who walked, we say that he walked in vain and that the walking <was> vain, implying that the 'in vain' is this, <namely> that which is by nature for the sake of another thing, whenever that for the sake of which it was and was by nature is not achieved (since if someone said that he bathed in vain because the sun was not eclipsed, he would be absurd: for the one was not for the sake of the other). Indeed, in this way what is by chance is also in accordance with its name [tautomaton] whenever it comes to be in vain [auto matên genêtai]; for the stone did not fall for the sake of striking; so the stone fell by chance, because it could have fallen as a result of someone's agency and for the sake of striking.

It [chance] is particularly distinct from what is from luck in the things which come to be by nature. For when something comes to be contrary to nature, in that case we say that it has

come to be not from luck, but rather from chance. But this too is different; for of the one the cause is external, whereas of the other it is internal.

198a What chance and luck are, therefore, and how they differ from each other has been stated. Of the modes of cause, each of these is in the sources of change; for they are always one of the causes which are by nature or from thought -- but of these the number is indeterminate.

Since chance and luck are causes <of things> of which either mind or nature could have been the cause, when something came to be an incidental cause of these same things, and <since> nothing incidental is prior to the things which are per se, it is clear that the incidental cause is not prior to the per se <cause> either. So chance and luck are posterior to mind and nature. Consequently, if indeed chance were a cause of the heavens, it is necessary that mind and nature be a prior cause both of this universe and of many other things.

List of divergences from Ross's text:

	RLJ	ROSS
196a23	τότε	τοτέ
196a33	θειότερα	θειότατα
196b34	κομιζόμενος	κομιζομένου
196b35-6	τοῦτο <τὸ> τοῦ κομίσασθαι	τοῦτο τοῦ κομίσασθαι
197a4-5	Retain κομιζόμενος	Delete κομιζόμενος
197a28-9	δυστυχεῖν ἢ εὐτυχεῖν	εὐτυχεῖν ἢ δυστυχεῖν
197b23	τῷ ἕνεκα ἄλλου ἐκεῖνο οὗ	τὸ ἕνεκα ἄλλου ἐκείνου

PHYSICS II. 4-6: COMMENTARY

II. 4

195b31. ἡ τύχη καὶ τὸ αὐτόματον : 'luck' and 'chance' seem to be the best translations. 'Chance' ranges more widely, as 'τὸ αὐτόματον' does, while 'luck' is most appropriate when used in connection with a special class of subjects -- persons -- which is close to the class to which Aristotle's τύχη is confined.[1] Moreover, 'luck' is normally applicable only to cases where some benefit or harm attaches to the subject -- a condition which answers to Aristotle's claim that lucky events are 'ἕνεκά του';[2] the fit here may be less perfect in the case of chance, since we may be willing to ascribe to chance things which satisfy Aristotle's other conditions for τὸ αὐτόματον, but which are not ἕνεκά του in the sense in which the products of Aristotelian chance must be;[3] despite this, 'chance' comes closer to the sense of 'τὸ αὐτόματον' as Aristotle uses it than any other term does.

Three further points should be made about the translation of 'τύχη' and 'τὸ αὐτόματον'. (1) Although in Phys. II. 4-6 Aristotle gives 'τύχη' a narrow sense, so that 'things due to τύχη' form a subset of 'things due to τὸ αὐτόματον', elsewhere he frequently uses 'τύχη' in a quite general sense which covers both luck and chance. (2) Within II. 4-6, Aristotle uses 'τὸ αὐτόματον' in two ways: in a general sense, which includes luck, and in a narrow sense which covers

chance things which are not due to luck. Where the distinction between these senses is important, or where the context does not make it clear which is intended, I shall use 'chance$_1$' to refer to τὸ αὐτόματον in the wider sense, and 'chance$_2$' to refer to it in the narrower sense.[4]

(3) The translation of 'τὸ αὐτόματον' by 'chance' is a controversial one. Recommending the rendering 'spontaneous', Guthrie writes: 'Tyche was the common word for chance, luck or fortune . . . Automaton had much in common with its modern derivative 'automatic', as used e.g. in Homer of the tripods invented by Hephaestus, which ran of themselves (Il. 18.376).'[5] Hardie and Gaye also adopt the translation 'spontaneous', while Charlton opts for 'automatic'.[6] Now it is certainly true that this is one sense of 'τὸ αὐτόματον'. Like Hephaestus' three-footed gadgets, the αὐτόματα to which Aristotle refers at MA 7 701b1ff. move 'of themselves' in this sense. What is involved in X's being αὐτόματος in this sense? I imagine that it is something like this: (i) X's behaviour regularly or reliably exhibits a certain pattern; (ii) the paradigm type of thing which behaves in this way or in analogous ways is either an intelligent agent or a natural object with a distinctive nature; (iii) the cause of X's behaviour is internal to X (it requires no further help beyond, perhaps, some initial prompting); but (iv) X is not an intelligent agent or a natural object (whichever the paradigm happens to be) -- or, if it is, its behaviour is not explained by this fact. At any rate, dishwashers are automatic

because they are like this (whereas people who wash dishes are not), and so are Hephaestus' gadgets. Now there is a good sense in which 'automata' like this can be said to 'imitate mind or nature'; and since a dominant idea in Aristotle's account of τὸ αὐτόματον in II. 4-6 is precisely that of events imitating mind or nature, it might seem tempting to say that 'αὐτόματος' in these chapters does indeed mean 'automatic' or 'spontaneous'. This would be to ignore two crucial differences between the concept which I have analysed and the one which Aristotle analyses in II. 4-6. Firstly, it is not necessary, on Aristotle's analysis, for the cause of a 'chance' event to be internal to the subject, as it is for some piece of behaviour to be 'automatic'; indeed, this condition on being αὐτόματος is at least superficially at odds with the condition stated in II. 6, that the cause of a 'chance' event must be external.[7] Secondly, it is essential to 'automatic' behaviour, as I have characterised it, that it should be normal behaviour for an automaton of the type in question; it is behaviour which we can understand and predict on the basis of an understanding of the thing's internal causal mechanisms. Automata are 'self-moving' precisely because they possess an internal mechanism which causes their characteristic behaviour. It is equally essential to Aristotle's analysis in II. 4-6, however, that 'chance' events are abnormal: they occur 'neither always nor for the most part', there is no logos of them, their causes are 'indeterminate' (which seems to involve the idea that

there is no predicting the effect from the cause, or vice versa). It is impossible to suppose that the analysis offered in II. 4-6 is intended as an analysis of 'τὸ αὐτοματον' in Guthrie's sense: for that sense involves regular 'imitation of mind or nature' which is open to scientific understanding, while in II. 4-6 Aristotle analyses a concept involving unusual and anomalous 'imitation of mind or nature' which is opaque to science.[8]

I have laboured the point that 'αὐτόματος' has two related, but quite distinct senses, not merely to justify my preference for 'chance' as a translation for the word in II. 4-6, but because a further issue is involved -- that of the consistency of Aristotle's account of spontaneous generation (γένεσις αὐτόματος). It is a familiar complaint that Aristotle's account of spontaneous generation in the biological works is inconsistent with his account of spontaneity in the Physics.[9] If my claim is correct that 'αὐτόματος' is ambiguous, however, then this general problem of inconsistency simply does not arise: the arguments for this inconsistency can, rather, be viewed as arguments that 'γένεσις αὐτόματος' in the Generation of Animals and the History of Animals is generation which fits the analysis of 'automatic' which I sketched earlier, and not chance generation in the sense which Aristotle describes in the Physics.[10] It is true that Aristotle does not explain the ambiguity of 'αὐτόματος', either in the Physics or in the biological works, but this is hardly enough to show

that he only uses the word in one sense; and beyond his use of the same term for 'chance' and 'spontaneous/automatic', there seems to be no evidence that Aristotle was confused about the difference between these concepts.[11]

195b33-4: τίνα οὖν τρόπον . . . τὸ αὐτόματον. This question may be answered by Aristotle's claim in II. 5 that luck and chance are incidental causes; but much more probably (as Ross thinks) by the claim that they are (incidental) efficient causes at II. 6 198a2-5, where Aristotle says that the other questions posed here have been answered and turns to the question of τῶν δὲ τροπων τῆς αἰτίας (cf. also the gloss on this question at end of chapter 4: καὶ πῶς εἰς τὰ διωρισμένα αἴτια ἐμπίπτουσιν).

195b36-196a7: ἔνιοι γάρ . . . ἀλλ' οὐ τύχην. Simplicius cites Eudemus' testimony that this belief was held by Democritus, and that he used this argument in support of it;[12] cf. Leucippus DK B4: οὐδὲν χρῆμα μάτην γίνεται, ἀλλὰ πάντα ἐκ λόγου τε καὶ ὑπ' ἀνάγκης. This identification is reasonably secure, but the same cannot always be said of commentators' ascriptions of some of the subsequent endoxa about chance to the Atomists: see below.

Although the example of the man going to the agora which is given here reappears later in the course of Aristotle's own analysis (II. 5 196b33ff.), it is important to note that here it may be presented in

oratio obliqua: thus the claim that the cause of the chance meeting is the man's wishing to go to the agora may be the Atomists' claim, not Aristotle's.

196a6. All the MSS except E have λεγομένων: there are no further grounds for including it (so Ross, whom I shall follow) or omitting it (Prantl[13] and Hardie and Gaye). In particular, reading λεγομένων does not remove the problem that the people who do not believe that luck exists describe some things as 'from luck': for they do that in any case at 196a3. If they do hold that chance and luck do not exist, then presumably we should read ἀπὸ τύχης at a3 as being in scare quotes -- and the same would hold for a6 if we do not read λεγομένων. The point of interest here is that it would be worth knowing whether these people (1) accept an analysis of 'chance' according to which X is not by chance if it has a 'determinate cause' (this would be in contrast to Aristotle's own analysis[14]), and hence conclude that nothing is by chance; or (2) accept that things do happen 'by chance', but are merely denying (as Aristotle does) that chance is an additional causal power in the world alongside Love and Strife or the atoms' motion. The initial terminology at 195b36 favours (1), but I do not think that the question can be settled with any certainty.

196a11-16. Torstrik was disturbed by the apparent failure of this sentence to say what Aristotle obviously means to say, and proposed the

deletion of ἀπὸ τύχης καὶ ἀπὸ ταὐτομάτου at a12.[15] Rightly rejecting this expedient, Ross takes τούτων at a15 to refer not to πολλά (196a11), but to τῶν γιγνομένων (a13-14): 'so interpreted the sentence, while grammatically irregular, contains no contradiction' (p. 514).[16] Ross's interpretation does nothing to ease the difficulty, however: to get the sense we want, the objects of the beliefs which Aristotle is describing must switch half-way through from 'things which happen by luck and chance' to 'things which happen', and merely saying that τούτων refers to the latter does not explain how it sensibly can. We have to admit, I think, that, by the time he gets to the clause, Aristotle has lost sight of how he began the sentence. This mistake was no doubt helped by the reference to the παλαιὸς λόγος, which says that <u>every</u> event (and not just every chance one) has a determinate cause: 'all agree that every event[17] has a cause,' Aristotle is thinking, 'but they still think that <u>some</u> of these are from luck and some are not.'

Torstrik also proposed to emend τῶν γιγνομένων (a13-14) to ὡρισμένον, as the former phrase seemed pointless ('Περὶ τύχης', pp. 432-3). Ross takes τῶν γιγνομένων with ἕκαστον instead of with αἴτιον, but this seems to make the switch from 'chance events' to 'every event' impossibly harsh. Perhaps τι αἴτιον τῶν γιγνομένων is a rather awkward way of saying 'some <u>ordinary</u> cause' -- e.g. wishing to go to the agora.

196a12-13. Aristotle might be thought to commit himself to the truth of 'every chance event has a determinate cause' by his claim that all are 'not unaware' of this fact. I think that Aristotle does believe that chance events have determinate causes, but I do not see this remark as evidence; Aristotle's phrasing in the exposition of these endoxa is far from careful (see the rather sloppy connections at 196a7-11, and the discussion of 196a11-16 above), and it cannot be pressed very hard.

196a14: ὁ παλαιὸς λόγος. Either 'the ancient argument', or 'the argument above'. Since the argument has been given above, I prefer the latter meaning (cf. Phys. VIII. 3 254a16 and Pol. III. 11 1282a15).

196a21. Cornford suggests (but does not print) ἄνω ἢ κάτω for ἀνωτάτω, on the grounds that ἀνωτάτω seems strange, and that at GC II. 6 334a1ff. Aristotle appears to say that Empedocles sometimes says that air sinks by nature.[18] But the GC passage merely has Empedocles saying that αἰθήρ sank -- he does not say that it sank by nature; and ἀνωτάτω should be retained.

196a22: ὅπως ἂν τύχῃ. Notwithstanding its etymological connection with τύχη, this phrase need carry no suggestion of happening by chance. As Barnes points out in the course of discussing συνέκυρσε at a22-3, 'τυγχάνειν' is 'standardly used in the sense of "come about", "actually happen"'[19] (contra Torstrik, who takes both τυγχάνειν here and συνέκυρσε below to mean 'to happen by chance': 'περὶ τύχης', p. 434).

196a22: ἐν τῇ κοσμοποιίᾳ. There is no need to capitalise 'cosmogony' in translating this, as Charlton and LSJ do.[20] There is no evidence that this was the title of Empedocles' cosmological poem, and as Met. A. 4 985a18-19 makes clear, 'κοσμοποιία' can be used to signify 'account of the creation of the cosmos'.[21]

196a22-3. Like τυγχάνειν, συγκύρειν seems to carry no regular implication of chance or coincidence.[22] Why, then, does Aristotle take this passage to be evidence that Empedocles 'uses chance'? Presumably it is, as Barnes says, because Empedocles here allows outcomes in the natural world which are 'neither always nor for the most part'; if so, Aristotle is not appealing to an explicit claim by Empedocles that chance is at work here, but is interpreting Empedocles' position in terms of something from his own account of chance. This sort of manoeuvre is not uncommon in Aristotle's treatment of his predecessors' thought.[23]

Should we understand τότε or τοτέ at a23? Ross (p. 515) appeals to GC II. 6 334a2-4 in support of τοτέ;[24] but the ὁτὲ μεν. . . ὁτὲ δέ of that passage does not seem to favour either reading over the other. τότε captures the requisite idea of infrequency a little more clearly than τοτέ and is perhaps preferable on these grounds.

196a24-35. (1) Which thinkers does Aristotle have in mind in this passage, and (2) is the argument at 196a30-3 theirs or Aristotle's?

(1): The people who hold the view outlined here presumably do not include Empedocles, since Aristotle has just mentioned his use of luck in connection with animal parts (contrast a29-30); but beyond this it is hard to pin down who the holders of this position are. Most commentators see the reference as being quite clearly to the Atomists;[25] but while the group may well include the Atomists, Aristotle's remark at a30-1 that these thinkers ascribe the genesis of animals and plants to 'either nature or mind or something else of this kind' points to a more general reference, and is not immediately suggestive of the Atomists.[26] Ross claims that 'Aristotle makes the same point, about the inconsistency of the Atomists, in De Part. An. 641b15-23' (p. 515), but the Atomists are not named in that passage either. If the Atomists are included in this group, then if they are also the ἔνιοι of 195b36ff. they must use 'by chance' in two senses: presumably they would mean the claim that the cosmos came to be by chance to express the idea that it was not the product of a design.[27]

(2): Whose is the argument at a30-3? Unlike the example at 196a3-5, this is clearly not in oratio obliqua, and Aristotle could be sketching the argument offered by the thinkers in question, or interjecting an argument of his own to show why this part of their position is sensible. The argument is generally supposed to be Democritus' rather than Aristotle's, but there seems to be no other

evidence for this claim,[28] and the argument is certainly one which Aristotle uses in his own person elsewhere.[29]

196a25: κόσμων. All the MSS (with the exception of E^1) read κοσμικῶν but this word is not safely attestable before the late 1st Century (and then in the Letter to Hebrews and the Letter to Titus), and Ross is probably right to read κόσμων.

196a33: τὰ θειότερα. This is the reading of all the MSS (Ross's apparatus corrects Bekker and Torstrik on this point), and should, I think, be retained (Ross emends to τὰ θειότατα). Cf. Cael. I. 2 269a30-4, and Guthrie's explanation of Cael. II. 12 292b21-2 ('On the Heavens', pp. 210-11, n. a).

196b2-5. 'ἐν δὲ τοῖς οὐκ ἀπὸ τύχης' contains an ambiguity which will recur with other 'ἐν τοῖς . . .' phrases later. It may pick out precisely those things which are not (sc. on this view) from luck; on this reading, Aristotle is saying that some of the things which they say are not from luck they observe actually to be from luck. Or it may pick out some wider class -- the types of thing which (sc. on this view) might be, or are mostly, or might be expected to be, not from luck. On this second reading, Aristotle is saying not that this view is directly contradicted by the observations of those who hold it, but that some of the things which are in the same range or category as the things which they say are not from luck are seen to be from luck. The second

interpretation is preferable here: Aristotle's complaint is not that these thinkers are straightforwardly refuted by observation, but that their identification of the realms in which they locate the 'from luck' and the 'not from luck' are the reverse of what their observation should have led them to believe. τοὐναντίον γίγνεσθαι: nothing very precise seems to be intended by this.

196b5-7. Democritus is once again thought to be the target (by Hardie and Gaye, and by Guthrie, History of Greek Philosophy II, 418-9). Aristotle here associates the claim that luck is 'obscure to human thought' with the idea that luck is a further causal power operating in the world (contrast 196a17-19) -- and a supernatural one at that. This is a radically different position from another which is also associated with the claim that luck is obscure to human thought: this is the view that lucky events have perfectly ordinary causes, and that we ascribe them to luck when -- and only when -- we are ignorant of what those causes are.[30] Democritus and Anaxagoras may have held this second view;[31] but the position which Aristotle sketches here is the other one, and he must have in mind superstitious beliefs, and the beliefs embodied in cults of Τύχη.

II. 5

Simplicius' remark on 196b10-17 applies to most of the chapter: 'It is clear that, having not yet distinguished luck and chance, [Aristotle's]

argument concerns both, even though he only mentions luck' (in Phys. 334.35-335.1).

196b10-11: 'Always, for the most part, and what is neither always nor for the most part'. I shall use the term 'rare' throughout this chapter and the next to signify the third of these classes; strictly, of course, 'neither always nor for the most' part includes events which happen exactly half the time as well as those which are less frequent, and I intend such events to be covered by my term 'rare'. The issue as to exactly what Aristotle means by this threefold classification is both important and complex; I shall examine it in chapters 5 and 6. It will turn out that Aristotle employs a notion of what I shall call 'conditional frequency': that is, the frequency of an event's happening on the occasions on which some other event happens. Thus judgments that E_2 happens always/for the most part/rarely are either (implicitly) judgments about some ordered pair of events $\langle E_1, E_2 \rangle$, or are derived in some way from such ordered-pair judgments.

196b11-13. Ross's remarks on this passage seem to be exactly right. Hamelin (followed by Hardie and Gaye) felt that the result of luck should not be said to fail to cause what is always or for the most part, since the results of luck (τὸ ἀπὸ τύχης) are just events which can be per se causes in their own right.[32] Hamelin's remedy was to shift the comma in b12 from after τύχης to after λέγεται. This produces a very

strained result, however, and Ross's defence of the comma after is convincing: 'an action which is itself the result of purpose [sc. or nature] but leads to a chance result can be described as ἀπὸ τύχης.... Where two events are thus connected, either can be said to be ἀπὸ τύχης' (pp. 516-17). This point will be of importance later when we consider which event in the 'subscription example' is supposed by Aristotle to fit his analysis of luck.

196b13-17. How exactly does Aristotle argue for his conclusion here? It seems to be something like this:

> There is a class of events which happen neither always nor for the most part -- call them rare events. <So an account is needed of how there can be such, and how they occur;> since all say that these rare events are products of luck, and that lucky events are rare, <this account of how rare events come about will be an account of luck, and> so luck is something.[33]

Aristotle here appears to commit himself to the view that all rare events are the products of luck and chance. This is strange, since he immediately goes on to give a further condition which rare events must satisfy if they are to be from (luck or) chance -- the condition that they be 'ἕνεκά του' (in some sense[34]): this seems pointless if chance events are all and only the rare events. It is unlikely, moreover, that the sense of ἕνεκά του here is such that all rare events count as being 'for the sake of something' in this sense; and Aristotle's introduction of the new condition does not suggest that it fits all rare events. It

is in fact clear that Aristotle takes the rarity condition to be necessary, but not sufficient, for chance, and we should not press the remark at b15-17 very closely.[35] For rarity as (at least) a necessary condition for chance, see also Post. An. I. 30 87b19-27, Cael. I. 12 283a32-b1 (cf. II. 5 287b24-5 and 8 289b25-7), GC II. 6 333b4-7, EE VIII. 2 1247a31-3 (cf. the not wholly serious remark at Rhet. I. 9 1368a13-15), Rhet. I. 10 1369a32-b5.

196b17. δὲ answers μέν at b10.

196b19: ἄμφω δ' ἐν τοῖς ἕνεκά του. I agree with Ross that ἄμφω refers to τὰ μὲν κατὰ προαίρεσιν, τὰ δ' οὐ κατὰ προαίρεσιν rather than to luck and chance, as Simplicius thinks (in Phys. 335.24ff.): see notes on 196b19-21 below. Ross's further claim that this remark anticipates the distinction between luck and chance, however, depends on a dubious interpretation of that distinction (I discuss this in the notes on 197a1-2 and 197b1-2 below). Aristotle just wants to stress that the class of things which are ἕνεκά του includes more than the things 'in accordance with choice'; Aristotle is probably thinking primarily of the ends achieved by nature, but if κατὰ προαίρεσιν means 'in accordance with actual choices', then τὰ οὐ κατὰ προαίρεσιν will also include practical ends which are achieved but which were not actually chosen. The precise meaning of 'ἕνεκά του' is a matter of controversy: my own

view is that it means 'producing an actual benefit', and I shall discuss this in the notes on 196b29-31 below.

Constantine Georgiadis suggests emending ἄμφω δ' ἐν τοῖς ἕνεκά του to ἄμφω δ' ἐν τοῖς ἀπὸ τύχης.[36] He offers two grounds: (1) on the MSS reading, Aristotle is making a redundant comment, since he has just divided τὰ ἕνεκά του into τὰ κατὰ προαίρεσιν and τὰ οὐ κατὰ προαίρεσιν; (2) the emendation gives Aristotle a valid argument for the conclusion he draws at 196b19-21 -- whereas on the MSS reading, his argument is plainly invalid. But (1) the repetition of the claim that 'both are among the ἕνεκά του' is not wholly pointless -- the range of τὰ ἕνεκά του is worth stressing. (2) Although the argument which Georgiadis can ascribe to Aristotle is better than the alternative, it would be an unlikely argument for Aristotle to be using here: see next note.

196b19-21. 'Some As are B. Some As are C. So some As which are B can be C.' This is invalid (pace Ross, p. 517); Simplicius takes ἄμφω at b19 to refer to luck and chance in order to produce a valid argument instead: 'Chance events are rare. Chance events are ἕνεκά του. So some rare events are ἕνεκά του.' (Georgiadis produces the same argument by emending ἕνεκά του to ἀπὸ τύχης at b19.) Ross rightly objects that this argument is not one in which Aristotle should be interested, however: 'the syllogism obtained is a hysteron proteron. What Aristotle wants to establish is that chance events are both unusual

and teleological, and he needs as a preliminary to this to show that unusual events may be teleological' (Ross, p. 517; italics original). The best we can do for Aristotle here, I think, is to see the invalid argument as a sloppy way of presenting the claim that chance events satisfy two conditions (rarity and being ἕνεκά του), Aristotle taking it as obvious that some events do satisfy both.

196b21-3. Torstrik wished to emend πραχθείη to πραχθῇ, on the grounds that Aristotle normally reserves 'for the sake of something' for events which are actually the work of mind or nature; this is because 'X is for the sake of Y' standardly indicates that Y explains X as the latter's final cause (Torstrik, 'Περὶ τύχης', pp. 445-7). Emendation is a desperate remedy, however, since a further emendation at b35-6 and two strained interpretations (at 196b17-21 and 197a1) are also required if we are to avoid the conclusion that Aristotle here uses ἕνεκά του in such a way that it does not carry any implication of final causation, and does apply to chance events (see notes on 196b29-31 and 196b35-6 below).

196b23. Torstrik argues that what follows at b24-5 requires us to read ὅταν κατὰ συμβεβηκὸς γένηται <αἴτια> ('Περὶ τύχης', pp. 444-5). As is so often the case, what is cited as evidence for Aristotle's text from the Greek commentators does not amount to much: Themistius and Simplicius both insert αἴτια, but this may simply be their own exegetical supplement.[37] Ross is right to say that 'the logic of the

passage does not require' this supplement: b24-9 serve to explain how something can 'come to be incidentally' -- what makes 'coming to be incidentally' possible is the existence of incidental causes.[38] In fact, the sense of the passage would be made more obscure if we followed Torstrik. For if τὰ τοιαῦτα means 'the things which are for the sake of something', Torstrik's supplement has the effect of distinguishing the ἕνεκά του condition from a new condition that chance events must be incidental causes (presumably of some other τέλος); while if τὰ τοιαῦτα means 'the things which are both rare and for the sake of something', we have the same difficulty and a similar one in connection with rarity -- chance events must be rare and must also be incidental causes. (See further on 196b29-31.)

196b24-7. ὧν ἐστι τὸ μὲν καθ' αὑτὸ τὸ δὲ κατὰ συμβεβηκός could be understood in terms either of 'being (F)' or of 'existing': we should understand αἴτιον ἐνδέχεται εἶναι correspondingly, as either 'it is possible for something to be a cause' or 'it is possible for a cause to exist'. Ross prefers 'existing', and takes the distinction in the ὥσπερ clause to be that between substances and accidents (p. 518). 'Being (F)', however, seems to provide a better parallel for the case of causes -- namely the distinction between per se and incidental attributes;[39] and the phrasing at b27-8 appears to confirm this.

'Incidental causation'. This concept raises many questions, some of which will be discussed in my notes on 196b29-31 below, and some in chapter 5.[40] If we use '+' to indicate concurrence in a subject, or 'accidental unity',[41] and '=>' to signify per se causation, then $\underline{E}_1$ can be an incidental cause of $\underline{E}_2$ in two different ways:

I	II
$\underline{E}_1 \Rightarrow \underline{E}_3$	$\underline{E}_1$
+	+
$\underline{E}_2$	$\underline{E}_4 \Rightarrow \underline{E}_2$[42]

Aristotle's illustrations at b26-7 are cases of type II; in Met. E. 2 he gives examples of both types -- a cook (aiming at giving pleasure) produces health in someone, a housebuilder (who happens to be a doctor) cures someone (1026b37-1027a5). I shall consider the question as to whether or not chance events can be incidentally caused in both these ways in Section I of chapter 5.

196b27-9. Cf. 197a15-17. Since an unlimited number of (types of) event can attach to the subject of $\underline{E}_1$, or to the subject of $\underline{E}_2$, an unlimited number of (types of) event can stand in the position of $\underline{E}_3$ or $\underline{E}_4$ in the two schemata given in the previous note. Thus there is no finite specification of the possible incidental causes which a given (type of) event may have, and there is equally no finite specification of the

possible 'incidental effects' which a given (type of) event may have. Why does this make incidental causes ἀόριστα? Presumably because it means that the would-be 'laws' which connect types of events under incidental causation are constituted simply by infinitely long disjunctions, and as such could not be objects of knowledge, in Aristotle's view.[43]

196b29-31: the 'first definition' of chance and luck. Two preliminary notes: (1) τοῦτο γένηται at b30 presumably refers to something's 'coming to be incidentally'. (2) ἐν τοῖς ἕνεκά του γιγνομένοις is ambiguous in the same way as the remark at 196b2-5 discussed above: does Aristotle mean 'among the things which are actually ἕνεκά του', or 'among the sorts of thing which are or can be ἕνεκά του'? If this were the only way in which Aristotle connects chance events with 'for the sake of something', we could avoid the problem mentioned in relation to 196b21-3 by adopting the second reading here; for then Aristotle would not be committed to characterising events which do not have a <u>per se</u> final cause by a term -- ἕνεκά του -- which standardly conveys the idea of <u>per se</u> final causation. But the remark at 196b21-3 and those at 196b35-6 and 197a1 (ποιῆσαι τοῦτο τὸ τοῦ κομίσασθαι ἕνεκα and τὸ τέλος, ἡ κομιδή) all support the view that Aristotle does wish to say that chance events are actually ἕνεκά του -- clearly in some 'non-explanatory' sense of the phrase: see below.

We can now consider Aristotle's account of luck and chance as it has developed so far. Something is the outcome of luck or chance (ἀπὸ ταὐτομάτου καὶ ἀπὸ τύχης) if it (i) comes to be incidentally, and (ii) is 'for the sake of something'.

The second condition on being the outcome of luck or chance is that the event 'be for the sake of something'. This raises an obvious difficulty; for Aristotle standardly <u>opposes</u> 'by chance' and 'for the sake of something'.[44] It is hard to resist the conclusion that he uses 'ἕνεκά του' in two different senses -- an 'explanatory' sense and a non-explanatory one. Even desperate emendation, such as Torstrik proposed, will not rid II. 5-6 of the idea that chance events are ἕνεκά του (see the preliminary notes on the present section, above); and if we attempt to remove it by interpreting 'ἐν τοῖς ἕνεκά του' merely as 'in the general class of things which are normally <sc. but need not be> for the sake of something', we still have to face the fact that Aristotle describes the result of the lucky encounter in the agora as (197a1).[45] If Aristotle does use 'ἕνεκά του' in a non-explanatory sense here, what is it? Ross, Charlton and Lennox all endorse some version of the view that '<u>E</u> is ἕνεκά του' in this sense means '<u>E</u> is such that it might have been for the sake of something'.[46] I prefer to take it to mean '<u>E</u> actually produces some benefit' -- i.e. 'is the <u>per se</u> cause of some benefit'. 'Benefit' is intended in a very general sense: <u>E</u> produces a benefit if it serves someone's interests, or

satisfies a desire or need.[47] There is little direct evidence bearing on this question. My main reason for preferring 'E actually produces some benefit' is simply that this seems to be a condition of being a lucky event in our (standard) sense: a man who stumbles upon treasure is neither lucky nor unlucky if he is indifferent to riches. But I concede that this does not prove that it is Aristotle's condition also. It can be said, however, that in the one other context in which Aristotle appears to use 'ἕνεκά του' in a non-explanatory sense, it is much more plausible to see him as meaning 'actually produces an end' than as meaning 'is suitable for producing an end'. This context is the list of things ignorance of which prevents an action from being ἑκούσιον (EN III. 1 1111a2-6 and 18-19, V. 8 1135b12-16 and EE II. 9 1225b1-5). Ignorance of what end the action is suitable for producing seems quite irrelevant to whether or not it is ἑκούσιον. What is relevant is ignorance of what end it actually will produce; and indeed the EN V. 8 and EE passages make it clear that this is what Aristotle means:

> . . . [injuries] done in ignorance are errors when the person acted on, the act, the instrument, or the end is not what the agent understood; he thought . . . that he was not hitting . . . with this end, but <the end> which resulted was not what he thought the end was -- e.g. he threw not in order to wound but only to graze . . . (EN V. 8 1135b12-16).[48]

Thus what we may call Aristotle's first definition of luck and chance (196b29-31) can be restated as follows:

An event E is the outcome of chance or luck iff (i) E comes to be incidentally, and (ii) E is the per se cause of a benefit.

What does condition (i) involve? The remark concerning incidental causation made à propos of 'coming to be incidentally' at b24-9 indicates that coming to be incidentally is a matter of being incidentally caused in some way, and that being incidentally caused is at least a necessary condition of coming to be incidentally. This idea is supported by the link with ἀόριστον (196b28-9, 197a8-10, etc.), and is confirmed both by the 'subscription example' at 196b33ff. and by the subsequent descriptions of luck and chance as incidental causes (197a12-13 and 32-5; cf. 198a5-10). What sort of incidental causation is relevant to the 'coming to be incidentally' condition? The per se/incidental distinction applies to all four causes;[49] does Aristotle have a particular mode of causation in mind when he speaks of chance events coming to be incidentally?[50] Aristotle himself raises this question (195b33-4, 196b8-9), and says that it is efficient causation which is involved: 'of the modes of cause, each of these [luck and chance] is in the sources of change' (198a2-3). Since luck and chance are elsewhere described as incidental causes, as we noted above, it is clear that the mode of incidental causation in question is incidental efficient causation. This is not to say that one cannot identify incidental causes of the other modes in cases of chance: in the 'subscription example', for instance, the per se final cause of the man's going to the

agora -- seeing a spectacle, or whatever it might be -- will stand as an incidental final cause of his meeting his debtor.[51] But Aristotle makes it plain that the 'coming to be incidentally' condition in the analysis of chance involves -- and only involves -- incidental efficient causation.[52]

Since both the incidental cause of a chance event and the benefit which that event produces can also be ascribed, in a derivative way, to chance or luck, and can themselves be called chance events,[53] let us distinguish the events which satisfy Aristotle's definition by calling them chance outcomes (or lucky outcomes).[54] As we have seen, it is a necessary condition of an event's being a chance outcome that it have an incidental (efficient) cause. Employing the two schemata for incidental causation which I gave above, we can derive two causal structures in which chance outcomes can be embedded:

I	II
A => C	A
+	+
CO => telos	B => CO => telos

'A', 'B', 'C' are placeholders for events, 'CO' is the chance outcome, and 'telos' stands for the benefit; as before, '+' signifies concurrence in a subject, or accidental unity, while '=>' now signifies per se

efficient causation. In both I and II the chance outcome has A as an incidental cause.[55]

What is it for an event to come to be incidentally? Given that Aristotle links this notion with that of incidental causation in the way he does, three possible answers suggest themselves. The necessary and sufficient condition for E's coming to be incidentally could be:

(1) E has at least one incidental cause.
(2) E is incidentally caused, but has no per se cause.
(3) E is incidentally caused by at least one, and is per se caused by none, of some favoured set of events.

Ross, as far as I can tell, endorses (1), while Charlton holds (2).[56] My own view is that (3) represents Aristotle's answer: I shall defend this claim in chapter 5 (see also the notes on Aristotle's 'second definition of chance' at II. 6 197b18-20, below).

The final issue to be raised here concerns rarity. Aristotle began the chapter by outlining two conditions -- being rare and being 'for the sake of something'. In the account of chance and luck which follows, and which culminates in the 'first definition', the second of these conditions is straightforwardly carried over, as we have seen. The rarity condition, however, seems to have disappeared, and to have been replaced by the 'coming to be incidentally' condition. This seems strange: if rarity is irrelevant, why does Aristotle begin by discussing it? Whatever we make of the remark at 196b15-17, moreover, it must at

least mean that rarity is a necessary condition of being a chance event.[57] This is confirmed (if confirmation were needed) by the fact that rarity reappears as part of what it is to be a chance event later in the chapter (197a3-5, 18-20, 30-2) -- to which we may add the references listed at the end of the note on 196b13-17 above. Clearly Aristotle must intend the 'coming to be incidentally' condition at least to entail the rarity one; for then if the former is a necessary condition on being a chance event, the latter will be also. How is this achieved? Incidental connections must themselves be rare connections.[58] That what is incidental is rare is, of course, confirmed by Met. Δ. 30 and E. 2.[59] The most natural way to cash out the idea of rarity in the case of incidental causation is to take Aristotle to hold that tokens of a given type of incidental 'effect' only occur rarely within the range of occurrences of tokens of the incidental cause: if this is correct, it lends some support to my claim that judgments of rarity in this context are judgments of what I have called 'conditional frequency'.[60]

196b31-3. The difference between $chance_2$ and luck is discussed at II. 6 197a36-b22.

196b33-197a5: the 'subscription example'. I shall first examine some points of detail, and then consider the example as a whole.

196b34: κομιζόμενος. Ross reads κομιζομένου, following J and the Greek commentators (and in company with Prantl, Charlton and Wagner[61]). He argues that κομισόμενος, the reading of FI, would make for 'a very insipid repetition of ἕνεκα τοῦ ἀπολαβεῖν τὸ ἀργύριον' (p. 520), but he ignores κομιζόμενος which is the reading of E^1 and which is immune to this objection.[62] Ross also thinks that κομιζομένου yields a better story, as it makes the chance nature of the meeting more striking. But the argument seems to go the other way: to have two distinct coincidences in the story would make the example more obscure (though admittedly more exciting).[63] κομιζόμενος avoids this difficulty, and makes a sensible and pertinent point. The subsequent occurrences of κομίσασθαι and κομιδή at 196b35, 197a1 and 15, moreover, all refer to the subject of the story, not to his debtor. (Ross uses this to explain the corruption to κομισόμενος but it is clearly a stronger argument against his view than it is against the reading of E^1).

What is the significance of this point at b33-4? Presumably it is not essential to an event's being by chance that the subject actually would have acted to produce this telos if he had known: this way of putting it is simply a vivid way of showing that the chance outcome is 'for the sake of something' in the relevant sense.[64]

196b35: αὐτῷ. This is read by E alone of the MSS, but its inclusion

seems preferable on the grounds that it picks up τῷ ἑνὶ συμβάίη at b29. (Prantl and Ross read αὐτῷ, but Charlton omits.)

196b35-6. The MSS have: καὶ ποιῆσαι τοῦτο τοῦ κομίσασθαι ἕνεκα, which Ross retains. Bonitz (followed by Hardie and Gaye, and Barnes) wished to delete τοῦ κομίσασθαι ἕνεκα, on the grounds that the man does not go for the sake of collecting -- and, indeed, Aristotle has just said ἦλθε δ'ου τούτου ἕνεκα. There are really two issues at stake here. The first is, should we emend so as to avoid having to ascribe two senses of 'ἕνεκά του' to Aristotle? There is no point in doing this unless we are willing to emend the text at 196b21-3 (see notes ad loc.), and to ignore the obvious sense of τὸ τέλος at 197a1 and of the introduction of the ἕνεκά του /οὐχ ἕνεκά του distinction at a17ff. (see above, notes on 196b29-31). The second question is this: even if we do ascribe two senses of 'ἕνεκά του' to Aristotle, is this sentence still too awkward as it stands? It might seem that the awkwardness is small, since the contrast between two occurrences of 'he went (not) for the sake of [collecting]' is explicitly marked by the presence of ἀλλὰ συνέβη: surely the switch from one sense of 'ἕνεκά του' to the other is adequately signalled by this. There is still a problem, however. Whatever precise account we give of the second, unfamiliar, sense of 'ἕνεκά του', it is a sense in which the (possible) end is not explanatory in the way signalled by the phrase in its familiar sense. Now it is one thing to see the non-explanatory sense at work in

expressions of the form 'this event is for the sake of something', but it is quite another to try to see it at work in expressions of the form 'he did this for the sake of something': here the explanatory sense seems hardly avoidable. This is why the rendering to which Ross seems committed is so difficult: 'it happened to him to go, and to do this with the end-like result that he collected the money'. For this reason, I prefer Charlton's suggested supplement τοῦτο <τὸ> τοῦ κομίσασθαι; for this means that the non-explanatory sense of 'ἕνεκά του' is used in a description of the event, and not in connection with the agent's performance.[65]

196b36-197a1: see notes on the subscription example below.

197a1-2. Ross (following Philoponus[66]) sees this as an anticipation of Aristotle's later distinction between luck and chance$_2$. In Ross's view, luck imitates νοῦς while chance$_2$ imitates φύσις. Ross's reading takes ἀλλά at a2 to signal the contrast between internal (= a 'blind impulse' whose operation imitates nature -- Introduction, p. 40) and external (= a possible object of choice, whose accidental achievement imitates νοῦς). It is a drawback of this interpretation of 197a1-2 that the luck/chance$_2$ distinction is irrelevant here, as Ross admits (p. 520). The decisive objection, however, is that Aristotle's distinction between luck and chance$_2$ cannot be what Ross claims it is: Aristotle's examples of chance$_2$ in II. 6 are all cases of the imitation of νοῦς, and his

positive account of the distinction at the start of II. 6 is not the same as Ross's (these points will be discussed below, in the notes on 197b1-15 and 18-22; see also the notes on 197b32-7). Aristotle's point here (197a1-2) is that the man does not act as he does because of a desire to collect the money -- his going to the market is intentional under that description, but not under the descriptions 'going to where his debtor is', 'setting about collecting the money', etc. (cf. ἦλθε δ' οὗ τούτου ἕνεκα at 196b34-5). If it were intentional under these descriptions, then of course we would not have a case of luck. Thus the contrast which Aristotle has in mind is not that between luck and chance$_2$, but that between cases of chance$_1$ and events which are not by chance at all (in the latter, the τέλος is produced per se by the sort of cause which is only an incidental cause in cases of chance[67]). My interpretation of a1-2 requires a different reading of ἀλλά, for on this account there is no conflict between a cause 'not being in the subject' and being a (possible) object of choice. I take the ἀλλά clause as concessive: 'but <for all that> it is a possible object of choice'. Aristotle is simply stressing the point that the collection is an 'end' (in the sense correlative to the non-explanatory sense of 'ἕνεκά του'), even though it is not an end which the man was trying to achieve.

197a2-5: see next note.

The 'subscription example'. I shall call the man who collects the money 'C', and his debtor 'D'. As Ross points out, the story is presumably the same as the one referred to at 196a3-5. Aristotle's presentation leaves it unclear whether the interpretation of the case given there is that of the people arguing against the existence of chance or is Aristotle's own. We would need to know more about their precise position before we could tell exactly what Aristotle's points of disagreement with them are (see above, notes ad loc.). As it is, we cannot tell from the earlier passage alone whether Aristotle agrees or not that chance events have per se causes, nor, if he thinks they do, whether or not he agrees that the per se cause of C's meeting up with D is C's wishing to go and be in the agora.

A good way to approach the subscription example is to ask, as Charlton does, what the chance outcome is. This will have an incidental cause, and will be 'for the sake of something' in the non-explanatory sense. Two candidates for the incidental cause suggest themselves: C's choice of the course of action of going to the agora, and his actually going to the agora. Nothing much would hinge on which of these we select;[68] but Aristotle seems to have the former in mind, if 197a17-18 is any indication.[69] There are three candidates for the chance outcome, (1) C's collecting his money, or recovering his debt, (2) C's meeting D, and (3) C's going to where D is; these are all incidentally caused by C's decision to go to the agora.[70] In his Introduction (p. 39), Ross

speaks as if he takes (1) to be the chance outcome, but appears to switch to (2) in his commentary (p. 520, ad 196b36-197a1); Charlton argues for (3) (pp. 107-8). Charlton ignores option (2), and those of his arguments which could be seen as offering support to (3) as opposed to (2) are quite unconvincing (see below). But he has a further, very good, argument which supports (2) and (3) equally, and which seems decisive against (1). Although each of (1), (2) and (3) could be described as 'for the sake of something' in the non-explanatory sense (however that is construed), Aristotle consistently presents (1) as the end in question -- as the thing 'for the sake of which' rather than the thing which is 'for the sake of something'. Thus he describes getting the money as the τέλος at 197a1, and uses the phrase τοῦ κομίσασθαι ἕνεκα at 196b35-6. We should conclude that, although Aristotle could have presented the story in such a way that (1) was the chance outcome (it does satisfy the definition, after all), he actually thinks of it here as the τέλος which the chance outcome produces.

This leaves us with options (2) and (3). As I said above, Charlton's two other arguments for (3) are flawed. Both rely on a false assimilation of 'C's going to where his debtor is' to 'C's going to the agora'. If these are not distinct, then 'C's going to where his debtor is' does not come to be incidentally relative to C's choice; for C's choice is the per se cause of his going to the market.[71] Thus to qualify as the chance outcome, C's going to where his debtor is must be

regarded as a different event from his going to the agora (or as the same event under a description which does not permit substitution salva veritate in causal contexts). Charlton's arguments for (3), however, both ignore this requirement. He argues first that 'in 196a3 where Aristotle is apparently thinking of the same story, it is the going to the market-place which is ascribed to luck' (p. 107); this needs no further comment. Secondly, he argues that, if (1) is the lucky outcome, 'it is not strictly relevant that A did not go to the place normally; but Aristotle is an economical writer, and if it is going to where B is which is lucky, there is some need for this addition' (p. 107). Charlton is right to point out that we need to explain the relevance of Aristotle's remarks at 196b36-197a1 and 197a2-5; but these remarks about rarity concern C's going to the place (εἰς τὸ χωρίον) -- i.e. to the agora. The failure of these arguments does not mean that (3) is ruled out; it just means that we have no evidence upon which to decide between (2) and (3) as the chance outcome. I cannot see that this decision is of any moment, however: both satisfy the definition of chance equally well, and both will yield the same structure of per se and incidental causal relations with respect to C's decision to go to the agora and to the τέλος of getting the money.[72] It is actually quite striking that Aristotle never specifies anything as the chance outcome in this illustration of his definition: the structure of the causal relations linking C's choice and the τέλος is what concerns him most (this has to

be mediated by a chance outcome, but it is of no great importance precisely what that outcome is).

How, then, are we to explain Aristotle's remarks about rarity at 196b36-197a1 and 197a2-5? Firstly, a question of text. At 197a4-5, all MSS read ἢ ἀεὶ φοιτῶν ἢ ὡς ἐπὶ τὸ πολὺ κομιζόμενος. Ross follows Torstrik in deleting κομιζόμενος: 'With Bekker's punctuation (with a comma after ἕνεκα and none after πολύ), κομιζόμενος spoils the correspondence with 196b36-197a1, besides making a clause which it is difficult to interpret. On the other hand, with a comma after πολύ and none after ἕνεκα, κομιζομενος reveals itself pretty clearly as a gloss' (p. 521). But the clause with κομιζόμενος is <u>not</u> hard to interpret (though it raises complex issues), and it is not impossible to bring the two clauses -- here and at 196b36-197a1 -- into line even if we retain κομιζόμενος at 197a4-5. Indeed, the earlier passage presents difficulties of its own which can only be solved if it can be understood as making a point parallel to that of the later passage with κομιζόμενος retained. I prefer, therefore, to follow Prantl, Hardie and Gaye, and Barnes (<u>CWA</u>), in retaining κομιζόμενος, and in putting commas after ἕνεκα and κομιζόμενος. Barnes's <u>CWA</u> translation reads: 'If he had chosen and gone for the sake of this -- if he always or normally went there when he was collecting payments -- he would not be said to have gone by chance.'

The second of our two remarks -- 197a2-5 -- seems to make a sound point (if we retain κομιζόμενος: if we delete it, then this remark presents the same difficulty as 197a1, which I discuss below). It seems reasonable to say that if C deliberately went to the agora to get his money, or if he generally went there to get subscriptions, then we would not have a case of luck. Two questions arise about this, however.

(1) Why do we not have a case of luck if C generally goes to the agora when collecting? Aristotle is, presumably, thinking that if C generally goes there for that purpose, that must be because there is some reliable connection between going to the agora when seeking subscriptions and actually getting the subscriptions. It is natural to take ἢ ἀεὶ φοιτῶν ἢ ὡς ἐπὶ τὸ πολὺ κομιζόμενος as picking up the rarity condition on luck, and thus to take Aristotle as indicating here how C's getting the money could have failed to satisfy this condition; the obvious inference is that Aristotle takes 'reliable' here to be at least coextensive with 'happening always or for the most part' -- and hence takes 'rare' as coextensive with 'not reliably connected'.[73] This lends support to the idea that 'rare' and 'happening always or for the most part' are essentially concerned with the frequency of one type of event relative to the occurrences of events of another type. Aristotle does not specify here whether, if C were to satisfy this 'ἢ ἀεὶ φοιτῶν. . .' condition, he is to be thought of as having the intention of collecting the subscription when he goes to the market on this occasion. I think

that he is, since if he does not have that intention (he has forgotten that it is subscription-day, perhaps), then his getting the money does seem to be a piece of luck once again.[74] If this is so, however, how are we to account for the first half of Aristotle's remark (197a3-4), in which going to the market with this intention appears as an apparently distinct condition? There are two possible solutions to this difficulty. One is to see the two clauses as genuine disjuncts, introducing different conditions, but to see the first clause as pointing to the case in which, although C chooses to go the agora to get his money, he does not normally go there to get it -- this is a special arrangement made with D. The other is to see the 'ἢ. . .ἢ' clause as amplifying or qualifying the 'εἰ δὲ προελόμενος' clause, and not as disjunctive with it; this is how the Oxford translators take it (cf. the CWA translation, quoted above).

(2) The second question is this: if lucky events are defined as rare events which are for the sake of something, why does Aristotle think it relevant to say that we would not have a case of luck if C had chosen to go to the agora to get his money? Indeed, if Aristotle's remark is true, it might seem to threaten the adequacy of his definition. Aristotle apparently needs to be able to claim that, if C chooses to go to the agora to get his money, his actually getting it is not 'rare': for if this claim were true, Aristotle's remark would be relevant to showing how the subscription example does satisfy his

definition of luck and would pose no threat to the adequacy of that definition. As it stands, the claim that, if C goes to the agora in order to get his money, his getting it will not be a 'rare' event, is straightforwardly false. C might, for instance, be trying the agora as a 'long shot', with no grounds at all for thinking D's presence there to be likely, or D might have promised to be there, but be very unreliable about such things: in such cases, we would expect C to <u>fail</u> to meet up with D, (and so fail to get his money), more often than not on the occasions on which C went to the agora for that purpose. But in such cases, we might well think that C's actually getting the money is a case of luck after all -- precisely because there is no reliable connection (in circumstances like this) between going to get the money and actually getting it. It is, of course, when there <u>is</u> a reliable connection between choosing a means to an end and achieving the end that the fact that <u>X</u> did choose the means defeats the claim that he achieved the end by luck. Aristotle, I suggest, has only such cases in mind at 197a3-4; if this is right, then he can be seen as continuing to maintain that the rarity condition is what distinguishes beneficial outcomes due to luck from ones which are not.[75]

Finally, we turn to 196b36-197a1. It is hard to avoid the view that here, too, Aristotle intends to illustrate his claim that rarity is a necessary condition for luck and chance. Yet if we take this as his intention, it is not easy to extract an appropriate and satisfactory

point from these lines. The question of the interpretation of this passage is of some importance, since here Aristotle appears to appeal to rarity in an 'absolute' way -- i.e. to a frequency unrelated to the occurrences of events of some other type: τοῦτο δὲ οὕθ' ὡς ἐπὶ τὸ πολὺ φοιτῶν . . . οὔτ ἐξ ἀνάγκης. As I shall argue in more detail in chapter 5, Section III, reflection on the way in which Aristotle links 'rare' and 'incidental' elsewhere, and on the general nature of the 'always/for the most part/rarely' classification, suggests that Aristotle does employ the notion of conditional, rather than absolute, frequency; this gains further support in the case of rarity and chance from the fact that chance is essentially connected with incidental causation, and conditional rarity is the obvious account of this connection. Aristotle's remark about rarity at 197a2-5 presented no serious difficulty for this 'conditional frequency' interpretation, if we retained κομιζόμενος; for κομιζόμενος introduces a set of decisions or actions on the part of C relative to which the frequency of other actions could be assessed. We could, moreover, make good sense of Aristotle's claim at 197a2-5 that luck would disappear from the story if a certain sort of rarity did. By contrast, 196b36ff. does seem to be put in terms of absolute frequency: so <u>prima facie</u> it is direct evidence against the view I wish to defend.

If we do take 196b36ff. to be making a point about absolute frequency, however, then what Aristotle says here is that C's getting

the money would not be a case of luck if his going to the agora was not rare. This would be a foolish thing for Aristotle to say. C's going to the agora is not thought of as a chance event in the subscription story itself, and so is probably not rare in the story itself; more importantly, it is almost certainly not the 'chance outcome' in the story,[76] and so its rarity or usualness is irrelevant to whether the subscription story embodied a case of chance. Moreover, even if it were the chance outcome, C could go to the agora as often as we like, and his getting his money from D could still be a matter of luck (since his meeting with D in the agora could still be a matter of luck).[77]

The first and second of these difficulties are independent of our view as to what 'rarity' involves. The third points to a fundamental problem with the 'absolute frequency' interpretation: judgments about absolute frequency seem to be irrelevant to our judgments about chance. This is true not just for the absolute frequency of C's going to the agora, but also for that of the combination of C's going to the agora and getting his money: what is relevant is the frequency of C's getting his money relative to other actions of his. Thus a defender of the absolute frequency view must face this third difficulty anyway; and although it constitutes a major problem for him, he may not think that its appearance here poses an extra problem. But taking Aristotle to be making a point about absolute frequency here still involves the first

two difficulties, and this severely undermines any claim to see this passage as good evidence for the absolute frequency view.

How can we avoid these difficulties? Ross suggests that 'we are perhaps meant to supply τούτου ἕνεκα, which is expressed at 197a4' (p. 520). He explains: 'If [C] went to the market-place every day to find [D], his finding [D] would not be an instance of chance at all.' Ross's suggestion seems a good one,[78] but his explanation is unsatisfactory on two counts. (i) If we supply τούτου ἕνεκα, it will refer, as it does at 197a4, to recovering the money (ἡ κομιδή), and not to finding D. (ii) More importantly, Ross does not distinguish here between absolute and relative frequency: C could go to the agora to find D 'always', in the absolute sense, and still only ever actually meet him by luck, if D's own appearances in the agora were always haphazard. As I said in connection with 197a2-5 above, what is needed to defeat the claim that the meeting (or the recovery) was by chance is the notion of a regular connection between going to the agora and meeting D (or recovering the money). I thus endorse Ross's basic suggestion, but think that the result should be interpreted in the same way as 197a4-5 (outlined above).

197a5-6. Aristotle again omits any direct reference to rarity. Torstrik was alarmed by this, but even he passes a 'non liquet' on the proposal to read τοῖς <ἐπ' ἔλαττον>.[79] But the claim that luck is an

incidental cause incorporates the requisite rarity condition: see notes on 196b29-31.

Aristotle does omit something from this account of luck, however: 197b1-2 and 20-2 make it clear that there is an additional restriction on being a case of luck rather than of chance$_2$ -- viz. that the subject be capable of προαίρεσις (see notes below). This extra restriction will be of particular importance in discussing 197b18-22.

197a7-8: cf. EN III. 2 1112a15-16.

197a11-12. All the MSS except E read ὅτι εὐλόγως; this reading is understood by Philoponus and Simplicius, and adopted by Prantl and Hardie and Gaye. Ross rightly prefers εὐλόγως , the reading of E, since ὅτι εὐλόγως gives Aristotle a very odd remark.[80] Note that even so, Aristotle has to be taken to be indulging in some rhetorical exaggeration in saying that all these statements are correct: it is not correct simpliciter that nothing comes about from luck, and some of the other endoxa are, on Aristotle's view, simply false -- e.g. that chance is a further causal force, and that it is divine.

197a15-17: '<the causes> are unlimited in number'. Presumably Aristotle means that the number of possible causes is unlimited. See notes on 196b27-9.

197a20-1: τὰ οὕτως αἴτια. Torstrik (pp. 453-4) and Charlton (p. 35) take this to mean 'causes of rare events', picking up the phrase in the previous sentence; Ross takes it to refer back to 197a12ff., and thus to mean 'incidental causes' (p. 521), and this makes the train of thought here less sharply compressed.

197a21-5. This passage is very obscure: in addition to textual uncertainties, the line of thought is highly compressed, the force of the οἷον and γάρ clauses is unclear, and Aristotle's own attitude towards the point raised is not made explicit (though it seems likely that he agrees with the point, and I shall take this to be the case). I follow Ross's text, reading εἴλησις and ἀποκεκάρθαι at a23-4. If we adopt these readings, and if we take πνεῦμα and εἴλησις to be intended as examples of allowable <u>incidental</u> causes of health (as the context suggests), the main interpretative problem is to explain how these things are 'ἐγγύτερα' than having a haircut, without turning them into <u>per se</u> causes of health.[81]

I suggest (though without much confidence) that Aristotle has the following sort of case in mind. A has been spending too much time indoors and is rather pale. He sits in the sun for a while to help regain his suntan; and at the same time he has his hair cut. There is no direct <u>per se</u> connection between these two activities -- it is not that his barber will only work in bright sunlight. Unbeknownst to all

concerned, A has an imbalance of humours for which this particular amount and degree of warmth is exactly the right cure, and he becomes healthy. (The same story would suffice, mutatis mutandis, for the beneficial πνεῦμα.) Now A's sunbathing and his having his hair cut are both incidentally connected to the per se cause of his becoming healthy, (viz. his being exposed to just that amount of warmth): they are both located in the same subject and at the same time as this per se cause. A's sunbathing is only an incidental cause of health because it is essentially an intentional action: its nature is determined by the knowledge which A has about it. As such, it is not aimed at health, nor do actions of this sort regularly produce health, even when performed by agents with the same unhealthy condition as A; for it is incidental to the nature of this action that it results in its subject receiving exactly this amount and degree of warmth. Nonetheless, A's sunbathing is a closer incidental cause than his having a haircut, in a fairly obvious way: the specification of the former activity includes a reference to a component of the per se cause, whereas the latter does not.

This line of thought can be applied to the passage in two different ways, neither of them entirely satisfactory. If we take the οἷον clause to be saying that πνεῦμα and εἵλησις are incidental causes, then my account requires that these terms stand for the relevant activities; for it is A's sunbathing (or taking the air) which is the incidental cause.

If this is too awkward, we could take the οἷον clause to be concerned with per se causes, and construe the passage this way: 'Can anything be the cause of a chance result? <Obviously not, for although any activity can be an incidental cause, some can point to the per se cause and others cannot;> for instance, the warmth can be a per se cause of health, but haircuts cannot <so A's sunbathing is closer than his haircut>.' But this is very compressed even by Aristotle's standards.

Why does Aristotle wish to deny incidental causes which are too remote the status of causing the chance result? Presumably because they are too remote from the lines of per se causation involved to give that appearance of final causation by the τέλος which is characteristic of chance.

197a25-30. On the extra sentence added before τύχη δέ by E, see Ross ad loc. (p. 522). Even without that extra sentence, this passage is rather out of place: it interrupts Aristotle's explanation of the way in which the endoxa are correct in an awkward fashion and for no good reason. Perhaps it is an addition inspired by the sudden appearance of εὐτυχία at a30.

II. 6

197a36. δ' picks up μέν at a32.

197b1-2. πρᾶξις: Charlton translates this as 'rational activity' (see

his note on p. 109), and Ross compares b5 -- ἡ εὐδαιμονία πρᾶξις τις -- to the EN doctrine that εὐδαιμονία is ἐνέργεια κατ' ἀρετήν (p. 522). But πρᾶξις is a much narrower term than either of these: here it means '(course of) action based on προαίρεσις'. At b5, Aristotle is more concerned with the word-play of πρᾶξις/εὐπραξία than in using his terms with any precision.

The account of luck which immediately follows the subscription example (197a5-6) might suggest that luck is involved whenever the incidental outcome might have been chosen -- that is, whenever the beneficial outcome 'imitates' thought or mind. Chance$_2$, then -- chance in the narrow sense -- would cover all, but only, the incidental outcomes which imitate nature.

This indeed is Ross's view (Introduction, p. 40, and commentary, p. 520), and in this he follows Philoponus (in Phys. 283.10-11; cf. 275.13-23). As I pointed out in the notes on 197a1-2, however, both the examples designed to illustrate chance$_2$ in II. 6 (the horse and the tripod) are cases of the imitation of thought. Moreover, the example of the falling stone at 197b30-2 must be a case of chance$_2$,[82] and yet Aristotle appeals explicitly to the fact that the outcome might have been brought about as a result of choice.

It is clear, therefore, that the account of luck at 197a5-6 is not a complete account: chance$_2$ outcomes can also satisfy this condition

(although they need not do so: see below). 197b1ff. spells out what the extra condition is which is satisfied by lucky outcomes but is not satisfied by any chance$_2$ ones. The subject of a lucky event must be capable of προαίρεσις.[83] An outcome which comes to be incidentally and which is 'for the sake of something' is thus lucky iff (i) it might have been the object of προαίρεσις, and (ii) its subject (i.e. the one who incidentally does it) is capable of προαίρεσις.[84]

Prima facie, then, there are two ways in which a chance$_1$ outcome could fail to be a case of luck (and hence would be a case of chance$_2$):

(1) its subject is not capable of choice, and/or
(2) it could not have been the object of choice.

Case (1) is obviously intended by Aristotle. Some commentators, such as Charlton (p. 110) and, perhaps, Simplicius (347.27ff), have been reluctant to see Aristotle as countenancing case (2) here. But the 'imitating mind' condition on being a case of luck is redundant if all chance$_1$ events imitate mind. It is true that the idea of 'able to be chosen' might seem to be all-embracing: what beneficial outcome could not be said to be a possible object of choice? If this were right, then the 'imitating mind' condition would indeed be redundant. Given that Aristotle does impose this condition, however, he must think that there are beneficial outcomes which cannot (in some sense) be the objects of choice. These are, presumably, outcomes which are the result of natural

processes which τέχνη cannot imitate: such outcomes might include having exceptional good looks, being too short for military service, or an animal's developing some useful 'deformity'. This seems a perfectly sensible distinction to draw. Note that the subjects of beneficial outcomes which are not possible objects of choice can be themselves either capable or incapable of choice, as my examples show.

197b6-8: cf. EN III. 2 1111b8-9.

197b14-15. πολλοῖς τῶν ἀψύχων is the reading of E and I; J has πολλοῖς τοῖς ἀψύχοις, and Philoponus and Simplicius read one or other of these; F alone drops πολλοῖς. Retaining τολλοῖς is the harder reading and has the support of most MSS, and I follow Ross's adoption of πολλοῖς τῶν ἀψύχων. If this reading is correct, which ἀψύχα does Aristotle mean to exclude? Presumably, Aristotle must mean any which cannot be the subjects of events which are 'for the sake of something' in the non-explanatory sense, because they cannot bestow benefits (or be benefited).[85]

197b16-18: the tripod example. Hardie and Gaye translate b17-18 as: 'though when it fell it stood on its feet so as to serve for a seat, it did not fall for the sake of that.' As I have argued, we do need to see a second sense of 'ἕνεκά του' at work in these chapters (see notes on 196b21-3, 29-31 and 35-6 above); but it is very hard to see them as both

in use here as Hardie and Gaye do: the switch from one to the other is unsignalled and extremely harsh.[86] Ross's interpretation is preferable:

> The reference is rather obscure, but the meaning probably is that if a standing tripod is thrown up and falls in such a position as to be capable of being sat on, this is a case of τοὐτόματον, since its position was not intended; while, when it was standing [sc. before being thrown], its position was intended (p. 522).

197b18: ὥστε. This presumably refers back to the whole of what precedes from 197b1, rather than just to the horse and tripod examples.

197b18-22: the 'second definition' of chance. I shall argue below that b18-20 present a definition of chance$_1$ -- i.e. of chance in the wide sense which includes luck -- and that b20-2 (ἀπὸ τύχης, κ.τ.λ.) presents a definition of luck which marks it off from chance$_2$ (i.e. from chance in the narrow sense). The 'second definition' of chance, then, is:

> An event E is the outcome of chance or luck iff (i) E is among the things which come to be for the sake of something 'without qualification', (ii) the cause of E is 'external', and (iii) E does not come to be for the sake of what results.

'Without qualification' in clause (i) seems to mean 'in the most general sense' (so Ross, p. 522),[87] and thus to indicate the broad, 'non-explanatory' sense of 'ἕνεκά του' which, as we have seen, characterises chance outcomes. Clause (iii), therefore, uses 'ἕνεκά του' in the strong, explanatory sense.

Thus clause (i) is the same as clause (ii) of the 'first definition' as I stated it above in the notes on 196b29-31. The other clause of the first definition stipulated that E must 'come to be incidentally': this has been replaced in the second definition by clauses (ii) and (iii). Now these conditions -- clauses (ii) and (iii) -- first appear in II. 6. This is very surprising if they are part of the definition of chance in general: that was the business of II. 5. Since II. 6 is largely concerned, not with developing an analysis of chance, but with distinguishing between luck and $chance_2$, we might be tempted to suppose that these conditions only apply to chance in the narrow sense -- $chance_2$. But b20-2, and in particular τούτων at b21, makes it clear that the definition at b18-20 applies to chance in the broad sense (the sense which includes luck). For b20-2 describes luck as a subset of the 'definiendum' of b18-20: lucky events are those which satisfy the definition at b18-20 and which also (τούτων δέ α) satisfy two further conditions. Conditions (ii) and (iii), then, apply both to $chance_2$ and to luck. If they are new, additional conditions, then Aristotle incorporates them without argument, or even warning. Can these conditions be found in II. 5?

The obvious starting point is the fact that the second definition puts conditions (ii) and (iii) in place of the condition that E 'comes to be incidentally' which was in the first definition. This suggests that the second definition is meant to be equivalent to the first, and

that these new clauses are thus meant to be equivalent to the original 'coming to be incidentally' clause. In discussing 196b29-31, we saw that a necessary condition of E's coming to be incidentally was E's being the incidental effect of something; I suggested that the necessary and sufficient condition might be:

> E is incidentally caused by at least one, and is per se caused by none, of some favoured set of events.

The key is to take this 'favoured set of events' to comprise the activity of all the natural capacities and deliberative processes (if any) which are going on in the subject of E: E comes to be incidentally if neither the φύσις nor the προαίρεσις of its subject is the per se cause of E.[88]

Now clause (iii) appears to be equivalent to 'coming to be incidentally' construed in this way, provided that E is incidentally connected to these processes (see n. 88). If E is incidentally related -- but only incidentally related -- to the natural and deliberative processes of its subject, then there will be no teleological explanation of E's occurrence, since such explanations only apply to beneficial outcomes which are caused per se by the subject's φυσις or προαίρεσις.[89] Conversely, if one of these processes is the per se cause of the beneficial outcome, E, this looks like a paradigm case of E's being for

the sake of the end that results, in the strong, explanatory sense which clause (iii) rules out.

Thus clause (iii), together with the proviso that E is incidentally connected with the natural and/or deliberative processes of its subject, is equivalent to the original condition that E comes about incidentally. What about the 'external cause condition'? Charlton tentatively suggests an account on which this condition would be equivalent to clause (iii).[90] This apparent duplication could perhaps be explained as the spelling out of the same condition in two different ways. But Aristotle's phrasing (ὧν ἔξω τὸ αἴτιον) clearly implies that E can satisfy condition (ii) without satisfying condition (iii). I would suggest that clause (ii) is to be seen as expressing the proviso that E is incidentally caused by some natural or deliberative process in its subject.[91] If this is right, then conditions (ii) and (iii) together are equivalent to the original condition in the first definition.

This explanation of the equivalence of the second definition to the first lends support to my account of how 'coming to be incidentally' is to be understood. I shall try to provide more support for this account, and to explain its significance, in Section III of chapter 5.

197b20-32: the 'in vain'. First, a point of text at b23. Ross defends τὸ ἕνεκα ἄλλου ἐκείνου ἕνεκα , the reading of all the MSS except E: '[this reading] offers no great difficulty if we remember that ἕνεκά του

may mean "producing an end-like result" . . . . The phrase then means "when that which is intended to produce a result other than itself does not produce it"' (p. 523). But this requires a very harsh shift from one sense of 'ἕνεκά του' to the other within the same clause, and I prefer the suggestion of Prantl (which is also adopted by Charlton and Barnes [CWA]): τῷ ἕνεκα ἄλλου ἐκεῖνο οὗ ἕνεκα (Barnes translates: 'when one thing which is for the sake of another, does not result in it').

What is Aristotle's point about τὸ μάτην here? Ross suggests that:

> In this parenthetical passage, Aristotle endeavours to support his definition of ταὐτόματον as the type of case in which an unintended (though end-like) result is produced, by deriving αὐτόματον from μάτην, which refers to cases in which an intended result is not produced (p. 523).

This gives Aristotle a rather unhappy train of thought. It also commits Ross to an interpretation of ὅταν αὐτὸ μάτην γένηται which makes the example of the falling stone irrelevant to Aristotle's point. Ross sees Aristotle as thinking that a chance event 'comes to be in vain' if 'in its own causal character (καθ' αὑτό) it has been ineffective, though it has by virtue of a concomitant led to an end-like result' (p. 524).

Were it not for the 'falling stone' example, this would be a reasonable way to understand Aristotle's 'αὐτὸ μάτην γένηται' point. Not all chance events 'come to be in vain' in this sense, of course -- C can get to see the spectacle as well as collecting his debt, the tripod can fulfil its nature as a heavy object by moving closer to the centre of

the earth, etc.. Aristotle does not say that they all do come to be in vain, however,[92] and he need only be making a connection between μάτην and some special set of chance events.[93] But the example (γάρ) of the falling stone which follows (b30-2) simply does not illustrate Ross's point; indeed, it is an example in which the subject of the chance event -- the stone -- quite clearly is effective in its own per se causal character.[94]

How could the stone example be relevant here? Presumably, it should be a case of a chance event 'coming to be in vain'. Chance events cannot fit Aristotle's definition of 'in vain' in an entirely straightforward fashion; for, as we have seen, there is no reason why all chance events must naturally be for the sake of something, yet fail to produce that thing. One way in which a chance event might be 'in vain' is by the benefit or 'end' which it produces being one which no one actually wants. Such an event is in vain in the sense that it could have served someone's interests; but on this occasion, no one's interests are actually served by the end which results. If this is right, then in the falling stone example, the death or injury of the victim is to be taken as an end which no one actually wanted (or which actually serves no one's interests), although someone could have wanted it (cf. πέσοι ἂν ὑπὸ τινὸς καὶ τοῦ πατάξαι ἕνεκα[95]). Aristotle's general point about the 'in vain' being a 'σημεῖον', on the present interpretation, will be this: if X can come to be in vain, then X must

(i) be such as to benefit someone/something, but (ii) actually fail to benefit anyone; it is a 'sign', therefore, of chance events being events which produce a benefit that they can come to be in vain. This in turn is so, because what makes something a chance event is that it could have been brought about intentionally, or by nature, but was not: within the class of events which imitate mind or nature in this way, some will actually answer to someone's interests, and others will not.[96]

197b32-7. Aristotle's meaning here is also disputed.[97] I take it to be as follows. Lucky events are cases of the 'imitation of mind' whose subjects are capable of deliberation and choice; some $chance_2$ events are also cases of the imitation of mind, but their subjects are incapable of deliberation; other $chance_2$ events are cases of the imitation, not of mind, but of nature; -- of these some have subjects which are capable of deliberation and some have subjects which are not. (I argued for this classification in the notes on 197b1-2 above.) Members of the very last class of $chance_2$ events in this list are 'twice removed' from lucky events: they are not cases of the imitation of mind, and their subjects are not capable of deliberation. Thus all they share with cases of luck is that they satisfy the general characterisation of $chance_1$ events as ones which 'come to be incidentally' and which produce a benefit. I suggest, then, that Aristotle here is talking about $chance_2$ events which 'imitate nature' and whose subjects are incapable of προαίρεσις: among

chance$_2$ events in general, they are 'the most distinct' from lucky events (μάλιστα δ' ἐστὶ χωριζόμενον τοῦ ἀπὸ τύχης).

These events are cases of chance$_2$ 'in the things which come to be by nature' (b33) in the double sense (i) that their subjects belong in the sphere of φύσις, and have no share in νοῦς; and (ii) that the ends which they produce are ends which would count as the work of nature if they were <u>regularly</u> produced.[98] In what sense are they also 'contrary to nature' (b34-5)? Presumably, in the sense that the results they produce -- a deformity which turns out to help the animal in question, for instance -- cannot be ascribed to the φύσις which the subject possesses: the results which that φύσις <u>per se</u> produces are quite different. Finally, what is the meaning of b35-7, ἔστι δε . . . τοῦ δ' ἐντός ? Here I follow Philoponus' suggestion that Aristotle is distinguishing between cases of chance$_2$ (I would say, the 'very last class' of chance$_2$, in the sense given above) and events which happen in accordance with nature. The former have an 'external cause' in the sense discussed in connection with the second definition at 197b18-22; that is, they are incidentally caused by some natural process in their subject. The latter, on the other hand, are <u>per se</u> caused by the workings of their subjects' natures.[99] Note that while ἔξω τὸ αἴτιον at 197b20 meant '[has] an incidental connection with its subject's φύσις ', the close contrast with τοῦ δ' ἐντός enables Aristotle to use 'ἔξω τὸ

αἴτιον' in the present passage to mean '[has] <only> an incidental connection with its subject's φύσις'

198a2-5: see notes on 196b29-31.

198a5-13: 'the priority argument'. What is involved in the claim that mind and nature are prior to luck and chance? Aristotle bases this claim upon the priority of per se causation over incidental causation. There is certainly a priority in λόγος in this case: the analysis of 'incidental causation' requires a reference to per se causation, but not vice versa. Aristotle clearly supposes a priority in οὐσία as well: X cannot be an incidental cause of Y unless either X is the per se cause of something which forms an accidental unity with Y, or unles something which forms an accidental unity with X is the per se cause of Y.[100] Let us grant Aristotle the premiss that all per se causal chains involve, or can be traced back to, the activities of mind or nature; then, since all chance outcomes are incidentally caused, all chance outcomes will be related in some way to a per se causal chain involving mind or nature. I take this to constitute the priority of mind and nature over chance.

The argument of 198a5-13 has not received a wholly favourable press. To Gomperz's impassioned criticism of the priority claim (see n. 100), we may add Guthrie's complaint:

> Aristotle's refutation of the mechanists [sic] executes a perfect circle: 'Accept my premise that every chance event is a

> by-product of a pre-existing purpose, and you must admit you were wrong in holding that chance was prior' (History of Greek Philosophy, VI, 241).

This misrepresents Aristotle's argument in at least two ways. (i) Aristotle's 'premise' does not mention purpose: it claims only that chance is posterior to the workings of 'mind and nature', and nothing in Aristotle's analysis requires that the workings of nature are even all teleological, let alone purposive.[101] (ii) The accusation of circularity implies that Aristotle has no argument for his 'premise'. But the analysis of chance as incidentally caused is a solution to the problem of giving an account of chance which avoids on the one hand having to view it as a causal force in its own right, and on the other hand having to see chance events as random -- as having only forwards connections with the causal order. Aristotle's opponents here do not wish to say the cosmos is due to chance in either of these two senses;[102] so they are free to reject Aristotle's account only if they can produce an alternative account of chance which manages likewise to steer between Scylla and Charybdis.

The major flaw in Aristotle's argument here, in fact, lies not in the priority claim, but in his over-ambitious inference from it at a12-13. The first part of his conclusion -- that even if the heavens came to be by chance, mind and/or nature will still be the cause of 'many other things' -- does follow from the priority claim; for that, as I

have said, is the claim that every chance event is related in some way to a per se causal chain which involves, or can be traced back to, the activities of mind or nature. But the second part of the conclusion is that even if chance is responsible for ὁ οὐρανός, mind and nature will still be the cause of τοῦδε τοῦ παντός: whether Aristotle intends this phrase to refer to the cosmos itself or to some larger whole, this part of the conclusion does not follow. For all that the priority claim shows is that, if the cosmos is due to chance, mind or nature must be responsible for some things; there is no necessity that they be responsible either for the very same things as chance -- i.e., in this case, the cosmos -- or for something larger or more grand than the products of chance, such as 'the universe as a whole'.[103]

Thus the atomists, for instance, could accept Aristotle's account of chance, and also accept the claim that mind and nature are prior to chance, by ascribing a φύσις to the atoms, which is the per se cause of their behaviour; the formation of a cosmos is incidentally caused by this natural behaviour. The atomists could justify the claim that the genesis of the cosmos was by chance -- if they wished[104] -- by arguing (1) that the atoms could have had a φύσις which included a cosmos-forming feature (thus nature could have been the cause of the cosmos, and atoms' behaviour could have been 'for the sake of forming a cosmos' in the explanatory sense of 'for the sake of'); but (2) that as a matter of fact they do not have such a φύσις -- the atomic theory can give an

adequate explanation of the formation of the cosmos without having to posit this extra feature of the atoms' φύσις. Aristotle, of course, does not think that the atomists can satisfactorily ascribe a nature to the atoms which would explain their motion, let alone the formation of the cosmos; but that is another argument.[105]

Chapter Four: Notes

1. See 197a36ff., and my discussion ad loc.. Aristotle restricts τύχη to subjects capable of προαίρεσις (see below), which excludes some subjects which we would normally regard as persons -- namely children.

2. This point is controversial: I discuss it below (see notes on 196b29-31 and 35-6).

3. Thus Willard M. Miller ('Aristotle on necessity, chance, and spontaneity', New Scholasticism 47 (1973) 204-13) thinks that a coin's landing and balancing on its rim when tossed is a case of chance even when it is not ἕνεκά του in the relevant sense. Miller, however, uses this to claim that Aristotle's definition of chance is inadequate: this seems futile. Charlton, on the other hand, thinks that the further, 'ἕνεκά του' constraint does not open up a gap between Aristotle's concept and our concept of 'chance' at all (W. Charlton, Aristotle's 'Physics' Books I and II: translated with introduction and notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1970); subsequent references to this work will be by author's name and page number alone). He thinks that we will, on reflection, agree that all chance events are ἕνεκά του (at least on Charlton's interpretation of this phrase as 'such as to be for the sake of something'): 'We ascribe a thing to chance only if we think it remarkable, and it is doubtful whether we should think a thing remarkable . . . if it did not seem to us, at least in a weak sense, such as to be for something . . . . For the moment it seems correct to say that nothing is attributed to chance . . . unless it is in a fairly striking way such as to be for something, adapted to some end' (pp. 106-7). But this seems to confuse 'X is not a chance thing unless it is suitable for an end' with 'we would not (bother to) pick X out as a chance thing unless it is suitable for some end'.

4. Ross proposes 'random' as the translation of 'chance$_2$' (ΑΡΙΣΤΟΤΕΛΟΥΣ ΦΥΣΙΚΗ ΑΚΡΟΑΣΙΣ: Aristotle's 'Physics': a revised text, with introduction and commentary (Oxford: Clarendon Press 1936); this

reference, Introduction, p. 38 (subsequent references to this work will be by author's name and page number alone). This translation is unhelpful: (i) it carries an unwanted suggestion of causelessness; (ii) $chance_2$ events are no more haphazard, or more random in any other sense, than lucky events.

5. W.K.C. Guthrie, A History of Greek Philosophy, 6 vols (Cambridge University Press 1962-1981), VI, 236, n. 1.

6. R.P. Hardie and R.K. Gaye, Physica, in the The Works of Aristotle Translated into English, edited by W. D. Ross, Volume II (Oxford: Clarendon Press 1930); Charlton, p. 105.

7. If my interpretation of this 'external cause condition' is correct, the incompatibility of these conditions is ultimately reducible, in fact, to the second difference between the two concepts which I mention here. See my notes on 197b18-22.

8. It should be noted that anomalous behaviour, too, can be αὐτόματον in something approaching this sense -- e.g. the 'self-movement' of the sacred weapons at the shrine of Apollo at Delphi (Herodotus VIII. 37). But even here, there is no question of the sense of 'αὐτόματος' being the same as the one analysed in the Physics: the sacred weapons do not move by chance -- on the contrary. Nor is their moving an incidental concomitant of some piece of ordinary weapon-behaviour. Again the idea is, rather, that they behave -- for a moment -- in a way which is paradigmatic of things which possess a φύσις (in this case they become self-movers). It is not quite so clear why the earth is described as αὐτομάτη in the Gospel according to Mark: αὐτομάτη ἡ γῆ καρποφορεῖ (4. 28; I am grateful to John Fenton for this reference). Here the notion of 'self-moving', whether by nature or not, seems to have taken over entirely.

9. See the paper by D. M. Balme, 'Development of biology in Aristotle and Theophrastus: theory of spontaneous generation', Phronesis 7 (1962) 91-104; cf. David L. Hull, 'The conflict between spontaneous generation and Aristotle's metaphysics', Proceedings of the Seventh Inter-American

Congress of Philosophy (Quebec: Laval University Press 1967), pp 245-50, and Augustin Mansion, Introduction à la Physique Aristotélicienne, Second Edition (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain; Paris: J. Vrin 1946), p. 310 and n. 54. I discuss the reply by James Lennox in n. 52 below (James G. Lennox, 'Teleology, chance, and Aristotle's theory of spontaneous generation', Journal of the History of Philosophy 20 (1982) 219-38). For Aristotle's account of spontaneous generation in the biological works, see especially GA I, II. 1, III. 11, and HA V and VI. (The question of the difference between the accounts in GA and HA, also discussed by Balme, lies outside the scope of the present discussion.)

10. The 'γένεσις αὐτόματος' mentioned in Met. Z 7 and 9, however, seems to be chance generation, as the context suggests (1032b28-32 and 1034b4-6). Aristotle has in mind exceptional cases in which an animal normally generated from seed is generated without seed. 'Spontaneous generation' in the biological works is always the norm for the species in question, not the exception (see Balme, 'Development of biology', pp. 97-8 [on 761a17ff.] and 99-100).

11. This interpretation of the use of 'spontaneous generation' in the biological works faces a problem of its own, in connection with the distinction between spontaneous generation and 'standard' generation from seed. If regular generation without seed is to count as 'spontaneous' in the sense analysed above, Aristotle must deny that the materials which give rise to spontaneously generated organisms have a distinctive φύσις which is the cause of their characteristic behaviour in generating organisms of a certain type (see clause (iv) of the analysis). But how can he deny this, given that these collections of materials produce organisms of the same species 'always or for the most part'? Even if my particular analysis of '"automatic" spontaneity' is incorrect, it is hard to see how any plausible analysis would include Aristotle's spontaneous generation but exclude generation from seed. There will still be some differences between the two cases, of course: in the former, the generating material is not produced by other members of the species, whereas in the latter it is. But why should this

difference make the former a case of the imitation of nature in the sense discussed, and not just a different sort of process used by nature?

This problem does not, however, constitute a reason for preferring Balme's account of spontaneous generation to mine; for an analogous difficulty faces his view that spontaneous generation in the biological works is regular but nonetheless by chance, and, as we shall see, the most plausible solution to this latter difficulty brings with it the most plausible solution to the 'φύσις' problem.

On what grounds could Aristotle deny that the collections of materials which regularly produce spontaneously generated organisms do so by virtue of their φύσις? Aristotle's most likely answer to this would be (i) that, for independent reasons, such collections of materials do not count as οὐσίαι, even though they occur regularly, and behave in regular and characteristic ways; and (ii) that there is an important sense of 'φύσις' such that only individual Aristotelian substances possess φύσεις. If Aristotle does endorse (i) and (ii), then he has good grounds for holding that the behaviour of these collections of materials, though natural in some weaker sense (see below), is not due to nature in the same way that the behaviour of seeds is: it is not due to a distinctive φύσις which they possess as such. It is very plausible to see (i) and (ii) as Aristotelian positions. For (ii), see Waterlow, Nature, Change, and Agency (which takes up the point made by D.D. Heath, 'On some misconceptions of Aristotle's doctrine on causation and τὸ αὐτόματον', Journal of Philology 7 (1877) 97-115, at p. 111); see also my remarks on teleology in the following two paragraphs. As for (i), Aristotle would certainly agree not only that these collections lack ψυχή, but also that they fail to be self-sustaining entities in any sense, and have no unifying principle -- they are brought and kept together (until generation is under way) by quite extraneous causal processes. These are good grounds for denying that they constitute Aristotelian substances. It is true, of course, that Aristotle also has to keep in play a weaker sense of 'φύσις': the behaviour of these collections (like that of inorganic μίξεις) must be natural in some sense if Aristotle is to maintain that all regular and predictable

behaviour is the product of φύσις or νοῦς. Whether Aristotle can successfully defend the need for his stronger sense of 'φύσις' once the weaker sense has been granted legitimacy is a familiar problem. But this problem is one which Aristotle faces in any case, given his general metaphysics of nature and substance; it is no objection to my account of spontaneous generation that it arises here too.

I said above that on Balme's interpretation, Aristotle faces a problem which is analogous to the 'φύσις' difficulty which he faces on my interpretation: this problem concerns teleology. If the processes which regularly give rise to spontaneously generated organisms do so by chance, then they differ from standard generation by not admitting of any teleological explanation. Yet these 'chance' processes produce paradigmatic Aristotelian οὐσίαι -- i.e. mature, self-sustaining organisms -- and they do so always or for the most part: so why do these processes lack final causes? Or, if they cannot be given a teleological explanation, why do processes of generation from seed require such explanation? (See Hull, 'The conflict . . .', p. 247, and Lennox, 'Teleology, chance . . .', pp. 228-9 and 235-8; Lennox's own solution to this problem is unsatisfactory: see n. 52 below.). Clearly, we would only be relabelling this difficulty if we said that 'αὐτόματος' in the biological works means the same as it does in Phys. II, but that Aristotle takes γένεσις αὐτόματος to be neither anomalous nor lacking teleological explanation.

Why should Aristotle feel able to deny that regular spontaneous generation has no final cause while insisting that standard generation must have one? The most likely answer here is similar to the one outlined in the previous paragraph -- that is, to take Aristotle to hold (a) that the collections of materials which give rise to spontaneously generated organisms do not constitute οὐσίαι, in Aristotle's sense; and (b) that while the regular, end-producing behaviour of individual substances requires teleological explanation, the regular, end-producing behaviour of things which are not Aristotelian substances does not even admit of such explanation, let alone require it. If Aristotle does endorse (a) and (b), then he has grounds for holding that the processes of spontaneous generation have no final cause. Phys. II. 8 lends some

support to the idea that Aristotle accepts (b). If Aristotle claims there that the seasonal weather is not for the sake of the growth of crops, then an endorsement of (b) promises to be the best explanation of his position on teleology as it is developed in that chapter: in contrast to the case of the arrangement of teeth, in the case of the weather there is no single Aristotelian substance to whose behaviour the production of the end is due. (I discuss this issue briefly in chapter 5, n. 37, and chapter 6, n. 4.) Now whatever account Aristotle would give as to why the regular, end-producing behaviour of individual substances has a final cause while that of non-substances does not, either it would appeal to an independently-based doctrine that there is an important sense of 'φύσις' such that only substances have a φύσις in that sense, or it would itself constitute the grounds for such a doctrine. If this is correct, then the position on teleology which enables Aristotle to affirm the existence of final causes for the behaviour of seeds while denying them for the behaviour of the collections of materials which produce spontaneously generated organisms, will also provide him with the basis for the claim that, in an important sense of 'φύσις', the production of mature organisms by seeds is due to φύσις while the production of organisms by these collections is not.

12. Simplicius, In Aristotelis Physica Commentaria, edited by Hermann Diels, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vols IX-X (Berlin: G. Reimer 1882 and 1895), 330.14-20.

13. Karl Prantl (ed.), Aristotelis Physica (Leipzig: Teubner 1879).

14. This claim has been disputed; I defend it in Section I of the next chapter.

15. A. Torstrik, 'Περὶ τύχης καὶ τοῦ αὐτομάτου: Aristot. Phys. B 4-6', Hermes 9 (1875) 425-70; this reference p. 432.

16. Strictly, of course, the sentence does not contain a contradiction anyway: there is nothing inconsistent about the claim that many things actually happen by chance, but people believe that only some of them

happen by chance. The problem with the sentence is that this cannot be the point Aristotle is trying to make here.

17. Here and throughout chapters 4-6 I use 'event' merely as a convenient abbreviation for 'event/process/activity/state'.

18. Cornford in Philip H. Wicksteed and Francis M. Cornford, Aristotle: The 'Physics': with an English translation, Loeb Classical Library, 2 vols (Volume I: London: Heinemann; New York: G.P. Putnam's Sons 1929; reprinted with revisions London: Heinemann; Cambridge, Mass.: Harvard University Press 1957; Volume II: London: Heinemann; Cambridge, Mass.: Harvard University Press 1934); this reference I, 144-5, n. a.

19. Jonathan Barnes, The Presocratic Philosophers, 2 vols (London: Routledge and Kegan Paul 1979), II, 121.

20. Charlton, p. 32. LSJ abbreviates Henry George Liddell and Robert Scott, A Greek-English Lexicon, revised by Henry Stuart Jones with Roderick McKenzie, Ninth Edition, with a supplement (Oxford: Clarendon Press 1968).

21. Ἀναξαγόρας τε γὰρ μηχανῇ χρῆται τῷ νῷ πρὸς τὴν κοσμοποιίαν.

22. As Barnes points out (The Presocratic Philosophers, II, 121). LSJ claims that the word does involve the notion of chance, but the passages which it cites do not support this.

23. I discuss this point in 'Aristotle and the Megarians'.

24. τοτέ is also read by Torstrik and Diels-Kranz (Hermann Diels, Die Fragmente Der Vorsokratiker: griechisch und deutsch, revised by Walther Kranz, 3 vols (Berlin: Weidmann: I^{17} 1974, II^{16} 1972, III^{12} 1967)).

25. Simplicius, in Phys. 331.16ff.; Diels-Kranz (who print 196a24-30 as Democritus A 69); Ross, p. 515; Cyril Bailey, The Greek Atomists and Epicurus: a study (Oxford: Clarendon Press 1928), pp. 139-43.

26. The question as to whether Aristotle does in fact ascribe a concept of 'φύσις' of the requisite sort to the Atomists is a moot one; the evidence that he did is rather more slender than is usually supposed. Relevant passages include Phys. II. 2 194a20-1 (cf. Met. A. 10 993a15-18), PA I. 1 642a24-7, Met. M. 4 1078b17-21; these are discussed by Balme, Aristotle's 'De Partibus Animalium' I and 'De Generatione Animalium' I (with passages from II. 1-3): translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1972), p. 100. The key text, to my mind, is Cael. III. 2 300b9-14 (Phys. VIII. 1 252a32-b1 and Met. Λ. 6 1071b31-3 should be read in the light of this): see the notes on 198a5-13 below, and chapter 5, n. 44.

27. So Barnes, The Presocratic Philosophers, II, 123. See also Lowell Edmunds, 'Necessity, chance and freedom in the early atomists', Phoenix 26 (1972) 342-57.

28. As Ross points out (p. 515), something like this argument was subsequently used by Epicurus (Letter to Herodotus, Diogenes Laertius X. 38-9); but Epicurus is as likely to have borrowed it from Aristotle as from Democritus.

29. GC II. 6 334b4-18, especially 7-11, and PA I. 1 641b26-8. (Phys. I. 5 188a31-b8 offers an interesting comparison.)

30. Aristotle does consider this second 'luck is obscure' position at EE VIII. 2 1247b4-8; see Michael Woods's discussion, Aristotle's 'Eudemian Ethics', Books I, II and VIII: translated with a commentary, Clarendon Aristotle Series (Oxford: Clarendon Press 1982), p. 178.

Aristotle's account of the sense in which luck and chance are 'obscure to human thought' on his own analysis is different from both of these positions: see my notes on 197a8-11 and 18-21. James Bogen implausibly sees the claim that we ascribe events to luck only when we are ignorant of their causes as fundamental to Aristotle's own account of lucky events as 'incidentally caused' ('Moravcsik on explanation', Synthese 28 (1974) 19-25; this reference p. 24). I discuss Bogen's view in chapter 5, Section III.

31. Hardie and Gaye, Guthrie, and Ross all cite Anaxagoras DK A 66 in support of their views. Here Aetius ascribes to both Anaxagoras and Democritus the claim that luck is ἄδηλον αἰτίαν ἀνθρωπίνῳ λογισμῷ, but he does not elaborate. If Anaxagoras and Democritus held any view of this sort, it must have been the 'ignorance of ordinary causes' view.

32. O. Hamelin, Aristote: 'Physique' II: traduction et commentaire, Third Edition (Paris: J. Vrin 1972), pp. 113-4.

33. For Aristotle's appeals to universal beliefs see: Christopher Kirwan, 'Truth and universal assent', Canadian Journal of Philosophy 11 (1981) 377-94; G.E.L. Owen, 'Τιθέναι τὰ φαινόμενα', in Suzanne Mansion (ed.), Aristote et les Problèmes de Méthode, Proceedings of the Second Symposium Aristotelicum (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1961); Gérard Verbeke, 'Philosophie et conceptions préphilosophiques chez Aristote', Revue Philosophique de Louvain 59 (1961) 405-30; Martha Craven Nussbaum, 'Saving Aristotle's appearances', in Malcolm Schofield and Martha Craven Nussbaum (eds.), Language and Logos: studies in ancient philosophy presented to G.E.L. Owen (Cambridge: Cambridge University Press 1982).

34. I discuss this sense of 'ἕνεκά του' in the notes on 196b29-31 below.

35. So Ross and Charlton, who both regard this remark as 'a first approximation' (Ross, Introduction, p. 39; Charlton, p. 106). Other responses to this problem are less satisfactory. Hintikka et al. take this remark to show that Aristotle's account of 'chance' is really an account of 'accident', and then complain that some accidents -- viz. the ones which are not ἕνεκά του -- fail to satisfy Aristotle's definition (Aristotle on Modality and Determinism, p. 115). Guthrie takes 'chance events are rare and vice versa' to be Aristotle's 'nominal definition' of chance (History of Greek Philosophy, VI, 238; the scare quotes are Guthrie's). On a strict account of 'nominal definition' this seems implausible, and perhaps Guthrie means just to endorse the 'first approximation' view. A. Mansion thinks that the account of chance in II. 5-6 constitutes a refinement of an earlier and vaguer doctrine, and

he sees this remark (and the material on good and bad fortune) as relics of earlier discussions (Introduction à la Physique Aristotelicienne, pp. 310-11). Mansion's main argument for this position is that there are a number of important incompatibilities between chance as defined in II. 5-6 and the conception of chance which Aristotle employs in most other works (see pp. 294-5). In particular, the II. 5-6 account leaves no room for bad luck, and it associates chance, rather than contrasts it, with ἕνεκά του. I discuss these points below, nn. 45 and 47.

36. Constantine Georgiadis, 'Fallacious reasoning in Aristotle's Physics B 5, 196b19-21? An emendation', Hermes 107 (1979) 253-5.

37. Themistius, In Aristotelis Physica Paraphrasis, edited by Heinrich Schenkl, Commentaria in Aristotlem Graeca, Prussian Academy Edition, Volume V part 2 (Berlin: G. Reimer 1900), 51.18; Simplicius, in Phys. 336.26 and 337.2. Ross appeals to 335.32 as evidence against Torstrik (p. 519); but once again this is hardly strong evidence for what text Simplicius read here.

38. The precise connection between 'coming to be incidentally' and 'having an incidental cause' is more obscure, however. This is discussed below, notes on 196b29-31.

39. So Guthrie, 'Notes on some passages in the Second Book of Aristotle's Physics', Classical Quarterly 40 (1946) 70-76, at p. 76.

40. See also Ross, pp. 518-19; Charlton, p. 108; Sorabji, Necessity, Cause and Blame, ch. 1; Jonathan Lear, 'Aristotle's philosophy of mathematics', Philosophical Review 91 (1982) 161-92; Woods, 'Eudemian Ethics', p. 117; David Charles, Aristotle's Philosophy of Action (London: Duckworth 1984), pp. 44-55; Cynthia A. Freeland, 'Aristotle on causal relations' (unpublished paper).

41. On this notion, and its importance in incidental causation, see the works listed in the previous note, and nn. 42 and 55 below.

42. Ascriptions of per se and incidental causation can be treated either as highly intentional (since E_1 may be a per se cause of E_2 under one set of descriptions of E_1 and E_2, but an incidental cause of E_2 under another), or as extensional, but presupposing a very fine-grained ontology, so that these different descriptions in fact pick out different events. (There is, indeed, a series of possible positions, in which the degree of parsimony in ontology is in direct proportion to the degree of severity in disallowing substitution of co-referring terms.) Aristotle may well have a preference for one or other of these positions; but which position he adopts makes no difference to the substance of his account of chance events as incidentally caused. Simply for convenience of presentation, I shall generally use the language of a very fine-grained ontology (on which, for example, 'the man's going to the agora' and 'the man's going to where his debtor is' pick out different events which unite accidentally in the man in the subscription story). I shall not consider here how fine-grained Aristotle's ontology of events, etc., actually is: for opposing views, see Gareth B. Matthews, 'Accidental unities', in Malcolm Schofield and Martha Craven Nussbaum (eds.), Language and Logos: studies in ancient philosophy presented to G E.L. Owen (Cambridge: Cambridge University Press 1982), and Charles, Aristotle's Philosophy of Action, ch. 1; see also Mario Mignucci, 'Puzzles about identity. Aristotle and his Greek commentators', in Jürgen Wiesner (ed.), Aristoteles: Werk und Wirkung, Erster Band: Aristoteles und seine Schule (Berlin and New York: De Gruyter 1985).

43. See the complaints made against Anaxagoras' unlimited principles at Phys. I. 4 187b7-11 (this should be read together with Cael. III. 4 303a29-b2). At 197a9-10 Aristotle says that it is because the causes of luck are ἀόριστα that luck is ἄδηλος ἀνθρώπῳ.

Three further points should be made. (1) I wish to stress that 'law' here is in scare-quotes: incidental causes are only rarely connected with their effects (see on 197a29-31, and chapter 5), and so there is no lawlike connection between them. (2) Nothing in this account of the 'obscurity' of chance rules out our being able to know in a particular case that a concurrence of such-and-such a sort is likely,

and hence being able to predict the chance event itself. (3) Balme understands the 'ἀόριστον' claim quite differently; he thinks that 'ἀόριστον' means 'causally undetermined' ('Greek science and mechanism I: Aristotle on nature and chance', Classical Quarterly 33 (1939) 129-38; this reference pp. 133-4). Although a number of commentators hold that Aristotle does take chance events to lack per se causes (for discussion see chapter 5, Sections I-II), Balme's reading of the present passage is very difficult to accept: Aristotle's focus on the unlimited number of possible incidental causes, for instance, would be a mysterious way to justify the 'ἀόριστον' claim if the expression meant 'causally undetermined'.

44. An. Post. II. 11 95a8-9 (ἀπὸ τύχης δ' οὐδὲν ἕνεκά του γίνεται); Phys. II.8; PA I. 5 645a24-5; Rhet. I. 10 1369a32-b5.

45. For further discussion of these and other attempts to avoid the conclusion that chance events are actually ἕνεκά του, see Lennox, 'Aristotle on chance', Archiv für Geschichte der Philosophie 66 (1984) 52-60, at pp. 52-6. A. Mansion's theory of a change of doctrine (see above, n. 35) is hardly convincing. Other difficulties aside, it is hard to see how Aristotle could first contrast chance with ἕνεκά του, and then define the former in terms of the latter, without a radical change in his conception of ἕνεκά του; so we would be obliged to posit two senses for 'ἕνεκά του' in any case. (It is also difficult to reconcile Mansion's theory with the fact that, in one and the same sentence, Aristotle says both that chance events are ἕνεκά του and that they do not come to be for the sake of what results [197b18-20].)

46. Ross, pp. 517-19, Charlton, p. 106, Lennox, 'Aristotle on chance', pp. 56-60. This interpretation goes back to Simplicius, who glosses τὰ ἕνεκά του here as τὰ δυνάμενα ἕνεκά του πραχθῆναι (335.33-336.5).

47. Note that, at least in cases in which the benefit produced is a possible object of choice (ἐν τοῖς κατὰ προαίρεσιν), it need not serve the interests of the subject of the event which is ἕνεκά του -- in just the same way as the goal at which an agent aims can be one designed to benefit others and not himself.

Apart from the remarks at 197a25-30, Aristotle's discussion ignores the idea of <u>bad</u> luck entirely. A. Mansion claims that Aristotle's analysis of luck does not leave room for bad luck, and that this a sign of a substantial change of doctrine (see n. 35 above). The first of these claims is formally correct, but the second does not follow. The association of ἕνεκά του, even in its non-explanatory sense, with the idea of a τέλος does suggest that it means 'produces a benefit' rather than 'produces a benefit or harm'; but it is easy enough to extend Aristotle's analysis in this way so as to include bad luck.

48. Both Stewart and Gauthier-Jolif interpret these passages in a similar way (J.A. Stewart, <u>Notes on the 'Nicomachean Ethics' of Aristotle</u>, 2 vols [Oxford: Clarendon Press 1892]; René Antoine Gauthier and Jean Yves Jolif, <u>L' Ethique à Nicomaque: introduction, traduction et commentaire</u>, Second Edition, 2 vols [Louvain: Publications Universitaire de Louvain; Paris: Béatrice-Nauwelaerts 1970]). J.A. Smith argues that 'ἕνεκά του' in the <u>EN</u> III. 1 passage does have its explanatory sense ('<u>Aristotelica</u>', <u>Classical Quarterly</u> 14 [1920] 16-22, at p. 16); but his interpretation of the passage is unconvincing.

49. <u>Phys.</u> II. 3 195a3ff.. For discussion of a related issue see the notes on 197a21-5 below.

50. The fact that Aristotle's illustrative examples at 196b26-7 and 197a14-15 are all cases of efficient causation is not decisive -- for the same is true of the examples in the general discussion of incidental causation in II. 3. Clearly this point would make it harder to argue that efficient causation is <u>excluded</u> from Aristotle's analysis of chance events as incidentally caused.

51. Whether there will be an incidental final cause present in <u>all</u> cases of chance will depend on whether Aristotle thinks that all the activities of νοῦς and φύσις have final causes. This is a notoriously difficult question. If the natural motions of the elements, for example, do not have final causes, the luck involved in a man's happening to land safely on a ledge after falling off a cliff will not have an incidental final cause. Discussion of this question is rather

meagre: for various aspects, see Guthrie, 'On the Heavens', Introduction, and 'The development of Aristotle's theology -- I', Classical Quarterly 27 (1933) 162-71; Robert R. Barr, 'Aristotle on natural places: some questions', New Scholasticism 30 (1956) 206-10; Philip Merlan, 'Two theological problems in Aristotle's Met. Lambda 6-9 and De Caelo A. 9', Apeiron 1 (1966) 3-13; Waterlow, Nature, Change, and Agency, ch. 5.

52. In 'Teleology, chance . . . ', Lennox takes it for granted that the incidental-cause condition is concerned with final, and not efficient causation (see, for example, p. 233: 'The felt difficulty in carrying over this notion [incidental causation] to Aristotle's theory of chance is that here the causation is teleological.'). Aristotle's explicit statement directly contradicts this. Moreover, it is hard to see any countervailing evidence to support Lennox's view. The only passage which could favour the final-cause interpretation is Aristotle's remark at 197a1-2: ἔστι δὲ τέλος, ἡ κωμῳδή, οὐ τῶν ἐν αὐτῷ αἰτίων . . . . I agree with Lennox that Aristotle is saying here that the incidental-cause condition is satisfied in the subscription example (see notes on 197a1-2 below). Clearly the word 'τέλος' is suggestive of final causation: so Aristotle may after all be appealing to incidental final causation in his analysis of chance. But τῶν ἐν αὐτῷ αἰτίων is equally suggestive of efficient causation; and the claim that the end is not one of the causes in the man could equally be taken to mean either that the end was not a per se final cause, or that the desire for the end was not a per se efficient cause. What is more, at 197a17-18 Aristotle describes the possible incidental causes of the lucky event as desires for various ends (see n. 69). These passages are at best neutral between the 'final' and 'efficient' interpretations (though if anything they support the latter).

Lennox might seek to defend his interpretation by claiming that only if we take the relevant incidental causation to be final can we explain why regular generation without seed can be called αὐτόματος in the same sense as that analysed in Phys. II. 4-6. But (i) I doubt that we ought to see spontaneous generation in the biological works as being meant to satisfy the conditions laid down in the Physics analysis of τὸ

αὐτόματον (see on notes on 195b31 above); (ii) Lennox's attempt, in 'Teleology, chance . . .', to show that spontaneous generation does satisfy these conditions is unsuccessful for quite independent reasons. In order to show that spontaneous generation counts as αὐτόματος in the Physics sense despite coming about regularly and regularly producing an end, Lennox claims that only processes which are form-replicating count as having a final cause -- viz. the εἶδος . But Lennox's interpretation does not seem promising: this condition might capture the extension of Aristotle's class of finally-caused γενέσεις -- viz. the γενέσεις of substances (see n. 11 above and chapter 5, n. 37, for related discussions); but the account faces at least three difficulties. (i) It appears to exclude animal parts and the activities of mature organisms -- which are not form-replicating, but form-expressing -- from having a final cause. (ii) Even within the class of γενέσεις, the form-replication condition seems entirely ad hoc: ascribing it to Aristotle as a way of solving the difficulty over spontaneous generation just pushes the problem one step back -- to the question as to what sensible motivation Aristotle could have for this restriction, given that he believes in the existence of regular and predictable γενέσεις which are not form-replicating. (iii) As Lennox in effect concedes in the last section of his paper, his 'solution' to the difficulty leaves Aristotle with a new difficulty which is all too close an analogue of the original one (this would be true even if we waived objections (i) and (ii)).

53. For the ascription of the incidental cause to luck, see notes on 196b11-13.

54. Here, as elsewhere, I shall use 'chance', 'chance$_1$' and 'chance$_2$' as appropriate.

55. Ross argues that the incidental causation involved in chance outcomes differs in an important way from the standard cases (p. 519). Whereas in both the standard types of case the incidental cause 'has no real share in the causation' of the incidental 'effect', Ross claims that the man's wish to go to the agora is a partial cause, not of the incidental effect, but of the τέλος which results from that effect. This combination of claims seems odd: since its only causal link with

the τέλος is via the incidental effect, how could the incidental cause fail to be a partial per se cause of its incidental effect if it is a partial per se cause of the τέλος? This problem arises because Ross here misidentifies the incidental effect. He takes it to be the debtor's presence in the agora; but, although this is a 'concomitant' of the creditor's presence in the agora, it is not 'in the same subject' (or: they do not form an accidental unity). 'Being in the same subject' is an essential condition of the relations of concomitance which can be allowed in our schemata for incidental causation, precisely because we do not want to say that the creditor's wish to go to the agora was an incidental cause of his debtor's being there. The creditor's wish is an incidental cause of his going to where his debtor is, and of his meeting up with his debtor (and hence it is an incidental cause of his getting the money as well).

Nevertheless Ross does seem to be right to say that the wish is a partial per se cause of the man's getting the money; this is so, however, only in virtue of its being a partial per se cause of his going to where his debtor is, and of the meeting. Pace Ross, this feature of the case (which may well be a general feature of cases of chance) does not change the nature of the incidental causation involved: this still satisfies -- and is adequately represented by -- the two schemata given above. Why is the incidental cause here a partial per se cause of the same thing? Because it is part of a conjunction which is the full per se cause (the full per se cause of the meeting is the conjunction of the creditor's decision to go to the agora then and the debtor's decision to go there). I shall return to this point in chapter 5, Sections I-II.

56. See Ross, Introduction, p. 39. In contrast to Ross (see previous note), Charlton appears to take it for granted that chance events have no per se cause -- witness his complaint that Aristotle fails to mention the difference which this makes to the nature of the incidental causation involved in chance events (p. 108, quoted in Section I of chapter 5 below).

57. See notes on 196b13-17 and n. 35.

58. Commenting on 196b23-7, Ross notes that the incidental has taken the place of the rare (p. 519). He approves of this change ('And well it may . . .'), but his explanation leaves it obscure whether he regards the reference to the incidental as preserving or as doing away with the rarity condition. As I have said, Aristotle must regard it as preserving the rarity condition.

59. How this doctrine is applied in E. 3 is problematic: I shall return to that issue in the next chapter. In claiming that what is incidental is rare, I except, of course, τὰ καθ' αὑτὰ συμβεβηκότα (see An. Post. I. 4-6, Top. V. 3-5, VII. 5, Met. Δ. 18, 30). For discussion of these problematic attributes, see Barnes, Aristotle's 'Posterior Analytics': translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1975), ad loc., and 'Property in Aristotle's Topics', Archiv für Geschichte der Philosophie 52 (1970) 136-55; Kirwan, Aristotle's 'Metaphysics', Books Γ, Δ and E: translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1971), ad loc.; Vernon E. Wedin, 'A remark on per se accidents and properties', Archiv für Geschichte der Philosophie 55 (1973) 30-35; William Graham, 'Counterpredicability and per se accidents', Archiv für Geschichte der Philosophie 57 (1975) 182-7; Brad Inwood, 'A note on commensurate universals in the Posterior Analytics', Phronesis 24 (1979) 320-29; Herbert Granger, 'The differentia and the per se accident in Aristotle', Archiv für Geschichte der Philosophie 63 (1981) 118-29; J.E. Tiles, 'Why the triangle has two right angles kath' hauto', Phronesis 28 (1983) 1-16.

60. See above, on 196b10-11, and the next chapter.

61. Hans Wagner, Aristotles: Physikvorlesung (Berlin: Akademie-Verlag 1972), p. 469.

62. κομιζόμενος is also read by Hardie and Gaye, and by Barnes in CWA.

63. Ross responds by pointing out that the example is probably not of Aristotle's devising, but is an example already in use in discussions of

chance (cf. 196a3-5): since the earlier use of the story is in the context of an attempt to 'discredit' chance, we might expect it to involve as striking a coincidence as possible. This explanation is ingenious, but again the argument seems to go against Ross: the man's wishing to go to the agora might plausibly constitute an adequate explanation (or 'determinate cause') of his meeting the debtor; it does not by itself seem very convincing as an explanation of his meeting the debtor when the debtor is ('by chance') in funds.

64. The remark does not help, however, to decide between the interpretations of 'for the sake of something' outlined above (notes on 196b29-31), since it can be understood in accordance with each of them.

65. Charlton, pp. 48-9. Some other features of Charlton's translation of the sentence seem to be incorrect, however: see the notes on the subscription example below.

66. John Philoponus, In Aristotelis Physica Commentaria, edited by Hieronymus Vitelli, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vols XVI-XVII (Berlin: G. Reimer 1887 and 1888); this reference XVI, 283.10-11 (cf. 275.13-23).

67. The way in which I specify what this contrast involves anticipates some of the conclusions of the following chapter.

68. See n. 70 and below.

69. Aristotle there speaks of wishing rather than choosing (cf. 196a3-5 again), but he is clearly thinking of wishes which issue in action via choices; contrast C's wish to collect his money (196b33-4), which is not even a part of the basis of his actual προαίρεσις.

70. If we took the relevant incidental cause to be C's going to the agora, then (3) would cease to be a candidate for the chance outcome, since it is accidentally the same as C's going to the agora, and is not incidentally caused by it. As I shall argue, however, the important choice is between (1) on the one hand, and (2) or (3) on the other.

71. This is the case in the earlier version of the story, at least (αἴτιον τὸ βούλεσθαι ἀγοράσαι ἐλθόντα), and it is very natural to take the full-dress example in the same way. Moreover, to make C's presence in the agora, as well as his meeting up with D, a matter of chance would be a gratuitous complexity. Aristotle's remarks that 'it happened to him to go' and 'he went from luck' here do not constitute strong evidence on the other side; for these remarks can be construed in the same way as 'going from luck' at 196a3-5 (see notes on 196b11-13). (Even if we did take C's presence in the agora to be by chance, the problem of 196b36-197a1 and 197a2-5 discussed below would remain: it could easily be the case that C goes frequently to the agora and yet his collecting the money happens by chance.)

72. If we had to choose one as being uppermost in Aristotle's mind, it should presumably be (2) -- C's meeting his debtor -- since Aristotle at least mentions this in the earlier appearance of the story.

73. As it stands, the line of thought which I ascribe to Aristotle is over-simple. Going to the agora when seeking subscriptions could be reliably connected with actually getting subscriptions even though the latter did not occur always or for the most part on the occasions when the former occurred. This would be the case if C's debtors were normally <u>either</u> in the agora <u>or</u> in the temple <u>or</u> in the Lyceum on subscription day (and if C regularly went to these places in that order!). This is a more complex case which Aristotle is simply not considering here; clearly, however, it poses no threat to the basic account of lucky events as being beneficial and rare. More importantly, however, the fit between 'rare' and 'not reliably connected' is not perfect, even when 'rare' is construed as 'rare relative to the natural and/or deliberative processes of the subject' (as I shall argue it should be in this context). For (i) there will be cases where the 'event-condition' ($\underline{E}_2$), relative to which the frequency of $\underline{E}_1$ is measured, itself occurs on so few occasions that judgments of frequency are no more likely to reflect the presence/absence of a reliable connection than not. (ii) $\underline{E}_1$ can happen regularly (or rarely) relative to $\underline{E}_2$ <u>by accident</u>: there is no reliable connection between my choosing to travel by a given train and its being late (supposing that trains are

normally on time), yet I usually manage to pick the one which turns out to be delayed. In both types of case the judgment of conditional frequency need not correspond to the presence or absence of a reliable connection: considerations as to what the nature of the event-condition would or could reliably bring about may override the prima facie judgment which the conditional frequency suggests. This qualification does not alter the fact that judgments of conditional frequency are fundamental here. The direct evidence, however, on the question as to how clearly Aristotle saw the need for the qualification is more meagre than we could wish. I discuss this further in chapter 5, Section III.

74. In chapter 5 (Section III and n. 38) I shall suggest how Aristotle can explain why C's getting the money in these circumstances is a case of luck, even though there is a reliable connection between his going to the agora and getting the money. (Indeed, it is a virtue of Aristotle's account that it can do this.)

As John Ackrill has pointed out to me, there can be more complex cases in which the absence of the relevant intention does not make the outcome lucky in this way: N regularly goes to town to do two tasks (to shop and to attend a college meeting, say). Forgetting the shopping, he goes to town for the meeting, but remembers the groceries in the end because he has to pass the shops on his way home. But in this case, his doing the shopping is not a lucky outcome precisely because of the regular connection between shopping and another προαίρεσις -- viz. to go to the college meeting.

75. For a qualification to this, see n. 73 above.

76. For this, and the claim that it is probably not a chance event at all, see above and n. 71.

77. Ross also complains about the irrelevance of this remark taken as it stands (p. 520); for Charlton's similar complaints, see my discussion above.

78. Understanding this or some similar phrase with φοιτῶν is made easier by the fact that Aristotle several times glosses ἐλθεῖν with '(for the sake of) getting the money'.

79. 'Περὶ τύχης', pp. 449-50. ἐπ' ἔλαττον is read by E^2, and is also what Philoponus writes; but both are more likely to be adding the phrase because they think that it ought to be there, than they are to be preserving the true reading.

80. Charlton and Barnes (CWA) also read εὐλόγως by itself.

81. Cf. Simplicius, 342.32-343.20. Ross's interpretation (pp. 521-2) does not overcome this difficulty. He takes πνεῦμα and εἴλησις to be meant as incidental causes, but the case which he envisages as illustrating their being ἐγγύτερα is one in which they appear to be per se causes. It is true that, in the case which Ross describes, the man becomes healthy by chance; but this does not mean that every cause of his health must be an incidental cause. (Moreover, in Ross's example the man's having a haircut is not a remote incidental cause, but a respectable, 'proximate' one.) The general problem is made harder by the fact that Aristotle recognises warmth as a per se cause of health (indeed, τὸ εἰλυθερεῖν is prescribed for certain unhealthy conditions in one Hippocratic text [Περὶ Νούσων II. 68 and 70]).

82. Although the point which it is used to illustrate holds of chance in the wider sense: see my notes ad loc..

83. The fact that Aristotle mentions only the 'imitation of mind' condition at 197a5-6 might suggest that he is unclear about the difference between it and the condition of 'having a subject capable of choice'. This would be unlikely given just the examples of horse, tripod and falling stone; and it is in fact ruled out by 197b18-22, where Aristotle lists both conditions as necessary for luck.

84. Met. Λ. 3 1070a6-9 (ἢ γὰρ τέχνῃ ἢ φύσει γίγνεται ἢ τύχῃ ἢ τῷ αὐτομάτῳ. ἡ μὲν οὖν τέχνη ἀρχὴ ἐν ἄλλῳ, ἡ δὲ φύσις ἀρχὴ ἐν αὐτῷ . . . , αἱ δὲ λοιπαὶ αἰτίαι στερήσεις τούτων) might be taken

to suggest that luck is the 'privation of φύσις', and chance$_2$ the 'privation of τέχνη'; this would support Philoponus and Ross. The passage need not be understood this way, however: Aristotle need only be saying that each case of luck or chance$_2$ is a case of privation of either τέχνη or φύσις.

85. I am not sure precisely what class of things Aristotle has in mind here. Perhaps it might include portions of the elements and inorganic compounds which are buried too deep in the earth, or which float too high in the heavens, to be able to interact with organic things capable of being benefited.

86. Cf. the question of the text at 197b22-3, discussed below.

87. Lennox takes Ross to be saying that the phrase 'things which come to be for the sake of something without qualification' means 'things which generally (i.e. normally) come to be for the sake of something' ('Teleology, chance . . .', p. 233 and n. 30). But this is a doubtful reading of Ross, and a virtually impossible reading of ἁπλῶς.

88. Although, of course, E must be incidentally caused by at least one of its subject's natural or deliberative processes; otherwise it would lack any connection with its subject at all -- and so could not be said to have that thing as its subject. I take this condition to be expressed in the 'external cause condition': see below.

89. This claim is an orthodox one, but still requires more defence than I can give here. I shall criticise one rejection of it (by John Cooper) in chapter 6, Section I.

90. In his second interpretation of our passage he writes: 'we could take the phrase "has an external cause" to mean "is not in fact due to nature or mind"' (p. 110). This latter is more in line with clause (iii).

91. See also the discussion of ἔξω τὸ αἴτιον (197b36) in the notes on 197b32-7 below.

92. Guthrie, who accepts Ross's intepretation, wrongly thinks that this commits Aristotle to the erroneous view that all chance events 'come to be in vain' in Ross's sense ('Notes on some passages . . . ', pp. 73-5; cf. History of Greek Philosophy, VI, 239).

93. Or he may be making a point about events which would be chance events if they did not come to be in vain: see below and n. 96.

94. Charlton offers two interpretations, but both face similar difficulties to Ross's -- they offer Aristotle an unimpressive general line of thought here, and they fail to incorporate the falling stone example.

95. ὑπὸ τινός here means 'through someone's agency', not 'through some cause': Aristotle's point is not that there was no cause of the stone's falling, but that it was not brought about intentionally by a deliberating agent.

96. On the interpretation of the 'non-explanatory' sense of which I have adopted, chance events which come to be 'in vain' in this way will not, strictly, count as ἕνεκά του, since they will not actually produce a benefit. Strictly, then, I should speak of 'candidates for chance events' coming to be in vain. This presents no serious difficulty, however.

97. For alternative views, see Ross, p. 524, and Charlton, p. 110.

98. It is plain that 'regularity' here must be relative to individual species; for ends produced by chance in one species could, obviously, be the 'product of nature' in another; similarly what counts as a deformity in one species may in another be a regularly produced natural feature.

99. See Philoponus, in Phys., 292.20-7. For 'external' causes as incidental causes, see notes on 197b18-22. The general view of 197b32-7 which I have sketched may be in accord with Philoponus' too; but his account (at 292.10-17) is not very explicit.

100. But not, in theory, vice versa. As things are, of course, all per se causes will no doubt have incidental effects as well; but we can at least conceive of a case in which this is not so, whereas we cannot conceive of a case in which an incidental effect exists without any per se causal chain. In this sense, the priority in οὐσία follows from the priority in λόγος. Aristotle does not argue on this basis for a priority in time, and so does not deserve Gomperz's memorable stricture:

> The decision is to be extracted from the concepts involved in the question. Since chance and automatism include the negation of end, of purpose, and so of mind, it follows that these last-mentioned concepts are the more primitive and the first-named derived from them . . . . From this relationship of the concepts an inference is drawn as to the relationship of the things themselves. The more primitive factor must have begun to act at an earlier time than the derived factor . . . . Who does not see here the fundamental vice of the metaphysical method, the inference from the order of human ideas to the order of natural facts, disdaining every veil and flaunting itself in unabashed nakedness? (Greek Thinkers: a history of ancient philosophy, Volume IV, translated by G.G. Berry [London: John Murray 1912], p. 101)

101. See above, n. 51.

102. They might wish to say that the genesis of the cosmos was random; but that would only mean that there was no overarching explanation of the formation of this complex object, and not that its formation was entirely unconnected with earlier causes. It is true, of course, that Aristotle's argument does not rule out the possibility that the cosmos sprang into existence through no cause at all; but Aristotle's concern, both in the discussion of endoxa in II. 4 and in the present passage, is with rival cosmological views, and (I should argue) he would regard this possibility as lying outside the scope of legitimate cosmology (cf. chapter 3, Section IV and n. 15).

103. Philoponus offers an ingenious defence of Aristotle against this objection. If all the cosmoi posited by the opponents' theory are due to chance, there is nothing else which can be the per se work of mind or nature; so if the cosmoi are due to chance, they must also be due to mind or nature (in Phys., 293.10-294.29). This defence is unsuccessful, however: for it ignores the possibility that the per se workings of mind or nature might be found in things within each cosmos -- e.g. in the behaviour of individual atoms (see below).

104. I see no reason why Aristotle's opponents here should ascribe the genesis of cosmos to chance rather than to accident -- i.e. why they should have to regard its formation as ἕνεκά του in the non-explanatory sense. (Aristotle's argument, however, does not rely on this special feature of chance.)

105. The relevant texts include Cael. III. 2 300b9-14 (and, more generally, the De Caelo as a whole), Phys. II. 8-9, VIII. 1 252a32-b1 and Met. Λ. 6 1071b31-3. (See n. 26 above, and chapter 5, n. 44).

Chapter 5: Rarity, chance and causation

In this chapter I shall consider some issues which are important for our understanding of Aristotelian chance, and in particular of its relationship to 'rarity'. In Sections I and II, I shall ask whether Aristotle thinks that chance outcomes have per se efficient causes; in Section III, I shall ask in what sense chance events are 'rare'.

I

A number of commentators have claimed, either on their own behalf or on Aristotle's, that chance outcomes have no per se efficient cause. Charlton, for instance, complains that:

> Aristotle is a little careless also in his talk about concurrence: he says that chance is a cause in the way in which a pale flute-player may be the cause of a house (196b26-7, 197a14-15). There is, in fact, an important difference between a thing due to chance and a house built by a musician. A house, under that description, i.e. qua house, has a proper cause, a builder . . . . A thing due to chance, as such, i.e. under the description under which it is attributed to chance, has no proper cause, though under another it may have . . . . Thus if A is not looking for B, nothing is the cause of his going to where B is; and nothing is the cause of the tile's falling on the pedestrian (p. 108).

Charlton presumably has in mind the coincidental nature of standard chance outcomes, and thinks that the coincidental encounter of debtor and creditor in the agora, or of the stone and the pedestrian, are not caused.

In Chapter 1 of Necessity, Cause and Blame (hereafter NCB), Sorabji argues that Aristotle himself believes that coincidences lack efficient causes. Sorabji offers a new interpretation of Met. E. 3, and claims that Aristotle's line of thought there can be best understood if we take him to assume that coincidences lack causes. Aristotle can hold that coincidences are causeless without trying to claim that they are random, because, in Sorabji's view, he thinks that to be a cause is essentially to be (something which provides) an explanation, rather than to be a sufficient condition; and coincidences, Sorabji argues, do not have explanations. This interpretation of E. 3 is in some ways very attractive, but it faces severe difficulties, to which I shall turn in a moment. The question as to how E. 3 should be understood is also worth considering here in its own right; for if Sorabji's account is mistaken, I think that the most plausible interpretation of the chapter is one which sees the argument as resting upon Aristotle's belief that what happens always does so of necessity. Before outlining the difficulties which Sorabji's interpretation of the chapter involves, I shall consider in more detail what is involved in his claim that coincidences lack per se causes.

There are various types of case in which accidents are involved in accidental and per se causation.[1] The view which Sorabji ascribes to Aristotle is that some accidents -- namely coincidences -- lack explanations (and hence, he claims, lack per se causes); he does not

deny that some Aristotelian accidents have explanations,[2] nor that accidents can themselves be explanatory of other things. Since all accidents have an 'accidental cause' (whether or not they have a per se cause as well), Sorabji distinguishes two senses of 'accidental cause'. The first sense involves the idea of being 'indirectly explanatory': when A is an accidental cause of B in this sense, citing A 'points the way towards a genuine explanation of [B], for someone who has the right information, or can gather it' (NCB, p. 11). In other words, (i) B must have a genuine explanation (and hence, on Sorabji's view, a per se cause[3]), and (ii) knowing that A is an accidental cause of B enables someone who knows further facts about A and/or B to infer what that per se cause is. An example of this is Polyclitus, who is the accidental cause of a statue: the per se cause is a sculptor, and someone who knows that Polyclitus is the accidental cause and that he is a sculptor is in a position to work out what the statue's per se cause is.

It is unclear whether Sorabji thinks that conditions (i) and (ii) can come apart, or whether he regards (i) as sufficient for (ii), and hence regards (i) as sufficient to make an accidental cause indirectly explanatory; for the second sense of 'accidental causation' is left unelucidated, except for the proviso that it does not involve the idea of even indirect explanation. I shall call these senses of 'accidental cause' 'the IE sense' and 'the NIE sense' respectively. If (i) is sufficient for the accidental cause to be indirectly explanatory, the

NIE sense of 'accidentally caused' will be applicable only to events which have no per se cause. If, on the other hand, (i) is not sufficient, the NIE sense could also apply to events which do have a per se cause. I shall return to this point below.

When Sorabji introduces these two senses of 'accidental cause' (NCB, pp. 5-6), he appeals to the distinction between the two forms or patterns of incidental causation which I described in chapter 4 above (in the notes on 196b24-7), and which I labelled 'type I' and 'type II'. He rightly holds that the IE sense of 'accidental causation' applies whenever the accidental nature of the causation is due to the 'cause' being an accident attaching to the per se cause -- i.e. when the accidental causation conforms to what I called the type II pattern. The schema for this sort of case is this:

(1)

B

+

C => D

In cases like this, which conform to the type II pattern of incidental causation, the incidentally-caused event (D) must have a per se cause as well as an incidental one. Thus if there are any cases in which an incidentally-caused event lacks a per se cause, they must be instances of the type I pattern. Now whereas the type II pattern required the existence of a per se cause, the type I pattern is in principle

compatible both with the incidental effect's having a per se cause and with its having none:

(2A)	A => E		(2B)	A => E
	+			+
	C => F			≠> F

('≠>' signifies the absence of any per se cause.)

These two schemata represent cases which are in principle possible. On Sorabji's interpretation, Aristotle obviously believes that schema (2B) is actually instantiated; but Sorabji does not commit himself to the view that in all cases of type I incidental causation the incidental effect lacks a per se cause.[4] Indeed, he explicitly restricts his discussion of type I incidental causation to those cases in which the 'effect' is a coincidence (NCB, p. 6). His claim is that, whatever the case may be for other sorts of accidents, coincidences are wholly uncaused; in other words, that the only 'causes' which coincidences possess are accidental causes.

Schema (2A) clearly is instantiated, in fact: the wholesomeness of the pastry-cook's confection has a per se cause in his use of wholesome ingredients (even if that itself was an accident). A clearer case, perhaps, would be that of a wall running from north to south, built by two teams of builders, one skilled, the other incompetent: the northern

half of the wall is well-built, the southern is shoddy. The competent builders' actions are the per se cause of the sturdiness of the northern half, but they only incidentally produce something which has a ramshackle southern half, and vice versa. For present purposes, it does not really matter whether or not we say that, in instances of (2A), A is indirectly explanatory of F (and C of E).[5] What is important is simply that the type I pattern of incidental causation is compatible with the incidental effect's having a per se cause.

This result is independent of what attitude we adopt towards the (non-)causation of coincidences. It may or may not be a coincidence that the wall has just this combination of features; in either case, its having this combination is a distinct state of affairs from its having a strong northern half (E), and from its having a weak southern half (F). The question of whether the conjunction of E and F is caused has no bearing on the question of whether E (or F), considered on its own, has both an incidental and a per se cause.

The conjunction of E and F is itself a concomitant of E and of F: the wall-with-a-strong-northern-half is accidentally the same as the wall-with-a-strong-northern-half-and-a-weak-southern-half. It is worth noticing that if this conjunction is not a coincidence, but the result of a deliberate policy, it is per se caused by the conjunction of the efforts of both teams of builders -- i.e. by the conjunction of A

and C.[6] (Sorabji would, I think, agree with this: cf. NCB, pp. 10-11.) Thus, whatever we think about the case of coincidences, it seems that an event can be both an incidental and a partial per se cause of the same thing; for in the schema (3A) below, which represents the sort of case exemplified by the deliberately-planned wall, A is a type I incidental cause of (E and F), and also its partial per se cause:

(3A)

$$\begin{array}{ccc} A & \Rightarrow & E \\ & & + \\ (A \text{ and } C) & \Rightarrow & (E \text{ and } F) \\ & & + \\ C & \Rightarrow & F \end{array}$$

(3B)

$$\begin{array}{ccc} A & \Rightarrow & E \\ & & + \\ & \not\Rightarrow & (E \text{ and } F) \\ & & + \\ C & \Rightarrow & F \end{array}$$

(Schema (3B) describes the case in which the conjunction [E and F] has no per se cause.) We found in chapter 4 that the incidental cause of a chance outcome could also be a partial per se cause of that outcome, if chance events have per se causes at all (see chapter 4, n. 55). This may have seemed to be an obstacle to regarding chance outcomes as having per se causes; but if so, the obstacle has now been removed. For Aristotle is in any case committed to the idea that an event can be both an incidental and a partial per se cause: this is because, whatever his view of coincidences, he must agree that there are cases of non-coincidental conjunctions which satisfy schema (3A).

It is clear that the issue of the (non-)causation of coincidences is the issue as to whether Aristotle regards them as instances of schema (3A) or of schema (3B); for the obvious candidate for the per se cause of a coincidence is the conjunction of the per se causes of its 'component' events.[7] To see how Aristotle's example in E. 3 could be a instance of schema (3A), let A = X's thirst, E = X's being at the well at t, C = the robbers' need for a quiet spot for their deliberations, and F = the robbers' being at the well at t; the conjunction (E and F), then, represents X's and the robber's being at the well simultaneously at t.[8] On Sorabji's account, however, the E. 3 example is a paradigm case of (3B); and it is to his interpretation of the argument in Met. E. 3 that I shall now turn.

II

Sorabji takes Aristotle here to associate causation with necessity (uncharacteristically, in Sorabji's view), and sees him as arguing that all events would possess absolute necessity were it not for the existence of coincidences. Coincidences prevent universal necessity by creating 'fresh starts' and breaking up chains of causation; this is because, lacking any genuine explanation, they do not have per se causes.

As I said above, this account faces a number of difficulties.

(1) Sorabji's account of why incidental things lack causes will work, if at all, only for a special subset of the incidental, as Sorabji agrees; this subset is the class of coincidences. Sorabji wishes to contrast other cases of the incidental, which can have causes, with the case of coincidences, whose 'accidental causes' cannot be even indirectly explanatory, since there are, he argues, no explanations at all of coincidences. Yet Aristotle gives no hint that his remarks in this chapter are to be taken to apply only to some restricted range of cases of incidental things -- still less does he actually mention the notion of a coincidence: the focus on coincidences in Sorabji's interpretation has to be grounded upon the claim that only an appeal to the special features of coincidences will make sense of the chapter. Thus Sorabji seems to be committed to supposing that Aristotle is, at best, very unclear about the fact that only coincidences lack causes in the relevant sense (or that he falsely believed that the argument could properly be put in terms of the incidental in general). An interpretation of E. 3 which saw Aristotle's argument as quite properly concerned with the incidental in a more general sense would clearly be preferable in this respect.

The same point holds for Sorabji's interpretation of the remark at E. 2 1027a7-8: τῶν γὰρ κατὰ συμβεβηκὸς ὄντων ἢ γιγνομένων καὶ τὸ αἴτιόν ἐστι κατὰ συμβεβηκός . He takes this to mean that accidents

have only accidental causes -- in other words, that accidents do not have per se causes. On Sorabji's own account, however, this is not true of all accidents, but only of coincidences.[9] Yet E. 2 gives every appearance of being concerned with accidents in general.[10]

(2) The argument for what Sorabji calls 'determinism', whose validity Aristotle is supposed to accept in E. 3, is roughly this:

> The past and present are irrevocable, and so absolutely necessary.
>
> For any future event, there is a continuous chain of causes, each of which necessitates the next, which leads from some present or past event to that future event.
>
> If X is absolutely necessary, and X necessitates Y, then Y is absolutely necessary.
>
> ---
>
> Every future event is absolutely necessary.

This conclusion is obtained, presumably, by repeated application of the last premiss to each of the causes in the relevant causal chains.[11]

There is a difficulty with this argument, however. The third premiss might give the appearance of an unexceptionable logical truth -- indeed, Sorabji compares it to a similar-sounding truth about the transmission of necessity in deductive arguments:

> The situation is parallel to that in logic: as necessity in the premises of a valid syllogism will spread to the conclusion (An. Pr. I 15, 34a22-4), so necessity in a cause [i.e. the

> cause's own absolute necessity] will spread to the effect. Aristotle's strategy in face of this is to deny that the causal ancestry of future events always reaches back into the past (NCB, p. 8).

But the two situations are not so obviously parallel. As Sorabji understands Aristotle's doctrine of the absolute necessity of the present and past, this necessity is simply a matter of their being beyond our power to influence.[12] If so, the most that could be transmitted to future events here would likewise be their being beyond our power to influence. Thus the third premiss amounts to this:

> If X is beyond our power to influence, and X necessitates Y, then Y is beyond our power to influence.

Sorabji himself endorses the truth of this premiss, so understood.[13] But that it is true is hardly beyond dispute: indeed, the question of its truth or falsity has always been at the centre of debates about the compatibility of causal determinism and responsibility.[14] Moreover, we have no independent grounds for ascribing this premiss to Aristotle.

(3) Whatever we think about the soundness of the 'transmission of necessity' claim, we cannot, on Sorabji's account, avoid ascribing a fallacious argument to Aristotle at another point -- a fallacious argument from 'X lacks a cause' to 'X is not necessitated'. Sorabji's interpretation requires Aristotle to believe, when writing E. 3, that all causes necessitate, since this is a premiss of the necessitarian

argument which Aristotle is supposed to accept: if Aristotle did not accept this premiss, he clearly would not need to appeal to the existence of causeless coincidences in order to defuse the necessitarian argument. The coincidental meeting at the well is necessitated by whatever sets of antecedent conditions respectively cause the victim's presence at the well and the robbers'; for each of these causes is sufficient for its effect, and the two effects together are sufficient for the meeting. As we shall see under point (4) below, causation in E. 3, according to Sorabji's interpretation, is associated now with explanation, now with necessitation. If the explanatory character of causes is uppermost in Aristotle's mind at this point, he ought to have seen that the meeting's lack of causation is irrelevant to the question of its necessitation by antecedent events; if the necessitating character of causation was in his mind, he ought to have seen that his inference from 'no cause' to 'no necessitation' was a simple case of the fallacy of denying the antecedent.

(4) On his own admission, Sorabji's interpretation requires him to ascribe to Aristotle the view that causes always necessitate, which Sorabji thinks is a view not held by Aristotle anywhere else. This might seem to constitute a merely ad hominem difficulty: anyone who rejected Sorabji's general conclusion that Aristotle's conception of causation is tied to explanation, rather than to necessitation and law, would not be troubled by this point. The problem runs deeper than this,

however. On Sorabji's account of E. 3, Aristotle must employ both conceptions of causation: for Aristotle can only be worried by a threat of determinism here if he is thinking of causes as essentially necessitating, but he solves the problem by thinking of them as essentially explanatory. His solution requires this way of thinking because the claim that coincidences lack causes relies on the claim that they lack explanations: it must do this since no argument is available to show that coincidences lack (temporally prior) sufficient conditions, and so they do have causes if causes are (temporally prior) sufficient conditions.

Another way of looking at the argument shows that Sorabji's interpretation is guaranteed to require Aristotle to appeal to both conceptions of causation. Believing that all causes must necessitate, but wishing to avoid determinism, Aristotle removes the threat by showing that some things lack causes. What reason can he offer for thinking that these things lack causes? It cannot be because they are not necessitated; for the absence of causation is itself, on Sorabji's view, presented as the grounds upon which determinism is refuted, and not as a further consequence of the denial that everything is necessitated.[15] So it is not surprising that Sorabji's Aristotle must resort to a different conception of causation when he tries to justify his claim that some things lack causes (the only obvious alternative way

to avoid determinism in this context would be to claim that there are random events).

Although Sorabji treats these conceptions of causation as very much opposed, the idea that, on his account, Aristotle must employ both conceptions in E. 3 may prompt the thought that we could defend Sorabji's view of the chapter by bringing the two conceptions together. In other words, we could suppose that Aristotle takes causes to be essentially (things which provide) explanations, but that he also holds that necessitation is a necessary but insufficient condition of being a genuine explanans. The problem with this approach is that, even in the idealistic Posterior Analytics, Aristotle appears to commit himself to the view that adequate explanations can hold only for the most part; hence an explanans need not necessitate its explanandum.[16] Aristotle could hardly hold that tokens of a given event-type necessitate their effect when they do produce it although such tokens produce the relevant effect only 'for the most part' -- or, at least, he could hardly do so without having to concede that the presence or absence of some further causal conditions is relevant to the outcome, and thus a part of the scientific explanation of the effect's (non-)occurrence: this would undermine the claim that the 'for the most part' explanation is an adequate explanation after all.[17]

If these objections are sound, Sorabji's account of Met. E. 3 faces very considerable difficulties, not the least of which are that on this interpretation Aristotle is in confusion over the nature of causation, and does not have even the makings of a good argument against universal necessity.

What other interpretation of E. 3 could we give? I would suggest that Sorabji's account of the overall structure of the chapter is correct -- i.e. that Aristotle is responding to a line of thought leading to the conclusion that everything happens of absolute necessity, and that he appeals to events like the thirsty man's murder in order to escape this conclusion; but we can avoid the difficulties facing his interpretation if we suppose a different line of argument for universal necessity, and a different reply by Aristotle. On this view, Aristotle starts from the belief that if something happens always, it does so of necessity -- our doctrine (P1).[18] By 'happens of necessity' Aristotle means 'happens of absolute necessity', and not merely 'is causally necessitated'.[19] Thus if everything that happens 'happens always', everything will happen of absolute necessity. As on Sorabji's interpretation, this is the conclusion which Aristotle wishes to avoid; the basis of the threat, however, is Aristotle's doctrine (P1), and not the argument involving causal necessitation and the necessity of the present and the past. What prevents it from being the case that everything happens of absolute necessity is the existence of the

incidental. For, as we know from the preceding chapter, the incidental happens rarely: the existence of rare events guarantees, not only that they do not happen always, but also that other types of event only happen for the most part (a corollary of Aristotle's demonstration in E. 2 that the existence of 'only for the most part' events guarantees the existence of rare events). So it is not true that everything happens always, and hence not true -- at least if 'of absolute necessity' entails 'always' as well as vice versa -- that everything happens of absolute necessity.

This interpretation of the argument in E. 3 raises at least two important questions. The first is, on what basis can Aristotle assert that the ἀρχαὶ καὶ αἴτια in question 'do not come to be' (1027a29-30)? The most plausible reading of this remark is that these causes do not undergo a process of coming to be.[20] If we take the remark this way, an easy answer seems to be available on Sorabji's interpretation: although the occurrence of a given coincidence is connected with antecedent processes, there is no process which we can identify as the gradual coming into existence of the coincidental state -- it comes to be instantaneously, at the moment when two independent (sets of) processes intersect. This answer clearly will not do if we see Aristotle here as having no special interest in coincidences.

I take the ἀρχαὶ καὶ αἴτια here to be incidental events/states in general, and suggest that there is a sense in which incidentals 'do not undergo a process of coming to be'. If $\underline{E}_1$ is an incidental event, it must on Aristotle's theory satisfy a description which makes reference to some distinct event (or set of events), $\underline{E}_2$, such that tokens of the same type as $\underline{E}_2$ are only rarely accompanied by tokens of the same type as $\underline{E}_1$ (see the passages from Met. Δ. 30 and E. 2 quoted in Section III below). Thus an event such as a meeting with a debtor is only an incidental event if it is also (say) a meeting with a debtor <u>when the creditor is going to see a spectacle</u>: if it were a meeting with a debtor when the creditor had arranged to meet him, it would not be an incidental event. Likewise, 'being pale' is an incidental if it is a man's being pale, but not if it is a lily's being pale (here the reference to a distinct event is abbreviated: the man's pallor is incidental relative to the operations of his φύσις as a <u>man</u>).

Aristotle's claim that incidental events/states do not undergo a process of coming to be should be taken, I think, as the claim that, whatever non-incidental causal process results in $\underline{E}_1$, it cannot be identified with any process of change <u>from E_2 to E_1</u>. Of course, $\underline{E}_2$ will have a causal connection of some sort with $\underline{E}_1$ -- their relationship will satisfy one of the schemata given in Section I; but, as we saw there, the most that this connection can amount to is that $\underline{E}_2$ is a <u>partial per se</u> cause of $\underline{E}_1$.

Why should this make Aristotle say that incidentals do not undergo a process of coming to be?[21] When the subjects of $\underline{E}_2$ and $\underline{E}_1$ are the same (as they are in paradigm cases of the incidental, though not perhaps in all), the subject of $\underline{E}_1$ can be described in a way which incorporates the reference to $\underline{E}_2$: 'the meeting with a debtor of the man-on-his-way-to-see-a-spectacle', 'the man's being pale'. By virtue of the point just made concerning the possible causal relationships of $\underline{E}_2$ and $\underline{E}_1$, there is no process of change such that (a) its per se subject is the subject of $\underline{E}_1$ described in this manner, and (b) it results in $\underline{E}_1$ -- i.e., in the subject's acquiring the relevant incidental form. In other words, if 'S' designates $\underline{E}_1$'s subject in a way which makes the appropriate reference to $\underline{E}_2$, and if $\underline{E}_1$ is S's being F, then 'S becomes F' does not describe any causal process of which S is, qua S, the per se subject. It might thus be tempting to say that S does not become F -- does not undergo any process of coming to be F -- even though some subject incidentally the same as S does become F (as the man-locked-in-a-dark-cellar is the per se subject of a process of becoming pale). This, I think, is why Aristotle can say that accidents do not undergo a process of coming to be despite their having per se causes.

The second question facing my interpretation of E. 3 is, why does Aristotle concentrate on the idea of tracing back chains of causation? Once again, the question is easy to answer on Sorabji's interpretation, since he sees Aristotle as worried by an argument which uses a premiss

of universal causal necessitation to reach its conclusion of universal absolute necessity. Aristotle's remark at 1027b11-12 is also relevant here: δῆλον ἄρα ὅτι μέχρι τινὸς βαδίζει ἀρχῆς, αὕτη δ'οὐκέτι εἰς ἄλλο. If he does not mean that 'this ἀρχή' has no cause, what does he mean?

This issue is best approached by considering what sort of world it is which Aristotle envisages when he envisages everything happening 'always' and of absolute necessity. In my discussion of the doctrine (Pl) in Section III of chapter 6, I shall argue that, as things are in the actual world, the only events to which absolute necessity attaches are those whose per se subjects are themselves eternal and necessary; in what way could Aristotle conceive of a world wholly governed by absolute necessity but containing perishable individuals? The line of thought which I shall later suggest underlies Aristotle's endorsement of (Pl) points to the idea that such a world would be one in which all the causative activities of νοῦς and φύσις produced their effects in a wholly exceptionless way (so that there were no laws linking these causes to their effects 'for the most part'), and in which every event was the per se product of the νοῦς or φύσις of some individual substance. This world would be one in which the behaviour of each substance forms a causal chain completely isolated, causally, from every causal chain involving another substance (with the exception of those involving ancestors and descendants -- reproduction itself, of course, would be asexual). For if two causal chains can intersect, and in doing

so produce together an event which neither chain by itself would have produced, this resultant event will not be entirely the per se product of the φύσις/νοῦς of a single subject (as we saw above); moreover, if there is causal intersection of this kind, the activities of neither substance will produce their normal effects without exception, since sometimes the outcome will be affected by the interference of another causal chain. It is such intersections which give rise to the existence of the incidental, and hence to the 'for the most part'.

If this account is correct, then Aristotle's interest in E. 3 in the intersection of causal chains is not surprising, despite his lack of concern with the general idea of causal necessitation. I suggest that when he traces chains of causation back, and looks for 'breaks' in them, he has in mind 'isolated' chains of the sort I have described -- i.e. chains every link of which is the per se effect of some previous activity of the mind or nature of a single, windowless subject. Similarly, when he says 'this [runs] no further to anything else' at 1027b12, he does not mean that it has no per se cause, but that it has no per se cause locatable entirely in the νοῦς or φύσις of its subject.

This interpretation requires more elaboration and defence than I can give here. It does avoid the difficulties which face Sorabji's account, however: it employs the idea of the incidental in general, and it does not require us to ascribe fallacies or uncharacteristic views to

Aristotle. In addition it makes E. 2 directly relevant to E. 3. If an account of this sort is correct, not only does Aristotle's endorsement of the doctrine (P1), and its importance to him, receive further confirmation, but, more importantly, E. 3 gives no support to the view that Aristotle takes coincidences to lack per se causes.

I conclude that we have no reason to ascribe to Aristotle the view that coincidences -- or incidental outcomes of any other sort -- lack per se efficient causes. It is true that the type I form of incidental causation is compatible with the incidentally-caused event's having no per se cause; but, as we have seen, this does not by itself show that Aristotle believes that any incidentally-caused events actually do lack per se causes. Indeed, the very fact which forms the basis of Charlton's complaint quoted at the beginning of the section -- the fact that Aristotle does not acknowledge any important difference in this respect between the incidental causation involved in chance, and that involved in a flute-player building a house -- seems to suggest that he takes chance events to have per se causes just as much as the house does. Moreover, as I said earlier, there is an obvious candidate for the per se cause of a coincidence, namely the conjunction of the per se cause of each of its 'components' -- e.g. the per se cause of the lucky encounter in the agora is the conjunction of the per se cause of the creditor's going to the agora and that of the debtor's going there. While decisions on the part of the creditor to see a spectacle are in

this case only rarely (and hence incidentally) connected with meeting his debtor, instances of this conjunction of causes would regularly result in their meeting -- and would do so in a perfectly understandable and predictable way.[22] Moreover, although such conjunctive causes cannot be located in the nature or choices of a single subject, they can nonetheless be traced back to the ordinary, per se workings of mind and nature; thus their recognition by Aristotle would in no way threaten the priority of mind and nature for which he argues at Phys. II. 6 198a3-10, and would be quite compatible with the claims he makes there.

III

In what sense are chance events rare? What does Aristotle mean by saying that an event happens always, or for the most part, or rarely? Obviously this categorisation of events must be primarily a categorisation of types of event, since all individual event-tokens happen only once. Event tokens can be classified in a derivative way, as being tokens of a type which happens rarely/etc.. Aristotle could mean one of two things by saying that E 'happens always/for the most part/rarely'.[23] The first involves what I called in chapter 4 the 'absolute frequency' interpretation: on this interpretation, Aristotle simply means, 'events of this type happen (literally) all the time, or most of the time, or neither'. The judgment of frequency is made

without reference to the occurrences of other events (except by way of comparison: 'events of this type happen less often than ones of that type'). Events which happen 'always' do just that -- they happen all the time -- while 'for the most part' events happen 'more often than not'. Thus in some colleges murder is very much the exception: there is only one every ten years; but drunkenness is going on most of the time, and breathing is going on all the time. This interpretation seems very hard to square with the way in which Aristotle applies his threefold classification. Many events which happen 'for the most part' (such as rain in winter, or confectionery-makers producing sweets) do not happen most of the time in this sense -- the former a fortiori, since winter only occupies half the time, and it does not rain every day in winter. Again, there are many celestial events, such as the conjunctions of planets, the completion of a Great Year, and so forth, which only happen very rarely in this sense; but Aristotle would wish to classify them with the perpetual motion of the celestial spheres (and to regard them as happening with the same necessity), rather than with murders at Christ Church. Moreover, as I said in Section I, Aristotle holds that there is no λόγος or ἐπιστήμη of rare events (see n. 22), and this would be puzzling on the absolute frequency interpretation: how could the timing of solar eclipses, or of the appearance of Halley's comet, be studied and calculated by astronomers if that were the case?[24] A

similar point holds for the opposition which Aristotle makes between 'rare' and 'by nature': see below.[25]

It is fairly clear, both from the results of Aristotle's classification and from his description of events when classifying them, that he has a different sort of judgment in mind, namely judgments, not of absolute, but of 'conditional' frequency. He regards rarity, etc., as relations involving ordered pairs of events: thus $\underline{E}_1$ is usual (rare) relative to $\underline{E}_2$ iff $\underline{E}_2$ is usually (rarely) accompanied by $\underline{E}_1$ when E_2 occurs. Thus rain in winter is usual, because when it is winter it rains more often than not. Moreover, Aristotle's familiar connection between 'always or for the most part' and 'by nature', and the opposition between 'by nature' and 'rarely',[26] makes best sense if the frequencies in question are conditional: the workings of nature are causal workings (operative in all four Aristotelian causes), and hence the obvious regularities to see as 'natural' are regular connections between things.[27] Indeed, the question as to whether some event 'happens always or for the most part' in the absolute frequency sense seems entirely irrelevant to the question as to whether it happens in accordance with φύσις (see n. 25).

This 'conditional frequency' interpretation finds confirmation in a number of places. In Met. Δ. 30, Aristotle connects rarity with the

incidental, and his explanation of the former notion appears to be in terms of conditional frequencies:

> We call <u>incidental</u> that which attaches to something and can be truly asserted, but neither of necessity nor for the most part; for instance, if someone in digging a hole for a plant found treasure. This -- the finding of treasure -- is incidental for the man who digs the hole; for neither does the one come of necessity from the other or after the other, nor, if a man plants, does he for the most part find treasure . . . (1025a14-19).

This is echoed in the discussion of the incidental in <u>Met.</u> E. 2:

> . . . this [the existence of things which are for the most part] is the origin and this the cause of the existence of the incidental: for that which is neither always nor for the most part we say is incidental. For instance, if there is wintry and cold weather in the dog-days, we say that this is incidental, but not if there is stifling heat, because the one is always or for the most part, the other not; and a man is pale incidentally, since <this> is neither always nor for the most part . . . (1026b30-36; cf. <u>Phys.</u> II. 8 198b34-199a3).

At two points in Aristotle's account of chance in the <u>Physics</u> we saw reason to take rarity as involving conditional rather than absolute frequency. (1) As I suggested in chapter 4 (in the notes on the 'first definition' of chance at 196b29-31), the condition that chance events are 'rare' seems to be equivalent to the condition that they 'come to be incidentally'. Coming to be incidentally is, as we saw in chapter 4, a matter of being incidentally caused in some way or other.[28] Thus the natural way to construe the rarity of chance events is as rarity relative to the occurrences of the relevant incidental cause(s). (2) In

discussing 196b36-197a5, we saw that judgments about absolute frequency are irrelevant to judgments about chance, and we could only make good sense of Aristotle's remarks here by taking them to be concerned with conditional frequency.

There is good reason, then, to take Aristotle's threefold classification as based on judgments of conditional frequency -- that is, on judgments of the frequency of tokens of $\underline{E}_1$ given the occurrence of tokens of $\underline{E}_2$.[29] There is a further question to be asked, however. Let us call the event-type which occupies the '$\underline{E}_2$' position in this schema the 'event-condition' for $\underline{E}_1$. There is a striking difference between some 'always/for the most part/rarely' judgments and others. In some judgments of this sort, the event-condition is explicitly stated -- rain <u>in winter</u>, finding treasure <u>when planting</u> -- or it is obvious from the immediate context: honey-water cures fever <sc. when it is given to fever victims>. In many cases, however, Aristotle's judgments contain no overt or contextual reference to any event-condition: are these judgments of conditional frequency, and if so, what is the intended event-condition? This question is especially urgent, since when Aristotle speaks of the totality of events as being divided into those which happen always, those which happen for the most part, and those which happen rarely, no event-condition is specified.

Light may be thrown on this issue if we consider Aristotle's definition of chance in Phys. II. 5-6. Aristotle's primary characterisation of chance events is that they are beneficial and '(conditionally) rare'; as I have said, rarity turns out to be at least closely connected with (if not equivalent to) 'coming to be incidentally'. One way to take 'rare' or 'incidental' here would be in a weak way -- as rare/incidental relative to something or other. Now every beneficial event will be rare relative to something, and will be incidentally caused by something: so some stronger specification is clearly required as to what this rarity is conditional upon.[30] What is this stronger requirement to be? A desideratum of this restriction is that it should explain what the point is of this classification of events as 'by chance'. Why is it important to be able to describe events this way? One way to answer this question would be to show that chance events form an important 'kind': to show that they all have some property which answers to some need or interest which we have. One such answer is in effect provided by Charlton and Sorabji; for on their view, chance events are marked out as lacking per se causes.[31] Another is offered by Bogen in 'Moravcsik on explanation':

> . . . [Aristotle] holds that what is caused incidentally (and happens by chance) always has a proper cause as well (198a6-13). Presumably, we speak of chance, according to this doctrine, only when we are ignorant of the relevant regularities, or of the features in virtue of which the things involved in a chance happening fit under the regularities. It

> follows that in the market case, it should be possible in principle to give a proper cause for the recovery of the debt, even if in fact we are unable to give it (p. 24).[32]

According to this account, 'chance' designates an important category because to ascribe something to chance is to signal our ignorance of its per se cause. I can see no evidence for attributing this doctrine to Aristotle, however; his endorsement of the ἔνδοξον that chance is ἄδηλον certainly does not commit him to it (see Phys. II. 5 197a15-17 and 196b27-9, and my notes ad loc. in chapter 4). Moreover, the doctrine is plainly false, since if there is a per se cause of C's meeting D in the agora, we do know what it is; our ascription of the meeting to chance indicates no sense of ignorance as to how it really came about.[33]

My suggestion is this: a chance event is rare relative to the natural and deliberative processes taking place in the subject.[34] This promises to explain why the category of chance is useful to us: our aim of understanding the world about us -- making sense of the workings of nature and the strategies of rational agents -- requires us to distinguish pieces of behaviour which are reliably connected with those workings and strategies from those which, even if they appear to be, are not.

We could arrive at this same position in another way, more obviously Aristotelian. What marks out chance outcomes, we might

suggest, is that they are cases where there is the appearance of final causation (since these outcomes are beneficial ones), but no actual (per se) final cause;[35] chance receives the attention which it does in the Physics because the distinction between merely apparent and actual final causation is fundamental, not only to making sense of the behaviour of other people, but also, of course, to Aristotelian natural science. This suggestion prompts the question, 'Why is there no final cause in cases of chance?' The answer must be: because chance outcomes, though beneficial, are only rarely connected with the natural capacities and choices being exercised in the subject, and hence the ends towards which those processes are directed cannot help to explain the occurrence of these outcomes.

Is this line of thought Aristotle's own? Whatever he thinks about their per se efficient causes, he certainly does think that chance events lack per se final causes: 'whenever <things> of which the cause is external come to be not for the sake of what results, we say that <they come to be> from chance' (Phys. II. 6 197b19-20). And, of course, he regularly opposes 'by chance' and 'for the sake of something'.[36] He is thus committed to the view that a chance event is not merely rare relative to something or other, but is rare relative to all the then-active workings of 'mind and nature' in the subject.[37] Moreover, there is good reason to suppose that Aristotle realises this, and utilises the point in his treatment of chance, as we saw in considering the second

definition at 197b18-22. For there he seems prepared to treat as equivalent the condition that the event is rare, on the one hand, and on the other, the complex condition that it is (a) incidentally related to its subject's natural and deliberative processes, and (b) not susceptible of final-cause explanation (sc. in terms of the τέλη of those processes).[38] We have good reason, then, to think that Aristotle defines a chance outcome as a beneficial event which is rare relative to the natural and deliberative processes taking place in its subject.[39]

One of the most striking things about Aristotle's discussion of chance in Phys. II. 4-6, however, is that he never adverts to -- let alone describes -- this relativisation of rarity to the subject's natural and deliberative processes. On the contrary: he introduces in a very formal way the two classifications 'beneficial/non-beneficial' and 'always/for the most part/rarely', and appears to think that it is entirely adequate to define the class of chance outcomes as the intersection of the classes of beneficial and rare events. This suggests that, when no event-condition is given, Aristotle's 'always/for the most part/rarely' classification is meant to incorporate this relativisation to the nature and choices of the relevant subject(s): to say that E happens neither always nor for the most part just is to say that it occurs only rarely on the occasions when the same natural capacities are being exercised or the same choices have been made.[40]

We have seen something of how this usage works in connection with rarity. It also accords well -- subject to a qualification discussed below -- with Aristotle's treatment of 'always' and 'for the most part'. If '_E_ happens for the most part' means '_E_ is the usual accompaniment of some natural or deliberative capacity which belongs to its subject', it is not surprising that, in connection with the sublunary world, Aristotle equates the events which 'happen for the most part' with those which happen in accordance with nature; for as a matter of course Aristotle sees the workings of nature as reducible to the workings of the natures of individual subjects. In a similar fashion, nature in general is equated with what happens 'always or for the most part'; this too accords with the idea that to say that _E_ happens always would be to say that _E_ always accompanies the operation of some aspect of its subject's nature. This last idea will be taken up again in the final chapter.

An important qualification must be made at this point. Aristotle sometimes speaks as if _E_'s happening rarely were by itself both necessary and sufficient for its happening incidentally to its subject (cf. the explanations of the incidental quoted above, and the discussion of the 'subscription example' [and n. 73] in chapter 4 above). Likewise, he sometimes appears to treat _E_'s happening always or for the most part as necessary and sufficient for its belonging _per se_ to its subject, and for its happening in accordance with the nature of that

subject. It would, however, be very surprising if Aristotle held precisely this view; for these straightforward equations leave no room for any distinction between regularities and anomalies which are incidental to their subjects and ones which are not. Suppose a given species of animal, S, never or only rarely interbreeds with another species -- i.e., members of S refrain always or for the most part from interbreeding in this way. It is obvious -- and should have been obvious to Aristotle -- that we ought to be able to distinguish between cases in which this failure to interbreed is due (in part) to the φύσις of S in some way, and cases in which interbreeding is perfectly possible physically, and the failure is due to something incidental to S's nature, such as geographical distribution.[41] If Aristotle takes E's regularity to be sufficient for E to belong per se to its subjects, he cannot make this distinction; it is hard to believe that he does adopt this naive view.

There is some evidence that Aristotle did reject the naive view, though it is, admittedly, very meagre. (i) At An. Post. I. 6 75a28-34 Aristotle seems to allow that something can belong to its subject always (or, presumably, for the most part), and yet be incidental: 'For what is accidental is not necessary, so that you do not necessarily know why the conclusion holds -- not even if it should always be the case but not in itself . . .' (75a31-3, Barnes's Clarendon Aristotle translation).[42] This counts for less than it might seem, since the passage comes at the

end of a section (I. 4-6) in which Aristotle develops an account of belonging _per se_ and of its relationship to being of necessity which seems to be confused and at odds with his standard view.[43] (ii) _Pol._ III. 8 1279b34-8: 'The argument seems to show that, whether in oligarchies or in democracies, the number of the governing body, whether the greater number, as in a democracy, or the smaller number, as in an oligarchy, is an accident due to the fact that the rich everywhere are few, and the poor numerous' (_CWA_ translation). At 1279b34-1280a6 Aristotle seems to countenance the idea that the rulers in oligarchies are always few in number, but that this is so _incidentally_: _per se_, such rulers are wealthy. Aristotle seems to be thinking that there is nothing in being wealthy, considered in itself, which requires the wealthy to be in a small minority, even though they always are. (iii) In two passages Aristotle describes as incidental processes involving τὸ ψυχρόν which he must think of as happening always or for the most part: '[fluid] is evaporated by heat _per se_, but by cold _per accidens_ -- in the latter case the fluid accompanies the heat when it makes its exit, as there is no fluid without its heat' (_GA_ V. 3 783a34-7, Peck's Loeb translation; cf. _Meteor._ IV. 5 382b7ff.). Aristotle cannot be denying that the cold is, _qua_ cold, a part of a lawlike causal chain which results in evaporation; he labels it a _per accidens_ cause nonetheless. Presumably this is because in his physical theory, cold is characterised essentially by its power of bringing things together (_GC_ II. 2 329b29-

30) -- the very reverse of evaporation. Considerations of the φύσις of τὸ ψυχρόν lead Aristotle to overrule the claim of this process to be called per se.[44]

These indications are slight; but (ii) and (iii), for what they are worth, suggest that Aristotle is prepared to regard the inference from regularity to belonging per se as defeasible by considerations of the nature of the relevant subject. Indeed, if my interpretation of the GA passage is correct, the inference can be blocked by such considerations even when the regularity is lawlike. It is, of course, precisely this idea of 'defeasibility by considerations of the nature of the subject' which we require to license the distinction between the two cases of regular failure to interbreed described above. If Aristotle is to recognise this distinction, he must hold that happening always or for the most part is sufficient for belonging per se and for happening in accordance with mind or nature providing that there are no countervailing considerations concerning the nature or choices of the subject. And this would be a sensible position to adopt: it leaves conditional frequency relative to the νοῦς or φύσις of the subject at the centre of the stage, but also recognises that these relata -- νοῦς and φύσις -- have a role to play in the relevant explanatory theory in their own right.[45]

If this suggestion is correct, then when Aristotle speaks of happening '(always or) for the most part' as being sufficient for belonging per se and for happening by nature, he must be using the expression to refer to a proper subset of the things which happen always or for the most part. That Aristotle does this would not in any case be very hard to understand. The regularities which comprise this subset not only constitute the vast majority of regularities (since incidental regularities are themselves rare), but also are 'scientifically perspicuous': they reflect truths about the causal workings of the world, and in consequence have a straightforward place in an explanatory theory. Incidental regularities, by contrast, embody only the appearance of a causal or explanatory order, and do not belong in such a theory as either input or output: statements of such regularities would figure as mere asides, at best.[46]

Moreover, Aristotle clearly does use 'happens (always or) for the most part' in this sort of way, to refer to scientifically-important subsets of what actually happens always or for the most part. His equations of '(always or) for the most part' with 'in accordance with nature', for instance, ignore those regularities which are the product of νοῦς: his concern in these passages is simply with the regularities relevant to natural science. A very striking case of this sort of narrowing down of the reference of 'for the most part' is his use of this expression in syllogistic contexts as apparently equivalent to a

'by nature' operator, even though the inclusion of the relevant event-condition positively invites the construal of 'for the most part' as a binary, 'most' quantifier.[47] Again, Aristotle sometimes equates 'neither always nor for the most part' with 'by chance', and even replaces the former by the latter in the threefold classification,[48] despite the fact that, as we know from Phys. II. 4-6, chance events constitute only a subset of rare events. The explanation clearly is that Aristotle narrows down the reference of 'neither always nor for the most part' to a subset of rare events which (as cases of apparent final causation) are especially important for the natural scientist.[49]

I conclude that, although 'always', 'for the most part' and 'neither always nor for the most part' strictly signify everything which has the appropriate conditional frequency relative to its subject's φύσις or νοῦς, Aristotle is prepared to use these expressions to signify special subsets -- ones which are of particular importance from the point of view of scientific theory. If so, nothing prevents us from seeing him as using them to refer to those regularities/anomalies which do not incur a countervailing judgment from theoretical considerations of their subject's φύσις in the way I described earlier. Thus it would be quite natural for Aristotle to use 'happens for the most part' and 'happens always' to refer to events which are the usual or exceptionless products of the operations of their subjects' natures and choices,

rather than to the wider class of events which normally or always accompany these operations. I shall return to this point in Section III of chapter 6.

Chapter Five: Notes

1. Sorabji uses 'accidental' rather than 'incidental'. In this discussion I shall use the terms interchangeably.

2. But see nn. 4 and 9.

3. Sorabji does not explicitly endorse this entailment, but it is hard to see how he could deny it: what would it be for an event to have a genuine explanation, but not to have a per se cause? Aristotle simply does not distinguish between 'cause-type' explanations and others. (Throughout this discussion 'cause' and 'explanation' are both restricted to one Aristotelian mode -- the 'efficient' mode; something could, of course, lack an explanation in one mode, but nonetheless have a cause in another mode.)

4. Cf. 'We must wait and see . . .', NCB, p. 6. Sorabji does claim at one point that, according to Aristotle, all accidents have only accidental causes (NCB, p. 5, n. 5, citing Met. E. 2 1027a7-8); if this were so, no accident would have a per se cause, and hence its accidental cause would not be indirectly explanatory. This is because Sorabji's Aristotle must think that an event has no genuine explanation at all if it has no per se cause (see n. 3 above). But Sorabji subsequently claims that some accidents do have per se causes (NCB, p. 6): it is not clear whether he regards Aristotle's assertion at 1027a7-8 as simply mistaken, or as intended to be restricted to coincidences. I shall return to this point, and suggest a different interpretation of 1027a7-8, later in this section.

5. The point only affects the question which we discussed earlier as to the precise nature of accidental causation in Sorabji's sense 2. If we deny that A is indirectly explanatory of C in this case, then an event's being accidentally caused in sense 2 must be compatible with its having a per se cause. If, on the other hand, we say that A is indirectly explanatory of C, then sense 2 of 'accidental causation' can be equivalent to 'only having an accidental cause'.

6. The decision to build a wall in this fashion is also, of course, a *per se* cause (further back in time) of the conjunction of *E* and *F*.

7. Sorabji argues that such conjunctions do not cause coincidences, and that coincidences do indeed lack any *per se* cause. Charlton also seems to think this. I am not convinced by Sorabji's argument, however; for criticisms see Gail Fine, 'Aristotle on determinism: a review of Richard Sorabji's *Necessity, Cause and Blame*', *Philosophical Review* 90 (1981) 561-79, at pp. 563-4 and 576.

8. It may be harder to construe the meeting of the robbers and the thirsty man at the well at *t* as forming an accidental unity with each of the respective 'conjuncts'; for, in contrast to my wall example, the subjects of the various states of affairs are different. But this difficulty is merely technical, I think: (i) Sorabji's argument about coincidences does not rely on any such point; (ii) *X*'s being at the well at *t* is clearly *some* sort of concomitant of *X*'s being at the well *together with the robbers* at *t*, and the parallelism of this case with that of the wall is such as to suggest that we should treat the causal relationships in each case in the same way, even if 'accidental unity' is not what connects the various 'effects'.

Note that we would be able to regard the murder example as an instance of schema (1) instead of schema (3A) if *A* here were taken to be a concomitant of the conjunction (*A* and *C*). But I think we should deny that *A* is a concomitant of *C*, and consequently of (*A* and *C*); this is precisely because *F* is a *coincidence*: for this to be true, *A* and *C* must be thought of as wholly independent of each other. (Contrast the case of *E*, which is not wholly independent of *G*, even if their connection is weaker than accidental unity.)

9. More strictly, his view is that it is only coincidences which *as a class* have only accidental causes. As we saw in Section I, Sorabji does not rule out the possibility that some other accidents may lack *per se* causes; but the existence of the type II form of incidental causation, and Sorabji's acknowledgment that incidental causes of this type, at

least, 'point the way' to genuine explanations, commit him to the view that some accidents do have per se causes.

10. The form of the remark at a7-8 -- τῶν γὰρ κατὰ συμβεβηκὸς ὄντων ἢ γιγνομένων καὶ τὸ αἴτιόν ἐστι κατὰ συμβεβηκός -- would make it very difficult to take it as applying only to the second class of accidents distinguished here, rather than to both classes. Even if this were possible, it would still be implausible to identify this second class with that of coincidences. I discuss this remark, and the denial implicit in 1027a5-8 that there are any τέχναι for producing accidents, in n. 22 below.

11. Strictly, this argument does not show that everything happens of absolute necessity, even if we supplement the conclusion with the content of the first premiss -- i.e. with the further claim that past and present are, because of their irrevocability, absolutely necessary. For all this argument shows is that every event which is future now is now necessary. But it looks as if we could derive the required conclusion by generalising twice over with respect to time: once to utilise the reference to the past more fully, to show that all now-future events have been absolutely necessary at all now-past times, and again to show that for any time, all the then-future events are at that time, and at all then-past times, absolutely necessary. Thus, for any event, there is no time at which that event is not absolutely necessary (if we add the necessity of the past and present). This would be true whether or not time had a beginning; for if time did have a beginning, the first event(s), while not shown to be absolutely necessary by the E. 3 argument (since they are never future), are nonetheless always absolutely necessary by virtue of the necessity of the present and past.

12. I think that Sorabji's interpretation here is the right one: for a defence of it, see my 'Today's sea battle', Section VI.

13. See his discussion of determinism and responsibility in NCB, chs 14-15, and in particular his claim that only the existence of non-necessitating causes will allow responsibility, on the grounds that

otherwise we should have to be able to influence the past if influencing the future is to be in our power (NCB, pp. 37 and 251-6).

14. The best discussion remains that of David Hume, An Enquiry concerning Human Understanding, section VIII; Sorabji's own position is liable to criticism of a Humean sort: see Paul Russell, 'Sorabji and the dilemma of determinism', Analysis 44 (1984) 166-72.

15. It is this feature of Sorabji's account which also ensures that Aristotle must make the fallacious move discussed under (3) above.

16. It might be argued that the An. Post. account is not concerned with causal necessitation (in the modern sense), but with 'essential' necessitation, since its concern is with definitions, not laws. But (a) Aristotle builds a general link between syllogisms and all four causes (see Léon Robin, 'Sur la conception aristotélicienne de la causalité', Archiv für Geschichte der Philosophie 16 (1909) 1-28 and 184-210, and Barnes, Aristotle (Oxford: Clarendon Press 1982), ch. 12); (b) the explananda treated in the An. Post. seem to call for the inclusion of causal laws somewhere in the chain (cf. Ackrill, 'Aristotle's theory of definition', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981), at pp. 381-2).

17. Of course, Aristotle's exact position on 'for the most part' explanations is notoriously obscure, and it is controversial whether he thinks that their presence in a science reflects simply our cognitive limitations, or an objective fact about the physical world. (See, for example, the disputed remark about honey-water at Met. E. 2 1027a22-6, and the comments of Ross and Kirwan ad loc. (Ross, Aristotle's 'Metaphysics', I, 361; Kirwan, 'Metaphysics' Γ, Δ and E, p. 195). I refer to this passage again, in different connections, in Section II below and in Section I of chapter 6.) This might provide a foothold for a defender of this reading of E. 3 who wished to argue that in Aristotle's view 'for the most part' explanations are not adequate or full explanations after all; but he would still have to explain away Aristotle's acknowledgment of 'for the most part' demonstrations in the

An. Post.. There is, it is true, a countervailing tendency in the An. Post. to insist that the explanans must necessitate (see, e.g., I. 2 71b9-16 and 4 73a21-7). That point would be of little use to the interpretation we are considering, however; for this work is concerned only with scientific knowledge. To base a claim that no 'for the most part' explanations are genuine upon this feature of the An. Post., one would also have to claim that, for Aristotle, the only adequate explanations are scientific explanations; among other difficulties, this would make it doubtful that Aristotle could take human action to admit of any genuine explanations. (Charles ignores the restricted scope on the An. Post. in the same way in connection with a related issue [Aristotle's Philosophy of Action, pp. 49-50]. He assumes that, since demonstrative explanations only employ predicates which belong per se to individual subjects, all per se causes must inhere in individual subjects too. This clearly does not follow: Charles needs the extra premiss that every per se cause can be the object of scientific knowledge.)

The issues here deserve a fuller treatment than I can give: see, in particular, Barnes, 'Aristotle's theory of demonstration', Phronesis 14 (1969) 123-52 (reprinted in a revised form in Jonathan Barnes, Malcolm Schofield and Richard Sorabji [eds], Articles on Aristotle, Volume 1 [London: Duckworth 1975]); Lloyd, 'Necessity and essence in the Posterior Analytics', in Aristotle on Science (see n. 16 above), at pp. 165-7; Sorabji, 'Definitions: why necessary and in what way?', in the same volume, at p. 212. Some commentators, such as Lloyd, take 'for the most part' not to be allowed as featuring in 'proper' explanations. But such interpretations seem forced to gloss 'proper explanation' as 'ideal explanation' -- so, at least, Lloyd, loc. cit.. (Lloyd cites the remark at An. Post. I. 8 75b33-6 in support of his interpretation [p. 166], but, as Barnes points out, this remark is simply not concerned with 'for the most part' [Barnes, 'Posterior Analytics', p. 131]; I discuss this remark further, in a different connection, in Section III of chapter 6.)

Although I have stressed here the significance of Aristotle's recognition of 'for the most part' explanations, I wish by no means to deny the significance of the necessitarian tendency in his account of

scientific understanding: it is clear that the paradigm of such understanding is the appropriate grasp of things 'which cannot be otherwise'. I return to this point in chapter 6, Section III.

18. Cf. Fine, 'Aristotle on determinism', p. 569.

19. See chapter 6, Section III, n. 26.

20. For a good discussion, see Arthur Madigan, 'Metaphysics E 3: a modest proposal', Phronesis 29 (1984) 123-36).

21. What follows owes something to the interpretation offered by Robert Heinaman in 'Aristotle on accidents', Journal of the History of Philosophy 23 (1985) 311-24. (I am unconvinced, however, by the main contention of his paper, which is that Aristotle's views on accidents are irredeemably confused.)

22. This point raises a final problem for the view that all Aristotelian incidentals have per se causes. Aristotle insists that there is no λόγος or ἐπιστήμη of the incidental (Phys. II. 5 197a19-20, Met. E. 2 1027a19-23; cf. An. Post. I. 30 87b19-27); Met. E. 2 also contains, as we have seen, an implicit denial that there are any of incidentals either. How can these claims be reconciled with the view that incidental events have per se causes which would regularly produce the same result? (The question as to why there are no τέχναι of incidental events is not actually made any harder by asserting that such events have per se causes; for no-one denies that they have temporally prior sufficient conditions -- the only issue is as to whether these conditions are causes. Faced with Aristotle's denial that there is any systematic knowledge of how to bring incidental events about, it is the fact that they have sufficient conditions which is problematic.) To answer these questions we once again need the point that an incidental event $\underline{E}_1$ must satisfy a description which makes reference to another event $\underline{E}_2$, to which it is incidentally connected. There is no ἐπιστήμη or λόγος of $\underline{E}_1$ in the sense that there is nothing in the nature of $\underline{E}_2$ which fully explains its connection with $\underline{E}_1$, and vice versa; incidental connections are 'indefinite', since an indefinite number of things could

possess the relation to $\underline{E}_1$ which $\underline{E}_2$ does, and vice versa (see Phys. II. 5 196b27-9 and my notes ad loc. in chapter 4). This indefiniteness is also the reason why there are no τέχναι of incidental causes. Getting from $\underline{E}_2$ to $\underline{E}_1$ will necessarily involve bringing together two chains of causation; but there may be any number of ways of doing this, and no systematic way of ordering these as more and less efficient: for which means are the most efficient will depend entirely on the circumstances of the particular case. (Keeping a man in a dark cellar will make him pale: but how does one get the man into the dark cellar? Kidnapping may be appropriate in one case, the mention of amontillado in another.) This seems to be something close to Aristotle's point at EE VIII. 2 1247b11-15: ἀλλ' ὅταν τὸ αὐτὸ ἀποβαίνῃ, ἀπείρων καὶ ἀορίστων, ἔσται μὲν τὸ ἀγαθὸν ἢ κακόν, ἐπιστήμη δ' οὐκ ἔσται αὐτοῦ δι' ἐμπειρίαν (I adopt Woods's text ['Eudemian Ethics', p. 217]). The impossibility of τέχναι thus hinges on the fact that $\underline{E}_2$ and $\underline{E}_1$ are connected by incidental causation; and I take Aristotle's remark at 1027a7-8 to be making the point that the connection is of this nature.

23. John Cooper offers a third option -- something like a combination of the two described below -- in 'Aristotle on natural teleology', in Malcolm Schofield and Martha Nussbaum (eds), Language and Logos: studies in ancient philosophy presented to G.E.L. Owen (Cambridge: Cambridge University Press 1982). I shall discuss this in Section I of chapter 6.

24. There are some things, of course, which could come under the heading 'the timing of eclipses' but which are incidental events (cf. Sorabji, NCB, pp. 9-11 and n. 16); examples include an eclipse occurring just when the Athenians are about to withdraw, and, perhaps, an eclipse occurring tomorrow -- although the reference at Met. K. 8 1065a16 is rather unclear. In these cases the incidental event is the concomitance of the eclipse with some other event (if the eclipse occurring tomorrow is incidental, 'tomorrow' must be construed as an indexical: what is incidental is the connection between the timing of the eclipse and what our position in the time series happens to be). Such incidental conjunctions are not the subjects of astronomical study, of course -- whereas the interval between two particular eclipses, for instance, is.

25. Although he does not formulate this distinction between absolute and conditional frequency, Mario Mignucci defends a view of 'for the most part' which is in essence the same as the absolute frequency interpretation ('Ως ἐπὶ τὸ πολύ et nécessaire dans la conception aristotélicienne de la science', in Aristotle on Science [see n. 16]). Mignucci rejects the idea implicit in my conditional frequency interpretation that 'for the most part' is a plurative quantifier ranging over cases, and defends the view that it ranges over times (more strictly, over instants of time). I am unpersuaded, for a number of reasons.

(i) Mignucci notes that while in some places Aristotle uses 'for the most part' in connection with 'times', in others he uses it in connection with 'cases'; he explains this apparent inconsistency as merely reflecting the flexibility of ordinary linguistic usage (pp. 185-7). But of the texts he cites for the 'times' usage, one contains no temporal word at all (Int. 9 19a18-22, which uses 'μᾶλλον'). Another -- GA I. 19 727b26-30 -- couples ὀλιγάκις with ὀλίγαις : Aristotle's point is clearly that the phenomenon in question happens in only a few cases, and ὀλίγαις and ὀλιγάκις merely make this point synchronically and diachronically. In the other two passages 'temporal' words do appear on their own (ποτέ at HA VI. 4 562b3-9, ἀεί at EN IX. 2 1164b30-34). But these words -- like 'often' (and indeed 'times') in English -- can be understood either temporally or non-temporally; and in both passages it is obvious that Aristotle is concerned with the frequency of cases, and not with the frequency of times. The reverse, however, is not true: the passages which Mignucci sees as referring to cases (Cat. 7 7b24-7, HA V. 20 553a4-6 and VI. 29 578b15-16, PA III. 2 663b28-9, Rhet. II. 15 1390b23-4) cannot be reconstrued as referring to times.

(ii) Mignucci's only positive argument in support of his interpretation is that Aristotle twice associates being 'for the most part' with being εἰκός (An. Pr. II. 27 70a2-6 and Rhet. I. 2 1357a34-b1). He writes, 'Il est facile de voir que le modèle auquel on peut se référér pour expliquer l'équation entre l'εἰκός et l'OETP est celui que nous avons caractérisé grâce à la quantification sur les instants du temps' (p. 197). But there is nothing in this 'equation' which favours

Mignucci's 'times' interpretation over the 'cases' interpretation; in fact, it favours 'cases' over 'times' for reasons analogous to those outlined under point (iii) below. Mignucci thinks that, if 'for the most part' refers to cases rather than to times, 'for the most part propositions' would be capable of being always true, and hence, via (P1), of being necessary and certain rather than merely probable. But this line of argument in effect begs the question, since it assumes that the relevant sense of 'always' is 'at all times', rather than 'in all cases' (he relies on this assumption again in a criticism of the 'cases' interpretation on p. 187). Mignucci also appeals to Rhet. II. 25 1402b34-1403a2 in support of his view of the link with εἰκός (p. 197 and n. 51); but, as he agrees, 'le passage est difficile', and can be interpreted so as to support either view.

(iii) If Aristotle does understand 'for the most part' as Mignucci suggests, then his association of 'for the most part' with 'by nature' is unjustified. A proposition's 'for the most part' truth, in this sense -- i.e. its being true at more times than it is false -- is irrelevant to the issue of whether the event/state which it describes occurs in accordance with nature. If the world goat-population were sufficiently large, for instance, 'There exist some hermaphrodite goats' -- or its equivalent in syllogistic form -- could be true at most or all times (cf. GA IV. 4 770a35-6 and b33-6), yet this condition could still be an unnatural and anomalous one for goats to be in. 'For the most part falsity' is similarly irrelevant: if it were relevant, births of normal human babies would only be in accordance with nature if the Earth's population were always large enough to ensure that there were more moments when a birth of this sort was taking place somewhere than moments when one was not.

26. See An. Pr. I. 13 32b4-13; Cael. I. 12 283a2-3 (with my notes ad loc. in chapter 2) and III. 2 301a7-9; the argument of Phys. II. 8-9, and especially 198b34-6; PA III. 2 663b28-9; GA IV. 8 777a17-21; EE VIII. 2 1247a31-3; Rhet. I. 10 1369a32-b2.

27. As I shall argue in Section I of chapter 6, Aristotle takes 'happening always or for the most part' over a finite period of an

appropriate duration to be sufficient (given certain other conditions) to demand scientific explanation. His own beliefs in the eternity of the cosmos and of (most) species, as well as in the basically cyclical character of both human and natural history, create a purely technical problem as to how the 'for the most part' and 'rarely' frequencies are to be measured when the number of occurrences of the 'event-condition' is infinite. (The same problem would arise on the absolute frequency interpretation: what is it for E to happen 'most of the time' if time is infinite?) We can solve this problem (for an Aristotelian universe of finite size) by introducing the notion of a 'sufficiently long, though finite, period of time'. $\underline{E}_1$ happens for the most part relative to $\underline{E}_2$ over an infinite time iff $\underline{E}_1$ accompanies most of $\underline{E}_2$'s occurrences in all such periods contained in the infinite time. The idea of 'sufficiently long' is that the period must be long enough to exclude expectable anomalies due to seasonal or freakish variations; how long is 'sufficiently long' will vary according to the nature of $\underline{E}_1$ and $\underline{E}_2$, and will have to be determined by considerations drawn from the relevant scientific theory. An analogous solution would also work for the absolute frequency interpretation, and is essentially the one adopted by Mignucci ('Ὡς ἐπὶ τὸ πολύ', pp. 199-201; see n. 25).

28. As I said in chapter 4, the necessary and sufficient condition for E's coming to be incidentally could be: (1) E has at least one incidental cause; (2) E is incidentally caused, but has no per se cause; (3) E is incidentally caused by at least one, and is per se caused by none, of some favoured set of events. It will be clear by now that I reject (2); I shall return to the question of which of the remaining possibilities does constitute coming to be incidentally at the end of this Section.

29. A further passage -- An. Post. II. 12 96a8-11 -- might appear to support my interpretation, since Aristotle there associates the 'always/for the most part' classification with propositions of the form 'All/most As are Bs': . . . τὰ δὲ ἀεὶ μὲν οὔ, ὡς ἐπὶ τὸ πολὺ δέ, οἷον οὐ πᾶς ἄνθρωπος ἄρρην τὸ γένειον τριχοῦται, ἀλλ' ὡς ἐπὶ τὸ πολύ. But since Aristotle's interest here is, of course, in syllogistic propositions, the use of propositions of the form 'All/most As are Bs'

is only to be expected, and does not tell us whether 'always' and 'for the most part' propositions are essentially of this form.

30. The same conclusion can be drawn from Aristotle's application of the threefold classification to the totality of πράγματα. The resulting classes are clearly meant to be exclusive; but they would not be exclusive if being rare were simply a matter of being rare relative to something or other, since all events satisfy that condition. (A similar point holds for the other divisions: one and the same event could happen always relative to one thing, and for the most part relative to another.)

31. Although if Sorabji's account of causes as explanations rather than sufficient conditions were correct, the property of lacking a per se cause would only be of theoretical, and not of practical, importance to us (see n. 22 above).

32. I agree with Bogen that Aristotle sees chance events as having per se causes, but I do not agree that the passage he cites -- 198a6-13 -- supports this view. Aristotle's claim there that mind and nature are prior to chance only requires that when a chance event occurs, mind and/or nature is or has been acting as a per se cause of something or other, but not vice versa; this is obviously compatible with the chance event's having no such cause (see further my notes ad loc. in chapter 4).

33. Nor is ignorance of the per se cause a sufficient condition of a beneficial outcome's being ascribable to chance: if I do not know how my pocket calculator works, I nevertheless do not ascribe the results to chance. (None of this, of course, is to deny that we apply to term 'game of chance' to games in which the prediction of certain outcomes is beyond the participants' ability.)

34. By this I mean relative to exercises of these natural and deliberative processes by any (relatively similar) subject, and merely relative to this subject's exercise of them. In Phys. II. 5, it is true, Aristotle illustrates the rarity condition in terms of the same subject's activities (197a2-5); but this illustrative procedure is

really compatible with either view, and if these frequency judgments are to be straightforwardly useful in explanatory theories -- as they are clearly meant to be -- they should be relativised to the activities of any relevantly similar subject.

35. I ignore here the question of bad luck, which does not materially affect the present point. (On bad luck, see chapter 4, n. 47.)

36. For references, see chapter 4, n. 44.

37. Aristotle's defence of teleology in Phys. II. 8 confirms this: the beneficial arrangement of teeth occurs always or for the most part in certain animals; therefore it cannot be the result of chance, and must have a per se cause (198b34ff.). This confirmation is not so straightforward as it might seem, however. For why is the case of teeth different from that of the regular and beneficial occurrence of seasonal rain: if the former is for the sake of easy eating, why is the latter not for the sake of the growth of corn? There would be no difficulty here, of course, if we agreed with Cooper that Aristotle does take the rain to be for the sake of the corn ('Aristotle on natural teleology', pp. 217-18 and n. 12); but I think that it is very difficult to understand II. 8 in this way (see chapter 6, n. 4 for a brief discussion). It might be suggested that the difference between the two cases is that the growth of the corn already has a teleological explanation in terms of human purposes. This will not do for a number of reasons. (i) There is no obvious reason why there cannot be teleological overdetermination, nor why different ends cannot form a conjunctive final cause. (ii) There are parallel cases in which it is hard to imagine Aristotle denying the applicability of natural teleology -- cases such as breeding livestock, where men clearly make use of processes which are naturally-teleological in their own right. (iii) The seasonal rain promotes the growth of many plants not cultivated by man: the view that Aristotle takes the rain to be for the sake of these is equally unattractive. Nor can the difference be that, in the case of the rain but not in the case of the teeth, we can give an adequate explanation without having to appeal to any final causes; for the issue is precisely whether this is true of the case of the teeth. The most

promising answer is that, in the case of the arrangement of teeth, the combination of processes required to bring about the τέλος is ascribable to the natural functioning of a single substance which is also the 'beneficiary' of the τέλος. This is clearly not so in the rain case: neither the rain which falls, nor the meteorological processes which cause it, is responsible for the presence of the seeds or young plants (though of course the fact that rain regularly falls here may be partly responsible), and the τέλος does not bestow any benefit on the rain, clouds, etc.. If the rain case did resemble the teeth case in these respects, then we would have reason both to see the rain/corn processes as being processes in a single whole, and to see the successful growth of the corn as a per se final cause of the rain.

38. It is this which enables Aristotle to explain how a man who regularly goes to the agora to collect subscriptions can nonetheless collect a subscription by chance when he goes to the agora, when he fails to have the relevant intention (see chapter 4, notes on 197a2-5 and n. 74). For if the man lacks the intention to collect subscriptions (perhaps because he forgets that it is subscription-day), his προαίρεσις to collect money is not operative, and his actually getting the money can be incidental to his other προαιρέσεις .

39. For an important qualification to this, see the end of the present Section.

40. The case of judgments that something is or happens incidentally presents an analogous feature. These judgments, too, are essentially relational judgments. As such they can be made relative to any condition, providing that this is specified or made obvious from the context: cold in the dog-days happens incidentally, a stumble may be incidentally worse than pleurisy (EN V. 11 1138b2-5); on this more generally, Met. M. 3 and the excellent discussion by Lear, 'Aristotle's philosophy of mathematics', pp. 162-75 (Lear glosses 'per se connection' as 'necessary connection'; this may be appropriate for the mathematical cases which are his main concern, but it is too strong to capture nature's 'for the most part' connections, and too weak for the essence/accident distinction). But these judgments can also have the particular

function of signifying what is incidental relative to the φύσις of the subject (as in the distinction between essential and accidental predication). In the nature of the case, however -- since 'incidental' usually modifies a predicate -- the analogue of the 'event-condition' continues to be specified via the designation of the subject of the predication.

41. Cf. the explanation which Aristotle reports of why interbreeding is more common in Libya than elsewhere, at GA II. 7 746b9-11: '. . . as there is very little water they all meet together at the few places where springs are to be found, and so animals of different species unite' (Peck's Loeb Translation). An incidental regularity can also occur as a matter of complete accident -- i.e., although each instance of the event has an explanation, there is no overarching explanation of why it occurs regularly. I think that there is some reason to suppose that Aristotle recognised this sort of case too (see n. 49 below), but my present point does not rest on it.

42. See Hadgopoulous, 'A note on Aristotle's notions of universality and necessity', Logique et Analyse 18 (1975) 171-4.

43. See Barnes's notes ad loc. in 'Posterior Analytics'.

44. One further passage which might seem relevant is Phys. VIII. 1 252a32-b2:

> But it is a wrong assumption to suppose universally that we have an adequate first principle in virtue of the fact that something always is so or always happens so. Thus Democritus reduces the causes that explain nature to the fact that things happened in the past in the same way as they happen now; but he does not think fit to seek for a principle to explain this 'always' . . . (CWA translation; cf. Met. Λ. 6 1071b31-3).

But Aristotle's point here is not that regularities can be incidental, and hence not explanatory, but rather than Democritus does not trace this regularity back to a φύσις. For a slightly different account of

this passage, see Barnes, The Presocratic Philosophers, II, 128-30. (Of course, as I said at the end of chapter 4, Aristotle does not think that the atoms' motion can be successfully ascribed to a φύσις which each atom possesses [for references, see chapter 4, n. 105].)

45. It is also to those considerations of what the φύσις/νοῦς are like to which we must, obviously, appeal when the actual occurrences of the 'event-condition' are too few to make a scientifically-respectable judgment of an event's conditional frequency (cf. chapter 4, n. 73).

Of course, the roles of frequency judgments and of judgments about the subject's φύσις are not as easily distinguished as I have made them out to be (δι᾽ἀσαφείας χάριν). This is especially true of a developing science; but Aristotle's interest in the question of how we arrive at a conception of something's φύσις on the basis of observed regularities is not itself well-developed (see An. Post. II. 19).

46. This point is quite compatible with the claim that some or all incidental regularities have per se causes. This is because, if the regularity is incidental to the natures of all the subjects involved, its per se cause(s) will not be located in the φύσις of any single scientific kind; but Aristotelian demonstrative sciences are concerned only with such natures.

47. See An. Post. I. 30 and II. 12 96a8-19, and Barnes, 'Posterior Analytics', pp. 184 and 228.

48. Equates: GC II. 6 333b4-7; Rhet. I. 10 1369a32-b5; replaces: An. Pr. I. 13 32b4-13.

49. In addition to these points, I think that it is possible to defend an interpretation of EE VIII. 2 according to which Aristotle acknowledges the possibility that someone could be regularly lucky (provided that this run of luck has no single recurrent cause); but I cannot defend this claim here.

Chapter 6: 'Always' and 'necessary' again

In this chapter I return to the question of Aristotle's belief in the principle (P1) -- the belief that what is or happens 'always' does so of necessity. I shall consider first a different account from mine of what 'always' means in the context of the the threefold 'always/for the most part/rarely' classification, and then an alternative explanation of the grounds for Aristotle's belief in (P1); in the final section I shall defend the 'conditional frequency' interpretation of 'always' adumbrated in chapter 5, examine the version of (P1) to which this understanding of 'always' gives rise, and outline the grounds which could have led Aristotle to endorse this version.

I

In 'Aristotle on natural teleology', John Cooper argues for a different interpretation of the 'always/for the most part/rarely' classification, claiming that 'always' and 'for the most part' carry a much stronger sense for Aristotle than the one which I wish to ascribe to him. Cooper apparently agrees that the terms do involve the idea what I have called 'conditional frequency'; but he insists that they involve something close to the notion of 'absolute frequency' as well:

> When Aristotle speaks . . . of some arrangement as being so 'always or for the most part' . . . he means to say that that arrangement is found existing eternally or recurring regularly throughout all time, with only the occasional exceptions implied in the 'for the most part' rider. . . . Some rare,

> fortuitous event that nonetheless happened in the same way every time would not be counted by Aristotle as something that happens 'always or mostly' in a certain way; nor would he count animal generation as happening 'always or mostly' in some particular way if animals were found in the universe only in a certain finite period of its existence, even though when they exist they are always or mostly generated in that way (p. 203, n. 4).

Cooper's claim is largely based upon his interpretation of Aristotelian teleology, and of the two defences of teleology in Phys. II. 8-9.[1] He holds that Aristotelian teleology rests upon the premiss of the eternity of species:

> It is the alleged fact of the permanence of the species of living things . . . that constitutes the foundation and justification for all the types of teleological arguments [Aristotle] ever accepts in the natural sciences, with only one small class of exceptions (p. 216; italics original).[2]

This 'alleged fact' of the permanence of organic species is itself a 'reasonable inference' from observed phenomena (pp. 202-4; I discuss this inference below). There are various ways in which this 'fact' could be accommodated within a scientific account of the world (p. 205): a materialist argument 'from below', a Platonistic argument 'from above', and 'Aristotle's way':

> . . . one might simply accept as a fundamental postulate of physical theory that the world permanently has whatever species it contains; that is, one might hold that it is an irreducible fact about the natural world, not further to be explained, that it so governs itself as to preserve in existence the species of well adapted living things that it actually contains (p. 205).

On this basis, according to Cooper, Aristotle argues that there really are goals in nature (viz. plant and animal forms) whose existence literally 'controls and directs those aspects of the processes of generation that need to be explained by reference to them, and that, indeed, is why they need to be so explained' (p. 215); these explanations in terms of animal/plant forms are 'causal explanations [in the modern sense of "cause"], whatever one may think of them so construed' (p. 214).[3]

Cooper detects this handling of the 'fact' of species-permanence at work in the two defences of teleology in Phys. II. 8 and 9, and his interpretation of those two arguments constitutes the main support for his account of Aristotelian teleology.[4] According to Cooper, Aristotle argues in II. 9 that the materialists' theory is simply inadequate to explain the complex development of organisms which always (unless something specifiable goes wrong) result from a given kind of seed. Cooper seems to ascribe a two-stage argument to Aristotle. (i) As far as the observational evidence available to the Greeks went, it must have seemed very unlikely -- even a 'fantasy' (p. 211) -- that the nature of the matter involved could necessitate the precise outcome of any complex physical development (pp. 211-12). (ii) If material necessity cannot explain the development of a complex organism, then what does explain it? The materialists are apparently obliged to say that there is no explanation. This might be acceptable, Cooper argues (pp. 212-14), for

even a very long run of luck -- a long series of 'regular-seeming' generations from seed -- provided that the run might stop at any time; it is not acceptable for processes which have happened and will happen always -- throughout all eternity.

The first stage of the argument, of course, does not depend on the fact of permanent species; correspondingly, the sense of 'always' which is in play here need involve no more than 'conditional frequency'. But in the second stage, the appeal to 'always' in Cooper's strong sense is either unnecessary or self-defeating. If Aristotle is prepared to concede that it would be acceptable to see these processes of generation as merely a long run of good luck (even if they have been occurring throughout recorded history), provided only that they have not been occurring eternally, then his rejection of the materialists' position relies on the reasonableness of the inference to permanence from the observed situation in the way which Cooper outlines on pp. 202-4. Cooper concedes that the claim that species are permanent does not follow from any proof of the eternity of the cosmic framework -- it just is a reasonable inference from observed facts concerning the harmonious and ecologically stable interaction of animals and plants. But now Cooper's Aristotle faces a dilemma. If this inference from the harmoniousness of present interactions is sound, then the materialists can endorse an analogue of it to explain precisely why the 'run of good luck' is in fact permanent: it is permanent because the ecosystem is

self-sustaining.[5] To say this would be to offer an overarching explanation of the run of 'luck' after all; but this explanation does not appeal to the existence of 'goals in nature', and hence would not involve any concession to Aristotelian teleology as Cooper construes it. Alternatively, the inference is only sound if one further assumes that the present harmonious order is not a chance matter: but then one cannot appeal to the inferred permanency of the species in order to demonstrate the falsity of the claim that the present harmonious order is a matter of chance.[6]

The same problem arises for Cooper's interpretation of the argument in II. 8 (pp. 207-209). His premiss (4) reads: 'animals' organs are <u>always</u> (with only occasional failures) formed in such a way as to serve the creature's needs' (p. 208; italics original). As Cooper points out (p. 209), 'always' here must be construed in the strong sense involving the notion of regular recurrence throughout all time; for otherwise the premiss is compatible with our being in a Democritean world, present regularities being merely temporary and a matter of chance. But the truth of premiss (4) so construed depends on the 'reasonable inference' from the ecological stability of the present order. Thus if <u>temporary</u> 'regularity' can be due just to chance, the materialists can simply appeal to whatever makes this inference reasonable in order to explain the <u>permanence</u> of regularity without recourse to 'goals in nature'. Or, if this explanation by the materialists is held to be inadequate, the

'reasonable inference' cannot be held to be reasonable without the additional assumption that the present harmonious order is not due to chance; but then the use of premiss (4) begs the question against the materialists.[7]

In addition to these negative remarks, there is some direct evidence against Cooper's claim about the meaning of 'always/for the most part'. For in at least two passages, Aristotle is quite clearly prepared to use 'always/for the most part' without the implication of eternal instantiation. The first of these is Phys. II. 5 196b36-197a5: Aristotle is not considering the supposition that the man goes to the market throughout all time! Now it is true that Cooper restricts his claim about the sense of 'always/for the most part' to cases of its application to natural arrangements; but the Physics passage is intended to illustrate the general point that events due to luck or to chance happen 'neither always nor for the most part': there is no hint that this condition is radically different when it applies to human arrangements on the one hand, and to natural ones on the other. The second passage is directly concerned with the workings of φύσις: at Met. E. 2 1027a22-6 Aristotle speaks of honey-water curing fever 'for the most part'. Even though the administration of honey-water in a given case may be due to προαίρεσις or τέχνη, this remark clearly refers to a natural regularity which honey-water exhibits (indeed, the prescription of honey-water could not be a matter of τέχνη if this

curative effect were not a natural regularity). There is no suggestion here, however, that honey-water's effect on fever need be regularly instantiated throughout (most of the) whole of time, or even that honey-water itself regularly exists throughout eternity. Aristotle here simply points to a regularity without any regard to the question of its permanent presence in the universe.

II

While Cooper's Aristotle takes the eternal existence of species as an empirical fact which calls for the application of teleological explanations to the members of each species, Waterlow's Aristotle takes it to be a fact of metaphysics, which is (in part) a <u>consequence</u> of his teleological conception of species-members. Waterlow employs the idea of the permanence of species as part of a line of argument which she thinks could have led Aristotle to endorse our principle (P1) (= Waterlow's B). This line of argument constitutes the second of the two sets of 'Aristotelian grounds' for (P1) which are advanced in <u>Passage and Possibility</u>, and of which the first depends on Waterlow's interpretation of <u>Cael.</u> I. 12. The <u>De Caelo</u> argument, as she construes it, makes use of the idea of the 'maximal exercise' of a capacity to be <u>F</u> eternally;[8] Waterlow thinks that this idea in turn depends upon a certain realist conception of infinity, which she sees Aristotle as

abandoning in Phys. III (Passage and Possibility, pp. 75-7). Since Aristotle does not appear to abandon (P1) as well, Waterlow looks for another set of grounds for (P1) which does not depend upon the rejected view of infinity.

This set of grounds is outlined in the second half of chapter 7 of Passage and Possibility (pp. 148-58). It has three basic elements. The first two of these are 'a metaphysical causal principle' that 'an effect is in some way a continuation of its cause' (p. 149), and Aristotle's 'organic concept of substance'. Using these, Waterlow constructs an argument for the conclusion that individual organic substances can be generated only by other organisms of the same species. The 'causal continuity' principle rules out the possibility of any 'pure emergence' -- any effect whose nature fails in some respect to be a function of the nature and properties of its cause(s). Aristotle insists that the φύσις of a given organic substance cannot be regarded as merely a function of the behaviour and properties of its constituent elements; hence the principle of causal continuity would be violated if such a substance were to be created simply by the interactions and rearrangements of the elemental materials, without any further cause being at work. The genesis of actual organisms does not violate the causal continuity principle in this way, since they are generated by another organism which already possesses -- and so can 'transmit' -- the requisite φύσις. But it is impossible for a new type of organism to

come into existence without a violation of the causal principle, since the first member of the new species would not be generated by a prior possessor of the same φύσις. In this way, the causal continuity principle and Aristotle's concept of organic substance are supposed to validate the claim that (in the case of substances) like can only come to be from like.

As for the third element in the scheme,

> . . . the principle of causal continuity which excludes the emergence of species can naturally be extended (an extension Aristotle takes for granted) so as to exclude their extinction. Thus as well as (1): 'Like comes from like', we have (2): 'In every generation like reproduces itself in sufficient instances to ensure the continuance of the species' (pp. 153-4).

Both the 'like only from like' and the 'no extinction' theses are to be thought of as necessary truths. Taken together, they entail that every species which occurs at all is ungenerable and imperishable -- i.e. that, in any given possible world, a species is instantiated at some time if and only if it is instantiated at all times. We arrive at versions of the principles (P1) and (P2) when this result is combined with Waterlow's RT conception of possibility. According to this conception, what is possible (or necessary) <u>simpliciter</u> is possible/necessary relative to the actual state of affairs in <u>this</u> world at some time or set of times (see chapter 3, Section VI above). Consequently, the instantiation of a species is possible <u>simpliciter</u> only if it is

always instantiated in this world, since if there is a time at which it is not instantiated, it cannot ever be instantiated.[9] A fortiori, then, if the instantiation of a species is possible, it will at some time occur -- a version of (P2). Similarly, if a species is instantiated at all, it is ungenerable and imperishable, and hence its permanent instantiation is necessary; a fortiori, if it is always instantiated, it is instantiated of necessity -- a version of (P1).

How satisfactory is this account of Aristotle's belief in (P1) and (P2)? The first point to note is that the versions of (P1) and (P2) to which it gives rise are quite different from those which Waterlow takes to be supported by her interpretation of the argument in Cael. I. 12.[10] In her discussion of that argument, Waterlow claimed that Aristotle's (P1) and (P2) cover every categorizable predicate and all (substantial) subjects;[11] the new (P1) and (P2), by contrast, only concern the instantiation of organic species (and perhaps the genesis of parcels of the four elements -- see p. 153, n. 17). More important than this ad hominem point, however, is the fact that these new versions do not coincide with those endorsed by Aristotle himself: as we saw in chapter 1, the phrase 'what is or happens always' is meant to include the eternal existence of individuals as well as at least some events (such as solstices) which do not constitute the genesis of a member of a substantial species. Waterlow says nothing about the second of these cases, but she does attempt to extend the 'permanence of species'

argument in order to validate the claim that eternal individuals exist of necessity (pp. 155-8).[12] This extension is unconvincing: since it rests on considerations arising from Aristotle's concept of organic substances, the most that it could show would be that if an organic substance exists always, it does so of necessity; but the eternal individuals with which Aristotle is concerned are not organic substances.

Thus the conclusion of Waterlow's reconstructed argument is too heavily restricted to encompass Aristotle's own version of (P1). What is more, Aristotle appears actually to reject one of the premisses of the argument -- the principle of causal continuity. Although Waterlow's defence of this principle (pp. 149-50) presupposes a very weak form, her argument for (P1) and (P2) requires a strong form: every object whose existence is caused must not only be 'in some way a continuation of its cause' (p. 149), but must also be the 'logical product' of its cause -- that is, its behaviour and properties must be 'wholly determined by those of its constituents' (p. 150). It is clear that Aristotle does not endorse this strong continuity principle. (1) On Waterlow's own understanding of the properties of the Aristotelian elements, no parcel of any inorganic μίξις is the logical product, in this sense, of its elemental constituents -- nor even of those constituents together with whatever external forces of heat, pressure, etc. are involved in its genesis: in this respect the genesis of such compounds seems to be on a

par with that of organic substances.[13] But Aristotle does not infer -- and does not believe -- that a parcel of a given μίξις can only be generated by another parcel of the same kind which transmits its φύσις to the new parcel, thus maintaining causal continuity. It is clear that in the case of naturally-occurring μίξεις, Aristotle does not accept the causal continuity principle, if this is construed as Waterlow's argument requires.

(2) Neither does he endorse the principle even in the case of natural organisms: the members of spontaneously-generated species are not the logical products of their causes, nor are they generated by another member of the same species. Waterlow concedes this point (p. 152, n. 15), but her response is unsatisfactory. She says firstly,

> Aristotle holds in effect that causal continuity does not apply to quite all organic kinds, as there are very low forms of life that arise from mud etc. (with which, being so low, they are <u>almost</u> continuous) (p. 152, n. 15; italics original).

This curious remark misrepresents the extent to which Aristotle in the biological works regards spontaneously-generated species as on a par with standardly-generated ones, and in any case does nothing to remove this counterexample to the causal-continuity principle. The second part of Waterlow's response is to claim that at least in the case of <u>reproductive</u> species Aristotle holds to the principle without exception:

> [Aristotle] does not however hold that where it does apply, as in the case of highly organized species, it applies only to some or most members. In these cases (the vast majority) the causal principle holds without reservation (p. 152, n. 15).

But (3) even this very restricted claim for causal continuity in Aristotle seems to be false; for at Met. Z. 7 1032a30-32 Aristotle writes, 'Some [makings] happen also spontaneously or by chance just as natural products sometimes do; for there also the same things sometimes are produced without seed as well as from seed' (CWA translation). What sort of case Aristotle has in mind here is a matter of dispute,[14] but Balme argues convincingly against Ross that Aristotle is thinking of the occasional generation without seed of members of species which are normally generated from seed.[15] Waterlow cites Z. 7 1032a22-5 and Θ. 8 1049b24ff. in support of her interpretation (p. 153, n. 16). In Θ. 8 Aristotle writes:

> For from the potential the actual is always produced by an actual thing, e.g. man by man, musician by musician; there is always a first mover, and the mover already exists actually. We have said in our account of substance that everything that is produced is something produced from something and by something, and is the same in species as it (1049b24-29, CWA translation).

The reference here is presumably to the Z. 7 passage cited by Waterlow:

> And, in general, both that from which they are produced is nature, and the type according to which they are produced is nature (for that which is produced, e.g. a plant or an animal, has a nature), and so is that by which they are produced -- the

> so-called 'formal' nature, which is specifically the same as the nature of the thing produced (though it is in another individual); for man begets man (1032a22-5, CWA translation).[16]

The remark about generation without seed which I quoted above follows this passage almost immediately; if Balme's interpretation is correct, then 1032a22-5 and 1049b24-9 should be understood as talking about normal or paradigm cases -- about cases logically and epistemologically prior to the exceptional ones -- rather than about every case. It is presumably true that Aristotle believes that most members of each reproductive species are generated by another member of the same species, and he may well regard this as a necessary truth. But it does not follow from this that it is impossible for a new reproductive species to come into existence at some moment in history: if Aristotle does believe that this is impossible, it must be on other grounds.[17]

Even if Balme's interpretation of 1032a30-32 is wrong and if 1032a22-5 and 1049b24-9 should be taken as Waterlow suggests, a belief in 'causal continuity' is not what explains Aristotle's rejection of the possibility of a new reproductive species. For the claim that Aristotle takes the causal continuity principle to hold of such species is just a way of saying that he believes that every species-member must be generated by another member of the same species; and as we have seen, we cannot appeal to a more general endorsement of causal continuity to explain why Aristotle believes that. The same point holds for the

belief which Waterlow ascribes to Aristotle that no reproductive species will die out: if Aristotle does not accept causal continuity, a fortiori his reason for denying species-extinction cannot be that it is a 'natural extension' of the causal continuity principle.[18]

III

In Section III of chapter 5, I argued that Aristotle's threefold classification should be regarded as based upon judgments of conditional rather than absolute frequency, and that, when there is no specification of the 'event-condition', these judgments are relativised in the way I outlined to the activities of the subject's φύσις and νοῦς.

Most of the evidence which I adduced for these two claims focused on judgments of rarity, and this might lead one to suppose that the application of these claims to the cases of 'for the most part' and 'always' has yet to be justified. But the general reflections which favoured conditional over absolute frequency hold equally for all three types of judgment; moreover, if these claims are true of judgments of rarity, we should expect them to be true of the threefold classification as a whole -- all the more so given that the three terms appear so often together. In this section I wish to examine two consequences of taking 'always' judgments in this way: this will provide further support for the claim that this is the right way to take them, by showing how the

application of my 'conditional frequency' interpretation to 'always' helps to explain Aristotle's belief that what happens always does so of necessity.

The first of these consequences is that we can explain the restrictions which Aristotle places upon the doctrine (P1). Many things might be candidates for 'being or happening always': a tenseless, dated sentence's being always true, for instance, or a possibility's going forever unrealised. Aristotle, as we have seen, rejects the versions of (P1) to which the admission of such candidates would commit him. What evidence we have suggests that he restricts 'happening always' to the exercises of the natural capacities of eternal things.[19] I shall deal with these points in turn.

(1) It can easily be seen why Aristotle is in a position to exclude the omnitemporal truth of propositions from the scope of (P1). 'Happening always', as I have interpreted it, concerns events which can stand in direct causal relations to other events: a proposition's being true, though not unconnected to causally-operative events, is itself neither cause nor (direct) effect.[20] If 'being always' is of a piece with 'happening always', it must mean 'existing or being F always' and not 'being true always': the candidates for being always will be individuals which can be the subjects of causally-operative events.

(2) Let the possibility in question be an S's being F, where S is the kind to which the possibility attaches.[21] If no S is ever F, then Ss' being not-F appears to happen always relative to all the natural and deliberative processes which take place in Ss: how can Aristotle exclude it from the scope of (P1)? And yet he must, if he is to retain the idea that an S's being F is possible. If 'an S's being F' goes forever unrealised, it is plausible to suppose that this fact -- and the corresponding 'regularity' that Ss are always not-F -- must be incidental to the nature of Ss. For suppose that the nature of an S makes it liable to be F, or would make it F if there were no external interference, and yet Ss are always not-F, this must either be due to some other factor which is incidental to that nature (like the geographical distribution of species in my example in chapter 5, Section III) or it must be a 'complete accident'[22] -- and hence, again, incidental to the nature of Ss. If, on the other hand, this nature rules out an S's being F, then we did not have a possibility to start with.[23] I suggest that, when Aristotle says that events which happen always do so of necessity, he is using 'events which happen always' to refer to those exceptionless regularities which are not incidental to the nature of their subjects, in the way described in Section III of chapter 5.[24] This will explain why the permanent non-realisation of a possibility is not included within the scope of (P1) as Aristotle understands it.

(3) I shall argue below that Aristotle has grounds for ascribing absolute necessity to an event only if its subject is one which exists eternally. This combined with (P1) requires him to hold that only events which have such a subject 'happen always' in the relevant sense; I shall try to justify this later. If this is so, and if, as I have claimed, 'happening always' in this context excludes incidental regularities, it is easy to see why 'happening always' is restricted to the exercises of the natural capacities of eternal things.[25]

We have yet to see, however, why Aristotle takes 'always' to entail 'necessary' at all, even granted these restrictions. This brings us to the second consequence of my interpretation of 'always' judgments. Someone might reasonably raise the following objection to this interpretation. The necessity involved in (P1) -- the necessity which Aristotle ascribes to events which happen always -- is very clearly <u>absolute necessity</u>.[26] Now suppose that we could find grounds for seeing 'always' as entailing 'necessary'; since '<u>E</u> happens always' is a judgment of <u>conditional</u> frequency -- of frequency relative to the occurrence of other events -- will not the necessity which 'always' brings with it be, likewise, conditional or relative necessity?

The point on which this objection rests seems to be quite sound. If there is a link between invariance and necessity, then an invariance of $\underline{E}_1$ relative to occurrences of $\underline{E}_2$ would appear to generate, at most, a

necessity relative to occurrences of $\underline{E}_2$; and it is hard to see how this could amount to more than the causal necessitation of $\underline{E}_1$ by $\underline{E}_2$. This threatens the idea that the relevant frequency in the case of 'happening always' is indeed a conditional one as I have maintained. In response, I suggest that Aristotle's belief in the necessity of what happens always is arrived at in two stages. Firstly, the invariance of the connection between the φύσις of $\underline{E}_1$'s subject and $\underline{E}_1$ itself establishes the causal necessitation of $\underline{E}_1$ by the relevant operations of the subject's φύσις. Now if the <u>existence</u> of the subject, with the nature it has, were itself absolutely necessary, then (by an argument familiar from <u>GC</u> II. 11), the occurrences of $\underline{E}_1$ could themselves become absolutely necessary; for conditional necessity turns into absolute necessity if the condition involved is absolutely necessary. I think that Aristotle takes the subjects of events which happen always themselves to <u>exist always</u>, and hence (for reasons to be explained below) takes them to exist of absolute necessity; it is this necessity which is transmitted to the events which 'happen always'.[27]

Why does Aristotle think that the subjects of events which happen always are <u>eternally-existing</u> subjects? This point is important, since it is hard to see how (given the world as it is) any finite subject's existence could be absolutely necessary; consequently, if events which happen always can have (a series of) finite subjects, they will not possess more than conditional necessity.[28] Strictly speaking, an event-

type which happens always can have (a series of) finite subjects in two ways: the event in question can be (i) the non-occurrence of a never-realised possibility, or (ii) something due to the φύσις of the subject which that φύσις produces without exception (and in everything which possesses it).

The two explanations which I shall offer as to what underlies these links between 'always' and 'necessary' both rely on the idea that Aristotle focuses on only those 'always' judgments which will qualify for inclusion as such in a mature, explanatory, physical theory. As I argued at the end of chapter 5, judgments of incidental regularities -- which, as we have seen, include the permanent non-occurrence of a possibility -- do not have a proper place in explanatory theories (except as asides), since they do not reflect any truth about the per se features of the relevant φύσεις. So in the context of (Pl), Aristotle will ignore all incidental 'always-judgments', whether they relate to eternal or to finite subjects. This rules out case (i).

What of case (ii)? In Aristotle's view, the natures of organic species generally produce their effects only for the most part, thanks to the imperfections and irregularities of matter and to the continual and multifarious intersections of different causal processes. Now it is of course possible that, despite these things, some aspect of an organic φύσις should produce its normal effect entirely without exception. But

to allow such a regularity to qualify for inclusion in our physical theory as one which holds without exception rather than for the most part, we would have to have good reason to believe that it would be exceptionless; and this would not be forthcoming given these general facts about organic matter and about the likelihood of causal interference. There will always be grounds for doubting such a regularity's claim to hold 'always', and hence reason not to promote it beyond the status of a 'for the most part regularity' within the physical theory. It is only in the case of the eternal subjects beyond the sublunary world (and in the case of the four elements) that these considerations do not apply, and that physical theory can supply positive grounds for supposing regularities to be exceptionless.[29]

If these reflections are sound, the 'always' regularities which Aristotle has in mind in connection with his doctrine (P1) are non-incidental, and have eternally-existing subjects. In other words, they are exceptionless regularities due to the φύσις of eternal things.[30]

It is this claim, and the two-stage account of the link between 'happens always' and 'happens of absolute necessity', which I wish to stress here. For while this structure clearly needs to be filled out with an explanation of what generates the respective necessities at these two stages, it is also independent of the particular explanations which we might give.

What sorts of considerations might lead Aristotle to believe, firstly that unvarying connections are (causally) necessary connections, and secondly that if something exists always, it exists of absolute necessity? I shall offer a brief account of two possible lines of thought (which are not mutually exclusive); both focus on the idea of judgments of 'being/happening always' as well-established elements of a physical theory.

The first line of thought draws upon considerations concerning the status of objects of knowledge. Aristotle holds that the paradigm form of scientific knowledge, both demonstrative and non-demonstrative, is of 'things which cannot be otherwise'.[31] In the case of demonstrative knowledge, at any rate, it is plausible to see invariant causal connections involving a single φύσις as the best possible objects of scientific understanding. If -- as Aristotle clearly believes -- demonstrative knowledge of the paradigmatic kind is possible, then these invariant connections will constitute its objects, and hence must be necessary.

This may explain the move from 'always' to 'necessary' at the first stage; how does this line of thought explain the idea that eternal subjects exist of necessity (the second stage)? If Aristotle were to admit the possibility of scientific knowledge of eternal individual substances, exactly the same account could be given; but it seems very

unlikely that he does,[32] and a less direct route is required in consequence. Why does paradigmatic knowledge have necessities as its objects? One answer which Aristotle gives is that knowledge must be stable: if the object known could change, then a subject's knowledge could turn into error (An. Post. I. 6 74b32-9, Met. Z. 15 1039b20-1040a7). If we combine this with his anti-Platonism in respect of the objects of knowledge, we can see that Aristotle could have grounds for taking the world's continued existence as having to be necessary, if genuinely stable knowledge is to be possible; for if the world ceased to exist, the truths known would cease to hold, and knowledge would again become error (cf. EN VI. 6 1140b31ff.). Since the eternal heavenly spheres are not reproductive, they must possess necessary existence if the world's existence is to be necessary.[33]

The second line of thought offers a more straightforwardly unified account. As I said above, if we are to include a regularity in a scientific theory as exceptionless, we must have very good reason for thinking that it will not be interfered with (and that the matter involved is not defective) -- otherwise we should accord it only 'for the most part' status. Now having good reason to think that there will be no such interference is, of course, not the same as having good reason to think that there can be no interference. The context which we are considering, however, is that of a mature physical theory: thus all the known evidence has been taken into account, and the capabilities and

limitations of all the relevant φύσεις have been established. Thus, although there is a possibility of interference with any causal chain which we judge in the theory to be exceptionless, this possibility is an 'abstract' one in the sense that it is not grounded in any particular, known, physical facts, nor implied by any particular part of the physical theory. Should the existence of this abstract possibility be given a place in the physical theory?[34] It is not implausible to see Aristotle as assuming that it should not. The 'possibility' in question answers to no physical reality in the world as we know it; it is at best a possibility based on conceivability, and as such does not count as a discovered fact about the natures of things. If Aristotle did exclude the recognition of such abstract possibilities from the scope of physical theory, judgments of exceptionless regularities within physical theories would have the status of necessities.[35] The same account would also explain the link between 'always' and 'necessary' at the second stage -- the ascription of absolute necessity to individuals which exist always.

The two lines of thought which I have sketched above are necessarily speculative; but I think that they at least point in the right direction. As I have tried to show in this essay, reflection on the nature of Aristotle's threefold classification, and the connection

between rarity and chance, make it clear that Aristotle's belief in the necessity of what is always is not rooted in his conceptions of modality and time, but in his philosophy of nature -- in his conceptions of ἐπιστήμη and φύσις.

Chapter Six: Notes

1. This leads to a further point of disagreement, since Cooper's account of Aristotelian teleology is in conflict with the one presupposed in chapter 5, Section III, above (see also chapter 4, notes on 197b18-22).

Cooper also supports his interpretation of the sense of 'always' by appealing to the argument against Democritus at GA II. 6 742b17-743a1: 'For the Democritean argument to be the threat he takes it to be Aristotle must be holding that the existing species . . . are existent through infinite time' (p. 203, n. 4); he continues, 'The strict interpretation required for "always" in this passage should put us on notice' that this is how Aristotle uses 'always' in the phrase 'always or for the most part'. 'ἀεί' can, of course, mean 'at all times', and seems to do so here; but the fact that Aristotle uses the word in this sense here in connection with the eternal instantiation of (at least some) species shows nothing as to its sense in the 'always/for the most part/rarely' classification.

2. The 'small class of exceptions' is comprised of those in which Aristotle 'appeals to a notion of fittingness derived from some conception of what is inherently well-ordered' (p. 220); these include the appeals to the greater 'nobility' of the front parts over the back and of right-hand parts over left-hand ones (see, e.g., PA II. 14 658a15-24, III. 2 665a6-26, and, in a cosmological context, Cael. II. 5). The problems posed by Aristotle's use of this form of teleological explanation are outside the scope of this discussion.

3. This form of teleological explanation of the eternity of species must be distinguished from (although it is compatible with) the explanation which Aristotle gives at GA II. 1 731b20-732a3 and GC II. 10 336b25-32. If Cooper's account were right, his 'goals actually existing in nature' would constitute the mechanisms, as it were, by which the eternity of organic species is brought about, while the argument in the

GA and GC would explain why these mechanisms exist at all (by showing that the eternity of species is better than non-eternity).

4. Cooper adduces two further pieces of evidence. (1) On the basis of Phys. II. 8 198b34-199a8, he claims that Aristotle takes seasonal weather to be for the sake of the promotion of plant life: it is a consequence of his interpretation of Aristotle's teleology that this belief is entirely in order (pp. 216-18). But this reading of 198b34-199a8 is by no means obligatory: the dichotomy of 'by chance or for the sake of something' (199a3ff.) need not be meant to cover everything which happens 'always or for the most part', and in particular need not apply to the rain and hot weather mentioned in the previous sentence (198b36-199a3) -- they are introduced simply to illustrate the point that rarity is a necessary condition of being a chance event. Moreover, Cooper's claim that when Aristotle says earlier that the weather is not for the sake of the corn (198b17ff.) he is speaking only on his opponent's behalf, is unconvincing: the second example (the rotting corn at 198b21-3) is clearly meant as a straightforward case of the absence of a teleological connection, and it would be very strange if Aristotle presented his opponent's case in this way -- using without comment one example which constitutes uncontentious common ground, and one which embodies the very disagreement at issue. (Why does Aristotle reject the idea that rain is for the growth of corn? For a brief discussion, see chapter 5, n. 37, above.) (2) Aristotle's notorious remark concerning the arrangement of sharks' teeth (PA IV. 13 696b24-34; cf. HA VIII. 2 591b25-9) is also in order given Cooper's account of Aristotelian teleology. Cooper is on somewhat stronger ground here, since this remark is certainly an embarrassment to most commentators (for discussion, see Balme, Aristotle's 'De Partibus Animalium' . . ., p. 96; Martha Craven Nussbaum, Aristotle's 'De Motu Animalium': text with translation, commentary, and interpretive essays (Princeton: Princeton University Press 1978), p. 95; Howard Robinson, 'Aristotelian dualism', Oxford Studies in Ancient Philosophy 1 (1983) 123-44, at pp. 136-8 [Nussbaum gives an unconvincing reply to this in 'Aristotelian dualism: reply to Howard Robinson', Oxford Studies in Ancient Philosophy 2 (1984) 197-207, at p. 205]). Taking the remark seriously does involve crediting Aristotle with the willingness to extend teleological notions

to at least some cases of interactive economy across species; but to show that this willingness stems from a pre-theoretical belief in the permanence of species is another matter.

5. Waterlow offers the materialists a similar argument in her discussion of Phys. II. 8, Nature, Change, and Agency, pp. 77-9.

6. The line of argument for the permanence of species which Cooper actually sketches on Aristotle's behalf seems to fall into both traps. Cooper writes:

> [i] One observes in the world itself, then, no internal disharmony or imbalance that could lead to its eventual destruction; and since [ii] there is nothing outside it that could attack it and cause its disintegration, it seems only reasonable to believe that in these respects no change is to be anticipated (p. 204; my numbering).

The first of these two points can be happily appropriated by the materialist in the way that I have suggested, while to assert the second is already to deny the truth of Empedoclean or Atomistic physics.

7. It is not impossible, of course -- though it seems unlikely -- that in II. 8-9 Aristotle does assume that the main outlines of his world-picture, including the permanence of (most) species, are correct, and is merely arguing that teleological explanation of organic phenomena is required given that basic world-picture. If this were so, Cooper's account of Aristotle's lines of argument in these chapters would not be open to the objection I have raised. But neither would there be any need to see the appeal to the instantiation of species throughout all time as conveyed by the sense of 'always' in the claim that animal parts are arranged thus always or for the most part; for if the permanence of species is being assumed in advance of the argument, the regular occurrence of organic parts arranged in this way throughout all time is entailed by their occurring 'always or for the most part' even in my weaker, 'conditional frequency' sense of these terms.

8. See Passage and Possibility, pp. 57-75, and above, chapter 3, end of Section VII.

9. If anything, however, it seems to be a drawback of the RT conception that it means that the ungenerability and imperishability of species entails that no non-actual species are even possible (and the impossibility in question would be as strong as that of a mathematical impossibility, such as the diagonal being commensurate: see Passage and Possibility, pp. 84-5).

10. Cf. Jane M. Day's review of Passage and Possibility, Philosophical Books 25 (1984) 81-3; she speaks of '. . . radical shifts in subject matter among the various versions of A′ and B′. The effect of these shifts is that in each case the so-called "different versions" are really entirely different propositions. This being so, how are the arguments in ch. 7 even relevant to A′ and B′ as defined in ch. 4?' (pp. 82-3).

11. See Passage and Possibility, p. 61, and above, Section II of chapter 1.

12. If this extension were successful, then the necessity of events which 'happen always' would be secured if such events were necessitated by the natures of eternal individuals (see Section III below). But it is hard to see how the 'permanence of species' argument itself could explain why events which 'happen always' must be necessitated in this way: this link between 'always' and 'necessary' would have to rest on some other set of considerations. If this is correct, no unified account of the connection between 'always' and 'necessary' would be available. In any case, the extension itself is unpersuasive (see the main text below), and Waterlow offers no good reason to believe that the line of thought is Aristotle's.

13. See Nature, Change, and Agency, pp. 80-92. Waterlow's interpretation of the defence of teleology in Phys. II. 8 is open to an objection parallel to the one offered here (see my review of Nature, Change, and Agency, pp. 231-2).

14. Ross, Aristotle's 'Metaphysics', ad loc. (II, 183), and Introduction, p. cxxi; Balme, 'Development of biology', pp. 99-100.

15. Balme also argues that the Z. 7 position, as he interprets it, is inconsistent with the GA: he cites GA I. 1 715b8-16 as providing a 'theoretical argument' against the possibility of the spontaneous generation of a member of a reproductive species:

> For if those that do not come from animals went on to produce animals themselves by coupling, then if the offspring were of the same kind the parents ought also to have been produced like this in the first place (this is a reasonable claim, for it is what we see happening in the other animals), but if the offspring were unlike them but able to couple, then from them in turn would come a different nature of animal, and from these in turn some other, and this would be going on without limit. But nature flees from the unlimited; for the unlimited is incomplete, but nature always seeks an end (Balme's Clarendon Aristotle translation).

Aristotle actually uses this argument to explain why it is reasonable that members of spontaneously-generated species do not generate offspring which are capable of further generation: what has this to do with the question as to whether, in the case of a species which is normally generated from seed, some members of the species could be spontaneously generated? Balme does not spell out why he thinks this argument is inconsistent with 1032a30-32, but presumably he has in mind something like the following. The GA argument might be taken to rule out the possibility that even a spontaneously-generated member of a (normally) reproductive species should itself beget a reproductive member of the same species; but if spontaneously-generated lions, say, cannot, as a class beget further lions which are capable of reproduction, then we might doubt that they are genuine members of the lion species at all. The first step of this argument, however, seems unwarranted: Aristotle's concern in this passage is only with what could regularly happen -- with what could happen always or for the most part -- as the appeal to 'what we see happening in other animals' (b10-12)

makes clear. There is no reason to see Aristotle as committing himself to the absolute impossibility of a testacean producing offspring capable of reproduction, but only to its being, at best, rare and anomalous. If this is correct, there is no conflict between the GA passage and Balme's interpretation of 1032a30-32.

16. Cf. also PA I. 1 640a19-26 and GA II. 1 734b19-735a4. Some of these passages are also discussed in A.C. Lloyd, 'The principle that the cause is greater than the effect', Phronesis 21 (1976) 146-56.

17. The argument at GA 715b8-16 does not supply such grounds: see n. 15 above. At GA II. 7 746a29 - 8 748a13, Aristotle actually insists on something quite close to the possibility of a new reproductive species coming into existence (this passage is cited by Balme in the course of making a different point, Aristotle's 'De Partibus Animalium' . . ., p. 97). Aristotle asserts here that the members of some species can -- and sometimes do -- interbreed, producing offspring which differ in species from both parents. With the exception of mules, these offspring are able to reproduce their own kind by mating with other hybrid offspring of the same sort. (Note that cases like this do not necessarily constitute a further set of counterexamples to Waterlow's 'causal continuity principle', since the φύσις of the new species may be wholly determined by the contributory φύσεις of the parents; for a rather literal-minded case of such determination, see Aristotle's remark at HA VI. 11 566a26-30 concerning the strange hybrid fish, the ῥινόβατος, which has the 'head and front parts of the ray and the after parts of the angel fish'.) Now to admit the possibility (and actuality) of this phenomenon is not quite to admit the possibility of the coming to be of a reproductive species never before instantiated; for Aristotle might hold that his hybrid species never had a first member but have been from time to time instantiated throughout the whole of the past.
Nevertheless, it is hard to see why Aristotle would resist the idea that there might be a pair of species which could interbreed but have never done so (for geographical reasons, perhaps: cf. 746b9-11, quoted in chapter 5, n. 41 above); if members of the two species were brought together, a reproductive species which had never been instantiated before could be generated.

18. Again, it is not entirely clear that Aristotle believes the permanent extinction of _any_ reproductive species to be absolutely impossible. Just as the claims at _Met._ 1032a22-5 and 1049b24-9, discussed above, could be seen as claims about paradigm and/or majority cases, but not necessarily as about every case, so too the texts which speak about the eternity of species need not commit Aristotle to more than the claim that it is necessary that _most_ existing species are eternal -- or perhaps that most existing species are necessarily eternal (see _GA_ II. 1 731b20-732a3; cf. _GC_ II. 10 336b25-32 and _De An._ II. 4 415a22-b7). Some possible grounds for these beliefs are sketched in Section III below (cf. n. 33).

19. See chapter 1, the notes on 28la28-b2 in chapter 2, and chapter 3. The one possible exception to this is the remark at _Phys._ III. 4 203b30, which I discuss in n. 35 below.

20. See Section VI of chapter 3; for this interpretation of 'πράγματα', see _Int._ 9 19a23-39 and my 'Today's sea battle', Sections VII and VIII.

21. I mean to include here cases in which the possibility is specified as attaching to one particular subject -- i.e. where the 'kind' has one member.

22. Cf. chapter 5, n. 41.

23. This leaves, of course, the possibility that the nature of _S_s discourages, but does not rule out, their being _F_. I shall argue below that in this case Aristotle has good reason, in the context of (P1), to relegate _S_s' being not-_F_ to the status of 'for the most part' instead of 'always'.

24. I shall offer a justification for this 'narrowing-down' usage in the context of (P1) later in the Section.

25. And, strictly speaking, to the realisations of their προαιρέσεις; but no subject capable of προαίρεσις is eternal. (I assume here that, if the heavenly bodies move because of _desire_ [_Met._ Λ. 7; cf. _Cael._

II. 12], the way in which the expression of this desire works has a closer affinity to the way in which sublunary φύσεις are expressed than to the way in which human προαιρέσεις are realised.

26. See GC II. 11; PA I. 1 639b24ff.; Met. E. 2 1026b27-37; EN VI. 3 1139b18-23; cf. Int. 9 19a7-11 and Met. Δ. 5 1015b11-15.

27. Aristotle seems to come close to this distinction at An. Post. I. 8 75b33-5: 'Demonstrations and sciences of things that come about often -- e.g. eclipses of the moon -- clearly hold always in so far as they are of such-and-such a thing, but are partial in so far as they do not hold always' (Barnes's Clarendon Aristotle translation).

28. Aristotle may believe that some (or all) organic species are eternal, and hence exist of absolute necessity; but this necessity is clearly not transmitted to the existence of any given member of the species, and hence cannot be passed on to events of which such members are the subjects. The same holds for any given series of species-members: it may be necessary that some such series exists, but it is not necessary that this one does. I qualify my claim in the text with 'given the world as it is'; this is because Aristotle would have grounds for ascribing absolute necessity to finite individuals if the world were one in which causal chains did not intersect, and in which each chain exhibited perfect regularity (see below and Section II of chapter 5).

29. See the De Caelo. Aristotle's account of the natures of the four elements raises many issues which I cannot pursue here. (Note that, since some portions of the elements exist eternally and others suffer transformation, the elements straddle the two stages in my account of the links between 'always' and 'necessary'. Aristotle's remark at Int. 13 23a2-3 -- τὸ πῦρ οὐ δυνατὸν θερμαίνειν καὶ μή, οὐδ' ὅσα ἄλλα ἐνεργεῖ ἀεί -- preserves the ambiguity.)

30. This means that the version of (P2) which is entailed by (P1) as Aristotle understands it is 'If it is X's nature to be F, and if X exists eternally, X will at some time be F'. For suppose X's being F is incidental to its nature; then if X permanently fails to be F, this

regularity will only be an 'incidental' one in the sense described earlier, and hence will not come within the range of (P1) as Aristotle understands it.

Two further points should be made here. Firstly, the interpretation I suggest does not restrict events which 'happen always' to those which are always expressing their subject's nature: for that nature can give rise to different behaviour at different times, and all that is needed is that the event in question happen invariably when the relevant part of the subject's nature is operative. Secondly, when we appeal to the operation of some natural capacity of X in order to explain a piece of X's behaviour, we take it that the exercise of the capacity involves some distinct event in X (perhaps involving some microscopic structure). In some cases of 'happening always' (such as the revolutions of the celestial spheres), it may be hard to specify a distinct event in the subject with which the behaviour in question is invariably linked; but this seems to be a general problem with Aristotle's conception of φύσις: he is in general relatively uninterested in spelling out how his explanatory appeals to the operations of natural capacities manage to be appeals to processes distinct from the behaviour they are supposed to explain (see chapter 3, n. 11). Perhaps the problem was obscured for Aristotle by the ease of the shift, in any given case, from efficient-cause explanation to formal-cause explanation: 'it does this because that is what tigers do' avoids the problems which loom in 'it is behaving like this because of the operation of its natural capacities'.

31. See An. Post. I. 2 71b9-16, 4 73a21-7, 6, 33; Met. Z. 15 1039b27-1040a5, EN VI. 3 1139b18-23. For Aristotle's reasons for this belief, see below and Sorabji, 'Definitions'. (This is not to deny, of course, that Aristotle also allows things which hold 'for the most part' to be objects of knowledge: cf. chapter 5, n. 17.)

32. See An. Post. I. 24, 31 and 33, with Barnes's notes ad loc..

33. Cf. the argument in Met. Λ. 6 discussed in the Appendix to chapter 3 (passage (2e)). A similar line of thought could also provide

Aristotle with the grounds for holding that it is necessary that some (or most) species are eternal; for if a species ceased to have instances, its definition would cease to be an object of knowledge.

34. Of course it must be given a place in our attitude towards the theory: for, in the light of new evidence, science could turn out to be wrong about the absence of such interference, as it could about anything else. But this point is independent of the present question, since this attitude of caution towards our physical theory is in order whether the theory states that such interference is impossible, or only that it will not happen.

35. An analogous explanation seems to be required for certain features of Aristotle's treatment of geometry. I have in mind his claims (1) that the finite size of the universe would make it impossible for geometers to reason about infinite magnitudes were it not for infinite divisibility (Phys. III. 7 207b15-34), and (2) that the truth of atomism would overthrow geometry (Cael. I. 5 271b9-11, III. 4 303a20-24). Clearly Aristotle regards geometry as an applied science (cf. Barnes, The Presocratic Philosophers, II, 55-6); but even so, why should the geometer not think of theoretically possible divisions in physically indivisible atoms, or of possible sizes of the universe larger than its actual size? The answer must be that Aristotle does not recognize such 'theoretical' possibilities as licensed within the relevant physical theory. Given the atomic theory, the splitting of atoms is only an abstract possibility -- grounded upon conceivability, not upon facts about the world. Within Aristotle's own cosmology, the possibility that the universe might have a different size to its actual one is similarly abstract. The same line of thought may explain the one passage where Aristotle endorses (P1) outside the context of the natural capacities of eternal subjects, namely Phys. III. 4 203b30: an infinite void would not have a φύσις in Aristotle's sense. But it is plausible to see Aristotle as thinking that to assert the existence of an infinite place would only be legitimate if that place had a non-abstract role to play in the cosmological theory; and he might think that the only possible role it could play would be as the receptacle for an infinite body.

Bibliography

I. Aristotle: texts, commentaries and translations

Aristotle Opera, edited by Immanuel Bekker, Prussian Academy Edition, 2 vols (Berlin: G. Reimer 1831)

------ Categoriae et Liber De Interpretatione, edited by L. Minio-Paluello, Oxford Classical Texts (Oxford: Clarendon Press 1949)

------ Analytica Priora et Posteriora, edited by W.D. Ross, with preface and appendix by L. Minio-Paluello, Oxford Classical Texts (Oxford: Clarendon Press 1964; reprinted with corrections 1968)

------ Topica et Sophistici Elenchi, edited by W.D. Ross, Oxford Classical Texts (Oxford: Clarendon Press 1958; reprinted with corrections 1970)

------ Physica, edited by Karl Prantl (Leipzig: Teubner 1879)

------ Physica, edited by W.D. Ross, Oxford Classical Texts (Oxford: Clarendon Press 1950; reprinted with corrections 1956)

------ De Caelo Libri Quattuor, edited by D.J. Allan, Oxford Classical Texts (Oxford: Clarendon Press 1936; reprinted with corrections 1955)

------ Meteorologicorum Libri Quattuor, edited by F.H. Fobes (Cambridge, Mass.: Harvard University Press 1919)

------ De Anima, edited by W.D. Ross, Oxford Classical Texts (Oxford: Clarendon Press 1956)

------ De Animalibus Historia, edited by Leonhardt Dittmeyer (Leipzig: Teubner 1907)

------ De Generatione Animalium, edited by H.J. Drossaart Lulofs, Oxford Classical Texts (Oxford: Clarendon Press 1965)

------ Metaphysica, edited by W. Christ (Leipzig: Teubner 1886; reprinted with corrections 1895)

------ Metaphysica, edited by W. Jaeger, Oxford Classical Texts (Oxford: Clarendon Press 1957)

------ Ethica Nicomachea, edited by I. Bywater, Oxford Classical Texts (Oxford: Clarendon Press 1894)

------ [Aristotelis Ethica Eudemia]: Eudemi Rhodii Ethica, adiecto de Virtutibus et Vitiis Libello, edited by Franz Susemihl (Leipzig: Teubner 1884; reprinted Amsterdam: Verlag A.M. Hakkert 1967)

------ Politica, edited by W.D. Ross, Oxford Classical Texts (Oxford: Clarendon Press 1957)

------ Ars Rhetorica, edited by Rudolf Kassel (Berlin and New York: De Gruyter 1976)

------ Fragmenta Selecta, edited by W.D. Ross, Oxford Classical Texts (Oxford: Clarendon Press 1955)

Ackrill, J.L. Aristotle's 'Categories' and 'De Interpretatione': translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1963; reprinted with corrections 1966)

Alexander of Aphrodisias In Aristotelis Metaphysica Commentaria, edited by Michael Hayduck, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vol. I (Berlin: G. Reimer 1891)

Ammonius In Aristotelis De Interpretatione Commentarius, edited by Adolf Busse, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vol. IV part 5 (Berlin: G. Reimer 1897)

Annas, Julia Aristotle's 'Metaphysics' Books M and N: translated with introduction and notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1976)

Balme, D.M. Aristotle's 'De Partibus Animalium' I and 'De Generatione Animalium' I (with passages from II. 1-3): translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1972)

Barnes, Jonathan Aristotle's 'Posterior Analytics': translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1975)

---------- (ed.) The Complete Works of Aristotle: the revised Oxford Translation, Bollingen Series LXXI.2, 2 vols (Princeton: Princeton University Press 1984)

Bonitz, Hermann Aristotelis Metaphysica, 2 vols (Bonn: Marcus 1848-1849)

---------- Index Aristotelicus, Volume V of Aristotelis Opera, Prussian Academy Edition (Berlin: G. Reimer 1870; reprinted Graz: Akademische Druck- u. Verlagsanstalt 1955)

Brunschwig, Jacques Aristote: 'Topiques', Tome I: Livres I-IV (Paris: Les Belles Lettres 1967)

Burnet, John The 'Ethics' of Aristotle: edited with an introduction and notes (London: Methuen 1900)

Burnyeat, Myles, and others Notes on Books Eta and Theta of Aristotle's 'Metaphysics', Study Aids Monograph No. 4 (Oxford: Sub-Faculty of Philosophy 1984)

Carteron, Henri Aristote: 'Physique': texte établi et traduit, 2 vols (Les Belles Lettres: Paris 1926 and 1931)

Charlton, W. Aristotle's 'Physics' Books I and II: translated with introduction and notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1970)

Elders, Leo Aristotle's Cosmology: a commentary on the 'De Caelo' (Assen: van Gorcum 1966)

Gauthier, René Antoine, and Jean Yves Jolif L' Ethique à Nicomaque: introduction, traduction et commentaire, Second Edition, 2 vols (Louvain: Publications Universitaire de Louvain; Paris: Béatrice-Nauwelaerts 1970)

Grant, Alexander The 'Ethics' of Aristotle: illustrated with essays and notes, Second Edition, 2 vols (London: Longmans, Green 1866)

Guthrie, W.K.C. Aristotle: 'On the Heavens': with an English translation, Loeb Classical Library (London: Heinemann; Cambridge, Mass.: Harvard University Press 1939)

O. Hamelin Aristote: 'Physique' II: traduction et commentaire, Third Edition (Paris: J. Vrin 1972)

Hicks, R.D. Aristotle: 'De Anima': with translation, introduction and notes (Cambridge: Cambridge University Press 1907)

Hussey, Edward Aristotle's 'Physics' Books III and IV: translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press; New York: Oxford University Press 1983)

Joachim, Harold H. Aristotle: 'On Coming-to-be and Passing-away' ('De Generatione et Corruptione'): a revised text with introduction and commentary (Oxford: Clarendon Press 1922)

---------- Aristotle: The 'Nicomachean Ethics': a commentary by the late H.H. Joachim, edited by D.A. Rees (Oxford: Clarendon Press 1951; reprinted with corrections 1955)

Kirwan, Christopher Aristotle's 'Metaphysics' Books Γ, Δ, and Ε: translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1971)

Lee, H.D.P. Aristotle: 'Meteorologica': with an English translation, Loeb Classical Library (London: Heinemann; Cambridge, Mass: Harvard University Press 1952)

Longo, Oddone Aristotele 'De Caelo': introduzione, testo critico, traduzione e note (Florence: Sansoni 1961)

Moraux, Paul Aristote: 'Du Ciel': texte établi et traduit (Paris: Les Belles Lettres 1965)

Nussbaum, Martha Craven Aristotle's 'De Motu Animalium': text with translation, commentary, and interpretive essays (Princeton: Princeton University Press 1978)

Peck, A.L. Aristotle: 'Generation of Animals': with an English translation, Loeb Classical Library, Revised Edition (London: Heinemann; Cambridge, Mass: Harvard University Press 1953)

---------- Aristotle: 'Historia Animalium': with an English translation, I and II (Books I-VI), Loeb Classical Library (London: Heinemann; Cambridge, Mass.: Harvard University Press: 1965 and 1970)

Peck, A.L., and E.S. Forster Aristotle: 'Parts of Animals': with an English translation by A.L. Peck and a foreword by F.H.A. Marshall; 'Movement of Animals' and 'Progression of Animals': with an English translation by E.S. Forster, Loeb Classical Library, Revised Edition (London: Heinemann; Cambridge, Mass.: Harvard University Press 1961)

Philoponus, Ioannes In Aristotelis Physica Commentaria, edited by Hieronymus Vitelli, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vols XVI-XVII (Berlin: G. Reimer 1887 and 1888)

Ross, W.D. ΑΡΙΣΤΟΤΕΛΟΥΣ ΑΝΑΛΥΤΙΚΑ: Aristotle's 'Prior and Posterior Analytics': a revised text with introduction and commentary, (Oxford: Clarendon Press 1949)

---------- ΑΡΙΣΤΟΤΕΛΟΥΣ ΤΑ ΜΕΤΑ ΤΑ ΦΥΣΙΚΑ: Aristotle's 'Metaphysics': a revised text with introduction and commentary, 2 vols (Oxford: Clarendon Press 1924)

---------- ΑΡΙΣΤΟΤΕΛΟΥΣ ΦΥΣΙΚΗ ΑΚΡΟΑΣΙΣ: Aristotle's 'Physics': a revised text, with introduction and commentary (Oxford: Clarendon Press 1936)

--------- Aristotle: 'De Anima': edited, with introduction and commentary (Oxford: Clarendon Press 1961)

Ross, W.D., and (for some volumes) J.A. Smith (eds.) The Works of Aristotle Translated into English, various translators, 12 vols (Oxford: Clarendon Press 1908-1954)

Simplicius In Aristotelis Physica Commentaria, edited by Hermann Diels, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vols IX-X (Berlin: G. Reimer 1882 and 1895)

---------- In Aristotelis De Caelo Commentaria, edited by I.L. Heiberg, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vol. VII (Berlin: G. Reimer 1894)

Stewart, J.A. Notes on the 'Nicomachean Ethics' of Aristotle, 2 vols (Oxford: Clarendon Press 1892)

Themistius In Aristotelis Physica Paraphrasis, edited by Heinrich Schenkl, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vol. V part 2 (Berlin: G. Reimer 1900)

---------- In Libros Aristotelis De Caelo Paraphrasis: Hebraice et Latine, edited by Samuel Landauer, Commentaria in Aristotelem Graeca, Prussian Academy Edition, vol. V part 4 (Berlin: G. Reimer 1902)

Wagner, Hans Aristoteles: Physikvorlesung (Berlin: Akademie-Verlag 1972)

Wicksteed, Philip H., and Francis M. Cornford Aristotle: The 'Physics': with an English translation, Loeb Classical Library, 2 vols (Vol.I: London: Heinemann; New York: G.P. Putnams's Sons 1929; reprinted with revisions London: Heinemann; Cambridge, Mass.: Harvard University Press 1957; Vol. II: London: Heinemann; Cambridge, Mass.: Harvard University Press 1934)

Williams, C.J.F. Aristotle's 'De Generatione et Corruptione': translated with notes, Clarendon Aristotle Series (Oxford: Clarendon Press 1982)

Woods, Michael Aristotle's 'Eudemian Ethics' Books I, II and VIII: translated with a commentary, Clarendon Aristotle Series (Oxford: Clarendon Press 1982)

II. Other Works

Ackrill, J.L. Aristotle's definitions of psuche', Proceedings of the Aristotelian Society 73 (1972-73) 119-33; reprinted in Jonathan Barnes, Malcolm Schofield and Richard Sorabji (eds.), Articles on Aristotle, 4 (London: Duckworth 1979)

---------- 'Aristotle's theory of definition: some questions on Posterior Analytics II 8-10', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

---------- Aristotle the Philosopher (Oxford: Oxford University Press 1981)

Allan, D.J. 'Causality, ancient and modern', Proceedings of the Aristotelian Society Supplementary Volume 39 (1965) 1-18

Allen, R.E. (ed.), Studies in Plato's Metaphysics (London: Routledge and Kegan Paul; New York: Humanities Press 1965)

Annas, Julia 'Aristotle on inefficient causes', Philosophical Quarterly 32 (1982) 311-26

Anscombe, G.E.M. 'Aristotle and the sea battle: De Interpretatione, chapter IX', Mind 65 (1956) 1-15; reprinted with revisions in J.M.E. Moravcsik (ed.), Aristotle: a collection of critical essays (London: Macmillan 1968)

Ashley, Benedict W. 'Aristotle's sluggish earth Part I: problematics of the De Caelo', New Scholasticism 32 (1958) 1-31

---------- 'Aristotle's sluggish earth Part II: media of demonstration', New Scholasticism 32 (1958) 202-34

Bailey, Cyril The Greek Atomists and Epicurus: a study (Oxford: Clarendon Press 1928)

Balme, D.M. 'Greek science and mechanism I: Aristotle on nature and chance', Classical Quarterly 33 (1939) 129-38

---------- 'Development of biology in Aristotle and Theophrastus: theory of spontaneous generation', Phronesis 7 (1962) 91-104

---------- Review of Aristotle's 'De Motu Animalium': text with translation, commentary and interpretive essays by Martha Craven Nussbaum, Journal of the History of Philosophy 20 (1982) 92-5

Barnes, Jonathan 'Aristotle's theory of demonstration', Phronesis 14 (1969) 123-52; reprinted with revisions in Jonathan Barnes, Malcolm Schofield and Richard Sorabji (eds.), Articles on Aristotle, 1 (London: Duckworth 1975)

---------- 'Property in Aristotle's Topics', Archiv für Geschichte der Philosophie 52 (1970) 136-55

---------- 'Aristotle, Menaechmus, and circular proof', Classical Quarterly 26 (1976) 278-92

---------- Review of Hintikka (J.), Time and Necessity: studies in Aristotle's theory of modality, Journal of Hellenic Studies 97 (1977) 183-6

---------- The Presocratic Philosophers, 2 vols (London: Routledge and Kegan Paul 1979)

---------- 'Proof and the syllogism', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

---------- Aristotle (Oxford: Oxford University Press 1982)

Barnes, Jonathan, Malcolm Schofield and Richard Sorabji (eds.)
Articles on Aristotle, 4 vols:
1. Science (London: Duckworth 1975);
2. Ethics and Politics (London: Duckworth 1977);
3. Metaphysics (London: Duckworth 1979);
4. Psychology and Aesthetics (London: Duckworth 1979)

Barnes, Jonathan, Malcolm Schofield and Richard Sorabji Aristotle: a selective bibliography, Study Aids Volume VII, Revised Edition (Oxford: Sub-Faculty of Philosophy, August 1980)

Barr, Robert R. 'Aristotle on natural place: some questions', New Scholasticism 30 (1956) 206-10

Berti, Enrico (ed.) Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

Blackburn, Simon Spreading the Word: groundings in the philosophy of language (Oxford: Clarendon Press 1984)

Bocheński, I.M. 'Notes historiques sur les propositions modales', Revue des Sciences Philosophiques et Théologiques 26 (1937) 673-92

Bogen, James 'Moravcsik on explanation', Synthese 28 (1974) 19-25

Bradie, Michael, and Fred D. Miller 'Teleology and natural necessity in Aristotle', History of Philosophy Quarterly 1 (1984) 133-46

Brody, B.A. 'Towards an Aristotelean theory of scientific explanation', Philosophy of Science 39 (1972) 20-31

Burnyeat, Myles 'Aristotle on understanding knowledge', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

---------- 'Is an Aristotelian philosophy of mind still credible?' (unpublished paper)

Butler, Ronald J. 'Aristotle's sea fight and three-valued logic', Philosophical Review 64 (1955) 264-74

Calvert, Brian 'Aristotle and the Megarians on the potentiality-actuality distinction', Apeiron 10 (1976) 34-41

Charles, David Aristotle's Philosophy of Action (London: Duckworth 1984)

Cherniss, Harold Aristotle's Criticism of Presocratic Philosophy (Baltimore: Johns Hopkins Press 1935; reprinted New York: Octagon Books 1964)

---------- Aristotle's Criticism of Plato and the Academy: Volume I (Baltimore: Johns Hopkins Press 1944)

Clark, Stephen R.L. Aristotle's Man: speculations upon Aristotelian anthropology (Oxford: Clarendon Press 1975)

Classen, C. Joachim 'Aristotle's picture of the sophists', in G.B. Kerferd (ed.), The Sophists and their Legacy, Proceedings of the Fourth International Colloquium on Ancient Philosophy . . . , Hermes Einzelschriften Heft 44 (Weisbaden: F. Steiner Verlag 1981)

Cooper, John M. 'Aristotle on natural teleology', in Malcolm Schofield and Martha Craven Nussbaum (eds.) Language and Logos: studies in ancient philosophy presented to G.E.L. Owen (Cambridge: Cambridge University Press 1982)

Cornford, Francis Macdonald Plato's Cosmology: the 'Timaeus' of Plato translated with a running commentary (London: Kegan Paul, Trench, Trubner 1937)

---------- 'Aristotle De Caelo 288A 2-9' Classical Quarterly 33 (1939) 34-5

Day, Jane M. Review of Passage and Possibility: a study of Aristotle's modal concepts, by Sarah Waterlow, Philosophical Books 25 (1984) 81-3

Denniston, J.D. The Greek Particles, Second Edition (Oxford: Clarendon Press 1954; reprinted with corrections 1959)

Diels, Hermann, Die Fragmente Der Vorsokratiker: griechisch und deutsch, revised by Walther Kranz, 3 vols (Berlin: Weidmann: I^{17} 1974, II^{16} 1972, III^{12} 1967)

Düring, Ingemar 'Aristotle the scholar', Arctos, Nova Series 1 (1954) 61-77

---------- 'Aristotle and Plato in the mid-Fourth Century', Eranos 54 (1956) 109-20

---------- (ed.) Naturphilosophie bei Aristoteles und Theophrast, Proceedings of the Fourth Symposium Aristotelicum (Heidelberg: Lothar Stiehm Verlag 1969)

Düring, I. and G.E.L. Owen (eds.) Aristotle and Plato in the Mid-Fourth Century, Proceedings of the First Symposium Aristotelicum (Göteborg: Elanders Boktryckeri Aktiebolag 1960)

Edmunds, Lowell 'Necessity, chance and freedom in the early atomists', Phoenix 26 (1972) 342-57

Eichholz, D.E. 'Aristotle's theory of the formation of metals and minerals', Classical Quarterly 43 (1949) 141-6

Fine, Gail 'Aristotle on determinism: a review of Richard Sorabji's Necessity, Cause and Blame', Philosophical Review 90 (1981) 561-79

---------- 'Truth and necessity in De Interpretatione 9' History of Philosophy Quarterly 1 (1984) 23-47

Frede, Dorothea Aristoteles und die 'Seeschlacht': das Problem der contingentia futura in 'De Interpretatione' 9, Hypomnemata 27 (Göttingen: Vandenhoeck und Ruprecht 1970)

---------- 'Comments on Hintikka's paper "On the ingredients of an Aristotelian science"' Synthese 28 (1974) 78-89

---------- 'The dramatization of determinism: Alexander of Aphrodisias' De Fato', Phronesis 27 (1982) 276-98

---------- 'The sea-battle reconsidered: a defence of the traditional interpretation', Oxford Studies in Ancient Philosophy 3 (1985) 31-87

Frede, Michael 'The original notion of cause', in Malcolm Schofield, Myles Burnyeat and Jonathan Barnes (eds.), Doubt and Dogmatism: studies in Hellenistic epistemology (Oxford: Clarendon Press 1980)

Freeland, Cynthia A. Review of Sarah Waterlow, Nature, Change, and Agency in Aristotle's 'Physics', and Sarah Waterlow, Passage and Possibility: a study of Aristotle's modal concepts, Philosophical Review 93 (1984) 439-43

---------- 'Aristotle on causal relations' (unpublished paper)

---------- 'Aristotle on possibilities and capacities' (unpublished paper)

Gaukroger, Stephen Critical Notice of Richard Sorabji, Necessity, Cause and Blame: perspectives on Aristotle's theory, Australasian Journal of Philosophy 60 (1982) 363-6

Georgiadis, Constantine 'Fallacious reasoning in Aristotle's Physics B 5, 196b19-21? An emendation', Hermes 107 (1979) 253-5

Gill, Mary Louise 'Sorabji and Aristotle against determinism', Ancient Philosophy 2 (1982) 122-33

Gomperz, Theodor Greek Thinkers: a history of ancient philosophy, Volume IV, translated by G.G. Berry (London: John Murray 1912)

Goodman, Nelson Fact, Fiction, and Forecast, Fourth Edition, (Cambridge, Mass., and London: Harvard University Press 1983)

Gotthelf, Allan 'Aristotle's conception of final causality', Review of Metaphysics 30 (1976-77) 226-54

Graham, William 'Counterpredicability and per se accidents', Archiv für Geschichte der Philosophie 57 (1975) 182-7

Granger, Herbert 'The differentia and the per se accident in Aristotle', Archiv für Geschichte der Philosophie 63 (1981) 118-29

Guthrie, W.K.C. 'The development of Aristotle's theology -- I', Classical Quarterly 27 (1933) 162-71

---------- 'The development of Aristotle's theology -- II', Classical Quarterly 28 (1934) 90-98

---------- 'Notes on some passages in the Second Book of Aristotle's Physics', Classical Quarterly 40 (1946) 70-76

---------- 'Aristotle as a historian of philosophy: some preliminaries', Journal of Hellenic Studies 77 (1957) 35-41; reprinted under the title, 'Aristotle as historian', in David J. Furley and R.E. Allen (eds.), Studies in Presocratic Philosophy, Volume I: The Beginnings of Philosophy (London: Routledge and Kegan Paul; New York: Humanities Press 1970)

---------- A History of Greek Philosophy, 6 vols (Cambridge: Cambridge University Press 1962-1981)

Hadgopoulos, Demetrius John 'A note on Aristotle's notions of universality and necessity', Logique et Analyse 18 (1975) 171-4

---------- 'The definition of the "predicables" in Aristotle', Phronesis 21 (1976) 59-63

Heath, D.D. 'On some misconceptions of Aristotle's doctrine on causation and τὸ αὐτόματον', Journal of Philology 7 (1877) 97-115

Heinaman, Robert 'Aristotle on accidents', Journal of the History of Philosophy 23 (1985) 311-24

Hintikka, Jaakko 'Necessity, universality, and time in Aristotle', Ajatus 20 (1957) 65-90; reprinted in Jonathan Barnes, Malcolm Schofield and Richard Sorabji (eds.), Articles on Aristotle, 3 (London: Duckworth 1979)

---------- 'On the ingredients of an Aristotelian science', Noûs 6 (1972) 55-69

---------- 'Reply to Dorothea Frede', Synthese 28 (1974) 91-6

---------- Time and Necessity: studies in Aristotle's theory of modality (Oxford: Clarendon Press 1973)

Hintikka, Jaakko, in collaboration with Unto Remes and Simo Knuuttila Aristotle on Modality and Determinism, Acta Philosophica Fennica, Volume 29, No. 1 (Amsterdam: North-Holland 1977)

Hocutt, Max 'Aristotle's four becauses', Philosophy 49 (1974) 385-99

Hull, David L. 'The conflict between spontaneous generation and Aristotle's metaphysics', Proceedings of the Seventh Inter-American Congress of Philosophy (Quebec: Laval University Press 1967), pp. 245-50

Hume, David Enquiries concerning Human Understanding and concerning the Principles of Morals, edited by L.A. Selby-Bigge, Third Edition, with text revised and notes by P.H. Nidditch (Oxford: Clarendon Press 1975)

Hussey, Edward The Presocratics (London: Duckworth 1972)

Inwood, Brad 'A note on commensurate universals in the Posterior Analytics', Phronesis 24 (1979) 320-29

Iseminger, Gary 'Foreknowledge and necessity: Summa Theologiae Ia. 14, 13 ad 2', in Midwest Studies in Philosophy, Volume I (1976): Studies in the History of Philosophy, edited by Peter A. French, Theodore E. Uehling and Howard K. Wettstein (Morris, Minn.: University of Minnesota Press 1976)

Jackson, Henry 'Eudemian Ethics Θ i, ii (H xiii, xiv). 1246a26-1248b7', Journal of Philology 32 (1913) 170-221

Jaeger, Werner Aristotle: fundamentals of the history of his development, translated by Richard Robinson, Second Edition (Oxford: Oxford University Press 1948)

Joachim, Harold H. 'Aristotle's conception of chemical combination', Journal of Philology 29 (1904) 72-86

Jones, Barrington 'Aristotle's introduction of matter', Philosophical Review 83 (1974) 474-500

Jones, W.H.S. Hippocrates: with an English translation, Loeb Classical Library, 4 vols (London: Heinemann; New York: G.P. Putnam's Sons 1923-1931)

Judson, Lindsay 'Eternity and necessity in De Caelo I. 12: a discussion of Sarah Waterlow, Passage and Possibility: a study of Aristotle's modal concepts', Oxford Studies in Ancient Philosophy 1 (1983) 217-55

---------- Review of Sarah Waterlow, Nature, Change, and Agency in Aristotle's 'Physics': a philosophical study, Classical Review 33 (1983) 231-3

---------- 'God or nature? Philoponus on generability and perishability', forthcoming in Richard Sorabji (ed.), Philoponus and the rejection of Aristotelian science (London: Duckworth 1986)

---------- 'Today's sea battle: De Interpretatione 9', forthcoming in Revue de Philosophie Ancienne, 1987

---------- 'Aristotle and the Megarians: Metaphysics Θ. 3-4' (unpublished paper)

Kahn, Charles H. 'The role of nous in the cognition of first principles in Posterior Analytics II 19', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

Kirk, G.S., J.E. Raven and M. Schofield The Presocratic Philosophers: a critical history with a selection of texts, Second Edition (Cambridge: Cambridge University Press 1983)

Kirwan, Christopher 'Truth and universal assent', Canadian Journal of Philosophy 11 (1981) 377-94

---------- 'Aristotle on the necessity of the present', forthcoming in Oxford Studies in Ancient Philosophy 4 (1986)

Kneale, Martha Review of Jaakko Hintikka, Time and Necessity: studies in Aristotle's theory of modality, Philosophical Quarterly 24 (1974) 369-70

Kneale, William, and Martha Kneale The Development of Logic (Oxford: Clarendon Press 1962; reprinted with corrections 1975)

Kosman, L.A. 'Understanding, explanation and insight in Aristotle's Posterior Analytics', in E.N. Lee, A.P.D. Mourelatos and R.M. Rorty (eds.), Exegesis and Argument: studies in Greek philosophy presented to Gregory Vlastos, Phronesis Supplementary Volume I (Assen: Van Gorcum 1973)

Kung, Joan 'Metaphysics 8. 4: can be but will not be', Apeiron 12 (1978) 32-6

---------- 'Aristotle's De Motu Animalium and the separability of the sciences', Journal of the History of Philosophy 20 (1982) 65-76

Lear, Jonathan Aristotle and Logical Theory (Cambridge: Cambridge University Press 1980)

---------- 'Aristotle's philosophy of mathematics', Philosophical Review 91 (1982) 161-92

Le Blond, J.M. Logique et Méthode chez Aristote: étude sur la recherche des principes dans la physique Aristotélicienne, Second Edition (Paris: J. Vrin 1970)

Lennox, James G. 'Teleology, chance, and Aristotle's theory of spontaneous generation', Journal of the History of Philosophy 20 (1982) 219-38

---------- 'Aristotle on chance', Archiv für Geschichte der Philosophie 66 (1984) 52-60

---------- 'What is natural history?' (unpublished paper)

Lewis, David Counterfactuals (Oxford: Basil Blackwell 1973)

---------- On the Plurality of Worlds (Oxford: Basil Blackwell 1986)

Liddell, Henry George, and Robert Scott A Greek-English Lexicon, revised by Henry Stuart Jones with Roderick McKenzie, Ninth Edition, with a supplement (Oxford: Clarendon Press 1968)

Lindbeck, George A. 'A note on Aristotle's discussion of God and the world', Review of Metaphysics 1, No. 5 (September 1948) 99-106

Linsky, Leonard 'Professor Donald Williams on Aristotle', Philosophical Review 63 (1954) 250-52

Littré, E. Oeuvres Complètes D' Hippocrate: traduction nouvelle . . ., 10 vols (Paris: J.B. Baillière 1839-1861; reprinted Amsterdam: A.M. Hakkert 1961-1982)

Lloyd, A.C. 'The principle that the cause is greater than the effect', Phronesis 21 (1976) 146-56

---------- 'Necessity and essence in the Posterior Analytics', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

Lloyd, G.E.R. Polarity and Analogy: two types of argumentation in early Greek thought (Cambridge: Cambridge University Press 1966)

---------- Magic, Reason and Experience: studies in the origin and development of Greek science (Cambridge: Cambridge University Press 1979)

Long, A.A. 'Chance and natural law in Epicureanism', Phronesis 22 (1977) 63-88

Lovejoy, Arthur O. The Great Chain of Being: a study of the history of an idea (Cambridge, Mass.: Harvard University Press 1936)

Lowe, Malcolm F. 'Aristotle on the sea-battle: a clarification', Analysis 40 (1980) 55-9

Łukasiewicz, Jan Aristotle's Syllogistic from the standpoint of modern formal logic, Second Edition (Oxford: Clarendon Press 1957)

---------- 'Philosophical remarks on many-valued systems of propositional logic', in Storrs McCall (ed.), Polish Logic 1920-1939, various translators (Oxford: Clarendon Press 1967)

McCall, Storrs Aristotle's Modal Syllogisms (Amsterdam: North-Holland 1963)

---------- 'Time and the physical modalities', Monist 53 (1969) 426-44; reprinted in Eugene Freeman and Wilfrid Sellars (eds.), Basic Issues in the Philosophy of Time (LaSalle: Open Court 1971)

McCarthy, Timothy 'On an Aristotelian model of scientific explanation', Philosophy of Science 44 (1977) 159-66

McClelland, Richard T. 'Time and modality in Aristotle, Metaphysics IX. 3-4', Archiv für Geschichte der Philosophie 63 (1981) 130-49

McDiarmid, J.B. 'Theophrastus on the Presocratic causes', Harvard Studies in Classical Philology 61 (1953) 85-156; reprinted in David J. Furley and R.E. Allen (eds.), Studies in Presocratic Philosophy, Volume I: The Beginnings of Philosophy (London: Routledge and Kegan Paul; New York: Humanities Press 1970)

Madigan, Arthur 'Metaphysics E 3: a modest proposal', Phronesis 29 (1984) 123-36

Magruder, James Edward 'Notes on Aristotle's view of "chance" and "fortune"', Kinesis 1 (1969) 75-81

Mansion, Augustin Introduction à la Physique Aristotélicienne, Second Edition (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain; Paris: J. Vrin 1946)

Mansion, Suzanne (ed.) Aristote et les Problèmes de Méthode, Proceedings of the Second Symposium Aristotelicum (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1961)

---------- Le Jugement d' Existence chez Aristote, Second Edition (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1976)

Matthews, Gareth B. 'Accidental unities', in Malcolm Schofield and Martha Craven Nussbaum (eds.), Language and Logos: studies in ancient philosophy presented to G.E.L. Owen (Cambridge: Cambridge University Press 1982)

---------- Review of Richard Sorabji, Necessity, Cause and Blame: perspectives on Aristotle's theory, Noûs 17 (1983) 135-8

Mau, Jürgen 'Die Welt, ungeworden und unvergänglich: Interpretation und Textkritik zu Aristoteles, De Caelo A 11-12', Hermes 97 (1969) 198-204

Mavrodes, George I. 'Aristotelian necessity and freedom', Midwest Studies in Philosophy, Volume I (1976): Studies in the History of Philosophy, edited by Peter A. French, Theodore E. Uehling and Howard K. Wettstein (Morris, Minn.: University of Minnesota Press 1976)

Merlan, Philip 'Two theological problems in Aristotle's Met. Lambda 6-9 and De Caelo A. 9', Apeiron 1 (1966) 3-13

Midwest Studies in Philosophy, Volume I: Studies in the History of Philosophy, edited by Peter A. French, Theodore E. Uehling and Howard K. Wettstein (Morris, Minn.: University of Minnesota Press 1976)

Mignucci, Mario 'Ὡς ἐπὶ τὸ πολύ et nécessaire dans la conception aristotélicienne de la science', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

---------- 'Puzzles about identity. Aristotle and his Greek commentators', in Jürgen Wiesner (ed.), Aristoteles: Werk und Wirkung, Erster Band: Aristoteles und seine Schule (Berlin and New York: De Gruyter 1985)

Miller, Willard M. 'Aristotle on necessity, chance, and spontaneity', New Scholasticism 47 (1973) 204-13

Mills, Michael J. 'Eudemian Ethics Θ, 2, 1247a7-13', Hermes 109 (1981) 253-6

---------- 'Aristotle's dichotomy of Εὐτυχία (Eudemian Ethics Θ, 2, 1247b18-1248a15)', Hermes 111 (1983) 282-95

Mingay, Jean M. 'Some controversial passages in the Eudemian Ethics', in Paul Moraux and Dieter Harlfinger (eds.), Untersuchungen zur Eudemischen Ethik, Proceedings of the Fifth Symposium Aristotelicum (Berlin: De Gruyter 1971)

Monod, Jacques Chance and Necessity: an essay on the natural philosophy of modern biology, translated by Austryn Wainhouse (London: Collins 1972; reprinted 1979)

Moraux, Paul 'Kritisch-Exegetisches zu Aristoteles', Archiv für Geschichte der Philosophie 43 (1961) 15-40

---------- 'La méthode d' Aristote dans l' étude du ciel: De Caelo I 1 - II 12', in Suzanne Mansion (ed.), Aristote et les Problèmes de Méthode, Proceedings of the Second Symposium Aristotelicum (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1961)

Moravcsik, Julius M.E. 'Aristotle on adequate explanations', Synthese 28 (1974) 3-17

---------- 'Aitia as generative factor in Aristotle's philosophy', Dialogue 14 (1975) 622-38

---------- (ed.) Aristotle: a collection of critical essays (London: Macmillan 1968)

Morrow, Glenn R. 'Necessity and persuasion in Plato's Timaeus', Philosophical Review 59 (1950) 147-63; reprinted in R.E. Allen (ed.), Studies in Plato's Metaphysics (London: Routledge and Kegan Paul; New York: Humanities Press 1965)

Mourelatos, Alexander P.D. 'Aristotle's "powers" and modern empiricism', Ratio 9 (1967) 97-104

---------- 'Aristotle's rationalist account of qualitative interaction', Phronesis 29 (1984) 1-16

Mulhern, M.M. 'Aristotle on universality and necessity', Logique et Analyse 47 (1969) 288-99

Mure, G.R.G. 'Cause and because in Aristotle', Philosophy 50 (1975) 356-7

Nussbaum, Martha Craven 'Saving Aristotle's appearances', in Malcolm Schofield and Martha Craven Nussbaum (eds.), Language and Logos: studies in ancient philosophy presented to G.E.L. Owen (Cambridge: Cambridge University Press 1982)

---------- 'Aristotelian dualism: reply to Howard Robinson', Oxford Studies in Ancient Philosophy 2 (1984) 197-207

Owen, G.E.L. 'Τιθέναι τὰ φαινόμενα', in Suzanne Mansion (ed.), Aristote et les Problèmes de Methode, Proceedings of the Second Symposium Aristotelicum (Louvain: L' Institut Supérieur de Philosophie de l' Université de Louvain 1961); reprinted in J.M.E. Moravcsik (ed.), Aristotle: a collection of critical essays (London: Macmillan 1968), in Jonathan Barnes, Malcolm Schofield and Richard Sorabji (eds.) Articles on Aristotle, 1 (London: Duckworth 1975), and in Owen's Logic, Science and Dialectic: collected papers in Greek Philosophy, edited by Martha Nussbaum (London: Duckworth 1986)

---------- 'Aristotle: method, physics, and cosmology', in Charles Coulston Gillispie (editor in chief), Dictionary of Scientific Biography, 16 vols (New York: Charles Scribner's Sons 1970-1980), I, 250-58; reprinted in Owen's Logic, Science and Dialectic: collected papers in Greek Philosophy, edited by Martha Nussbaum (London: Duckworth 1986)

---------- Logic, Science and Dialectic: collected papers in Greek Philosophy, edited by Martha Nussbaum (London: Duckworth 1986)

Owens, Joseph 'Teleology of nature in Aristotle', Monist 52 (1968) 159-73

Patzig, Gunther Aristotle's Theory of the Syllogism: a logico-philological study of Book A of the 'Prior Analytics', translated by Jonathan Barnes (Dordrecht: D. Reidel 1968)

Philoponus, Ioannes De Aeternitate Mundi Contra Proclum, edited by Hugo Rabe (Leipzig: Teubner 1899)

Plato Opera, edited by John Burnet, Oxford Classical Texts, 5 vols (Oxford: Clarendon Press 1900-1907)

Preus, Anthony 'Aristotle's natural necessity', Studi Internazionali di Filosofia 1 (1969) 91-100

---------- 'Aristotle's "Nature uses. . ."', Apeiron 3 (1969) 20-33

---------- 'Science and philosophy in Aristotle's Generation of Animals', Journal of the History of Biology 3 (1970) 1-52

Prior, A.N. 'Three-valued logic and future contingents', Philosophical Quarterly 3 (1953) 317-26

---------- 'The formalities of omniscience', Philosophy 37 (1962) 114-29; reprinted in his Papers on Time and Tense (Oxford: Clarendon Press 1968)

---------- 'It was to be', in his Papers in Logic and Ethics, edited by P.T. Geach and A.J.P. Kenny (London: Duckworth 1976)

Proclus In Platonis Timaeum Commentaria, edited by Ernst Diehl, 3 vols (Leipzig: Teubner 1903-1906)

Robin, Léon 'Sur la conception aristotélicienne de la causalité', Archiv für Geschichte der Philosophie 16 (1909-1910) 1-28 and 184-210

Robinson, Howard 'Aristotelian dualism', Oxford Studies in Ancient Philosophy 1 (1983) 123-44

Russell, Paul, 'Sorabji and the dilemma of determinism', Analysis 44 (1984) 166-72

Sambursky, S. 'On the possible and the probable in Ancient Greece', Osiris 12 (1956) 35-48

---------- Physics of the Stoics (London: Routledge and Kegan Paul 1959)

Schofield, Malcolm An Essay on Anaxagoras (Cambridge: Cambridge University Press 1980)

Schofield, Malcolm, Myles Burnyeat and Jonathan Barnes (eds.) Doubt and Dogmatism: studies in Hellenistic epistemology (Oxford: Clarendon Press 1980)

Schofield, Malcolm, and Martha Craven Nussbaum (eds.) Language and Logos: studies in ancient philosophy presented to G.E.L. Owen (Cambridge: Cambridge University Press 1982)

Sedley, David 'Diodorus Cronus and Hellenistic philosophy', Proceedings of the Cambridge Philological Society 23 (1977) 74-120

Seel, Gerhard Die Aristotelische Modaltheorie, Quellen und Studien zur Philosophie, 16 (Berlin and New York: de Gruyter 1982)

---------- 'Diodore domine-t-il-Aristote?', Revue de Metaphysique et de Morale 87 (1982) 293-313

Sharples, R.W. 'Responsibility, chance and not-being (Alexander of Aphrodisias mantissa 169-172)', Bulletin of the Institute of Classical Studies 22 (1975) 37-64

---------- 'Aristotelian and Stoic conceptions of necessity in the De Fato of Alexander of Aphrodisias', Phronesis 20 (1975) 247-74

---------- Alexander of Aphrodisias on Fate: text, translation and commentary (London: Duckworth 1983)

---------- 'Alexander of Aphrodisias: problems about possibility II', Bulletin of the Institute of Classical Studies 30 (1983) 99-110

---------- Review of Sarah Waterlow, Passage and Possibility: a study of Aristotle's modal concepts, Classical Review 33 (1983) 62-4

Smith, J.A. 'Aristotelica', Classical Quarterly 14 (1920) 16-22

Solmsen, Friedrich 'Aristotle and Presocratic cosmogony', Harvard Studies in Classical Philology 63 (1958) 265-82

---------- Aristotle's System of the Physical World: a comparison with his predecessors (Ithaca, N.Y.: Cornell University Press 1960)

---------- 'Platonic influences in the formation of Aristotle's physical system', in I. Düring and G.E.L. Owen (eds.), Aristotle and Plato in the Mid-Fourth Century, Proceedings of the First Symposium Aristotelicum (Göteborg: Elanders Boktryckeri Aktiebolag 1960)

---------- 'Nature as craftsman in Greek thought', Journal of the History of Ideas 24 (1963) 473-96

Sorabji, Richard 'Function', Philosophical Quarterly 14 (1964) 289-302

---------- Necessity, Cause and Blame: perspectives on Aristotle's theory (London: Duckworth 1980)

---------- 'Causation, laws, and necessity', in Malcolm Schofield, Myles Burnyeat and Jonathan Barnes (eds.) Doubt and Dogmatism: studies in Hellenistic epistemology (Cambridge: Cambridge University Press 1980)

---------- 'Definitions: why necessary and in what way?', in Enrico Berti (ed.), Aristotle on Science: the 'Posterior Analytics', Proceedings of the Eighth Symposium Aristotelicum (Padua: Editrice Antenore 1981)

---------- Time, Creation and the Continuum: theories in antiquity and the early middle ages (London: Duckworth 1983)

Stemmer, Nathan 'Brody's defense of essentialism', Philosophy of Science 40 (1973) 393-6

Thayer, H.S. 'Aristotle on nature: a study in the relativity of concepts and procedures of analysis', Review of Metaphysics 28 (1974-1975) 725-44

Tiles, J.E. 'Why the triangle has two right angles kath' hauto' Phronesis 28 (1983) 1-16

Torstrik, A. 'Περὶ τύχης καὶ τοῦ αὐτομάτου: Aristot. Phys. B 4-6', Hermes 9 (1875) 425-70

van Fraassen, Bas. C. 'A re-examination of Aristotle's philosophy of science', Dialogue 19 (1980) 20-45

van Rijen, Jeroen 'The Principle of Plenitude, the de omni - per se distinction and the development of modal thinking', Archiv für Geschichte der Philosophie 66 (1984) 61-88

Verbeke, Gérard 'La structure logique de la preuve du Premier Moteur chez Aristote', Revue Philosophique de Louvain 46 (1948) 137-60

---------- 'Philosophie et conceptions préphilosophiques chez Aristote', Revue Philosophique de Louvain 59 (1961) 405-30

Verdenius, W.J. 'Traditional and personal elements in Aristotle's religion', Phronesis 5 (1960) 56-70

---------- 'Critical and exegetical notes on De Caelo', in Ingemar Düring (ed.), Naturphilosophie bei Aristoteles und Theophrast, Proceedings of the Fourth Symposium Aristotelicum (Heidelberg: Lothar Stiehm Verlag 1969)

Vlastos, Gregory 'The disorderly motion in the Timaios', Classical Quarterly 33 (1939) 71-83; reprinted with minor revisions in R.E. Allen (ed.), Studies in Plato's Metaphysics (London: Routledge and Kegan Paul; New York: Humanities Press 1965)

---------- 'Creation in the Timaeus: is it a fiction?', in R.E. Allen (ed.), Studies in Plato's Metaphysics (London: Routledge and Kegan Paul; New York: Humanities Press 1965)

---------- Plato's Universe (Oxford: Clarendon Press 1975)

Vuillemin, J. 'L' argument dominateur', Revue de Metaphysique et de Morale 84 (1979) 225-57

Waterlow, Sarah Nature, Change, and Agency in Aristotle's 'Physics': a philosophical study (Oxford: Clarendon Press 1982)

---------- Passage and Possibility: a study of Aristotle's modal concepts (Oxford: Clarendon Press 1982)

---------- 'Time and modality in De Caelo I 12', in Myles Burnyeat and others, Notes on Books Eta and Theta of Aristotle's 'Metaphysics', Study Aids Monograph No. 4 (Oxford: Sub-Faculty of Philosophy 1984), pp. 69-92

Wedin, Vernon E. 'A remark on per se accidents and properties', Archiv für Geschichte der Philosophie 55 (1973) 30-35

Weiss, Helene Kausalität und Zufall in der Philosophie des Aristoteles (Basel: Falke 1942)

White, Michael J. 'Aristotle and temporally relative modalities', Analysis 39 (1979) 88-93

---------- 'Aristotle's temporal interpretation of necessary coming-to-be and Stoic determinism', Phoenix 34 (1980) 208-18

---------- 'Facets of Megarian fatalism: Aristotelian criticisms and the Stoic doctrine of eternal recurrence', Canadian Journal of Philosophy 10 (1980) 189-206

--------- 'Necessity and unactualized possibilities in Aristotle', Philosophical Studies 38 (1980) 287-98

Wieland, Wolfgang 'Das Problem des Prinzipienforschung und die aristotelische Physik', Kant-Studien 52 (1960-61) 206-19; translated by Malcolm Schofield under the title, 'Aristotle's physics and the problem of inquiry into principles', in Jonathan Barnes, Malcolm Schofield and Richard Sorabji (eds.), Articles on Aristotle, 1 (London: Duckworth 1975)

---------- Die Aristotelische Physik: Untersuchungen über die Grundlegung der Naturwissenschaft und die sprachlichen Bedingungen der Prinzipienforschung bei Aristoteles, Second Edition (Göttingen: Vandenhoeck und Ruprecht 1970)

Williams, C.J.F. 'Aristotle and corruptibility', Religious Studies 1 (1965) 95-107 and 203-15

---------- 'True tomorrow, never true today', Philosophical Quarterly 28 (1978) 285-99

---------- 'What is, necessarily is, when it is', Analysis 40 (1980) 127-31

Williams, Donald C. 'The sea fight tomorrow', in Paul Henle, Horace M. Kallen and Susanne K. Lange (eds.), Structure, Method and Meaning: essays in honour of Henry M. Sheffer (New York: Liberal Arts Press 1951)

---------- 'Professor Linsky on Aristotle', Philosophical Review 63 (1954) 253-5

---------- 'Form and Matter, I' and 'Form and Matter, II', Philosophical Review 67 (1958) 291-312 and 499-521

Woodfield, Andrew Teleology (Cambridge: Cambridge University Press 1976)

Wright, Georg Henrik von 'Time, truth and necessity', in Cora Diamond and Jenny Teichman (eds.) Intention and Intentionality: essays in honour of G.E.M. Anscombe (Brighton: Harvester Press 1979)

---------- 'Determinism and future truth', in his Truth, Knowledge, and Modality: philosophical papers, Volume III (Oxford: Basil Blackwell 1984)

---------- '"Omne quod est quando est necesse est esse"', in his Truth, Knowledge, and Modality: philosophical papers, Volume III (Oxford: Basil Blackwell 1984)

---------- Truth, Knowledge, and Modality: philosophical papers, Volume III (Oxford: Basil Blackwell 1984)

Zeller, Eduard 'Die Lehre des Aristoteles von der Ewigkeit der Welt', in his Vorträge und Abhandlungen III (Leipzig: Fues's Verlag 1884)