RICHARD GASKIN

THE SEA BATTLE AND THE MASTER ARGUMENT

ARISTOTLE AND DIODORUS CRONUS ON THE METAPHYSICS OF THE FUTURE

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To my parents

Preface

I began the preparation of this study as a Junior Research Fellow of St. Edmund Hall, Oxford, and completed it as a Lecturer at the University of Sussex. I have debts of gratitude to both institutions: to St. Edmund Hall for granting me two years of leave to work in Mainz and Cambridge; to Sussex University for granting me an extra term of leave, which has enabled me to finish the project, and for providing a grant towards printing costs. I should like especially to thank the staff of the Interlibrary Loans Office at Sussex University for their tireless efforts in tracking down my requests. Many friends and colleagues have given me assistance, either practical or intellectual, or both. I should like to thank all of the following: István Bodnár, Cathrin Boerckel, Roger Crisp,Dorothea Frede, György Geréby, Justin Gosling, David Langslow, Robert Lockie, Mario Mignucci, Michael Morris, Peter Øhrstrøm, Jeremy Quick, Robert Sharples, Richard Sorabji, Hermann Weidemann and David Wiggins. Of course the responsibility for the product is mine alone. Earlier versions of some of the sections on the Master Argument were read to philosophy groups at Budapest and Sussex Universities; I am grateful to the participants for their helpful comments. The book is dedicated to my parents, who have been a constant source of encouragement and support over the years.

Sussex, England, April 1994 Richard Gaskin

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Abbreviations

Works of Aristotle

An Po	Analytica Posteriora
An Pr	Analytica Priora
Cat	Categoriae
DA	De Anima
DC	De Caelo
DI	De Interpretatione
Div	De Divinatione per Somnum
EE	Ethica Eudemia
GA	De Generatione Animalium
GC	De Generatione et Corruptione
MA	De Motu Animalium
Met	Metaphysica
NE	Ethica Nicomachea
PA	De Partibus Animalium
Phys	Physica
Poet	Poetica
Rhet	Rhetorica
SE	De Sophisticis Elenchis
Top	Topica

Other Abbreviations

AGPh	Archiv für Geschichte der Philosophie
APQ	American Philosophical Quarterly
BICS	Bulletin of the Institute for Classical Studies (London University)
Bonitz	Index Aristotelicus ed. H. Bonitz (Darmstadt, 1955)
CQ	Classical Quarterly
DK	H. Diels and W. Kranz eds., Die Fragmente der Vorsokratiker 7th ed. (Berlin, 1934)
DL	Diogenes Laertius: Lives of Eminent Philosophers ed. R. Hicks (London, 1925)
Döring	K. Döring ed., Die Megariker (Amsterdam, 1972)
Hülser	K. Hülser ed., Die Fragmente zur Dialektik der Stoiker vol. 3 (Stuttgart, 1987)

JHP	Journal of the History of Philosophy
JPhil	Journal of Philosophy
LS	A. Long and D. Sedley eds., The Hellenistic Philosophers (Cambridge, 1987)
OSAP	Oxford Studies in Ancient Philosophy
PAS	Proceedings of the Aristotelian Society
PL	Patrologia Latina ed. J. Migne (Turnhout)
PQ	Philosophical Quarterly
PR	Philosophical Review
SVF	Stoicorum Veterum Fragmenta ed. H. von Arnim (Leipzig, 1903–5)

[For further abbreviations, see Bibliography]

1 Preliminaries: Terminology and Notation

We may make a distinction between *temporally definite* and *temporally indefinite sentences.*[1] In my usage, a temporally definite sentence is a sentence whose temporal indicators are fixed by dates, for example: 'The Norman Conquest took place in 1066'. The verb here is expressed in the past tense, but that is an inessential feature of the sentence; one could equally well replace it with a tenseless analogue, '[takes place]', where the square brackets denote a function from tensed to tenseless form. The apparent commitment to atemporality of the form '[takes place]' need not be taken seriously: it is open to us to regard it as shorthand for 'has taken place, is taking place, or will take place'. A temporally indefinite sentence is a sentence not all of whose temporal indicators are fixed. Such a sentence will typically contain indexical expressions[2] such as 'now', 'yesterday', 'in three days' time'. Where such expressions do not figure explicitly, indexicality will be imported by tense in the verb. Ancient thinkers do not make use of temporally definite sentences in logical discussions; their reflections are deeply infused with the indexicality of ordinary language.[3] But we will not eschew temporally definite sentences entirely; in particular they will be relevant at some points in our treatment of the Master Argument.

A modern distinction which I mention here in order to set aside, is the *type-token* distinction. A sentence-type is a universal, which may be uttered, inscribed or conceived (in general, tokened) on different occasions and by different individuals. By 'sentence' I shall intend 'sentence-type', but the contrasting notion will not be 'sentence-token', because this latter notion, for our purposes, is too fine-grained to be of use. We will not want to distinguish between, say, one tokening of 'There will be a sea battle tomorrow' and another tokening of the same sentence-type on the same day. That distinction corresponds to no relevant con-

---

[1] Rescher and Urquhart, *Temporal Logic* (Vienna/New York, 1971), p.25. We shall be concerned in what follows exclusively with '*ἀποφαντικοὶ λόγοι*', i.e. indicative, assertoric sentences, capable of being true or false (*DI* 17a2–7).

[2] What Rescher and Urquhart call pseudo-dates, *Temporal Logic*, p.27.

[3] Cf. Hintikka, *Time and Necessity* (Oxford, 1973), ch.4.

sideration in the discussion of fatalism. Rather, we shall want a concept which collects all tokenings on the same day of 'There will be a sea battle tomorrow' and marks these off from tokenings of that type on another day. We shall want to collect not only actual, but also possible, tokens. Let a *statement* be what all actual and possible tokenings of any given sentence-type at the relevant time (instant or duration) express in common. The 'relevant time' will be determined by the (explicit or implicit) indexical feature of the sentence. In the case of 'There will be a sea battle tomorrow', all actual and possible tokenings of this sentence on a single day express the same statement.

As I have set up the notion, a statement is essentially tensed. 'There will be a sea battle tomorrow' cannot be used to express the same statement as 'There was a sea battle yesterday'. That will be so even if the former is tokened two days before the latter. But in that case, we may say that the two statements express the same *proposition*, or Fregean thought.[4] Propositions can be regarded as classes of statements which are truth-value linked to the same temporally definite sentence.[5] A temporally definite sentence will in all contexts express the same statement and indeed the same proposition; a temporally indefinite sentence, on the other hand, will express different statements and different propositions in different temporal contexts. Two temporally indefinite sentences, in relevantly different temporal contexts, cannot express the same statement, but they may express the same proposition.[6]

[4] Cf. Frege, 'Der Gedanke', in Patzig ed., *Logische Untersuchungen* (Göttingen, 1976), 30–53, p.38.

[5] This definition of a proposition might appear to assume the Principle of Bivalence. In view of the fact that the acceptibility of this principle is going to be very much in question in what follows, that would hardly be a satisfactory situation, but we can circumvent the difficulty if we interpret truth-value linkage as: '*p*' and '*q*' are truth-value linked just if '*p*' cannot be true and '*q*' false, and *vice versa*. Necessary truths and falsehoods obviously raise a problem here, but one we can ignore for the purposes of what follows.

[6] In Hintikka's usage (see, e.g., *Aristotle on Modality and Determinism* (Amsterdam, 1977), p.31) a sentence such as 'There will be a sea battle tomorrow' can count as *either* a temporally indefinite sentence or a temporally definite sentence, the latter when it is used on a particular occasion (the reference of 'tomorrow' being thereby fixed to a dateable day). This seems to me a confusion. The *sentence*, as used on any particular occasion, remains temporally indefinite; but the *statement* which it is then used to express has a content capturable by (or at least truth-value linked with) a certain temporally definite sentence. It is misleading to say (ibid., p.40 n.1) that 'in Aristotle, the word 'now' can be either temporally definite or temporally indefinite' (with reference to *Phys* 219b11ff and b31; cf. Remes, 'Aristotle's Sea Fight Discussion', *Ajatus* 37, 1977, 41–7, p.43). The point which Aristotle is here making – which we might put by distinguishing between the Fregean sense (which changes from moment to moment) and the Kaplanian character (which remains constant from moment to moment) of 'now' – is best captured by a distinction between the sentence '*p* now' and the statement that *p* now, rather than by conflating 'now' with temporally definite temporal indicators, i.e. dates.

How do truth and falsity enter this picture? If we permit truth-values to attach to all the linguistic items introduced so far, then clearly they cannot do so in the same way to each. In the case of temporally definite sentences, statements and propositions, there are two options: one is to say that truth-values attach to these entities omnitemporally (or timelessly) and invariably. This approach would be rejected by anyone who regards the future as open in the sense that contingent sentences about the future are, in advance, neither true nor false. On that view, such a sentence can *become* true or false at a certain point, but it is not true or false *before* that point is reached. Still, there is a common core to both approaches (at least if omnitemporality be allowed to stand in for timelessness on the first approach), namely that *once* such a sentence has acquired a truth-value, it retains that truth-value thereafter. Temporally indefinite sentences, on the other hand, vary in truth-value from occasion to occasion. The sentence 'Socrates is sitting' may be true now, but false in ten minutes.

It is common nowadays to regard truth-values as attaching to statements (or propositions) rather than to sentences as used at times. On this view, since the time-index is built into the identity of the statement (or proposition), truth/falsity can attach absolutely to their bearers. This approach contrasts with the standard ancient and medieval one, according to which truth-values attach at times to temporally indefinite sentences.[7] That is, instead of attaching truth-values to statements of the form 'Socrates is sitting at t_1', the ancient and medieval policy was to attach truth-values *at times* to sentences of the form 'Socrates is sitting'. It is this approach which underlies Aristotle's insistence that the same λόγος can at one time be true and at another false.[8] It also underlies the Stoic attempt, reported by Alexander, to avoid necessitar-

[7] Prior, *Time and Modality* (Oxford, 1957), appendix A.

[8] *Cat* 4a23–26; *Met* 1012b23–6, 1051b13–15. See here Nuchelmans, *Theories of the Proposition* (Amsterdam, 1973), ch.3. Nuchelmans is surely right in his claim that the ancient position relates just to *temporal* variation of truth-value. 'Socrates sits' uttered at t_1, counts as the same λόγος as 'Socrates sits' uttered at t_2, as long as the reference of 'Socrates' is held fixed: 'Socrates sits', said at t_2 of my dog Socrates, would not count as the same λόγος as 'Socrates sits' said at t_1 of the philosopher. But we do not

ianism by relying on the varying truth-value of the sentence 'There will be a sea battle tomorrow'.[9]

This conception did not have it all its own way in antiquity. A very old sophism, the Dissoi Logoi, seems to have worked by bringing the two conceptions into (sophistic) confrontation with one another: one argument claims that a *λόγος* (=sentence) can be both true and false (i.e. true at one time, false at another); the opposing argument, in seeking to expose this position as an absurdity, in effect construes '*λόγος*' as 'statement' rather than 'sentence'.[10] The same equivocation seems also to underlie one of the Stoics' so-called Changing Arguments (*μεταπίπτοντες λόγοι*): it is not both true that I have asked something of you already and that the stars are not even in number; I have asked something of you already; therefore the stars are even in number.[11] Here the *sentence* 'I have asked something of you already' changes in truth-value from false to true (the propounding of the first premiss being taken to constitute asking something of you), giving the appearance of paradox. The paradox vanishes if we distinguish the different *statements* made at each propounding of this sentence.[12]

In general, however, the conception of truth as attaching at times to sentences, rather than as attaching once-for-all to statements (or propositions), seems to have prevailed. Contrary to the claims of some modern writers, there is nothing incoherent in the alternative approach adopted by the ancients to truth-evaluation.[13] Any semantic theory which contains a tense logic in the ancient style will take as its central semantic concept truth-at-a-time rather than (once and for all) truth. Evans objects[14] that such a theory could not serve as a theory of sense.

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need to adjust the terminology: we can still individuate the relevant linguistic items, to which truth-values attach, as *sentences*. 'Socrates', the name of the philosopher, is a different *word* from 'Socrates', the name of my dog: hence the sentences in which the names figure will be different. After all, *λόγοι* are not simply assemblages of noises or scratches, but meaningful such assemblages (*DI* 4. Cf. the Stoic view, as reported by Sextus *AM* 8.11).

[9] *De Fato*, ch.10, in Bruns ed., *Alexandri Aphrodisiensis Scripta Minora = Supplementum Aristotelicum* 2.2 (Berlin, 1892), 177.7–178.7. On this chapter, and its relevance to the topic of this study, see now my 'Alexander's Sea Battle: a Discussion of Alexander of Aphrodisias *De Fato* 10', *Phronesis* 38, 1993, 75–94.

[10] *DK* II.90.4. Nuchelmans, *Theories of the Proposition*, p.39.

[11] Sextus, *PH* 2.231.

[12] Nuchelmans, *Theories of the Proposition*, p.80.

[13] Cf. Hintikka, *TN*, p.149 n.5.

[14] 'Does Tense Logic Rest on a Mistake?', in his *Collected Papers* (Oxford, 1985), 343–363, at p.349f.

His main argument (apart from a dubious appeal to 'ordinary language', which in point of fact supplies locutions to both sides of the debate) appears to be that such a theory does not reveal that it is the *point* of assertion to aim at correctness at the time of utterance, and not at any other time. But no theory of meaning (conceived as an axiomatised system in the style of Davidson yielding meaning-specifications of input sentences) has as its job to tell speakers what the point of assertion is: that belongs in the informal preamble to any such theory. Any such preamble would find 'true at *t*' just as coherent a central semantic concept as 'true': the point of assertion, it would be explained, is to assert sentences (conceived as varying in truth-value over time) which are true at the time of utterance. As far as the logical machinery of a theory of meaning goes, the only overall constraint is that the theory should deliver *correct* meaning-specifications of its input-sentences. There is no *a priori* reason why different types of machinery should not be, as far as that task goes, equivalent. It does not appear to matter whether the time index enters the theory as part of the context in which utterances (say) receive a once-for-all assessment, or as part of the theory's machinery in which utterances receive a time-relative assessment.

Given the overall equivalence between the two approaches to the truth-evaluation of appropriate linguistic items, it follows that provided we are clear about the main differences between ancient and modern styles, there is no reason why we should not adopt the whole range of terminology introduced so far. Apart from the type-token distinction, I shall do so. It is convenient to be able to talk about statements, as defined, and their (absolute) truth-values, rather than have to refer to sentences as assessed for truth/falsity at a time. The former talk may be regarded as shorthand for the latter. *Mutatis mutandis*, the same remarks apply to the attachment of modal operators to linguistic items. When I talk of the (absolute) truth or necessity of a statement, that is to be regarded as a mere *façon de parler* for what an ancient would naturally have conceived as the truth at a time, or necessity at a time, of a sentence.

In some contexts (especially in the later sections on the Master Argument) an important distinction will be between temporally indefinite sentences on the one hand, and temporally definite sentences, statements and propositions on the other. The basis of the distinction is that, in the case of the former category, truth-values, once acquired, may subsequently change, whereas in the case of the latter category they

may not. For the sake of brevity, I shall use the phrase 'temporally definite expressions' to cover all three items in the latter category. Corresponding to the linguistic distinction between temporally definite expressions and temporally indefinite sentences is an ontological distinction between event-particulars and event-types.

In discussing fatalism it is convenient to make use of symbolic notation.[15] My policy will be slightly unusual in this regard, because I shall make use of *two* notations. These notations correspond to the two methods, ancient and modern, of evaluating linguistic items for truth and falsity. My eclectic approach to terminology is thus mirrored in the symbolism. In the first place, I shall follow the notation of Prior's tense-logic ('Priorean notation').[16] In this notation, tense-logical operators are prefixed to letters holding place for temporally indefinite sentences as follows:

Pp = it has been the case (at least once) that p
Fp = it will be the case (at least once) that p.

Prior also introduces two further operators:

Hp = it has always been the case that p
Gp = it will always be the case that p.

In some contexts it is convenient to define 'Hp' and 'Gp' in terms of 'Pp' and 'Fp' respectively ($Hp = \neg P \neg p$; $Gp = \neg F \neg p$). (This will be so in the case of Prior's reconstruction of the Master Argument.) It is also frequently convenient to introduce a metric into the primitive formulae:

Fnp = it will be the case in n units of time that p, etc.

Priorean tense-logic is not committed to any particular interpretation of the times at which its formulae are verified: these may be instants or durations.

[15] I shall follow the convention of not distinguishing notationally between quotation and quasi-quotation (on which see Quine, *Mathematical Logic* (Harvard, 1940), #6). The context will always make it clear whether the expression 'p' is intended to mention the sixteenth letter of the alphabet, or a sentence for which that letter is by convention holding place. I trust that all unexplained notation will be familiar. Note that '$\rightarrow$' symbolises *material* implication throughout.

[16] See esp. 'The Formalities of Omniscience', in his *Papers on Time and Tense* (Oxford, 1968), 26–44; 'Time and Determinism', in his *Past, Present and Future* (Oxford, 1967), 113–136.

Prior's notation is easily translateable into the notation of first-order predicate logic ('Standard notation'), with ordinary quantifiers binding variables ranging over times (again with no necessary commitment as to whether the times are instants or durations).[17] So, for example, where '$A \ldots$' is a one-place predicate letter with a slot for times, and '$<$' is a two-place predicate with slots for times and the fixed interpretation '... is earlier than ...', we can translate the Priorean 'p' into 'At' and render the tense-logical operators in Standard notation as follows:

$$Fp = \exists t' [t < t' \,\&\, At']$$
$$Pp = \exists t' [t' < t \,\&\, At']$$
$$Gp = \forall t' [t < t' \rightarrow At']$$
$$Hp = \forall t' [t' < t \rightarrow At']$$

We would also have, for example:

$$PPp = \exists t' [t' < t \,\&\, \exists t'' [t'' < t' \,\&\, At'']]$$
$$PFp = \exists t' [t' < t \,\&\, \exists t'' [t' < t'' \,\&\, At'']]$$

and so on.[18]

It is a straightforward matter to characterise a translation function from Priorean notation to the equivalent expression in Standard notation. The following mapping takes a tense-logical formula ϕ to a formula $\overline{\phi}$ of Standard notation containing one free time variable:[19]

$\overline{p} = At$, for sentence letters p
$\overline{\neg \phi} = \neg \overline{\phi}$
$\overline{\phi \rightarrow \psi} = \overline{\phi} \rightarrow \overline{\psi}$
$\overline{F\phi} = \exists t^i [t < t^i \,\&\, \overline{\phi}\ (t^i)]$ where $t^i = t'^{\cdots'}$ (i times) and i is the smallest number such that t^i does not occur in $\overline{\phi}$ and $\overline{\phi}\ (t^i)$ is the result of substituting t^i for t in ϕ
$\overline{P\phi} = \exists t^i [t^i < t \,\&\, \overline{\phi}\ (t^i)]$ where....etc (as above).

[17] I am indebted in much of what follows to Van Benthem: 'Tense Logic as a System of Logic', *Logique et Analyse* 80, 1977, 41–83.

[18] See here Van Benthem, 'Tense Logic as a System of Logic', p.397; Rescher and Urquhart, *Temporal Logic*, p.52.

[19] Van Benthem, 'Tense Logic as a System of Logic', p.408.

For most purposes, I have chosen to use Priorean formulae. But sometimes it is preferable, or even mandatory, to use Standard notation. This will be so when, for example, we need to time-index modal operators. Modal locutions make room for what is called 'double indexing', i.e. indexing both the operator and the sentence to which it is prefixed. Sometimes it is mandatory to 'double index' in order to capture particular nuances.[20] Here it convenient to make use of Standard notation. Suppose one wishes to formalise 'It is possible at some time that p at some time (not necessarily the same time)'. If we symbolise 'possibly p' as 'Mp', then the translation of this sentence into Standard notation is:

$$\exists t \exists t' \, [M_t p_{t'}].$$

The simple Priorean formula 'Mp', on the other hand, commits us to the simultaneity of the time of possibility with the time at which the sentence may possibly hold. I shall also allow myself to mix Priorean and Standard notations. For instance, I shall count such formulae as '$[Fp]_t$' as well-formed. In general, I make no assumptions about the temporal content of sentence-letters in Priorean contexts: they hold place for temporally indefinite sentences which may be tensed anyhow. I trust that my sacrifice of consistency for the sake of convenience in the matter of notation will not lead to confusion.

I have no metaphysical preference for either of the notations. The Standard approach involves an ontological commitment to times, but so (implicitly) does the Priorean approach: the 'F' operator is interpreted as 'It will be the case at some time that...' The major difference

[20] That both simple and time-indexed modalities are to be found in Aristotle's works is argued by Seel in his *Die Aristotelische Modaltheorie* (Berlin/New York, 1982). (He calls the simple modality 'nichtzeitgebunden' and indexed 'zeitgebunden'.) It seems clear that Seel is correct in his general claim that both sorts of modality are present in Aristotle, and that a further distinction can be drawn within the category of time-indexed modality between cases where a modal operator is indexed to the *same* time as the modalised sentence (which Seel calls 'unmittelbare Notwendigkeit bzw. Möglichkeit') and cases where it is not ('mittelbare Notwendigkeit bzw. Möglichkeit'). Seel's terminology seems to me peculiar (for some apposite criticisms see Weidemann, 'Die Aristotelische Modaltheorie: eine Auseinandersetzung mit dem gleichnamigen Buch von Gerhard Seel', *Zeitschrift für Philosophische Forschung* 40, 1986, 104–20), and I do not follow it; but the distinctions themselves will be of great importance in what follows. In particular: double-indexing is required to capture the nuances present in real (as opposed to logical) modalities: cf. McCall, 'Time and the Physical Modalities', *Monist* 53, 1969, 426–446, p.427f; Weidemann, ibid., p.111.

between the approaches is that the Priorean notation lacks machinery for quantification over times. It is also true that not everything which we would intuitively regard as true about time and tense and which can be expressed in Standard notation can also be expressed in Priorean notation. Not all the examples which can be found in the literature purporting to illustrate the comparative poverty of Priorean notation are convincing;[21] but a case in point would be the irreflexivity of the 'earlier than' relation:

$$\neg \exists t \, [Ett].$$

[21] Kamp ('Formal Properties of 'Now'', *Theoria* 37, 1971, 227–73, at pp.230–2) argues that an operator 'N' interpreted as 'now' and construed rigidly is needed if we are to distinguish

A child was born which would be king
$P \exists x \, [Bx \,\&\, FKx]$

from

A child was born which will be king
$P \exists x \, [Bx \,\&\, NFKx]$.

But the latter can be expressed in Priorean by

$\exists x \, [PBx \,\&\, FKx]$.

Admittedly, this formula commits as to the existence *now* of something which was born and will be king; but on any plausible view of identity, that is hardly a commitment we should wish to avoid. McKirahan ('Diodorus and Prior and the Master Argument', *Synthese* 42, 1979, 223–53) suggests that Priorean notation contains crucial ambiguities along Kampian lines. For example, the formula (which will be important below)

(i) $p \rightarrow PFp$

is, McKirahan claims (p.231), ambiguous as between

(ii) $p_t \rightarrow \forall t' \, [t' < t \rightarrow \exists t'' \, [t' < t''[p_{t''}]]]$

and

(iii) $p_t \rightarrow \forall t' \, [t' < t \rightarrow \exists t'' \, [t < t''[p_{t'}]]]$.

Now (iii) would be captured by Kamp as

$p \rightarrow PNFp$.

As a point about Prior's own usage, McKirahan's claim seems to me incorrect. On my reading of Prior, he understands (i) as (ii), not as (iii). (That is indeed why Kamp felt it necessary to introduce his 'N' operator; in general, the embedding of tense-operators within other tense-operators is just what is distinctive – and controversial – about the whole enterprise of tense-logic.) But so as to remove any possible ambiguity, I here lay it down that, in what follows, (i) is to mean (ii) and not (iii). In a metric tense-logic we can capture (iii) as follows:

There is no Priorean equivalent of this formula: the expression of this truth requires explicit quantification over instants.[22] But this relative expressive poverty of Priorean notation will not affect us.

Prior adumbrates two models of time which he calls 'Ockhamist' and 'Peircean'.[23] Although I shall deal with these models in some detail in #13, it is necessary to make a few general remarks about them here. The Ockhamist model allows for truth-value gaps; the Peircean model does not. On the Ockhamist model, where '*p*' is contingent, '*Fp*' is neither true nor false; the semantics of this model make no distinction between '$\neg Fp$' and '$F\neg p$', which are equally, for contingent '*p*', neither true nor false. It accordingly adopts what has been called 'choice negation' ('$\neg Fp$' is true iff[24] '*Fp*' is false), rather than 'exclusion negation' ('$\neg Fp$' is true iff '*Fp*' is not true).[25] In this model, the modal operators are interpreted intensionally; '*Lp*' means 'now unpreventably *p*';[26] '*Mp*' is defined as its dual in the usual way (i.e. $Mp \equiv \neg L\neg p$). The Peircean model retains the principle that every well-formed assertoric sentence is either true, or alternatively false, *tertium non datur*. On this approach, where '*p*' is contingent, '*Fp*' counts as *false*. A sharp distinction is now made between '$\neg Fp$' and '$F\neg p$', the former counting as true, the latter false (for contingent '*p*'). The modal operators are defined extensionally, '*MFp*', for example, being defined as '$\neg F\neg p$' (there is no distinction on this model between '*Fp*' and '*LFp*' or between '*MPp*', '*Pp*' and '*LPp*') . Since this model distinguishes between '$\neg Fp$' and '$F\neg p$', it

$p \rightarrow PnFnFp$

i.e.

$p \rightarrow \exists n \exists m\ [PnFnFmp]$.

In general, tense-operators are to be construed as creating their own temporal contexts: a formula falling within the scope of such an operator is to be assessed from the temporal point of view introduced by that operator, and not from any other point of view (such as that of the absolute present).

[22] Rescher and Urquhart, *Temporal Logic*, p.56; Prior, *PPF*, p.45. The uses of 'since' and 'until' are not capturable in Priorean notation. But a tense logic containing 'since' and 'until' as its primitive operators can capture everything expressible using Prior's operators: see Rescher and Urquhart, pp.123–4.

[23] *PPF*, ch.7.

[24] I use this abbreviation for 'if and only if' throughout.

[25] See here van Fraassen, 'Presuppositions, Supervaluations and Free Logic', in Lambert ed., *The Logical Way of Doing Things* (Yale, 1969), 67–91, at p.69.

[26] Prior, *PPF*, p.117; cf. Wiggins, 'Towards a Reasonable Libertarianism', in his *Needs, Values, Truth*, 2nd ed. (Oxford, 1991), 269–302. This sense of '*L*' properly includes strict logical necessity: Wiggins, ibid., p.285.

cannot retain the equivalence '$Gp \equiv \neg F\neg p$'. We do indeed have '$Gp \rightarrow \neg F\neg p$', but not '$\neg F\neg p \rightarrow Gp$'.

In what follows I shall interpret the modal operators, unless I signal otherwise, in accordance with the Ockhamist understanding of them: '*Lp*' means 'It is now unpreventable that *p*.[27] In this formulation we may (1) replace 'now' by a variable, which may then be (2) bound by a quantifier or (3) replaced by a date, so: (1) $L_t p$ (2) $\forall t\ [L_t p]$ (3) $L_{t_1} p$. A parallel set of adaptations is available for the simple '*p*', which means '*p* now': if we replace 'now' by a variable, bound or otherwise, we move from Priorean to Standard notations. In order to avoid clutter, however, I shall generally not adorn the modal operators with indices unless it is strictly necessary for the sense to do so. In the context of the Master Argument, for example, we shall be concerned with the modal axiom

$$L\ [p \rightarrow q] \rightarrow [Lp \rightarrow Lq].$$

It will involve no loss of generality if we work with this formula, rather than insist on the more accurate but cumbersome

$$\forall t\ [L_t\ [p \rightarrow q] \rightarrow [L_t p \rightarrow L_t q]].$$

[27] The main alternative interpretation I shall consider will be the Diodorean 'It is and will be true that *p*'.

2 Aristotle and the Future Sea Battle: Introduction

There is general agreement that the thesis which Aristotle means to counter in *DI* 9 is logical fatalism (which I shall henceforth call just 'fatalism'): the thesis that the truth of a statement entails its necessity, in the sense of its inevitability for the agent; in particular that the truth of a statement bearing on the future entails that there is nothing anyone can do to affect the obtaining or otherwise of the relevant state of affairs. But there, unfortunately, the concensus on Aristotle's intentions in this chapter ends. A number of competing interpretations of the chapter have been put forward. In this section I shall briefly review the four interpretations which I propose to discuss in detail: the anti-realist, realist and statistical interpretations, and the interpretation of the earliest extant commentators.

On the interpretation which is frequently called the traditional, or standard, interpretation, and which I shall call the anti-realist interpretation (**AR**),[1] Aristotle seeks to counter fatalism by denying the

[1] Versions of **AR** are supported by Łukasiewicz, 'On Determinism', in S.McCall ed., *Polish Logic* (Oxford, 1967); Sorabji, *Necessity, Cause and Blame* (London, 1980), ch.5; Taylor, 'The Problem of Future Contingencies', *PR* 66, 1957, 1–28; Craig, *The Problem of Divine Foreknowledge and Future Contingents from Aristotle to Suárez* (Leiden, 1988), ch.1; Vuillemin, *Nécessité ou Contingence: l'Aporie de Diodore et les Systèmes Philosophiques* (Paris, 1984), ch.6; Kneale and Kneale, *The Development of Logic* (Oxford, 1962), pp 45–54; Patzig, *Die Aristotelische Syllogistik* (Göttingen, 1963), ch.2; Sambursky, 'On the Possible and the Probable in Ancient Greece', *Osiris* 12, 1956, 35–48; Ross, *Aristotle* (London, 1964), p.80, 201, *Aristotle's Metaphysics* (Oxford, 1924), vol.1 p.lxxxi; Baylis, 'Are Some Propositions Neither True Nor False?', *Philosophy of Science* 3, 1936, 156–66; D.Williams, 'The Sea-fight Tomorrow', in Henle et al eds., *Structure, Method and Meaning* (New York, 1951), 282–306; Quine, 'On a So-called Paradox', *Mind* 62, 1953, 65–7; Butler, 'Aristotle's Sea-fight and Three-valued Logic', *PR* 64, 1955, 264–74; Saunders, 'A Sea-fight Tomorrow?', *PR* 67, 1958, 367–78; Bradley, 'Must the Future be what it is going to be?', *Mind* 68, 1959, 193–208; Prior, *Formal Logic*, 2nd ed. (Oxford, 1962), pp.240–50; Cahn, *Fate, Logic and Time* (Yale, 1967); Wieland, 'Aristoteles und die Seeschlacht', *Berichte zur Wissenschaftsgeschichte* 2, 1979, 25–33; and less wholeheartedly by Ackrill in his commentary, *Aristotle's Categories and De Interpretatione* (Oxford, 1963). The designation 'traditional' derives from Hintikka, *TN*, p.148–9. Sorabji points out (p.92) that in view of the antiquity of the view championed by Ammonius and Boethius, the label is something of a misnomer; although I used it in previous publications, I abandon it here in favour of what I hope is a more perspicuous designation. Not all defenders of an anti-realist interpretation include preservation of **LEM** alongside restriction of **PB** in the definition of their position. It will be important in what follows that I have defined **AR** to include both these features.

Principle of Bivalence (**PB**) in respect of future contingents, while preserving the Law of Excluded Middle (**LEM**). I follow the well-established custom of distinguishing these theses as follows: **PB** is the semantic thesis that (it is necessary that) every meaningful, assertoric statement is either true or false; **LEM** is the syntactic thesis that '*p* or not-*p*' holds for any substitution into the position occupied by the letter '*p*'.[2] These two principles are equivalent if **PB** is true; but if **PB** is false, there is still room for **LEM** to be true. The fatalist seeks to infer the necessity of a statement about a purported future contingency (**FCS**) from its truth.[3] According to **AR**, Aristotle accepts the inference but

[2] Some of the earlier Sea-Battle literature is vitiated by a failure to draw this distinction: a particularly confused case is Dickason, 'Aristotle, the Sea Fight and the Cloud', *JHP* 14, 1976, 11–22. This way of drawing the distinction is to be distinguished from that followed by Łukasiewicz (see the papers collected in McCall ed., *Polish Logic; Aristotle's Syllogistic* 2nd ed. (Oxford, 1957)). In 'On Determinism' (in *Polish Logic*), Łukasiewicz formulated **LEM** as: 'Two contradictory sentences are not false together, that is ... one must be true' (p.23). But the second clause does not follow from the first (Weidemann, 'Möglichkeit und Wahrheit', *AGPh* 61, 1979, 22–36 at p.28). In *Aristotle's Syllogistic*, Łukasiewicz simply says: 'Of two contradictory propositions, one must be true.' (p.82). This version is followed by Frede (*Aristoteles und die Seeschlacht* (Göttingen, 1970), p.11; cf. Whitaker, *An Analysis of Aristotle's De Interpretatione* (Cambridge Ph.D thesis, 1993), p.75ff; Celluprica, *Il capitolo 9 del De Interpretatione di Aristotele* (Bologna, 1977), p.33) and Donini, *Ethos: Aristotele e il determinismo* (Alessandria [Turin], 1984), p.2. I prefer the syntactic version (as given by, e.g., Kneale, *DL*, p.47; von Wright, 'Determinismus, Wahrheit und Zeitlichkeit', *Studia Leibniziana* 6, 1961, 161–78, p.162; Haack, *Deviant Logic* (Cambridge, 1974), p.64ff) because the semantic version is ambiguous as between a reading which, in the language of the commentators, preserves the definite truth of at least one disjunct of a disjunction of future contingent statements, and a reading which does not (truth and falsity not being divided definitely): see #12 below. (If the semantic way of characterising **LEM** is taken in the former of these senses (one disjunct is definitely – dividedly, separately – true) then, assuming choice negation, the distinction between **LEM** and **PB** is obliterated. But that deprives us of a important distinction.) On the other hand, I see no objection to the characterisation of **LEM** indicated by the first part of Łukasiewicz's 'On Determinism' formulation: two contradictory sentences are not *false* together (so too Vuillemin, *NC*, ch.6). In antiquity the distinction between **LEM** and **PB** was explicitly drawn by the Epicureans, some of whom favoured a policy of adhering to the former while abandoning the latter (i.e. the position corresponding to **AR**): Cicero, *De Fato* 37. (Epicurus himself is said by Cicero to have rejected **LEM** itself: *Academica Priora* 97.) A clear modern exposition of the distinction and its importance is McCall, 'Temporal Flux', *APQ* 3, 1966, 270–81.

[3] Only 'purported', because if the fatalist's inference goes through, the relevant state of affairs is necessary, not contingent. A typical example of a FCS is 'There will be a

avoids necessitarianism by denying that **FCS**s are true or false (alternatively: that the propositions expressed by **FCS**s are *already* true or false), while allowing that a *disjunction* of contradictory **FCS**s (a **FCD**) is true (and indeed necessarily true). Hence, according to **AR**, Aristotle's position is that **FCS**s are neither true nor false; alternatively, that they have a third (intermediate) truth-value: I do not distinguish these positions.[4]

AR is to be contrasted with a realist interpretation of *DI* 9 (**R**), according to which Aristotle does not restrict either **LEM** or **PB**; rather, he rebuts fatalism by distinguishing between the truth/falsity of a **FCS** and its necessity, allowing the former but refusing the latter; and, in particular, banning an inference from the necessity of **LEM** to the several necessities of the disjuncts.[5] According to **R**, Aristotle *rejects* the fatalist's inference from truth to necessity.

sea battle tomorrow'. This is a categorical statement about the future. I see no warrant for Bäck's claim ('Sailing through the Sea Battle', *Ancient Philosophy* 12, 1992, 133–51) that Aristotle sometimes regards it as logically equivalent to the statement that there will possibly be a sea battle tomorrow.

[4] Sainati (*Storia dell' organon aristotelico* (Florence, 1968), pp.240–261) conducts a fierce polemic against supporters of **AR** who construe Aristotle as embracing the trivalence thesis in respect of **FCS**s, favouring instead the formulation (to put it in my terminology): the propositions expressed by **FCS**s are *not yet* either true or false. But he fails to make clear wherein the alleged distinction consists.

[5] Versions of **R** are to be found in Anscombe, 'Aristotle and the Sea Battle' (originally in *Mind* 65, 1956; I follow the pagination of the reprint in Smart ed., *Problems of Space and Time* (New York, 1964), 43–57); Strang, 'Aristotle and the Sea Battle', *Mind* 69, 1960, 447–65; Linsky, 'Professor Donald Williams on Aristotle', *PR* 63, 1954, 250–2; Lowe, 'Aristotle on the Sea Battle: a Clarification', *Analysis*, 40 1980, 55–9; C.Williams, 'What is, necessarily is, when it is', *Analysis* 40 1980, 127–31; Wolff, 'Truth, Eternity and Contingency', *Mind* 69, 1960, 398–402; Rescher, *Studies in the History of Arabic Logic* (Pittsburgh, 1963), 43–54; 'Truth and Necessity in Temporal Perspective', in Gale ed., *The Philosophy of Time* (London, 1968), 183–220; Huber, *Die Vereinbarkeit von göttlicher Vorsehung und menschlicher Freiheit in der Consolatio Philosophiae des Boethius* (Zürich, 1976), p.39; A. Becker, 'Bestreitet Aristoteles die Gültigkeit des 'Tertium Non Datur' für Zukunftsaussagen?', *Actes du Congrès International de Philosophie Scientifique* 6, Paris 1936, 69–74; Ackrill gives **R** a hearing in his commentary, but does not support it (*pace* Celluprica, *Il capitolo 9 del De Interpretatione*, pp. 67–8). **R** is sometimes called the 'non-standard' interpretation. In a previous publication I called it 'modern', but that label is unsatisfactory, because **R** does have medieval exponents (Appendix 1). Rescher indeed calls the interpretation 'medieval', but this is equally a misnomer: among medieval commentators **R** appears to be a minority interpretation. Rescher also uses the label 'Farabian' for **R**: but while al-Farabi certainly offers a statement of the realist view that antecedent truth is compatible with contingency, he does so *in propria voce*, not as an interpretation of Aristotle. See Zimmermann, *Al-Farabi's Commentary and Short Treatise on Aristotle's De Interpretatione* (Oxford, 1981), pp.91–6. In antiquity, such a view was also defended by Cicero in *De Fato*, and his mentor Carneades: *De Fato* 23–8; cf Long, *Hellenistic Philosophy*, 2nd ed. (London, 1986), pp.101–3.

The third interpretation which will concern us is the statistical interpretation (**S**), which presupposes **R** but offers a further diagnosis of Aristotle's solution.[6] The contribution of **S** is to argue that Aristotle is dealing in *DI* 9 not with temporally definite expressions, but with temporally indefinite sentences. **S** argues that Aristotle responds to the fatalist by pointing out that the temporally indefinite sentence 'There will be a sea battle tomorrow' is contingent in the sense that it is sometimes true, sometimes false and so not necessary (necessity being construed as truth at all times).[7]

Finally, on the interpretation of Aristotle first found extant in the commentaries on *DI* by Ammonius and Boethius,[8] and subsequently adopted by a significant number of medieval commentators, **AR**, while right as against **R** and **S** on all major points of divergence, is wrong to claim that Aristotle *denies* **PB** in respect of **FCS**s; rather, he *adapts* it in this sense: while an antiphasis of **FCS**s (a **FCA**) does divide truth and falsity between its members, it does not do so in a definite (or deter-

[6] Hintikka, *TN*, especially ch.8; and *AMD*; Fine, 'Truth and Necessity in *De Interpretatione* 9', *History of Philosophy Quarterly* 1, 1984, 23–47; Bosley, 'An Interpretation of *On Int* 9', *Ajatus* 37, 1977, 29–40; Chadwick seems to follow Hintikka in his *Boethius: the Consolations of Music, Logic, Theology and Philosophy* (Oxford, 1981), pp. 158–9. The fact that **S** presupposes **R** (cf. Fine, p.34) means that my rejection of **R** below is sufficient for the rejection of **S**. But I include consideration of **S** for the sake of completeness; further, I shall not reject all aspects of **S**.

[7] Hintikka at one point (*TN*, p.173) tentatively suggests that Aristotle may even have thought that the truth-values of *statements* are variable. This suggestion is clearly implausible, and I shall not consider it further. For some criticisms, see Waterlow, *Passage and Possibility* (Oxford, 1982), pp.123–4.

[8] Whether Boethius relied on Ammonius is a matter of controversy which I shall not take up: Courcelle has argued for dependence (*La Consolation de Philosophie dans la Tradition Littéraire* (Paris, 1967), part 4 ch.1), Shiel ('Boethius' Commentaries on Aristotle', in Sorabji ed., *Aristotle Transformed* (London, 1990), 349–72), Tarán (*Anonymous Commentary on Arisotle's De Interpretatione* (Meisenheim, 1978), p.vii n.10), and Chadwick (*Boethius*, pp.152–7) against. Certainly both commentators relied, directly or indirectly, on a long line of (now lost) commentaries on *DI*, including those of Alexander of Aphrodisias, Porphyry, Syrianus and Iamblichus. See here Issac, *Le Peri Hermeneias en occident de Boèce à St. Thomas* (Paris, 1953), ch.1; Obertello, 'Proclus, Ammonius and Boethius on Divine Foreknowledge', *Dionysius* 5, 1981, 127–164, #4; Shiel, pp.356–61; Chadwick, pp.129–30, 152–7; Ebbesen, 'Boethius as an Aristotelian Commentator', in Sorabji, ed., op. cit., 373–91 at pp.375–7; Sharples, *Cicero: On Fate and Boethius: the Consolation of Philosophy* (Warminster, 1991), pp.41–2; Zimmermann, *Al-Farabi's Commentary*, p.lxxxivff. For a judicious assessment of some of the issues, see de Vogel, 'Boethiana I', *Vivarium* 9, 1971, 49–66.

minate) way.[9] **FCS**s are indeed in some sense either true or false, but they are not definitely one or the other, i.e. it is not metaphysically determinate which member of a **FCA** is true and which false. (Elucidation of the precise import of this claim will have to await the discussion of the commentators in #12.) I shall call this interpretation '**C**'.[10]

It may be helpful to give a quick overview of the main differences between **AR** and **R** before plunging into the detail of the text. The ninth chapter of *DI* has a tripartite structure. In the first part (18a28–34) Aristotle argues that a certain thesis applies to statements about the present and past but not – or not in the same way – to singular statements about the future. According to **AR**, that thesis is **PB**. According to **R**, it is the thesis that either necessarily *p*, or necessarily not-*p*. In the second part (18a34–19a22) Aristotle develops the fatalist's argument that, given the truth of a **FCS**, its necessity follows. He rejects the fatalist's conclusion that everything comes about of necessity; that obliges him to reject either the fatalist's premisses, or his argument. According to **AR**, Aristotle accepts the derivation of the necessity of a **FCS** from its truth, but he rejects the premiss, that **FCS**s have a truth value; thereby he rejects **PB** for **FSC**s. According to **R**, he accepts the premiss, and in this section merely records the fatalist's argument without yet rejecting it. The dispute between the rival interpretations comes to a head over the third part of the chapter (19a23–b4). Here the realist view is that Aristotle rejects the fatalist's argument by exposing in it the fallacy of operator shift. On this view Aristotle accepts **PB**, regarding it as equivalent to **LEM**. On the anti-realist interpretation Aristotle has accepted the fatalist's argument in the second part; in the

[9] A disjunction of **FCS**s (a **FCD**) is a sentence of the form '*Fp v* ¬*Fp*'. An antiphasis of **FCS**s (a **FCA**) is a **FCS** together with its contradictory opposite (*DI* 17a33–4), arranged consecutively. A disjunction is a sentence; an antiphasis is a list. The sentential components of a disjunction are its disjuncts; I shall call the sentential components of an antiphasis its 'members.'

[10] This interpretation of Aristotle is, I think, supported by Frede, *Seeschlacht*; 'The Sea Battle Reconsidered', *OSAP* 3, 1985, 31–87 (but the interpretation of these studies is not entirely straightforward: see #12 below); cf. Talanga, *Zukunftsurteile und Fatum* (Bonn, 1986), pp.19–82. (Frede calls this interpretation 'traditional'.) It is important to note that I use the label '**C**' *not* as an abbreviation of 'Ammonius' and Boethius' interpretation of Aristotle, whatever that was', but to refer to the *specific* construal of Ammonius' and Boethius' interpretation of Aristotle which I offer in #12. It is, needless to say, a matter of controversy not only how we should interpret Aristotle, but also how Ammonius and Boethius (among others) interpreted him: some critics enlist them in the cause of **R**.

third part he rejects the fatalist's premiss that every statement is either true or false, and he does so while carefully seeking to preserve the truth, and indeed the necessity, of **LEM**. In symbolic terms, the realist interpretation construes Aristotle as rejecting the inference from '*L* [*Fnp v* ¬*Fnp*]' which he accepts, since it is the necessitation of a substitution-instance of **LEM**, to '*LFnp v L*¬*Fnp*'.

My tactic will be as follows: in ##3–5 I shall discuss **R**, **S** and **AR** in relation to the three parts of the text I have identified. My case here will be mainly negative: I aim to show that **R** and **S** cannot succeed as overall interpretive strategies for *DI* 9, although I shall concede that **S** has some insights to offer. These three sections do not purport to provide complete commentaries on their respective subdivisions of the chapter, and many exegetical issues will be left over for subsequent treatment. The positive case for **AR** (and, by implication, for **C**) will be initiated in these sections, but not completed until #12, where I shall argue that **AR** and **C** are notational variants of each other, but that, although as far as the logic of future contingency goes either of **AR** and **C** has equal claim to interpret the chapter correctly, **C** has a rhetorical advantage, clear from Boethius' commentary in particular, over **AR**, and provides the most satisfying interpretation of *DI* 9 as a whole. In #6 I shall reject an interpretation of the chapter along causal lines, and in #7 deal with the role which the so-called Principle of Plenitude plays in Aristotle's thinking about future contingency. ##8–10 will be concerned to justify the claim – central to both **AR** and **C** – that Aristotle accepts the fatalist's inference from truth to necessity, and hence must seek to avoid the fatalist's conclusion (which he clearly wishes to avoid) by challenging the premiss (**PB**) in some way. (In #11 I shall examine the inference in the Peripatetic tradition.) I conclude my treatment of the 'Sea Battle' proper in #13 with a brief overview of the logic of the position reached. Having examined, in #14, a text which provides an illuminating parallel to *DI* 9 – *Met* E.3 – I turn in #15 to the Master Argument, and seek to provide a convincing reconstruction of this celebrated logical puzzle. In so doing I aim to bring the Argument into comprehensible relation with *DI* 9 and Aristotle's attitude to **PB**.

3 The Opening Moves

The battle between the rival interpretations of *DI* 9 is joined as soon as the chapter opens. We must accordingly examine Aristotle's first words carefully:

> (1) *ἐπὶ μὲν οὖν τῶν ὄντων καὶ γενομένων ἀνάγκη τὴν κατάφασιν ἢ τὴν ἀπόφασιν ἀληθῆ ἢ ψευδῆ εἶναι·* (2) *καὶ ἐπὶ μὲν τῶν καθόλου ὡς καθόλου ἀεὶ τὴν μὲν ἀληθῆ τὴν δὲ ψευδῆ* (3) *καὶ ἐπὶ τῶν καθ' ἕκαστα, ὥσπερ εἴρηται·* (4) *ἐπὶ δὲ τῶν καθόλου μὴ καθόλου λεχθέντων οὐκ ἀνάγκη· εἴρηται δὲ καὶ περὶ τούτων.* – (5) *ἐπὶ δὲ τῶν καθ' ἕκαστα καὶ μελλόντων οὐχ ὁμοίως.*
>
> (1) In the case of things which are and those that have been it is necessary that the assertion or the denial be true or false; (2) and in the case of universals taken universally it is always the case that one be true and the other be false, (3) and so too in the case of particulars, as has been said; (4) in the case of universals not taken universally it is not necessary: these have also been dealt with. (5) – But in the case of particulars which are going to be it is not likewise. (18a28–34)

The contrast is between present and past antiphases on the one hand (*ἐπὶ μὲν . . .*), where both members must take one of the two standard truth-values (in the case of universals not taken universally the corresponding members need not take opposite truth-values; but in the case of singular statements and statements involving universals taken universally, they must do so), and future singular antiphases on the other hand (*ἐπὶ δὲ . . .*), where the members need not take either of the two standard truth-values, or, if they do, then 'not in the same way'.[1] (2)–(4) relate just to statements about the present and past, not to all statements: that is guaranteed by the fact that (2)–(4) presuppose and go beyond (1) – (1) merely requires conformity to **PB**;[2] (2)–(4) place additional constraints on *which* truth-values certain members in antiphasis can bear – and that singular statements are mentioned in (3): if (2)–(4) did not related solely to statements about the present and past, there would be a clash between (3) and (5); for (5) is excepted from the purview of (1). So in excepting (5) from the claim in (1), Aristotle is committed to excepting it too from the claims in (2)–(4). It is true that the claims of (2) and (4) are not in general restricted by Aristotle to the present and the past.[3] But that is not in point here: Aristotle here contents himself with a weaker statement than he is entitled to.

[1] See here Weidemann, 'Möglichkeit und Wahrheit' p.30, Ackrill, commentary, pp.133–4.

[2] Fine has a different view of the meaning of (1): see below in this section.

This interpretation involves giving '*ἀνάγκη*' in (1) wide scope. In one version, **R** gives this '*ἀνάγκη*' narrow scope. But this is syntactically very awkward immediately after 18a26-27, where '*ἀνάγκη*' in the same syntactic position undoubtedly has wide scope.[4] Furthermore, Aristotle immediately goes on to use '*ἀεὶ*' in (2) and '*ἀνάγκη*' in (4), both positioned initially, with wide scope. (2)–(4) refer back to 17b27–30, where Aristotle first makes the distinctions which he is recapitulating here. Taking the two passages together, it is clear that there is an equivalence between the two operators ('*ἀνάγκη*' at 17b27 = '*ἀεὶ*' at 18a30; '*ἀεὶ*' at 17b30 = '*ἀνάγκη*' at 18a32): the two operators are mere stylistic variants.[5] But the equivalence of the two operators and the parallelism between the two passages creates difficulty for **R**, because it is simply not semantically possible to give either '*ἀνάγκη*' at 17b27 or '*ἀεὶ*' at 17b30 narrow scope.[6] The question of the scope of '*ἀνάγκη*' will again raise difficulties for **R** when we come to examine 19a23ff.

It is of course true that Aristotle can position the necessity operator outside a disjuction, while not intending it to have wide scope: he does this for example at *Cat* 13a12–13, *DI* 22b21, *Met* 1027b5–6[7] and *Met* 1065a6–11[8] (I examine the first of these passages in #12). And in the case of some occurrences of '*ἀνάγκη*' in what follows (18a35, 18b4), although these are probably not cases where '*ἀνάγκη*' has *exclusively* narrow scope (the operator probably has what one might call 'double scope'), the emphasis is admittedly on a narrow scope reading of an initially placed operator. So it would be tendentious to argue for either reading purely on the basis of *Wortstellung* in isolation from the whole

[3] Fine, 'TN', p.39.

[4] On ch.8 see now the helpful discussion of Whitaker, 'An Analysis of *Aristotle's De Interpretatione*', pp.88–95.

[5] I discuss the general equivalence between the always and the necessary in #7 below.

[6] Frede, *Seeschlacht*, p.27ff.

[7] See here Kirwan, *Aristotle's Metaphysics* Γ, Δ, E (Oxford, 1971) ad loc.

[8] See here Weidemann, 'Aristoteles und das Problem des kausalen Determinismus', *Phronesis* 31, 1986, 27–50, p.31f.

context.[9] But, given the considerations adduced above relating to the context, it would be at the very least highly misleading of Aristotle to position '*ἀνάγκη*' where he does in (1), if he intended it to have narrow scope. According to R, Aristotle must be adjudged to be perfectly capable of giving the necessity operator exclusively narrow scope, and of making this clear syntactically: he does so, on this view (indeed on any view), with '*ἀναγκαῖον*' at 19a29 and 19a31, there carefully distinguishing the narrow scope deployment of the operator from the wide scope use at 19a32. So it would be wholly inexplicable why he should fail to make this crucial distinction when he is setting out the problem.

It has been suggested that Aristotle is trading, in this opening passage, on an ambiguity between wide and narrow scopes of '*ἀνάγκη*'.[10] But when Aristotle comes to sum up at 19a39–b4, he again gives '*ἀνάγκη*' a syntactically initial position, formulating the conclusion in an almost identical way to the introduction at 18a28ff.[11] He would hardly do this if his solution consisted in clearing up an ambiguity which that formulation imported.

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[9] Frede, *Seeschlacht*, p.17. At p.29ff and *passim* (cf. 'Sea Battle', p.48), Frede argues for the wide-scope reading of '*ἀνάγκη*' at 18a28 on the ground that Aristotle nowhere distinguishes between 'true' and 'necessarily true' and so is incapable of understanding '*ἀνάγκη*' and '*ἀληθής*' together. But he does so at *Met* 1019b23ff. Frede's objection to this parallel is that '*ἀληθής/ψεῦδος*' are not predicates of sentences in *Met* Δ.12. But this seems simply wrong: see, e.g., 1019b29–30. (Note that Ammonius feels free to use '*τὸ ἐξ ἀνάγκης ἀληθεύειν*' at *In De Int*, *CIAG* IV.5, 153.9. Aristotle himself uses the phrase '*ἀνάγκη ἀληθεύειν*' at 18a37. In any case, even if the linguistic point were correct, it would be of very limited value. Supposing Aristotle not to accept the grammatical combination of '*ἀνάγκη*' with '*ἀληθής*', that does not show that an initially-positioned necessity operator must have wide scope if there is an explicit truth-predicate within its scope. Granted, if Aristotle wants the concept of 'necessarily true', he will normally write simply '*ἀναγκαῖον*' or '*ἀνάγκη*'. But that does not mean that the form 'necessarily (A is true or B is true)', where the operator is understood as having narrow scope, is debarred to him. In any case, **R** can perfectly well be stated without appeal to the concept 'necessarily true': **FCS**s are true but the events to which they refer are not necessary. So Frede's claim that Aristotle nowhere distinguishes 'true' from 'necessarily true' would, even if it were correct, not seriously upset **R**'s position.

[10] Strang, 'Aristotle and the Sea Battle', p.447; Anscombe, 'Aristotle and the Sea Battle', p.43; Rescher, *Studies in the History of Arabic Logic*, p.50; Hintikka, *TN*, p.164. Cf. too Kneale, *DL*, p.93.

[11] Not quite identical: in the introduction it is claimed that **PB** does not apply to **FCS**s; in the concluding lines (19b1–3) Aristotle claims that what has been shown is that the members of a **FCA** do not take opposite truth-values. But since he has argued (18a38–9, 18b17–25) that such members, if they took truth-values, would have to take opposite values, his conclusion is tantamount to a rejection of **PB** with respect to **FCS**s: see Ackrill, commentary, p.141; Frede, *Seeschlacht*, p.10.

How does **R** cope with (5)? On **R**'s view, **PB** does apply fully to **FCS**s. But Aristotle states that it does not apply 'in the same way'. **R** will naturally construe this qualification as pointing to the fact that present and past truths are necessary, but future ones contingent. But, given that '*ἀνάγκη*' in (1) has wide scope, the relation between (1) and (5) demands that **FCS**s differ from statements about the present and past in some way which relates specifically to **PB**. And the '*εἰ γὰρ . . .*' clause which follows also indicates that '*οὐχ ὁμοίως*' is in some way restricting or adapting **PB** for **FCS**s ('for *otherwise*, if **PB** applied [sc. in the same way?] to **FCS**s, fatalism would follow'). Aristotle cannot mean that as far as **PB** goes, there is no difference between future and present/past (the difference lying elsewhere). It is clear that the sense is: in point of conformity or otherwise to **PB**, there is a difference between future statements and present/past statements. But just so far we have no indication whether **PB** does not apply to **FCS**s at all (the view of **AR**), or whether it does apply, but differently (the view of **C**, requiring the qualification 'definitely' to be understood at appropriate places).

Fine has offered a different reading of (1)–(5) from what one might call the orthodox position of **R**.[12] She suggests that (1) relates not to **PB**, but to the thesis that one member of an antiphasis must be true and the other false (the subject matter of (2)–(4)), so giving '*ἀνάγκη*' in (1) wide scope.[13] But in that case Aristotle would simply repeat himself; he could have jumped straight to (2). She also takes (5) to mean that **FCS**s *do* conform entirely to **PB**, but that there is some other difference, unrelated to **PB**, between future statements and present and past statements. Fine takes that difference to be not that present and past statements are non-contingent, whereas future ones are contingent, but that future states of affairs, unlike present and past ones, can be affected by deliberation. But the objection made above to the orthodox version of **R**'s reading of (5) is effective here too: on Fine's interpretation of *DI* 9, **PB** does apply in exactly the same way to the future as to the present and past. The fact that deliberation is available in the one domain, but not the other, is not a difference in the way **PB** applies to

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[12] 'TN', pp.38–40.

[13] So too Waterlow, *PP*, pp.97–8, who states, without argument, that the locutions in 18a26–7 (*τὴν μὲν ἀληθῆ, τὴν δὲ ψευδῆ*) and 18a28–9 (*τὴν κατάφασιν ἢ τὴν ἀπόφασιν ἀληθῆ ἢ ψευδῆ*) are synomymous. This mistake leads Waterlow into an implausible interpretation of Aristotle as worried in *DI* 9 not about the truth of FCSs, but (exclusively) about their falsity: see #8 n.13 below.

those domains; it is another difference entirely, so that, on this line too, Aristotle's '*οὐχ ὁμοίως*' would be unintelligible.[14]

It is not clear why Aristotle restricts his claim to singular statements about the future: what follows applies equally to universals not taken universally (for this category, see *DI* 7);[15] and indeed Aristotle's favoured example – a sea battle tomorrow – involves a universal not taken universally. (Singular predications are those that cannot be said of more than one thing (*DI* 17a40f); but many things (events) can be a sea battle.)[16]

There is possibly a belated recognition of this fact at 18b26–9, where Aristotle states that the fatalist's (absurd) conclusions follow from the application of **PB** to **FCS**s, whether those **FCS**s are statements about universals taken universally, or singular statements (*ἢ ἐπὶ τῶν καθόλου λεγομένων ὡς καθόλου ἢ ἐπὶ τῶν καθ' ἕκαστα*). Now Aristotle surely does not intend here to backtrack on his opening claim in (5) that it is (sc. *only*) singular statements about the future which raise a difficulty for **PB**. The 'whether ... or' (*ἢ ... ἢ*) construction of 18b27–8 must mean '*regardless* of whether ... or'. So the point is: these problems arise when one applies **PB** unrestrictedly and blindly to the whole domain of statements about the future, regardless of what sort of statement is in question, whether it is one about (for example) universals taken universally (in fact unproblematic), or singulars (problematic). This is surely Aristotle's intended point, but the fact that here the only types of future statements referred to are those concerning universals taken universally and those concerning singulars – as if this classification were meant to be exhaustive – suggests that he may be loosely conceiving of statements concerning universals not taken universally as falling under one of these subdivisions. Since that would hardly be likely to be the former (where he specifies 'universals *taken universally*'), he is perhaps here thinking of the category of '*τὰ καθ' ἕκαστα*' as including

[14] Fine sees this difficulty ('TN', p.40), but I think she underestimates how damaging it is to **R**, in either the orthodox version or her own. On Fine's solution, see further #5 n.14 below.

[15] Statements about universals not taken universally used to be called 'particular' (i.e. *κατὰ μέρος*) statements. For this sense, see the excerpt from Gregory of Rimini's *Lectura Super Primum et Secundum Sententiarum* eds. Trapp and Marcolino (Berlin/New York, 1984), quoted in Appendix 1. I shall follow the modern practice of using 'particular' to refer to the ontological correlate of singular statements.

[16] Cf. Whitaker, 'An Analysis of Aristotle's *De Interpretatione*', n.195.

universals not taken universally. (This passage comes immediately after the first mention of the example of a sea battle: 18b25.) I do not want to lay great weight on this interpretation, which must remain speculative, but it is at least possible that some such undercurrent is present at this point in the text.

However this may be, the fact is that it is not even sensible to invoke singular statements in the debate with the fatalist: he (and equally the determinist) may agree that such statements lack a truth-value whenever the singular term lacks a referent, on the ground, for example, that a purported statement containing an empty singular term fails to say anything at all, and so is not even a candidate for truth/falsity.[17] But that is an irrelevant consideration in the debate with the fatalist. The best type of example to focus on is the one Aristotle in fact chooses: a universal not taken universally (=an indefinite description). I shall concentrate on this type of case, and shall so understand the abbreviation '**FCS**' employed in the text.[18]

[17] Ryle, *Dilemmas* (Cambridge, 1969), ch.2; McDowell, 'Truth-Value Gaps', in Cohen et al eds., *Logic, Methodology and the Philosophy of Science*, 6 (Amsterdam, 1981), 299–313.

[18] Holding that **PB** applies unrestrictedly to universal statements about the future but not singular ones might look inherently unstable if the usual entailment relations between universal and singular statements are preserved. Aristotle bequeathed this difficulty to those medieval thinkers, such as Peter Aureoli, who adopted his approach to the problem of future contingency. (See here Normore, 'Divine Omniscience, Omnipotence and Future Contingents', in Rudavsky ed., *Divine Omniscience and Omnipotence in Medieval Philosophy*, 3–22, pp.12–3 with n.16; a related difficulty is raised by Gregory of Rimini, *In I Sent* d.38.q.1, pp.249–51.) The inconsistency is avoided, however, if, as Aristotle believed, there cannot be any *accidental* universal truths or, what comes to the same thing, there can only be universal truths about items which are guaranteed now to be necessary (eternal) existents. There can be no universal truths about (for example) sea battles. Hence Molina is wrong to gloss 'in singularibus' in his commentary on 18a33–4 (*Quaestio de Futuris Contingentibus*, in Stegmüller ed., *Geschichte des Molinismus* (Münster, 1935), vol.1, 1.17–21) as: 'non quod non cernatur idem quando sunt enuntiationes contradictoriae de subjecto universali, sed quia res facilior in singularibus, et praeterea quia praedicata contingentia solent prius convenire singularibus quam universalibus.' There cannot even be universal negative truths about sea battles, such as that it is not the case that all sea battles will be won by the aggressor (which would then entail that *some* sea battles will not be won by the aggressor). For, given that a purported universal truth ('All sea battles will be won by the aggressor') is, for Aristotle, a purported necessary truth guaranteed to be true now, its negation is really the denial of necessity now to the positive statement, which carries no implication that it is now guaranteed that there will be any negative instances: it can fail to be true now that all sea battles will be won by the aggressor without its being true now that some sea battles will not be won by the aggressor (see further ##7–9).

4 The Fatalist's Arguments

In 18a34–19a22 Aristotle develops the fatalist's position, and rejects it *via* a *reductio* argument on grounds of incompatibility with the facts of human deliberation (18b26–19a9), and, in general (*ὅλως*, 19a9), with the existence of contingency in the world.[1] The fatalist supports his position with two arguments. I shall first state my interpretation of the two arguments briefly, and then proceed to discuss them in more detail.[2] The clearer (second) argument is given at 18b9–16:[3] if something is white now, then it was true to say earlier that it would be white, and if it was true at any time previously to say that it would be white, then it was true at all times previously to say that it would be white, and if it was true at all times previously to say that it would be white, then it was necessary that it would be white.[4] Aristotle subsequently repeats what is essentially the same argument, but with human action as the subject matter (18b26–19a6). It is not immediately clear how this argument is supposed to work. Three features of it which might seem to be relevant, but, as I shall argue below, are not, are: the role of the past, the actual utterance on any particular occasion(s) of a prediction, and the move taking us from 'true at any time' to 'true at all times'.

The fatalist's first argument is given at 18a34–b9. This version is textually problematic, but I suggest that the fatalist is not here offering an argument which differs materially from that at 18b9ff.[5] The main difference is that he here approaches the issue from a purported **FCA** rather than a particular purported **FCS**. We start with the claim that unrestricted **PB** leads to fatalism (18a34–5; the operator at 18a35 must

[1] Frede, *Seeschlacht*, p.12; Donini, *Ethos*, pp.1–8; Sainati, *Storia dell' organon aristotelico*, p.242.

[2] I shall only deal with the main thread of this part of the text in this section: more detailed consideration of the arguments of 18b17–25 and 19a7–22 must wait until #12 and #7 respectively. The text of 18b11–13 is discussed in #18.

[3] Cf. Ammonius, *In De Int* 144.9–14.

[4] I collapse the modally equivalent forms through which Aristotle moves at 18b12–14.

[5] *Contra* McKim ('Fatalism and the Future: Aristotle's Way Out', *Review of Metaphysics* 25, 1971–2, 80–111), who seems to support a realist interpretation of the fatalist's first argument, and a causal reading (see below #6) of the second argument.

have narrow scope, since this line gives us the fatalist's conclusion).[6] The claim is supported by four steps: 1) If something is white or not white, then it is true to say or to deny that it is white (18b1–2); 2) But if someone asserts and another denies that *Fp*,[7] then (at least and at most)[8] one of them must, given **PB**, be right (18a35–9); 3) If one of them is right, then what he is right about – the truth/falsity of '*Fp*' – must be (18a39–b1);[9] (4) hence the members of the purported **FCA** are in fact severally necessary/impossible (18a34–5, 18b4).[10]

The other main difference between the two arguments is their location in time of the relevant prediction: in the first argument, the prediction is envisaged as occurring now or later, and relates to a still later state of affairs; in the second argument, the prediction has already occurred, and relates to a state of affairs which obtains now. We need to take the two arguments together if we are to understand exactly what the fatalist's position is. Otherwise we might be misled into placing

[6] Cf. Frede, 'Sea Battle', pp.35–40; Vuillemin, *NC*, p.158. But Vuillemin takes '*ἀνάγκη*' at 18b4 widely, which must surely be a mistake.

[7] *ὁ μὲν φήσει ἔσεσθαί τι*: '*φήσει*' is the future of argument; '*ἔσεσθαι*' is a real future: the assertion is a *prediction*.

[8] At most': 18a38–9; 'at least' is not justified until 18b17–25, where the falsity of both disjuncts is ruled out (and since the fatalist presupposes **PB**, there are no other possibilities to be considered). It is true that the content of 18b17–25 belongs more with the fatalist's first argument than as an appendage to the second; but it is unnecessary to move it, as Frede proposes (*Seeschlacht*, pp.86–7).

[9] Do the occurrences of '*ἀνάγκη*' at 18a37 and 18b1 have wide or narrow scope? In other words, do these lines already contain the fatalist's conclusion? I am not sure that these questions admit of a clear answer. (Whitaker argues, 'An Interpretation of Aristotle's *De Interpretatione*, pp.99–100, that 18a39–b1 do not yet reach the fatalist's conclusion.) No doubt the syntactically narrow placing of the operator eases the path to the conclusion, even if the occurrences are in each case meant to be read widely. On 18a39–b2 cf. #8.

[10] I have, for convenience, taken the points out of order. I have also omitted 18b2–3, which makes allowance for the possibility of falsity. My reconstruction of this argument shows that the inferential pattern requires the Oxford text's '*εἰ γὰρ*' at 18a35, not '*εἰ δή*' (so Frede, *Seeschlacht*, p.85), or '*ὥστε εἰ*' (so Fine, 'TN', p.36). This '*γὰρ*' is in fact corroborated by the '*γὰρ*' in 18b7, which confirms that the truth of the utterance is not an inference *from* the necessity of the relevant disjunct, but forms a stage in the argument *to* that necessity. And the clearer version of the fatalist's argument at 18b9ff also confirms my reconstruction. It is therefore unnecessary to swop 18a34–9 and 18a39–b3 around, as Frede proposes (*Seeschlacht*, pp.85–7). The second '*γὰρ*' (18a39) is explanatory not of the preceding clause, but co-explanatory – along with the '*γὰρ*' of 18a35 – of 18a34–5 (see Denniston, *The Greek Particles* (Oxford, 1954), pp.64–5. That is, the two '*εἰ γὰρ*' clauses (18a35–9, 18a39–b1) taken *together* constitute the justification of the assertion in 18a34–5. '*δὲ*' in 18a39 instead of '*γὰρ*' would have been clearer, but there is no need to emend.

undue emphasis on features of either argument which are in fact adventitious.

In the first place, if we considered the second argument in isolation, we might suppose that the fatalist is relying crucially on the necessity of the past.[11] If that were so, the argument would take something like the following form. Let '*p*' be the true statement 'This is white'. Then we have:

(1) *p*	Assumption
(2) *PFp*	1, **PB** (18b9–10)
(3) *LPFp*	2, Necessity of the past
(4) *L* [*PFp* → *p*]	Tense logic
(5) *Lp*	3,4, Modal logic.

Now to construe the fatalist's second argument in this way would not lessen its effectiveness in the eyes of Aristotle, who accepts the necessity of the past[12] and the modal principle.[13] The only place where Aristotle could question the above derivation is its application of **PB** at line (2) in the proof. But that is just where he will anyway want to challenge the fatalist's argument, on the interpretations of **AR** and **C**. So perhaps this reconstruction does capture the thrust of the second fatalist argument. That is, indeed, how Ockham read it.[14]

However, although Aristotle does believe in the necessity of the past, he makes no reference to it at this point. The fact that the fatalist's first argument probably proceeds without reference to the past should

[11] This is the line taken by von Kutschera, 'Zwei Modallogische Argumente für den Determinismus: Aristoteles und Diodor', *Erkenntnis* 24, 1986, 203–17; Sorabji, *NCB*, p.91; C.Williams, 'True Tomorrow, Never True Today', *PQ* 28, 1978, 285–99; von Fritz, Review of Frede, *Seeschlacht*, *Gnomon* 44, 1972, 241–250, p.245.

[12] *NE* 1139b5–11; *Rhet* 1418a1–5; *DC* 283b12–14. Fine argues ('TN', n.18) that '*τὸ ὄν*' at *DI* 19a23ff cannot be taken as covering past as well as present. But '*τῶν ὄντων*' at 19b3 does just that. (Fine takes this phrase as elliptical for '*τῶν ἀεὶ ὄντων*' and '*τῶν μὴ ὄντων*' in the same line as elliptical for '*τῶν ἀεὶ μὴ ὄντων*' (n.36). But that we should be required to understand so important a word as '*ἀεί*' is hardly credible. In any case, if '*τῶν ὄντων*' were elliptical for '*τῶν ἀεὶ ὄντων*', one would naturally hear '*τῶν μὴ ὄντων*' as '*τῶν μὴ ἀεὶ ὄντων*', which gives the wrong sense entirely. See further #5.) The argument of *Met* 1027a29–b14 depends on both the necessity of the present and the necessity of the past (see below, #9).

[13] See e.g. *An Pr* 34a5ff; *Met* 1047b14–16.

[14] Boehner ed., *The Tractatus de Praedestinatione et de Praescientia Dei et de Futuris Contingentibus of William Ockham* (New York, 1945), p.105.

alert us to the likelihood that the way the past figures in the second argument is inessential to it.[15] What, then, is the point of the shift of the dialectic into the past? We can assist ourselves here if we observe that the first argument makes use of the *future* at 18a35–6. For again, since the future does not figure in the second argument, the way it figures in the first argument cannot be at the core of the fatalist's position. What is at that core must be what is common to the two perspectives. The common element is that in both cases the predictor makes his prediction *before* the event to which it relates.[16] The precise temporal relation of either prediction or predicted event to the present moment is irrelevant; what matters is their relation to each other.[17] But Aristotle does achieve something important by incorporating the future into the first argument and the past into the second: he shows that the same argument works wherever the relevant events are located in the time-series. By presenting two versions of the fatalist's position, and varying the temporal perspective from one to the other, Aristotle could be said to be making just the point (on behalf of the fatalist) that it is the relative, not absolute, positions in the time-series of prediction and predicted event which are functional in the argument. The truth of the prediction necessitates the occurrence of the predicted event regardless of when,

[15] In fact the past may creep into the fatalist's first argument at one point: '*ἦν*' at 18b2. (So Vuillemin, *NC*, p.158.) But it seems more probable that here the content of '*ἦν*', as frequently elsewhere in Aristotle (e.g. the phrase '*τὸ τί ἦν εἶναι*'), is not specifically past; cf. Kirwan, 'Aristotle on the Necessity of the Present', *OSAP* 4, 1986, 167–87, p.183f; Frede, 'Sea Battle', p.37 n.12. It is also possible that '*ἦν*' is a corruption of '*ἤ*', which is found in a Syrian translation and implied by Boethius' Latin version ('vel') . The Syrian MS also has '*ἦν*', but Boethius has 'est'. The early Armenian versions of *DI* also have '*ἔστι*' here (Conybeare, *Anecdota Oxoniensia: a Collation with the Ancient Armenian Versions of the Greek Text of Aristotle's Categories, De Interpretatione etc.* (Oxford, 1892), p.35). That suggests that the text may originally have read: *ἀληθές ⟨ἐστι?⟩ ἢ φάναι ἢ ἀποφάναι* (yielding Boethius' version: verum est vel affirmare vel negare). The '*ἐστι*', if it was present, dropped out, and the first '*ἤ*' was subsequently corrupted to '*ἦν*' (cf. Frede, *Seeschlacht*, pp.14–15). Donini seems to think (*Ethos*, p.6 n.15) that denying that '*ἦν*' has temporal force commits one to denying that the *future* enters into the fatalist's first argument, but that is not so. The argument obviously sets up a temporal distance between the present and the (absolute) future (18a35–6). The question is whether the (absolute) past also figures. However, even if we conceded that '*ἦν*' has temporal force, the point would remain that the *necessity* of the past plays no role in the fatalist's argument.

[16] Note especially '*πρότερον*' at 18b10; Kirwan, 'Aristotle on the Necessity of the Present', p.183.

[17] This emerges clearly from Ammonius' comments on '*ἦν*' at 18b2: *In De Int* 141.10–17.

in relation to the absolute now, either the prediction or that event occurs.

A second feature – this time of both arguments – which might seem to be crucial but which is in fact inessential is the involvement of actual predictions. In his second argument the fatalist concedes (18b36–19a1) that the existence or otherwise of a prediction is irrelevant to the argument. What is doing the work is simply the anterior *truth* of a sentence which could be used to make a prediction, not the actual use of that sentence on any occasion(s) to make that prediction.[18]

A final feature of the second argument which we must consider is the step taking us from 'It was true at some time...' to 'It was always true...'[19] This step is shown to be extraneous not only by its absence from the first argument, but also by the fact that even in the second argument the fatalist twice presents his case without reliance on this step: at 18b20–2 and 18b33–6 (with 18b38–19a1).[20] I examine these passages in turn. 18b17–25 as a whole gives rise to two fundamental difficulties. The passage is an argument to the effect that the supposition that both members of a **FCA** might be false is an unsuccessful move against the fatalist. The first difficulty is this: although the relevant hypothesis is indeed of the *falsity* of both members, Aristotle's first formulation (18b17) of that hypothesis is cast in terms of their *lack of truth*. Is this formulation an incautious gesture towards the formulation, which follows in 18b18–20, in terms of the falsity of both members, or does Aristotle regard the two formulations as equivalent? I mention this difficulty now, but it is not relevant to our current concerns and I accordingly postpone discussion of it (to #12). The second general difficulty is that it is not clear exactly what the fatalist's response to the objection is. In 18b18–20 the response seems to be that the objection leads to contradiction (the sea battle would have to happen and not happen). But 18b20–4 seems to argue rather that if a sea battle will neither take place nor not take place tomorrow, the fatalist's conclusion follows *anyway*. In 18b25, indeed, both responses seem to be present.[21] But if that is right, the passage contains the fatalist's inference without

[18] Reality is prior to the truth of *utterances: Met* 1051b6–9 (cf. Whitaker, 'An Analysis of Aristotle's *De Interpretatione*', p.103).
[19] This step is regarded as crucial by Hintikka, *TN*, ch.8.
[20] Cf. Frede, *Seeschlacht*, p.37ff.
[21] Cf. Ackrill, commentary ad loc.

reliance on the move 'true at some time' to 'always true'. The passage contains two textual problems – whether to read '*μέγα*' or '*μέλαν*' at 18b21, and whether to read '*ὑπάρξει ... ὑπάρξειν*' or '*ὑπάρξειν ... ὑπάρξει*' at 18b22 – discussion of which I relegate to a footnote.[22]

In the second passage (18b33–6, 18b39–19a1), the fatalist argues that since nothing prevents someone having predicted ten thousand years ago that I would do something (and someone else having predicted the opposite), my action (or its opposite, whichever I perform) is necessary. Aristotle makes clear that whether anyone actually made the

[22] In spite of the unclarity of 18b17–25, '*μέλαν*' must be the right reading in 18b21. '*μέγα*', which has some MS. support and is favoured by Ackrill, would add nothing of argumentative value to '*λευκόν*'. But the starting point for both of the two arguments present in 18b17–25 is the supposition (to be branded absurd by one argument and idle by the other) that contradictory states of affairs obtain. Aristotle puts forward in 18b17 the possible objection to the fatalist that neither member of a **FCA** might be true, then replacing his formulation with one according to which both members are false. Whatever the relation between these formulations, the latter is the starting point for the fatalist's response. It is then a short step from the hypothesis of the *falsity* of both members to the hypothesis of the *truth* of both members. If it is false that a sea battle will take place and false that one will not take place, then it is both true that one will not take place and true that one will take place. (This argument assumes the equivalence of '$\neg Fp$' and '$F\neg p$': see below: #8.) It must be by some such enthymematic route that we arrive at the positive formulation in '*εἰ ἀληθὲς εἰπεῖν ὅτι λευκὸν καὶ μέλαν*'. Strictly, of course, white is the contrary, not the contradictory, property to black, so that one could not arrive at the positive position starting from 'It is false that X is black' and 'It is false that X is white' (it might be grey). But at this point (18b20–22) Aristotle is arguing that the suggested manoeuvre against the fatalist announced at 18b17 is idle (as opposed to: contradictory): for that purpose a conjunction of contraries will do just as well as a conjunction of contradictories. (Or perhaps Aristotle originally wrote '*λευκὸν καὶ οὐ λευκόν*', the latter conjunct being glossed as '*μέλαν*', which found its way into the text and was corrupted to '*μέγα*': a possibility in this direction is suggested by readings found in the early Armenian versions of the text: see Conybeare, *Anecdota Oxoniensia*, p.35; Frede, *Seeschlacht*, p.88.) At 18b22 the reading *ὑπάρξει ... ὑπάρξειν* (sc. *δεῖ*) produces a smoother sense. The alternative reading (*ὑπάρξειν* (sc. *δεῖ*) ... *ὑπάρξει*) is undesirable on two counts. It locates in the premiss of the argument an unargued leap to the necessity of the future which can simply be rejected by the opponent; and it yields an irrelevant implication from that necessity to truth. Obviously, if a sea battle must happen tomorrow, it will happen. But the question is whether, if it will happen, it therefore must happen. If the fatalist is to present his case, we want '*ὑπάρξει ... ὑπάρξειν*'. That involves the fatalist *applying* the entailment from truth to necessity (asserted in 18b21) to the crucial case of the future. The argument then is: if the entailment from truth to necessity holds of truths about the present, then it equally holds of truths about the future. The significance of the argument in 18b17ff that if both members of a **FCA** are false the fatalist's conclusion follows anyway is missed by Whitaker ('An Analysis of Aristotle's *De Interpretatione*', pp.98–9). My interpretation of this passage coincides with that of al-Farabi: *Commentary*, pp.81–3.

prediction is immaterial (18b36–9). He also affirms that the selection of the number ten thousand was arbitrary (18b39–19a1). The important point is that the argument is complete at this point. Whatever the correct interpretation of the passage which follows (beginning '*ὥστ' εἰ* . . .' 19a1ff), it cannot affect the completeness of the argument as stated: '*ὥστε*' must, as one would naturally suppose anyway, indicate a corollary of the argument, not a premiss. The argument is to the effect that the necessity of my action follows from the anterior truth, *at any time*, of a sentence (whether uttered or not) predicting that action. Although I shall consider **S** in due course, and concede that it can contribute to our understanding of parts of *DI* 9, the fact that the fatalist is twice allowed to present his argument without recourse to the move from truth at some time to truth at all times is on its own sufficient to indicate that **S** cannot succeed in making sense of the chapter as a whole.[23]

It follows from the above that the inference from truth to necessity must be supposed to operate on temporally definite expressions. For temporally definite expressions, truth at any time implies truth at every subsequent time, so that the statement expressed by the prediction which was true ten thousand years ago has been true ever since. Nevertheless, the fact remains that the fatalist's expression of the argument at this point does not trade on that feature of statements. Kirwan supposes that the step must be implicit, otherwise the deterministic conclusion that it is true at all times that the predicted event will occur does not follow.[24] But the point is that Aristotle does not need any such strong conclusion. The upshot of the fatalist's argument which Aristotle regards as absurd and wishes to controvert is that we do not need to deliberate or take trouble: this absurdity follows, according to the fatalist, from the bare assertion that it is possible on just one occasion to predict someone's future action. If it is true at t_1 that I will perform an action at t_2 ($t_2 > t_1$), then it follows, on the fatalist's argument, that my action at t_2 is necessitated.

It is certainly a corollary of the argument (which the fatalist immediately draws: 19a1–6) that if it is true at *any* time anterior to my action that I will perform it then it is true at all anterior times. That is because the anterior instant was selected arbitrarily, so that the argument can be run through for each anterior moment. No fallacy is involved here in the move from 'any' to 'all'. But this corollary, though immediate, is incidental to the fatalist's central claim, which is that anterior truth (at *any* time, in the first instance)[25] implies necessity. This interpretation of 18b33–19a1 now enables us to construe 19a1–6 correctly. The argument there moves in three stages. The conclusion (also a corollary of the foregoing) is stated first, that if in the whole of time (*ἐν ἅπαντι τῶι χρόνωι*) things were such that one member of a **FCA** was true, then it was necessary for the relevant event to occur, and hence (generalising) that it is always the case (*ἀεί*, 19a3) that everything happens of necessity. The reason (*γὰρ*, 19a4) for this conclusion is then given in two parts: (1) What anyone truly predicted would happen happens necessarily, and (2) At all moments (*ἀεί*, 19a6) any prediction of the relevant event would have been true. Given now that '*ὥστ' εἰ* . . . *γενέσθαι*' (19a1–3) is presented *both* as a corollary of the foregoing argument *and* as a conclusion of the succeeding argument, one is motivated to ask whether these arguments are in fact the same. It is indeed the case that they are. The first part of the succeeding argument (19a4–5) is what is doing the work: necessity follows from the truth of even a single prediction (and, by implication, the availability of just one time at which to make that prediction). The second part of the succeeding argument (19a5–6) confirms the corollary, that this principle holds for *any* moment. That corollary is built into the statement of the argument at 19a1–3.

In fact, on my interpretation, 19a1–3 does not state the fatalist's argument in its strongest terms. Perhaps the fatalist thinks it looks more impressive to argue from truth at *every* anterior moment to necessity; but the logically stronger position is the inference from truth at *any* anterior moment to necessity. However, while in general it is correct that 'every' entails 'any' but not *vice versa*, in this particular context, as I have noted, no fallacy is involved in inferring an 'every' from the 'any': so in this case the two possible premisses available to the fatalist – 'If at any time in the past it was true to predict. . .' and 'If at every time in the past it was true to predict. . .' – are of logically equal strength. At 19a1–2 the fatalist selects the latter premiss, although the context as a whole indicates that the former premiss would present his case in a purer form. The fatalist's parting shot at 19a4–5 gets it exactly right: a single, one-

[23] *Pace* Hintikka, *AMD*, p.44, *TN*, pp.152–3.
[24] 'Aristotle on the Necessity of the Present', p.186.
[25] That is, not necessarily (yet) at *every* time.

off prediction is sufficient, if true, to necessitate the predicted event. That is the whole of the fatalist's argument . As an afterthought (*καὶ*, 19a5), he notes that the single prediction could be made at any (hence, in this case, every) time.[26]

Again, this argument, though cast in the past, does not rely on the necessity of the past.[27] The argument would retain its full effect if shunted forward so that a prediction made today necessitates whether or not a sea battle occurs ten thousand years from now. Aristotle allows the fatalist both temporal lines of attack: past truths about the present (my actions), and present truths about the future (tomorrow's sea battle). But we should not be misled into supposing that these are anything more than rhetorically motivated variations on the same logical theme.

A fundamental objection to both **R** and **S** is that they fail to make sense of Aristotle's solution as an answer to the fatalist.[28] Hintikka argues[29] that the solution resides in the fact that the (temporally indefinite) sentence 'There will be a sea battle tomorrow' is sometimes true and sometimes false; but the fatalist can accept this without damage to his argument, which depends on the antecedent truth, on any particular occasion, of the above sentence (i.e. the antecedent truth of the statement which that sentence, on any particular occasion, may be used to express).[30] **R** is similarly guilty of ignoring the role of antecedent truth in the fatalist's argument. It is true that the first version of that argument (18a34–18b4) can be read as committing, in its last line, the fallacy of operator shift (subsequently diagnosed in 19a27–32);[31] however,

[26] There is in any case an incoherence in the use Hintikka tries to make of the fact that it has *always* been true (if it *is* true) that a sea battle will take place tomorrow. What has always been true is of course not the (temporally indefinite) *sentence* 'There will be a sea battle tomorrow', but the *proposition* expressed by this sentence today (as Hintikka himself observes: *TN*, p.169). So the point in the fatalist's second argument about infinite past truth, if it were germane, would be in the service of **AR** or **C**, not **S**: **S** concerns the omnitemporal truth (or falsity) of temporally indefinite *sentences*.

[27] *Pace* Kirwan, 'Aristotle on the Necessity of the Present', p.186.

[28] Ackrill, commentary, pp.139–40.

[29] *TN*, ch.8.

[30] Hintikka has Aristotle *realise* that the fatalist is dealing with statements rather than sentences, since the fatalist's proof allegedly turns on 'There will be a sea battle tomorrow' having been *always* true (false), and certainly the above *sentence* has not been always true or always false. But then he supposes that Aristotle merely makes just this latter point in reply to the fatalist (*TN*, pp.169–71). Hintikka's view (p.162) that Aristotle's strategy does not consist in pointing out a fallacy in the fatalist's argument but in re-interpreting its conclusion is not consistent with 18b26 and 19a7.

[31] Fine, 'TN', pp.36–7; cf. Kneale, *DL*, p.93.

even in this part of the text the role of antecedent truth is crucial; and when the first argument is summarised at 18b5–9, the premiss from which the fatalist moves contains no initial necessity-operator, only antecedent truth (*ἢ γὰρ ὁ φὰς ἀληθεύει ἢ ὁ ἀποφάς*, 18b7–8). In the second argument given by the fatalist (18b9ff), the role of antecedent truth can hardly be missed. Fine suggests here that 'the fatalist begins by assuming that 'Necessarily (if it was always true to say of anything that it would be white, then it was white)", but that he then slides the operator to the apodosis of the conditional.[32] But this is not his argument: Fine's insertion above of 'necessarily' is illicit – the fatalist says no such thing.[33] He argues that necessity is a metaphysical consequence of antecedent truth; he does not commit the fallacy of operator shift, because he has no initial operator to shift. (Alternatively, if we interpret the fatalist's second argument as relying on the necessity of the past, then although the fatalist certainly would have to start with something like Fine's principle, there would be no fallacious operator shift: the fatalist would be *entitled* to the necessity of the apodosis, because he would have the necessity of the protasis.) Given that operator shift is not to be diagnosed in the fatalist's second argument, it is likely too that it is a mistake to find it in the first argument.

Examination of the dialectical presentation of the two arguments confirms this approach. The first argument is introduced as *justifying* the claim (which Aristotle accepts) that **PB** does not apply (or not in the same way) to **FCS**s (as it does to sentences about the present or past): this is indicated by the '*γὰρ*' at 18a34. The second argument is introduced as providing support to the first argument (*ἔτι*, 18b9). We can also account for the stylistic variation between the two arguments. The first fatalist argument moves from truth to necessity for each member of a **FCA**. The focus on a **FCA** as the starting point of the argument is explicable here on the grounds that Aristotle's introduction at 18a28–34 has distinguished **FCA**s from present and past antiphases. Hence Aristotle naturally takes a case of a **FCA** to illustrate and argue his point. But that future antiphases differ in the stated respect from past anti-

[32] 'TN', p.38, following Anscombe, 'Aristotle and the Sea Battle', p.46. Frede's reconstruction of Anscombe's drift – that Aristotle shifts from a *de facto* necessity (i.e. the necessity of the present and past) to an absolute necessity – is not correct (*Seeschlacht*, pp.44–6). Anscombe makes it clear that she purports to find (and objects to) a slide from *necessitas consequentiae* to *necessitas consequentis*.

[33] As McKim notes: 'Fatalism and the Future', p.106. Cf. Frede, *Seeschlacht*, p.37; Bäck, 'Sailing through the Sea Battle', pp.137–8.

phases is *itself* a consequence of the fact that **FCS**s differ from statements about the present and past. Hence the second fatalist argument abandons the distinction which has turned out to be merely consequential, and addresses the fundamental point: if **FCS**s were true (false) in the way that statements with a present or past content are true (false), their necessity (impossibility) would ensue. We can accordingly view Aristotle's development from the first to the second fatalist argument as evincing an improved grasp of what is essential to the fatalist's case.

5 Aristotle's Response: a First Approximation

Since Aristotle rejects fatalism, which step in the fatalist's argument does he take exception to? I deal first with the purported solution to the problem (19a32–b4), and turn below to the crucial introduction of the solution at 19a23–32. The solution begins (19a33) by noting the equivalence between the way things are and the way a true statement represents them as being: this is a transitional device to take Aristotle from his ontological version of the solution at 19a27–32 to his linguistic version at 19a32ff. He then states his conclusion, that for **FCS**s:

> (1) *ἀνάγκη μὲν θάτερον μόριον τῆς ἀντιφάσεως ἀληθὲς εἶναι ἢ ψεῦδος*, (2) *οὐ μέντοι τόδε ἢ τόδε ἀλλ' ὁπότερ' ἔτυχεν*, (3) *καὶ μᾶλλον μὲν ἀληθῆ τὴν ἑτέραν*, (4) *οὐ μέντοι ἤδη ἀληθῆ ἢ ψευδῆ*. (5) *ὥστε δῆλον ὅτι οὐκ ἀνάγκη πάσης καταφάσεως καὶ ἀποφάσεως τῶν ἀντικειμένων τὴν μὲν ἀληθῆ τὴν δὲ ψευδῆ εἶναι.*
>
> (1) It is necessary that each part of the antiphasis be true or false, (2) not however this one or that one[1] but whichever chances, (3) and [it is necessary that] one of them [be] true rather than [more often than?/ more likely than?] the other, (4) not however thereby [already?] true or false. (5) So it is clear that it is not necessary that of every assertion and denial of opposites the one be true and the other be false. (19a36-b2)

We are confronted, again, with the problem of the scope of '*ἀνάγκη*'. **R** requires wide scope in (1), and narrow scope in (5), since the alleged solution involves distinguishing wide from narrow readings of the operator, and ruling out an inference from the former to the latter.[2] But given, on this view, that Aristotle has just distinguished (19a28–32), by precise attention to *Wortstellung*, the two readings (see below), why does he then go on, in our passage, to position '*ἀνάγκη*' twice initially, where intelligibility requires, on the realist view, wide-scope followed by narrow-scope readings? It would be the most extra-ordinary carelessness for Aristotle to be so cavalier in the manner in which he draws what is

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[1] Either 'this member or that member true', or 'this truth-value or that truth-value attaching to each member': Frede, *Seeschlacht*, p.71, 'Sea Battle', p.76. The two options come to the same.

[2] Rescher, *Studies in the History of Arabic Logic*, p.49; Strang, 'Aristotle and the Sea Battle', p.461.

supposed to be his decisive distinction. In fact the situation is even worse for **R**. **R** requires not only that '*ἀνάγκη*' be given narrow scope in (5), but also that it be understood in (2), with narrow scope, in other words that (2) means: 'not however necessarily this one or necessarily that one'.[3] But that seems linguistically quite impossible, given that '*ἀνάγκη*' does not even occur in (2).[4]

It might be objected that (5) does not need to be read by **R** in such a way that '*ἀνάγκη*' has narrow scope: could (5) not be construed as denying that in the case of any particular **FCA**, it is necessary that *this* member be true and *that* false? This reading would avoid having to read '*ἀνάγκη*' into (2); it would in effect assimilate the meanings of (2) and (5), and thereby collapse the senses of the locutions '*τόδε ἢ τόδε*' and '*τὴν μὲν ... τὴν δὲ*'. The latter phrase seems elsewhere to mean 'one [true], one [false]', the former '*this* one [true], *that* one [false]' (18a28–33, 18b28–9). But the collapse is not in itself a fatal objection; I shall argue below that **C** is correct in spite of its assimilation of the two locutions at this point in the text. The problem lies elsewhere. On **R**, it is necessary that *one* of the members of a **FCA** be true and the other false, but not, on the proposal now before us, any *particular* one of the members true, and the other false. But how can that be? Take an example of a **FCA**: there will be a sea battle tomorrow – there will not be a sea battle tomorrow. Realist interpreters are trying to find in Aristotle an expression of the view that the future is as metaphysically determinate as the past, only not necessary. So on any given day, it will be metaphysically determinate that there will be a sea battle on the next day, or it will be metaphysically determinate that there will not be a sea battle on the next day. Take today (20th June 1993). Suppose that there will be a sea battle tomorrow, on June 21st. In that case the left-hand member of our **FCA** is true, and the right-hand member false. So it is not merely the case that *one* of the members is true (the other false); it is further the case that a *particular* one of the members is true, and the other false. We may not know which member is true: it may be epistemically indeterminate. But that is immaterial. The metaphysical determinacy remains unaffected.

This passage presents us with a further general problem: the meaning of '*μᾶλλον*' at 19a38. Discussion of this crux will allow me to deal in more detail with the statistical interpretation of the whole chapter. To gain leverage on the sense of '*μᾶλλον*' here, we must compare our passage with 18b8-9 and especially with 19a18–22, which reads:

> *φανερὸν ἄρα ὅτι οὐχ ἅπαντα ἐξ ἀνάγκης οὔτ' ἔστιν οὔτε γίγνεται, ἀλλὰ τὰ μὲν ὁπότερ' ἔτυχε καὶ οὐδὲν μᾶλλον ἢ ἡ κατάφασις ἢ ἡ ἀπόφασις ἀληθής, τὰ δὲ μᾶλλον μὲν καὶ ὡς ἐπὶ τὸ πολὺ θάτερον, οὐ μὴν ἀλλ' ἐνδέχεται γενέσθαι καὶ θάτερον, θάτερον δὲ μή.*
>
> It is therefore clear that not everything is or comes to be of necessity, but some things [come about] whichever way it chances and the assertion is not rather [more often?] true than the denial, whereas in the case of other things one [of the outcomes] happens rather [more often?] than the other and for the most part, not but what it is possible for the other to happen instead, and the first one not to happen.

S can certainly make good sense of this passage taken in isolation.[5] In particular, the statistical interpretation of the second '*μᾶλλον*' looks plausible: it is followed (according to **S**: glossed) by '*ὡς ἐπὶ τὸ πολύ*'.[6] Here 'one rather than the other' could mean 'one more often true than the other' (applied to temporally indefinite sentences). And it has to be admitted that the first '*μᾶλλον*' also makes sense if read statistically. In that case, Aristotle would be relying on his familiar distinction between chance events, of the sort which happen no more often than not (and hence the temporally indefinite sentences keyed to them are no more often true than false), and events of the sort where there is a predominance of happening over not happening (and hence the relevant temporally indefinite sentences are more often true than false).[7]

How does **AR** construe this passage? It has little trouble with the '*τὰ μὲν*' clause: '*μᾶλλον*' (19a19) would mean 'rather than'; and the '*κατάφασις*' and '*ἀπόφασις*' would have to be understood as **FCS**s, since in the case of an antiphasis of the form 'A sea battle is taking place (has taken place) – a sea battle is not taking place (has not taken place)' one member *is* true rather than the other. These interpretations do not un-

[3] So Fine, 'TN', p.32.
[4] A parallel difficulty need not arise for **R** over (4): **R** may follow **S** here.
[5] As it can of 18b8–9 where the phrase '*ἔχει ἢ ἕξει*' seems to import a statistical sense into the preceding '*μᾶλλον οὕτως ἢ μὴ οὕτως*'. This sense is not avoidable by construing the '*ἢ ... ἢ*' construction as 'vel ... quam' rather than (as it would surely more naturally be taken) 'quam ... vel' (*pace* Talanga, *Zukunftsurteile und Fatum*, p.47). Cf. too 18b11–13 discussed in #18 below.
[6] Bosley, 'An Interpretation of *On Int* 9', p.35.
[7] See further Fine, 'TN', p.33; Hintikka, *TN*, pp.169–71.

duly strain the text. But the '*τὰ δὲ*' clause is more problematic for the anti-realist. The problem is simply '*καὶ ὡς ἐπὶ τὸ πολὺ*' which is, for **AR**, just an irrelevancy. '*μᾶλλον*' (19a20) would have to be construed as meaning something like 'more likely to be true'.[8] On that construal Aristotle would claim that one member of an antiphasis of future contingent *statements* is more *likely* to be true and then (in clarification, likelihood being a statistical notion) that one member of an antiphasis of future contingent (temporally indefinite) *sentences* is more *often* true. This claim is of course quite irrelevant as a move against the fatalist.[9] It seems that Aristotle, on **AR**, cannot be saved from confusion in his response to the fatalist. The question is how much confusion we ascribe to him. It seems that the confusion which **AR** is forced to ascribe Aristotle is tolerable. After all, the failure to distinguish between statements and sentences, and the additional failure to distinguish within the category of sentences between the temporally definite and indefinite, is general to ancient discussions of truth.[10] Aristotle's interest, for physical reasons, in the distinction between chance events, things which happen for the most part, and things which always happen, has invaded a discussion where it has no place.

But while **S** can make good sense of this passage taken on its own, it cannot integrate it into a convincing interpretation of the chapter as a whole. That was clear from our discussion in #4. But it becomes even clearer from a consideration of 19a32ff. Given that 19a18–22 and 19a36–39 are parallel passages, it seems that '*μᾶλλον*' at 19a20 corresponds to '*μᾶλλον*' at 19a38: in each case, **S** will construe it as 'more likely' or 'more often' (keyed to appropriate linguistic items). '*ἤδη*' at 19a39 will then have the logical force ('thereby') urged by several writers.[11] If we now interpret the whole of (1)–(5) statistically, it reads as follows:

> (1) It is always the case that one side of the antiphasis is true and the other false, (2) not however this member [always true] or that one [always true],[12] but as it turns out, (3) or one member may be more likely to be true (more often true) than the other one, (4) but not thereby true (or false) [on any particular occasion]. (5) So it is clear that it is not necessary that for every assertion and denial of contradictories the one is [always] true and the other [always] false.[13]

Again, considered in isolation, (1)–(5) can perhaps be read in this way, although to understand 'always' twice in (5) involves no inconsiderable strain. But an insurmountable problem arises for **S** when we try to integrate such a reading with the rest of the chapter. Given that 19a39–b2 recapitulates what 18a28–34 introduced, the latter passage must now be read as claiming that a contingent temporally indefinite sentence about the present or past is always true or always false; that it is (for example) always true (or always false) that a sea battle took place on the previous day. For 18a28–9 asserts in respect of present and past what is to be denied in respect of the future. But that is an absurd result. Aristotle clearly believes in *DI* 9 that there is some sort of *asymmetry* between the present and past on the one hand and the future on the other. But **S** yields no asymmetry: if the sentence 'There will be a sea battle tomorrow' is no more often true than not (or at any rate not *always* true), the same can be said of 'There was a sea battle yesterday'.[14]

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[8] See, e.g., Weidemann, 'Überlegungen zu einer temporalen Modalanalyse', *Zeitschrift für Philosophische Forschung* 40, 1980, 405–22, p.420.

[9] Ackrill, commentary, p.136.

[10] Cf. Boethius, *Commentarii in Librum Aristotelis De Interpretatione* ed. Meiser (Leipzig, 1887–9), 1.124–6 (esp.125.5–14).

[11] Anscombe, 'Aristotle and the Sea Battle', p.50; Fine, 'TN', p.35. I postpone consideration of the force of '*ἤδη*' until #12.

[12] Or: not however [always] this one [i.e. truth] or always that one [i.e. falsity]. Cf. Bosley, 'An Interpretation of *On Int* 9', p.32.

[13] See Fine, 'TN', pp.31–5. The insertion of 'always' is required in (5), because if Aristotle is to preserve **PB** he must agree that on any particular occasion one member is true and the other false. On '*καί*' at 19a38 as carrying the meaning 'or' see Fine, n.25.

[14] Cf. Waterlow, *PP*, p.125 This point is seen by Bosley, 'An Interpretation of *On Int* 9', p.30. But he fails to see that it destroys **S**'s prospects for delivering the needed temporal asymmetry. It is also noted by Fine, but accepted. Her view is that 19a23–b4 is not intended to deliver a temporal asymmetry ('TN', p.35 with n.36). (For her interpretation of 19b2–4, see #4 n.12 above.) On her view, that asymmetry occurs elsewhere, in the reference to human deliberation in the second part of *DI* 9 (cf. #3). But (i) Aristotle's references to the facts of human deliberation are plainly meant to indicate merely that the fatalist's conclusion is to be rejected, not where in his argument he went wrong. It is hard to read the chapter otherwise than as assigning this latter task to 19a23ff. (ii) In that case 19a23ff must yield a temporal asymmetry, because fatalism was only introduced by Aristotle at 18a34ff as a way of showing why the need to find a temporal asymmetry (announced in 18a28–34) arises. (iii) That a temporal asymmetry is intended by 19a23ff is rendered certain by the verbal similarities between the opening passage and, especially, 19a39–b2: this clause picks up the content of the opening claim (18a28–34) and indicates that it has now just been shown that the opening claim was correct. Since that claim introduced a temporal asymmetry, 19a39–b2 in effect says that it has been shown that of future contingent statements/ sentences in antiphasis it is not necessarily the case that one

S's failure to produce a satisfying construal of the chapter as a whole does not end there. Let us look back briefly at the two fatalist arguments. The first argument can only be brought into line by emending '*εἰ γὰρ*' at 18a35 to '*ὥστε εἰ*,' but I have shown above that '*εἰ γὰρ*' must be correct.[15] The second fatalist argument (18b9ff) cannot be brought into line at all. '*ἔτι εἰ ἔστι λευκὸν νῦν ...*': it might possibly have been ambiguous whether the first fatalist argument dealt with statements or with temporally indefinite sentences. But no such ambiguity can be ascribed to 18b9-10: the '*νῦν*' resolves any doubt on that score; the second fatalist argument deals with statements, *not* temporally indefinite sentences. Aristotle rejects it, and with it the claim that 'it is necessary that of the opposites the one be true and the other false' (*ἀνάγκη τῶν ἀντικειμένων εἶναι τὴν μὲν ἀληθῆ τὴν δὲ ψευδῆ*, 18b28–29). Here **S** must again find an implicit 'always' qualifying each member. But even if this reading were linguistically possible, how could Aristotle offer such a patent non-sequitur immediately after the clarity of the fatalist's second argument? And how could he suppose that a *statistical* solution to the problem of future contingency could support the practice of deliberation, which requires, after all, the contingency of *particular* events and situations, and not the contingency (in a statistical sense) of event- or situation-types?[16] The statistical interpretation of this phrase must be wrong, so too its interpretation of the almost identically worded 19a39–b2, which we have anyway seen to be irreconcilable with 18a28ff, and therewith **S**'s interpretation of the chapter as a whole collapses.

The criticism of **S** has nothing to do with the degree of complexity achieved in the characterisations of relevant regularities. Sea battles do not happen every day, but perhaps they fall under some more complex regularity?[17] On **S**, Aristotle's answer must be that they do not,[18] or

member is true and the other false. And now a statistical reading of this move would destroy the asymmetry.

[15] The point is that the fatalist must be taken by **S** to claim in 18a34–5 that if every assertion (or denial) is [always] true or [always] false, then what is asserted (or denied) is necessary. With that reading, '*γὰρ*' at 18a35 would make no sense: that the truth of a prediction is *on any particular occasion* guaranteed to be followed by the occurrence of the predicted event would not support 18a34–5 on the statistical reading, but at best could be said to follow from it.

[16] Cf. Waterlow, *PP*, p.123.

[17] By 'regularity' I understand the *exceptionless* obtaining of relevant events in relevant circumstances. Hence 'irregularity' covers 'for the most part' as well as 'no more often than not' and 'rarely'.

[18] Judson argues ('Chance and 'Always or For the Most Part'', in Judson ed., *Aristotle's Physics* (Oxford, 1991), 73–99, #3) that 'always' and 'for the most part' should in any case be taken in a relative, not absolute way (i.e. as relativised to cases or circumstances, not times). So the claim that sea battles do not happen always, or for the most part, would mean that for any type-specification of attendant circumstances, C, sea battles do not happen always, or for the most part, in C. It is certainly true that Aristotle *ought* to regard his operators 'always' and 'for the most part' as ranging over cases or circumstances, not times; and it is also correct that this treatment does, as Judson shows, make best sense of Aristotle's central examples. (Aristotle can hardly mean that the lucky creditor of *Phys* 2.5 would have to spend more than half his life collecting subscriptions in the market place in order not to be said to encounter his debtor by luck.) What is less certain is whether Aristotle himself was entirely clear on the matter. Some of his remarks seem to indicate that he thought of 'always' and 'for the most part' as ranging over times, not cases: *An Pr* 32b8–9, *Rhet* 1402b36–1403a1. Further, as we shall see, Aristotle's identification of the always with the necessary is often an identification of the *eternal* with the necessary. My criticisms of **S** do not depend on one particular reading of 'always' and 'for the most part'. On 'for the most part' see #14 n.9 below.

rather that it is not guaranteed (true) that they do,[19] but again this answer cannot be the whole of Aristotle's response to the fatalist, because it both fails to exploit any asymmetry between the future and the past, and fails to address the fatalist's argument. If regularities of arbitrary complexity are not guaranteed to obtain in one temporal direction, while it does not automatically follow that they will not be guaranteed to obtain in the other direction either, we need to be given some reason to suppose that there is any asymmetry between past and future in prospect; certainly, Aristotle neither provides, nor seeks to provide, any such reason. Aristotle's view must be that a guarantee of regularity is incompatible with contingency. Hence his stress in *DI* 9 that any contingencies capable of escaping the fatalist's net cannot (be guaranteed to) fall under any relevant regularity: but this insistence introduces a *precondition* of the solution, not that solution itself. That is indeed how Aristotle expresses the matter at 19a9–10: contingency is *located in* the irregular (*ὅλως ἔστιν ἐν τοῖς μὴ ἀεὶ ἐνεργοῦσι τὸ δυνατὸν εἶναι καὶ μή*); it is not said to *consist in* irregularity. (Similar remarks apply to 19a35–6.) In terms of the sentence/statement distinction, the point is that the contingency of any particular *statement* depends on, but does not consist in, the fact that it is not guaranteed that the *sentence* will be regularly true (or false). If the failure of the corresponding sentence to be guaranteed to be regularly true were sufficient as well as necessary for the contingency of a statement, then the statement that there was a sea battle yesterday

[19] Cf. #3 n.18 above and ##7–9 below, for further elucidation of this point.

would count as contingent; but in fact it is either necessarily true or necessarily false.

The phrase '*μᾶλλον ἀληθῆ*' at 19a38–9 is less embarrassing. This phrase no doubt introduces statistical considerations, *via* a recapitulation of the '*μᾶλλον*' at 19a20; for even if we follow **AR** and interpret it as applying to *statements*, and as meaning 'more likely to be true', nevertheless a statement is more likely to be true in virtue of the preponderant but not exceptionless truth of the corresponding *sentence* (in relevant circumstances): likelihood is a statistical notion.[20] But although a statistical sense for '*μᾶλλον ἀληθῆ*' at 19a38–9 cannot be avoided, the passage as a whole does not present a statistical *solution* to fatalism, for 19a38–9 is only one clause of that solution, and we have seen that we have reason not to interpret the other clauses statistically. Aristotle's discussion cannot, then, be entirely absolved of confusion on the role of statistical considerations: 19a18–22 remains an embarrassment. But we can achieve sufficient independent grip on the sense of the chapter to say that this passage is a lapse form the path to the solution, not the solution itself. The lapse is perhaps rendered comprehensible, if not excused, by Aristotle's failure to distinguish explicitly between statements and sentences. If he had made that distinction, he would have had available to him the thought that within the overall category of the contingent the 'for the most part' is a statistical notion (the relevant sentence is in most cases true), and that the rest of the contingent can be further divided into a purely statistical region (the relevant sentence no more often true than not), and a non-statistical region (potentiality for opposites: the relevant statement not either true or false).[21]

[20] Cf. al-Farabi's commentary, which draws a clear connection between likelihood and statistical frequency (pp.89–90) without, however, offering a statistical interpretation of *DI* 9 as a whole. The connection between likelihood (*τὸ εἰκός*) and *τὸ ὡς ἐπὶ τὸ πολύ* is drawn by Aristotle in a number of passages: e.g. *An Po* 70a2–6, *Rhet* 1357a34–b1, 1402b13–1403a1. See Mignucci, '*Ὡς ἐπὶ τὸ πολύ* et Nécessaire dans la Conception Aristotélienne de la Science', in Berti ed., *Aristotle on Science* (Padua, 1981), 173–203, p.197, with Judson, 'Chance and 'Always or For the Most Part'', p.87.

[21] Or: the relevant proposition not *yet* either true or falsa (see #12 n.71). Note that Ammonius' interpretation of 19a18–22 is statistical: *In De Int* 151.34–152.4. Another passage where Aristotle seems to think of contingency in primarily statistical terms is *An Pr* 32b4–22 (cf. Hintikka, *TN*, p.170). This passage is consistent with my interpretation of *DI* 9, for the point is just that some kinds of contingent event happen a certain way for the most part, but the opposite can also happen, conferring contingency on both *ἀντικείμενα* (cf. *DI* 19a20–2), whereas other kinds exhibit no

I have argued that **R** and **S** cannot do justice to important elements of *DI* 9. It remains, however, to examine 19a23–32. For this passage does, at first sight, seem to be diagnosing the fallacy of operator shift in two of its manifestations. 19a23–27 might be read as rejecting the inference from *necessitas consequentiae* to *necessitas consequentis*, i.e. from '$L[p \rightarrow p]$' to '$p \rightarrow Lp$' (or perhaps: from '$\forall t[L_t\ [p \rightarrow p]]$' to '$p \rightarrow \forall t\ [L_t p]$'. But it will suffice to operate with the simpler formulation):

> *τὸ μὲν οὖν εἶναι τὸ ὂν ὅταν ᾖι, καὶ τὸ μὴ ὂν μὴ εἶναι ὅταν μὴ ᾖι, ἀνάγκη· οὐ μέντοι οὔτε τὸ ὂν ἅπαν ἀνάγκη εἶναι οὔτε τὸ μὴ ὂν μὴ εἶναι· – οὐ γὰρ ταὐτόν ἐστι τὸ ὂν ἅπαν εἶναι ἐξ ἀνάγκης ὅτε ἔστιν, καὶ τὸ ἁπλῶς εἶναι ἐξ ἀνάγκης· ὁμοίως δὲ καὶ ἐπὶ τοῦ μὴ ὄντος.*
>
> It is necessary that what is be whenever it is, and that what is not not be whenever it is not; but not everything that is necessarily is, nor is everything that is not necessarily not. For that everything is of necessity when it is, is not the same as that it is *simpliciter* of necessity; and similarly for what is not.

19a27–32 might be read as rejecting the inference from '$L[Fp \vee \neg Fp]$' to '$LFp \vee L\neg Fp$':

> *καὶ ἐπὶ τῆς ἀντιφάσεως ὁ αὐτὸς λόγος· εἶναι μὲν ἢ μὴ εἶναι ἅπαν ἀνάγκη, καὶ ἔσεσθαί γε ἢ μή· οὐ μέντοι διελόντα γε εἰπεῖν θάτερον ἀναγκαῖον. λέγω δὲ οἷον ἀνάγκη μὲν ἔσεσθαι ναυμαχίαν αὔριον ἢ μὴ ἔσεσθαι, οὐ μέντοι γενέσθαι αὔριον ναυμαχίαν ἀναγκαῖον οὐδὲ μὴ γενέσθαι· γενέσθαι μέντοι ἢ μὴ γενέσθαι ἀναγκαῖον.*
>
> And the same account holds of antiphases. It is necessary that everything either be or not, and be going to be or not; but it is not possible to divide and say that either [member] is necessary. The sort of thing I am saying is this: it is necessary that a sea battle will take place tomorrow or not take place, but it is not necessary that a sea battle occur tomorrow, nor that it fail to occur; it is however necessary that it occur or not occur.

Aristotle says that the same kind of reasoning is involved in rejecting both inferences (19a27–8), and it might seem perfectly natural to char-

tendency to happen one way rather than the other (cf. *DI* 19a18–20). But Aristotle rather incautiously groups together as examples of the latter category (the *ἀπὸ τύχης*) walking and the coincidence of walking at the same time as an earthquake. Walking is a central case of an action the contingency of which I am arguing cannot be explicated (solely) in statistical terms; walking at the same time as an earthquake, on the other hand, and coincidences in general, are, as I concede in #11 below, given a purely statistical underpinning by Aristotle (though one which in turn rests on the natures of things (cf. Frede, *Seeschlacht*, p.62), as indeed the present passage suggests). The '*μᾶλλον*' in 32b13 (*οὐδὲν γὰρ μᾶλλον οὕτως πέφυκεν ἢ ἐναντίως*) and in 32b17–18 should accordingly be read statistically.

acterise both fallacies as involving an illegitimate operator shift.[22] The above formalisation of the first fallacy may not, admittedly, capture its temporal character:[23] perhaps the fallacy is the move from 'Necessarily: everything is (true) when it is (true)' to 'Everything is necessarily (true) when it is (true)'. But that inadequacy, if it be one,[24] can perhaps be overlooked.

One problem with this version of the text is the point of introducing this first type of fallacy at all: what relevance does it have? As I have observed, the fatalist does not start his argument with a *necessitas consequentiae*, so that to warn against a possible confusion of this species of necessity with *necessitas consequentis* would not hit any target. It is a little lame to say that Aristotle 'is softening us up' for the solution.[25] The fact is that, on the realist analysis of 19a23–27, the fallacy it diagnoses has nothing to do with either the fatalist's claim or the proposed solution. We should therefore look for a more coherent understanding of these lines.

In the first place, 19a27–32 do not need to be construed as rejecting the inference from '$L[Fp \vee \neg Fp]$' to '$LFp \vee L\neg Fp$'. As Ackrill points out, the passage makes good sense if we construe the ban on 'dividing' as rejecting an inference from '$L[Fp \vee \neg Fp]$' *either* to 'LFp' *or* to '$L\neg Fp$.'[26] Ackrill supposes the passage actually makes better sense if read in this way on the grounds that the two fallacies can then be exposed by 'the same reasoning', as Aristotle promises (19a27–8). But this does not appear to be correct. As Fine points out,[27] on **R**'s interpretation of 19a23–7 and 19a27–32, the former fallacy *entails* the latter, i.e.

$$L[p \rightarrow p] \rightarrow [p \rightarrow Lp]$$

[22] Fine, 'TN', pp.30–1.
[23] Frede, *Seeschlacht*, p.64f.
[24] Fine argues (*contra* Frede) that both '*ὅταν*' and '*ὅτε*' have non-temporal uses ('TN', pp.24–5). Frede responds at 'Sea Battle', p. 70. But this debate on the force of '*ὅταν*' and '*ὅτε*' will turn out to be irrelevant: #8 below.
[25] Fine, 'TN', p.32. Fine erroneously claims that 'Necessarily ['p' is true or 'not-p' is true]' is a substitution-instance of 'Necessarily [p or not-p]'. This claim involves an obliteration of the distinction between **LEM** and **PB** (cf. #2 n.2), and should be resisted by supporters of **AR**, for whom the former (**PB**) is false (assuming choice negation), while the latter (the necessitation of **LEM**) is true.
[26] Commentary, p.138; Frede, *Seeschlacht*, p.69, 'Sea Battle', pp.74–5.
[27] 'TN', p.30 with n.23.

entails

$$L[p \vee \neg p] \rightarrow [Lp \vee L\neg p].$$

AR and **C** may follow D. Frede[28] and explain '*ὁ αὐτὸς λόγος*' as *applying* 19a23–7 to ('*ἐπί*') 19a28–32: each disjunct in the disjunction only gets its necessity-value *when* it gets its truth-value. (More accurately: the **FCS**s composing a **FCD** never receive a truth-value, but the corresponding present-tensed statements, which are true or false at the time when the relevant state of affairs obtains or fails to obtain, receive a necessity-value along with their truth-value.) The truth of the disjunction as a whole is already fixed (it is absolutely necessary), so it gets is necessity-value *now*.[29] The fact is that the vague phrase '*ὁ αὐτὸς λόγος*' does not adjudicate between the rival interpretations, and nothing much can be built on it.[30] But excellent sense can be made of the passage if we take '*διελόντα*' (19a29) as referring to the *splitting up* of the disjunction into its component disjuncts and inferring from the disjunction as a whole to either component, rather than as referring to an illegitimate

[28] *Seeschlacht*, p.67ff. Cf. Bäck, 'Sailing through the Sea Battle', p.140.
[29] What are the *πράγματα* (19a33) which render statements true? There is a danger, in posing this question, that we will be tempted to foist on Aristotle a correspondence theory of truth, which the principle that '*ὁμοίως οἱ λόγοι ἀληθεῖς ὥσπερ τὰ πράγματα*' in no way invites (Donini, *Ethos*, ch.1, esp. p.17). The *πρᾶγμα* 'corresponding' to the truth of 'There will be a sea battle tomorrow or there will not be a sea battle tomorrow' is just the fact that there will either be a sea battle tomorrow or not (but then there is no question of correspondence). See further #6.
[30] Boethius attempts to elucidate '*ὁ αὐτὸς λόγος*' at *In De Int* 1.123.27–124.7, but I do not think his attempt can be judged successful: 'In quo igitur similitudo est contingentis contradictionis et temporalis neque simplicis necessitatis? In eo scilicet, quia sicut necesse est esse quod est, quando est, non tamen simpliciter necesse est esse quod est praeter temporis adiectionem: ita in contradictione contingenti affirmationem quidem vel negationem veram esse necesse est, non tamen vel affirmationem simpliciter ac definite veram vel negationem, sed utramlibet et quam certae veritatis constituerit eventus.' Equally unpersuasive is Molina's attempt in his commentary: 'Itaque similitudo consistit in hoc, quod sicut de qualibet re existente simpliciter non est verum dicere 'necessario est,' sed cum hoc addito 'quamdiu est,' seu 'supposito quod sit,' ita de quolibet futuro contingenti simpliciter non est verum dicere 'erit,' nisi addat sub disiunctione 'vel non erit'; nec rursus simpliciter est verum dicere 'non erit' nisi addat 'vel erit' ' (*Quaestio de Futuris Contingentibus* 4.33–38). In both cases the 'sicut ... ita' structure limps somewhat. But both passages are highly relevant to our assessment of their authors' positions; in particular, they confirm that these authors do not subscribe to **R**. On Boethius, see #12; on Molina, see my 'Molina on Divine Foreknowledge and the Principle of Bivalence', *JHP* 32, 1994, 27–47, #3.

slide of the initial operator inside the disjunction. This is indeed how Ammonius[31] and Boethius[32] understood Aristotle.

Ackrill suggests that the point of the ban is indeed ultimately to reject the inference from '$L[Fp \vee \neg Fp]$' to '$LFp \vee L\neg Fp$', and that Aristotle fails to see that he can do this directly, believing that the argument requires a middle step in which the inference to either disjunct is shown up as fallacious. Ackrill's reason for not construing the passage as a simple ban on 'dividing', as above understood, is that dividing 'is not a move that anyone (in chapter 9 or elsewhere) is tempted to make'.[33] But this riposte implicitly concedes the general thrust of **R**. On **AR**, Aristotle is not trying to ban any inferences in the fatalist's argument: he precisely accepts them. What he rejects is the premise that there is such a thing as the anterior truth of **FCS**s (that **PB** applies to them). The line that **AR** must take on 19a27–32 is that Aristotle is not yet setting out his solution (which comes at 19a32ff), but making a vital preliminary distinction between **LEM** and **PB**, so that he can coherently accept the former and reject (or restrict) the latter. The fatalist just assumed **PB**. Aristotle wishes in some way to restrict it in respect of **FCS**s, without giving up – what looks on any account like a truism – that either there will be a sea battle tomorrow or there won't, *tertium non datur*.

It will naturally be asked: what, for **AR**, is the point of couching the argument here in terms of *necessity* rather than simply *truth*? Why not simply ban the inference from the truth of '$p \vee q$' either to the truth of 'p' or to the truth of 'q'? The answer is that Aristotle accepts the fatalist's inference from truth to necessity, so that he is merely making his point with that inference worked into the presentation of the argument.[34] He accepts the conclusion of the fatalist's argument for disjunctions of the form '$Fp \vee \neg Fp$'; but he contraposes the argument in the case of the disjuncts: they are not necessary, and so not true either.

But Aristotle does not just tacitly adopt the inference from the fatalist: he also provides his own statement of it. That is the role of 19a23–27. In construing this passage, what is required is a shift in perspective away from **R** like the shift which I argued was demanded in interpreting 19a27–32. Instead of seeing in it a wholly irrelevant ban on the inference from '$L[p \rightarrow p]$' to '$p \rightarrow Lp$', we should rather regard Aristotle as *accepting* some suitable version of *necessitas consequentis*, and distinguishing this from some suitable conception of the absolute necessity of 'p', which, in the case of a 'p' which enjoys *τὸ δυνατὸν εἶναι καὶ μή*, does not obtain. (My expression of the necessities in question is intentionally vague: I shall turn to the issue of their correct formal representation in #8.) That is in any case the most natural way of reading 19a25–6, where Aristotle places the necessity operator within the scope of '*ὅτε*'.[35] It also coheres with Aristotle's more or less explicit equation between the contingent and the future (18a28ff together with 19a36–b4).[36] My formulation of the argument of 19a23–7 ascends from the ontological to the linguistic level. But, as Aristotle goes on to say (19a33), nothing turns on the distinction here.[37] The necessity of the consequent embodies the ineluctability[38] of the present and the past. For the present and the past are given, so by the necessity of the con-

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[31] *In De Int* 154.32–4, quoted in #12 below.

[32] 2.246.5–11: 'Cras enim bellum navale fieri aut non fieri necesse est, non tamen ex necessitate fiet cras aut ex necessitate non fiet, ut possit aliquis dividere et praedicare dicens cras fiet, ut hoc vere dicat et ita ex definito contingat, vel rursus cras non fiet, et hoc eodem modo proveniat.'

[33] Commentary, p.138.

[34] In his commentary on this passage, Antonius Andreas argues that Aristotle intends his talk of necessity at 19a23ff to be a way of introducing a point about truth (*Super Artem Veterem*, Venice, 1496), presumably *via* the inference from necessity to truth. And both Ammonius and Boethius take Aristotle's ban on 'division' to relate to truth (#12 below). The historical justification for applying this inference to Aristotle, in the case of disjunctions, is contested by Frede, *Seeschlacht*, pp.73–7, 'Sea Battle', pp.77–8. But the fact that Aristotle did not himself *formulate* the inference does not mean that it is not implicitly contained in his text. That inference, together with the principle of semantic ascent (which, *pace* Frede, Aristotle does formulate, quite generally, in 19a33), takes us from the necessity that there will either be a sea battle tomorrow or not to the truth of 'There will either be a sea battle tomorrow or there will not be a sea battle tomorrow.' Conversely, a parallel principle of semantic descent, coupled with the fatalist's inference from truth to necessity, takes us back from this latter formulation to the formulation in the text.

[35] Frede, 'Sea Battle', p.72, 'Omne quod est quando est necesse est esse', *AGPh* 54, 1972, 153–67, pp.154–5.

[36] Waterlow, *PP*, p.83.

[37] *Pace* Frede, *Seeschlacht*, pp.64–5, who makes a great deal of the distinction between ontology and language (so too Donini, *Ethos*, ch.1). I return to this issue below (#8), where I shall argue that a great deal turns on the distinction between linguistic and metalinguistic levels. In denying that any significance attaches in *DI* 9 to the distinction between ontological and lingusitic levels (discourse in the material and formal modes) I concur with Hintikka, *TN*, pp.168–9. Cf. Waterlow, *PP*, p.116ff.

[38] Ackrill's word, commentary, p.139. Frede talks of 'die Unabänderlichkeit des einmal Eingetretenen': 'Omne quod est quando est', p.160. Cf. Łukasiewicz, 'Many-valued Systems of Propositional Logic', in McCall ed., *Polish Logic*, pp.42–3.

sequent we may detach their necessity. We have independent evidence that Aristotle accepted the necessity of the present as well as the past: I present this evidence in #9. (The remarks in this paragraph have been preliminary only and will be elaborated and defended in the sequel.)[39]

The general shape of 19a23–b4 is, we may say, as follows. Aristotle begins by supplying a statement, *in propria voce*, of the inference from truth to necessity (distinguishing this variety of necessity from absolute necessity), which he has accepted from the fatalist. There is accordingly an equivalence between truth and necessity which he relies on in the next part of the argument where he differentiates his position from the fatalist's. He accepts the necessity (≡ truth) of a **FCD** while rejecting the necessity (≡ truth) of either of the disjuncts taken severally. He then states that this involves (in some way) restricting **PB** in respect of **FCS**s. He concludes that in so doing he disposes of a vital premiss in the fatalist's proof. The restriction on **PB** yields at least this much: **FCS**s are not straightforwardly true, or alternatively false. For the time being we can content ourselves with the view of **AR** that they are neither true nor false. But this rather stark position will need refinement in the light of the contribution of **C**.

[39] Note that even those supporters of **R** who do not interpret 19a23ff as introducing the necessity of the present (and past) are committed by the evident contrast in *DI* 9 between present/past and future to ascribing to Aristotle acceptance of the necessity of the present and past: **R** interprets Aristotle as distinguishing between truth and necessity in the case of **FCS**s, but *not* in the case of statements about the present and past. Hence **R** can be represented as rejecting an inference from the necessity of the present and past to the fatalist's generalised inference from truth to necessity: I discuss the plausibility of this rejection in #8.

6 Bivalence and Determinism

It has been suggested that causal considerations underpin Aristotle's thought in *DI* 9,[1] but there is no warrant for adducing them here, where the fatalist's argument and, to all appearances, Aristotle's refutation, work on an purely logical level.[2] Supporters of the causal interpretation adduce *Met* E.3, where it is plausible to interpret Aristotle as rejecting universal (efficient) causal determinism. But future truth, as such, plays no role in *Met* E.3: Aristotle does not take himself to be contraposing the conditional 'If it is true that *Fp*, then it is causally necessitated that *Fp*'. Rather, he argues against universal causal determinism without reference to **PB**. Similarly, there is no warrant for finding the conditional implicit in the argumentation of *DI* 9. The argument of *DI* 9 seems to be *not* that a **FCS** could be true only if the future event were

[1] This line is taken by von Wright in his 'Time, Truth and Necessity', in Diamond and Teichman eds., *Intention and Intentionality* (Sussex, 1979), 237–250, and in 'Omne quod est quando est necesse est esse', in his *Truth, Knowledge and Modality* (Oxford, 1984), 72–85; and by White, 'Fatalism and Causal Determinism: an Aristotelian Essay', *PQ* 31, 1981, 231–41. See here Frede, *Seeschlacht*, p.32ff. Cf. also Wieland, 'Zeitliche Kausalstrukturen in der aristotelischen Logik', *AGPh* 54, 1972, 229–37. Wieland argues that Aristotle could have arrived at a restriction of **PB** in respect of **FCS**s on the basis of two principles which he elsewhere accepts: the unique direction of causation from earlier to later, but including contemporaneous cause and effect (*An Post* 2.12), and the principle that the truth of a statement is caused by the state of affairs to which it relates, but not vice versa (*Cat* 14b18ff, *Met* 1051b7ff; *Phys* 208a14ff), although Wieland rightly notes (p.235) that there is no reason to suppose that these principles are operative in *DI* 9. The argument retains its force when we interpret the causal relation between reality and true utterances as one of conditioning (i.e. that things are thus and so is a necessary condition of the truth of the relevant utterances), for on Aristotle's view necessary conditions normally precede what they are conditions of (p. 237). Wieland's argument might seem to commit Aristotle to restriction of **PB** in respect of *all* future statements (non-contingencies included), which would clearly go too far (so Seel, *DAM*, p.366). But this untoward consequence can be avoided if we regard truths about future non-contingencies as being caused by the same present state of affairs which causes the future non-contingencies in question, or, in the case of eternal processes, as being derived from eternal truths, rather than as being caused directly by the future non-contingencies themselves.

[2] Cf. Ackrill, commentary, p.136; Donini, *Ethos*, p.5; Kirwan, 'Aristotle on the Necessity of the Present', pp.185–6. In his 'Fatalism and the Future', McKim seems to

'present in its causes' – those causes providing an objective correlate for the truth of the **FCS** – so that to adhere to unrestricted **PB** in respect of **FCS**s would be to commit oneself to a form of causal determinism. Rather, the position seems to be that *relative* to the truth that a certain event will occur that event must occur. Given a parallel move for falsity, the fatalist concludes from **PB** to his necessitarianism.

It seems that it was because Łukasiewicz was attracted by such a correspondence theory that he rejected **PB**.[3] But in fact logical fatalism and causal determinism are distinct doctrines.[4] The truth of a **FCS** no more implies that the relevant event be 'present in its causes' than does the truth of a past-tensed statement imply that the past event be 'present in its effects'. (Łukasiewicz embraced this corollary willingly, however, as he tells us in the moving conclusion to 'On Determinism'.) The demand that true statements have 'real' (i.e. causal) correlates does not have to be accepted by the fatalist, whose position cannot be so easily tipped into the doubtful coherence of a correspondence theory of truth. By 'a correspondence theory of truth' I mean more than the harmless (because truistic) realism inherent in the claim that sentences (or statements) are made true or false by facts, or are true in virtue of the way the world is.[5] That realism is indeed implicit in Aristotle's position that there are no future states of affairs available to make **FCS**s true or false. But a correspondence theory goes further than that: it claims that the facts which make sentences true at times are facts about

support the causal reading of the fatalist's second argument. He claims that Aristotle's response is to distinguish anterior truth of a **FCS** (which is innocuous) from its anterior decidability (which has a necessitarian implication). Decidability seems to entail, for McKim, the obtaining of conditions which are causally sufficient for the occurrence of the relevant event. His argument is invalid, resting on an egregiously inaccurate rendering of 19a36–8, which McKim takes as saying that the anterior decidability of a FCS cannot be inferred from its anterior truth. A *purely* epistemic reading of *DI* 9 (anterior truth of **FCS**s innocent; anterior knowability entails necessity) has as little textual warrant as the causal reading. (Some of McKim's formulations are incautiously epistemic; so too Huber, *VgV*, p.27; cf. D. Williams, 'The Sea Fight Tomorrow', pp.293–4.) Untenable also is the view of Olympiodorus, in a scholion to *DI* 9, that the chapter is directed against astrology: see Tarán, *Anonymous Commentary*, pp. xiii–xiv, xxx–xxxi.

[3] 'On Determinism' *passim*, in McCall ed., *Polish Logic*, 19–39. Cf. Jordan, 'Logical Determinism', *Notre Dame Journal of Formal Logic* 4, 1963, 1–38; also Patzig, 'Hegels Dialektik und Łukasiewicz's dreiwertige Logik', in *Das Vergangene und die Geschichte*, Festschrift für R. Wittram (Göttingen, 1973), 443–60, at p.454.

[4] See here Baylis, 'Are Some Propositions Neither True Nor False?'.

[5] *Cat* 4b8–10, 14b18–22, *Met* 1011b26–7, 1051b6–9, *DI* 19a33.

the causal disposition of the world at those times. If there are no such facts, then the corresponding sentence lacks a truth-value at the relevant time. It is this position which cannot be found in *DI* 9.[6] Łukasiewicz's position seems to be that while he accepts that fatalism is a logically distinct doctrine from causal determinism, he does not see how **FCS**s possibly *can* be true in advance if they are not 'present in their causes'.[7] That recalls Chrysippus' position as reported by Cicero in his *De Fato*.

According to Cicero's account, both Chrysippus and Epicurus adhered to an implication from unrestricted **PB** to universal causal determinism.[8] Chrysippus, since he believed in unrestricted **PB**,[9] affirmed universal causal determinism. Epicurus, on the other hand, contraposed the implication: rejecting determinism, he rejected unrestricted **PB**.[10] Why did Chrysippus and Epicurus find the implication so natural if, as I am arguing, it is not present in either *DI* 9 or *Met* E.3, where one might expect to find it? The suggestion is made by White that they both believed that, in some sense, only the present is actual.[11] The reality (in a derivative sense) of past and future can then only be secured by finding causal relations with the present.[12] Evidence for Epicurus is difficult to find on this matter.[13] For Chrysippus, White cites a passage from Sto-

[6] The distinction between the harmful and harmless realisms can be put like this: the harmless realism merely claims that the way the world is makes sentences (or statements, or propositions) true; the harmful realism goes further in claiming that facts themselves (or truths) correspond to (rather than being the same as) the way the world is ('the world' then being conceived along the lines of 'what is present in its causes or effects'). See my 'Conditionals of Freedom and Middle Knowledge', *PQ* 43, 1993, 412–430, #5, on the misguided search for a *fundamentum veritatis*. It is not quite clear which sort of realism Ackrill means to pin on Aristotle in his commentary (pp.140–1). His characterisation of it is: 'If the state of affairs now is such that it is not settled whether X will occur or will not occur, then 'X will occur' is not now either true or false: there is not yet anything in the facts for it to correspond or fail to correspond with.' Does 'settled' mean here 'determinate' or '(causally) determined'? Dickason ('Aristotle, the Sea Fight and the Cloud') seems to take it that any version of realism about truth is committed to equating 'determinate' with 'determined', and accordingly finds the equation in *DI* 9.

[7] This seems also to be the position, if I understand him correctly, of Harris, 'Solving the 'Naval Battle'', *PAS* 78, 1977–8, 45–61.

[8] *De Fato* 20–1 = *SVF* 2.952.

[9] M.Frede, *Die Stoische Logik* (Göttingen, 1974), 40–1.

[10] *De Fato* ibid; *Academica Priora* 97; *De Natura Deorum* 1.70.

[11] 'Time and Determinism in the Hellenistic Philosophical Schools', *AGPh* 65, 1983, 40–62.

[12] White, 'Time and Determinism', p.47.

[13] White cites Sextus, *AM* 10.219 = LS 7C; but this is inconclusive.

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baeus in which Chrysippus develops a distinction between the instantaneous and specious ('broad') present.[14] But this passage does not show that Chrysippus denied the existence of the past and future *tout court*: if anything, his reasoning threatens the existence of the present.[15] Rather, he claims that they do not exist in the same sense as the present (i.e. the broad present): they 'subsist' (*'ὑφεστάναι'*) whereas the present exists (*'ὑπάρχειν'*). Indeed Chrysippus defines time as 'the dimension accompanying the world's motion' (*τὸ παρακολουθοῦν διάστημα τῇι τοῦ κόσμου κινήσει*). Given the eternity of the world's motion, which persists through the conflagration at the end of each cycle, he is therefore committed to the existence, in some sense, of the past and the future.[16] Indeed his commitment to the reality of the past is guaranteed by his commitment to its necessity (Cicero, *De Fato* 14). That is what we should want to say for Aristotle too. That Aristotle is also committed to the reality, in some sense, of the future, is indicated by his definition of time as the measure of motion, taken together with the eternal rotation of the heavens.[17] Of course, that commitment does not threaten contingency: not all aspects of the future are yet fixed. As far as the evidence goes, then, we have no warrant for supposing that Epicurus and Chrysippus believed, against Aristotle, that the past and future are unreal.

I suggest that the reason why Chrysippus and Epicurus found the implication from **PB** to causal determinism natural, although it is missing in Aristotle, is that the implication naturally pushes itself forward,

[14] Stobaeus 1.106.5–23 = *SVF* 2.509 = LS 51B. The relevant part (=LS 51B (3)) reads: *'ἐμφανέστατα δὲ τοῦτο λέγει, ὅτι οὐδεὶς ὅλως ἐνίσταται χρόνος. ἐπεὶ γὰρ εἰς ἄπειρον ἡ τομὴ τῶν συνεχόντων ἐστί, κατὰ τὴν διαίρεσιν ταύτην καὶ πᾶς χρόνος εἰς ἄπειρον ἔχει τὴν τομήν· ὥστε μηθένα κατ' ἀπαρτισμὸν ἐνεστάναι χρόνον, ἀλλὰ κατὰ πλάτος λέγεσθαι.'*

[15] Indeed Plutarch's polemic against Chrysippus in *Comm Not* 1081c–1082a (=LS 51C) is precisely that the Stoics say *only* the past and the future exist. Plutarch tries to reduce Chrysippus' notion of the 'broad present' to absurdity: it is subject to indefinite division into the strictly past and the strictly future.

[16] Further evidence that the Stoics believed in the reality of the past and the future: Apollodorus *apud* Stobaeus 1.105.8–16 (=*SVF* 3 Apollodorus 8 = LS 51D); Posidonius *apud* Stobaeus 1.105.17–106.4 (=LS 51E).

[17] *Phys* 221b3–7, where eternal things are said to be, *qua* eternal, not *in* time (i.e. surrounded by time). Such things are co-extensive with time, and hence not measured or acted on by time. But though eternal things are not, in this technical sense, in time, their reality is enough to secure the reality of the future. (It is guaranteed that there will be a future: *Phys* 222b6–7, with Hussey, *Aristotle's Physics III, IV* (Oxford, 1983), p.xlvii.)

once universal causal determinism has become an issue. There are hints in Aristotle that he senses a problem in the region of determinism (*Met* E.3 is one such); but determinism does not become a serious philosophical problem until the Hellenistic period. Once determinism is on the table, it is quite natural to associate it with **PB**. To prise them apart requires something like an atemporal conception of time – the conception of time as laid out quasi-spatially from beginning to end. There is some evidence that this conception was achieved in antiquity by the Academic tradition, though at what stage remains unclear.[18]

[18] White argues ('Time and Determinism') that we can see the beginnings of the atemporal conception already in the writings of the Middle Academy, where there seems to be room for the rejection of the implication from **PB** to determinism in the following position found in Pseudo-Plutarch's *De Fato*: there are world cycles, each qualitatively identical with the others (569c); but universal causal determinism is false (570cff). And indeed at the end of *De Fato* Pseudo-Plutarch seems to be preparing to combine adherence to **PB** with a rejection of determinism (574e–f). But these manoeuvres do not constitute a significant advance on Cicero's position in his *De Fato*. The extent to which Neoplatonists achieved an explicit formulation of McTaggart's distinction between A-series time and B-series time remains controversial. For an optimistic assessment: Plass, 'Timeless Time in Neoplatonism', *The Modern Schoolman* 55, 1977, 1–19; more pessimistic: Sorabji, *Time, Creation and the Continuum* (London, 1993), ch.3. Sorabji finds a distinction between static and flowing time in Iamblichus, but rejects an assimilation of Iamblichus' conception of static time to McTaggart's B-series.

7 The Worn-out Cloak and the Principle of Plenitude

If the approach to *DI* 9 has been correct so far, we can see that Aristotle makes one significant slip in the chapter. As an example of a future contingency which he refuses to surrender to the fatalist, Aristotle talks of a cloak which may be cut up, or alternatively may wear out first (19a12–18). However, he does not express himself as cautiously as this, instead suggesting (19a12–14) that

> *τουτὶ τὸ ἱμάτιον δυνατόν ἐστι διατμηθῆναι καὶ οὐ διατμηθήσεται, ἀλλ' ἔμπροσθεν κατατριβήσεται* . . .
>
> It is possible for this cloak to be cut up, but it will not in fact be cut up, but will wear out first . . .

Aristotle has, I have argued, conceded to the fatalist that anterior truth does imply necessity: his contention is that as far as future contingencies are concerned, there are no anterior truths available, so that the fatalist has no material on which to get going. If that is right, then Aristotle helps himself to a future tense in the quoted passage which he is not entitled to and had very much better avoid. For if it is (now) true that the cloak will wear out, then it is *not* possible for it to be cut up. In saying that the cloak can be cut up but will in fact wear out first, Aristotle has incautiously given utterance to a claim which, if my interpretation of *DI* 9 is correct, he elsewhere in that chapter expressly rejects.

Weidemann has suggested[1] that we can save Aristotle from inconsistency in this passage if we distinguish between two interpretations of the formula '*Fp*': (*i*) It is now a firm fact that *Fp* (Es steht bereits zum gegenwärtigen Zeitpunkt fest, daß *Fp*); and (*ii*) It is not now a firm fact that *Fp*, but it will turn out that *p* (Es wird sich erst im Laufe der Zeit herausstellen, daß *p*). The distinction is said to correspond to the interpretations given to '*Fp*' by, respectively, Peircean and Ockhamist models of time.[2] '*Fp*' in the first, Peircean, sense is equivalent to the

[1] 'Das sogenannte Meisterargument des Diodoros Kronos und der Aristotelische Möglichkeitsbegriff', *AGPh* 69, 1987, 18–53, at p.36.

[2] Weidemann, 'DSM', p.46 n.72; Prior, *PPF*, ch.7.

Ockhamist's '*LFp*'. '*Fp*' in the second, Ockhamist, sense, has no equivalent in the Peircean system: it aims to secure a sense in which '*Fp*' obtains, but does so only contingently. Weidemann now suggests that '*οὐ διατμηθήσεται*' might be taken in the Ockhamist sense of '*Fp*', so saving Aristotle from the embarrassment of self-contradiction.

But Aristotle is not to be saved. The manoeuvre tries to secure a form of future truth which is contingent, but Aristotle has accepted from the fatalist that there is no such form. I will in any case reject the claims of the Ockhamist model to represent Aristotle's thought on future contingency; but even in its terms no allowance is made for the contingent truth of simple future statements of the form '*Fp*'. For although the truth-value assigned to '*Fp*' varies according to which branch of the future it is assessed on, if '*Fp*' is simply true, then on an Ockhamist model it is necessary:

$$Fp \models LFp.$$

Of course, where '*Fp* occurs as part of a more complex formula, it may indeed fail to be equivalent to '*LFp*' in the Ockhamist model. For example, '*PFp*' is not equivalent to '*PLFp*'. (It is just this feature of the Ockhamist model which I shall claim is non-Aristotelian.) But where '*Fp*' occurs as a simple assertion (or assumption), it is equivalent to '*LFp*' . That holds of the Ockhamist model as well as any model which could be called Aristotelian. There is no Aristotelian way in which it can be true that things will turn out in such a way that *p*, without its now being a firm fact (and hence necessary) that '*Fp*'.[3]

What is a 'firm' fact? (What does 'feststehen' mean?) Although Weidemann's assimilation of the 'firm' sense of '*Fp*' to the Peircean interpretation of this formula suggests that 'firm' means 'necessary', at other points his language incautiously gestures towards an unmodalised sense of 'firm', underpinning a distinction between its being (merely) a fact (now) that *Fp*, and its not being (now) a fact that *Fp*, but its *turning out* that *p*. The fatalist's inference to necessity is then taken to follow only from the fact (now) that *Fp*.[4] Of course, if one restricts **PB** with

[3] These brief remarks on Aristotle's relation to the Ockhamist and Peircean models will be elucidated in ##12–13.

[4] E.g. 'DSM', pp.32–3, where 'es steht bereits zum gegenwärtigen Zeitpunkt fest, daß . . .' is replaced by 'es ist bereits zum gegenwärtigen Zeitpunkt eine Tatsache, daß . . .', and the inference from factuality to necessity registered separately. Cf. pp.45–6,

respect to **FCS**s, one is in a position to hold that it can turn out that *p* without having previously been a fact that *Fp*. But what one cannot say is that although it is not now a fact that *Fp*, (it is nevertheless true that) it will turn out that *p*. For there is no difference (other than one of terminology) between its being a fact that *Fp* and its going to turn out (i.e. be true) that *p*. If it will turn out that *p*, then it is true that it will turn out that *p*; so it is true that *Fp*; so it is a fact that *Fp*; and contrariwise. If the fatalist's inference to necessity is licensed by the fact that *Fp*, it is licensed by its now being the case that it will turn out that *p*.[5]

Much of the disparity among the various accounts of possibility and

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where concerning the 'weaker' sense of '*Fp*' (i.e. (ii)) Weidemann states that 'es (von jetzt an) irgendwann einmal der Fall sein wird, daß *p*, wobei völlig offenbleibt, ob dies jetzt schon als eine Tatsache feststeht oder nicht.' Weidemann claims to find this distinction in Seel, 'Diodore domine-t-il-Aristote?', *Revue de Métaphysique et de Morale* 87, 1982, 293–313. But, as I read Seel, he is careful not to attempt to distinguish two ways in which '*Fp*' can be true (firm fact that *Fp*/ will turn out that *p*), but rather distinguishes the truth of '*Fp*' from its turning out *later* that *p* (sc. although '*Fp*' was not true in advance): see pp.307–11 (admittedly the point is clouded in Seel's exposition by a number of irrelevant distinctions: see #25 n.6 below). Indeed, Seel is encouraged by this distinction to seek to exhonerate Aristotle in the cloak passage in the following terms: 'Le passage 19a29–36 montre de plus qu'Aristote affirme qu'il y a des événements auxquels dans le présent revient la possibilité d'avoir lieu à un instant précis de l'avenir et pour lesquels il apparaît ensuite qu'ils n'ont effectivement pas eu lieu à cet instant.' (p.308) The word 'ensuite' is the mistake here: Aristotle should have taken the position Seel ascribes to him, but unfortunately he tries to combine the possibility that the cloak will be cut up with the truth *now* that it will not be. Seel corrects the mistaken formulation on pp.309–10, where he recognizes that Aristotle is guilty, in the cloak passage, of an 'imprécision de langage' in his supposition that '...une entité, qui ne sera jamais réalisée [i.e. it is true now that it will not be realised], peut quand même avoir la possibilité d'être réalisée ...' Seel groups *Met* 1071b12–26 with *DI* 19a12–14 as involving the problematic commitment to both the possibility of future realisation and the truth now of subsequent non-realisation (p.312 n.60: the passage is wrongly cited as 1047a12–26), but this seems to me mistaken. That passage allows that possibilities may remain unrealised, and hence argues that the Prime Mover must be in motion *ἐνεργείαι* rather than *δυνάμει*, if there is to be a *guarantee* (now) that things will remain in existence. There is no suggestion in this passage that the possibility of future realisation (non-realisation) can consist with the *fact* of future non-realisation (realisation). (Equally, the passage need not be read as containing a commitment to the Principle of Plenitude: see n.17 below.)

[5] Frede sometimes draws a distinction between a weaker and a stronger notion of truth, suggesting that the fatalists' inference can be circumvented if future truth is construed as truth in the weaker sense (*Seeschlacht*, pp.32–6, 41, 46–9, here recapitulating a similar distinction in Strang, 'Aristotle and the Sea Battle'; 'Sea Battle', p.55). But the fatalist seeks to infer necessity from (simple) truth: truth does not come in weaker and stronger forms, unless one already understands the stronger form to be some kind of necessary truth; but then the fatalist would insist on inferring necessity from the *weaker* form (he is not in the business of producing a purely circular argument), unless the weaker form is – as Frede's description of it as 'purely hypothetical' suggests – not a species of truth at all, but of possibility: in that case it is irrelevant to the inference. Frede recognises that there is no Aristotelian basis for the distinction (*Seeschlacht*, p.48), but she interprets the *διαιρέσεων λόγος* as committing a *petitio principii* of the specified kind, i.e. inferring necessity from future truth of the stronger (already modalised) variety. On the contrary, the argument of the *διαιρέσεων* is precisely the same as that of Aristotle's fatalist: see Appendix 2.

necessity in Aristotle's writings can be clarified if we bear in mind the distinction between temporally definite expressions and temporally indefinite sentences. It is true that Aristotle is not self-conscious about this distinction; but it is vital if we are to reconcile his disparate claims. Essentially, Aristotle works with two different modal systems:[6] on one view, truth coincides with (relative) necessity; the important contrasting notion to necessity in this sense is not its dual, possibility, but the contradictory of necessity-or-impossibility, contingency, or potentiality for opposites.[7] (But Aristotle has some difficulty distinguishing possibility from contingency.)[8] In this sense the present and past are necessary; the future is the domain of the contingent. This account is appropriate to temporally definite expressions. An alternative picture which Aristotle sometimes presents is this: necessity coincides with being always true, and hence, by implication, its dual, possibility, coincides with being sometimes true.[9] The principle that all genuine possibilities must at some time be realised, dubbed by Lovejoy the 'Principle of Plenitude'[10] can be found in Aristotle, but the extent to which it is so – at least as regards the sublunary world – remains a matter of controversy; the converse implication from the eternal to the necessary is much more securely present in Aristotle's writings.[11]

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[6] Hintikka, *TN*, ch.2; Kneale, *DL*, p.84.

[7] *DI* 19a7–11, *Met* 1050b10–12; Frede, *Seeschlacht*, p.56.

[8] *Met* 1050b8–12; *DI* 19a9–11, 21b34–23a26; *An Pr* 32a18–20. See further #22 below.

[9] That the derivation of the equivalence between possibility and truth at some time from the equivalence between necessity and truth at all times requires possibility to be taken strictly as the *dual* of necessity ($Mp \equiv \neg L \neg p$) is demonstrated by Dancy, 'Aristotle and the Priority of Actuality', in Knuuttila ed., *Reforging the Great Chain of Being* (Dordrecht, 1981), 73–115, pp.102–3. But the derivation can be blocked: see below in this section.

[10] *The Great Chain of Being* (Harvard, 1936), p.52. Lovejoy's view is that Aristotle does not subscribe to the principle. But the passages he adduces (p.55, 340), *Met* 1003a2–5 and 1071b13–4, do not support his claim: Hintikka, *TN*, pp. 97–9 (cf. Seel, *DAM*, p.252). Hintikka claims that the latter of these passages indeed presupposes the principle: but I think that goes too far (see n.17 below).

[11] See 'Further Remarks on the Principle of Plenitude' at the end of this section.

This latter way of handling the modal notions is inappropriate to the debate with fatalist,[12] and it might seem that it could only be applied to temporally indefinite sentences.[13] But it is clear that Aristotle does regard the Principle of Plenitude as not wholly inapplicable to transient particulars (the subject-matter of temporally definite expressions). However, it has been observed by several critics[14] that Aristotle only applies the equivalence between the always and the necessary to everlasting things (including things in categories other than substance), and that the converse equivalence between possibility and actuality at some time is applied by Aristotle to transient things (again, including things in categories other than substance) only in the special case of their possible non-existence.[15]

The future non-existence of a transient particular is for Aristotle a non-contingent matter. Such a particular was generated; so it will one day corrupt. Hence there can be no obstacle, on Aristotle's view, to applying the Principle of Plenitude in this special case. That means that in the case of the *statement* 'This cloak will one day cease to exist' pos-

[12] See here White, 'Aristotle and Temporally Relative Modalities', *Analysis* 39, 1979, 88–93; Seel, *DAM*, p.253.

[13] Cf. Dancy's concluding 'intuition' ('Aristotle and the Priority of Actuality', p.106) that 'the Principle is restricted to possibilities that are around for all eternity, and have all eternity to get realised in.'

[14] Sorabji, *NCB*, ch.8. Cf. also Judson, 'Eternity and Necessity', *OSAP* 1, 1983, 217–55; Frede, *Seeschlacht*, p.49, 'Sea Battle', p.54. Frede distinguishes between everlasting *existence* – which she concedes that Aristotle attaches necessity to – and everlasting *truth* – which she claims is not an Aristotelian concept. But *DI* 19a33 precisely licences free movement between ontological and linguistic levels. Further, *Met* 1051b15–17 tells us that in the case of eternal things, it is always the case that the same sentences are true (false): *ἀεὶ ταὐτὰ ἀληθῆ καὶ ψευδῆ*. Frede seems to find a distinction between this claim and the claim that that the sentences in question are always true (false); but I cannot see what it is. As I insist elsewhere in this study, nothing turns, in *DI* 9, on the distinction between ontological and linguistic levels.

[15] *Top* 115b17–8, *DC* 1.12 (cf. *Top* 145b27f). Cf. *Met* 1050b6–14. These equivalences apply not merely to substances, but to things in all categories (*DC* 281a30–3; cf. *Met* 1050b12–15); cf. Seel, *DAM*, p.229, 250; Dancy, 'Aristotle and the Priority of Actuality', p.103. Hence, in view of the argument of *DC* 1.12, we can say that the whiteness of a painted gate, say, having been generated (at least when the gate was generated, if not after), will also be destroyed (at least when the gate is destroyed, if not before); that it (an existent particular whiteness) can *have been* generated implies that that it was generated, and that it can be destroyed implies that it will be destroyed. But it does not follow that if a white gate (not yet in existence) can *be* generated, one will be generated; nor can any conclusions be drawn as to mode of destruction: the whiteness of a gate can be destroyed by burning the gate, but also by painting it green (compare the cloak).

sible truth coincides with actual truth. The Principle of Plenitude cannot be confined to temporally indefinite sentences. Nor, on the other hand, does the Principle have free rein in the domain of temporally indefinite sentences. Some of these sentences deal with contingencies: for example, 'A cloak is cut up'. Why should Aristotle concede that if this sentence is possibly true, it must at some time be actually true? Each cloak which comes into existence has the potential to be cut up. Why should that potential depend on some cloak's actually being cut up? Perhaps, as each cloak lives out its life, it fails to be cut up, but wears out first.[16] Of course, we must not build into this scenario that it is *true in advance* that each cloak will fail to be cut up; we only need to insist that it is equally not true in advance that *some* cloak will be cut up. Cloaks (and sea battles) are not suitable subject-matter for universal, necessary truths: it is not true in advance that they will fall under *any* regularities (except transience); but that does not preclude their seeming as time goes by to do so (only 'seeming', because we will never attain the Archimedean standpoint in the history of the eternal world from which to discern eternal regularities in their entirety).[17]

[16] Hintikka, in line with his support for **S**, has to construe the cloak passage as asserting that the Principle of Plenitude applies to the *sentence* 'A cloak is cut up', since it clearly cannot apply to the *statement* 'This cloak is cut up' (*TN*, p.100, 171–2). But it does not even apply to the sentence, let alone the statement, and Aristotle has no reason to suppose that it does. The corruptibility of cloaks permits no inference as to how either particular cloaks or cloaks in general will corrupt. In any case, Arisotle is here talking about a particular cloak, not cloaks in general. Aristotle's remarks on the cloak simply cannot be reconciled with **S**. See here Seel's relevant criticism of Hintikka: *DAM*, pp.251–3, and Frede's in her review of *TN*, *Philosophische Rundschau* 22, 1974, 237–42, at p.241 (although her remarks at pp.110–1 of *Seeschlacht* are sympathetic to the view that the Principle of Plenitude operates at the level of kinds).

[17] At *Met* 1071b12ff Aristotle argues that anything which is capable of not acting cannot provide the basis for eternal motion. Hintikka claims (*TN*, pp.98–9) that Aristotle must be appealing tacitly to the Principle of Plenitude: whatever is capable of not being must at some time fail to be. In that case the Principle of Plenitude would be present, but only in the restricted sense already conceded to be Aristotelian (relating to existence and non-existence). But it is likely that Aristotle's point is rather that, in the case of something which is capable of not acting, it is not *guaranteed* (not now true, and hence not necessary) that it will always act. (Equally, it need not be guaranteed – now true – that it will at some time fail to act.) But a candidate for the role of something supporting eternal motion must be something of which it is guaranteed (true now, and hence necessary) that it will always act. The passage opens with the claim: *'Ἀλλὰ μὴν εἰ ἔστι κινητικὸν ἢ ποιητικόν, μὴ ἐνεργοῦν δέ τι, οὐκ ἔσται κίνησις· ἐνδέχεται γὰρ τὸ δύναμιν ἔχον μὴ ἐνεργεῖν ...'* (1071b12–13). The sense of *'ἔσται'* here, and in the parallel passages 1071b18–19 (*οὐ γὰρ ἔσται κίνησις ἀΐδιος·*

Sorabji records[18] as an embarrassment for Aristotle's view the fact that he accepts that negative properties may attach everlastingly to transient objects,[19] so that in the case of a cloak which is never in fact cut up, ought he not to concede that it cannot be cut up?[20] Well, such a property will only apply to a contingent individual at a point in time: in the case of the cloak which wears out before it is cut up, the property of not being cut up does not attach to the cloak *before* it passes out of existence, for until that moment there is, on Aristotle's official view, the possibility that it will be cut up, and no fact of the matter as to whether it will be cut up or not. At the moment when it passes out of existence, without having been cut up, it becomes everlastingly true – and so necessary – that it neither was nor is nor will be cut up. But this necessity constitutes no embarrassment to Aristotle: once the cloak has ceased to exist without having been cut up, its failure to be cut up achieves the status of a necessity parallel to the inability of the sun to stop moving – something which has always been that way and which the future can do nothing to change (cf. *Met* 1050b18–27). Aristotle can therefore accept the application of the Principle of Plenitude to the histories of contingent individuals *once* the relevant possibilities have been closed off; but it is quite true that he must reject it in respect of the genuine future possibilities which such individuals enjoy. At that stage, the implications from everlasting truth to necessity and from

ἐνδέχεται γὰρ τὸ δυνάμει ὂν μὴ εἶναι) and 1071b25–6 (*ἀλλὰ μὴν εἰ τοῦτο* [potentiality is prior to actuality] *οὐθὲν ἔσται τῶν ὄντων· ἐνδέχεται γὰρ δύνασθαι μὲν εἶναι μήπω δὲ εἶναι*), is 'There will necessarily be' (Ross, commentary on *Met*, vol.2, p.369 ad loc; cf. #9 below). Hence the claim in these passages is that what is potentially [sc. in motion] cannot support eternal motion, because it is not now necessary that it will always be [sc. in motion]. What is potentially [in motion] is also potentially not [in motion]. Cf. *Met* 1088b15–25, 1050b6ff (with n.21 below).

[18] *NCB*, pp.128–30.

[19] *Cat* 13b26–35, *DI* 16b11–15.

[20] The argument of *DC* 1.11 281a8ff – that capacities have maxima – might seem to provide Aristotle with a way of evading this difficulty: any such capacity will have a cut-off point, after which the opposite capacity will be activated. But there is nothing in Aristotle's account to rule out infinite maxima. (Indeed, his argument requires infinite maxima: he wishes to reach the conclusion that what is always $\langle F \rangle$ must be $\langle F \rangle$.) The cloak's capacity not to be cut up (assuming that it wears out first) is a case in point. Cf. Waterlow, *PP*, pp.60–1; but she does not apply the doctrine of *DC* 1.11 to the cloak, on the ground that 'being cut up' is not a category (cf. *DC* 281a30–3). This line is, as she admits, hard to reconcile with *Cat* 4, where '*πάσχειν*' is said to be a category, and 'being cut' is given as a case of '*πάσχειν*'.

possibility to truth at some time have no application, because there is no (future) truth in the picture.

The way to refuse, on Aristotle's behalf, the connection between the equivalence of the eternal with the necessary and the Principle of Plenitude is to insist that the equivalence obtains between the always *true* and the necessary. The converse principle for possibility is then that what is possible is not always false. This principle is, as such, unobjectionable, since it is not yet equivalent to the Principle of Plenitude. That is the principle that what is possible is sometimes true.[21] There is no immediate inference from the not always false to the sometimes true (the reverse entailment is uncontroversial). Such an inference would require **PB**: but that is not, in this context, available. Expressing the point in terminology I have already drawn on, we may say that the necessary (in relation to temporally indefinite sentences) is what is *guaranteed* to be always true; the possible is what is *not* guaranteed to be always *false*, which falls short of the conception of possibility required by the Principle of Plenitude, namely that the possible be guaranteed to be sometimes true. (Note that the word 'guarantee' in this context has no epistemic or modal force: what is guaranteed is just what is true, or a fact.)[22]

That Aristotle is not self-conscious about the existence in his thinking of the two quite different modal systems explains why he gets into such a muddle at *DI* 22b10ff.[23] He is aware that more than one

[21] Hence Dancy's purported discovery of the Principle of Plenitude in the argument of *Met* 1050b5ff (which presupposes some kind of connection between eternity and necessity) can be blocked ('Aristotle and the Priority of Actuality', p.102). The Principle of Plenitude is in any case not necessary for the argument of that passage, only the equivalence between eternity and necessity. (On the other hand, there would be no harm in finding the Principle here, since it would apply only in the restricted sense.)

[22] Symbolically, if we formalise 'It is true that *p*' by '*Tp*', we have

$$L\,[\forall t p_t] \equiv T\,[\forall t p_t]$$

and hence

$$M\,[\exists t p_t] \equiv \neg T\,[\forall t \neg p_t].$$

But we cannot move from this to the Principle of Plenitude, which would be

$$\begin{aligned} M\,[\exists t p_t] &\equiv T\neg\,[\forall t \neg p_t] \\ &\equiv T\,[\exists t p_t]. \end{aligned}$$

Without **PB**, the equivalence '$T\neg p \equiv \neg Tp$' fails. See here von Wright, 'Logical Modality', in his *Truth, Knowledge and Modality*, 104–116, and #8 below.

[23] See Ackrill, commentary, p.151. Cf. *An Pr* 25a37–9 (discussed in #22 below), 32a18–21; *Met* 1019b28–32 with Kirwan ad loc. Further, Hintikka, *TN*, pp.27–40,

definition of possibility is possible (*An Pr* 25a37–39), and hesitates between one-sided possibility ($= \neg L \neg$) and two-sided possibility ($= \neg L \neg$ & $\neg L$), eventually coming down on the side of one-sided possibility. What he fails to see is that he need not choose between them. One-sided possibility is the appropriate modality in some contexts: in that sense the past and the present are possible, because they happened/are happening.[24] Two-sided possibility coincides with contingency, or potentiality for opposites – the concept which Aristotle requires in his argument against the fatalist.

I have argued that – except in very restricted contexts – Aristotle did not accept the Principle of Plenitude in the sublunary world. But there are a number of passages which we must examine concerning the realisation of potentialities in animate and inanimate things. Some of these passages might seem – and have been argued – to support the presence of the Principle in Aristotle's writings.[25]

Aristotle's occasional remarks that conditions for the realisation of a potentiality must be counted in to the definition of that potentiality (e.g. *Met* 1047b35–1048a2, 16–21) might seem to point to a position according to which we cannot speak of a genuine possibility unless all the

48ff; *AMD* ##29–30; Seel, *DAM*, p.147ff; van Rijen, *Aspects of Aristotle's Logic of Modalities* (Dordrecht, 1989), pp.18–9; White, 'Facets of Megarian Fatalism: Aristotelian Criticisms and the Stoic Doctrine of Eternal Recurrence', *Canadian Journal of Philosophy* 10, 1980, 189–206, n.9; Kneale, *DL*, p.84f; Frede, *Seeschlacht*, p.59; Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', *BICS* 29, 1982, 91–108, p.96ff. Cf. also Boethius, *In De Int* 2.234.5, 236.1. In view of the confusion present in *DI* 12–13 and probably also in *An Pr* 1.3 (see #22), it is pointless to try to render *An Pr* 1.13 consistent by athetising 32a21–9 (so Becker, followed by Ross).

[24] *Poet* 1451b17–19, *DI* 23a7–11. Cf. Frede, 'Omne quod est', p.164.

[25] Is there anything to be made in this context of the distinction between '*δύναμις*' and '*δυνατόν*'? The former is generally translated by 'potentiality', 'capability', 'capacity' or simply 'power', the latter by 'possible'. '*δύναμις*' is, like '*δυνατόν*', clearly a modal concept (*pace* Seel, *passim* in *DAM*): it is a narrower concept, relating specifically to potentialities for change possessed by things in virtue of their nature (*Met* Δ.12 esp. 1019b21–1020a6). It might seem that this distinction could be pressed into service against the Principle of Plenitude; for it appears to make available the thought that a thing has a capacity to be *F* which, in the total context, is not a genuine possibility (because it will be prevented from being realised). But although this kind of point is not unfamiliar to ancient and medieval thought (see n.31 below with #9 nn.41 and 42), I am doubtful whether it can be found in Aristotle's writings, and I accordingly do not avail myself of it: in the present context I shall talk indifferently of the realisation of possibilities and potentialities in time. Cf. Seel, *DAM*, p.257ff; Stallmach, *Dunamis und Energeia* (Meisenheim, 1959), chs. 1 and 2; Ross on *Met*, vol.2, pp. 240–1.

necessary conditions for the actualisation of the possibility are in place, and that then the possibility *must* be actualised (otherwise a necessary condition for actualistion would be absent, and so the possibility would not yet be constituted).

There is one passage where Aristotle does seem to state clearly that irrational potentialities are only constituted in circumstances sufficient for their actualisation. The passage in question is *Phys* 8.1, where Aristotle is arguing that there was no first motion in the universe. At 251b1–7 he claims that those things which are capable (*δυνατὰ*) of acting or being acted upon are not so capable in all circumstances (*πάντως*), but only when they are suitably disposed (*ὡδὶ ἔχοντα*) and approaching one another (*πλησιάζοντα ἀλλήλοις*). Whenever they do so approach, the one acts, and the other is acted upon.[26] Hence (*τοίνυν*), if there was a time when there was no motion, then there were not yet things capable of acting or being acted upon. It follows from this passage that a thing can only count as capable of acting or being acted upon when it is actually engaged in a process of actualisation of the potentiality.[27]

However, other passages in Aristotle suggest a different line on irrational potentialities. At *EE* 1226a22–5 Aristotle says that some things which come into being not due to us (*οὐκ ἐφ' ἡμῖν*) but due to nature (*διὰ φύσιν*) or other causes can both be and not be. In *Met* Θ.7 Aristotle takes the view that both in the case where the source of a change is external and where it is internal, external hindrances do indeed prevent the constitution of a potentiality, not merely its actualisation. But the absence of external hindrances is not tantamount to the presence of conditions sufficient for the actualisation of the potentiality. The internal conditions have to be right for the potentiality to obtain – for example, earth is not yet a potential statue – but once they are right the potentiality is in place, *however* matters develop thereafter; once earth has metamorphosed into bronze it *is* a potential statue, even if it is not made into one.[28] *Met* Θ.7 strongly suggests the position, attributed to

[26] Cf. 255a30–b13: they only interact if external circumstances do not prevent. But if external circumstances did so prevent, that would also inhibit the constitution of the possibility, not merely its actualisation.

[27] See here Seel, *DAM*, pp.398–9.

[28] Cf. 1048a32–3: the statue of Hermes exists potentially in the block of wood. On this passage Seel suggests (*DAM*, pp.308–9) that the Hermes example is not a clear case of a possibility which can remain unrealised, because Aristotle may have meant

Aristotle by Alexander[29] and Philoponus,[30] which lies midway between a Diodorean commitment to the Principle of Plenitude and a Philonian acceptance that possibilities can obtain even in circumstances where external factors prevent their realisation.[31] The absence of external hindrances is necessary for the constitution of a possibility, but the failure of the possibility to be realised does not itself count as an external hindrance to its realisation.[32] I shall return to irrational potentialities below.

In *Met* Θ.5 Aristotle argues that potentialities *κατὰ λόγον* are potentialities for opposites,[33] so that such potentialities can be present without automatically being realised. Indeed that must be so, otherwise contradiction would ensue (1048a7–10). (Potentialities for opposites are characterised by contingency, rather than possibility in the strict sense – the dual of necessity – but the Principle of Plenitude requires possibility in the strict sense.) What is needed to actualise a rational potentiality is an overriding desire ('*ὁποτέρου ... ἂν ὀρέγηται κυρίως*') or choice (*προαίρεσις*) on the agent's part. It is plausible to regard these

that the Hermes exists potentially in the block of wood only if a sculptor is going to realise it. But this is ruled out by the other two examples which Aristotle mentions in the same place: that half a line exists potentially in the whole, and that the knower who is not exercising his knowledge has it potentially. In the former case, Seel's approach would have the consequence that infinity (by division) could not be potential without also being actual. Cf. *Met* 1048b14–17, which Hintikka interprets (*TN*, pp.131–4) as indeed lodging this claim. But whatever the correct interpretation of this passage – and Hintikka's view is only one possible reading, as he admits – that cannot be Aristotle's considerd view on the infinite by division: for one thing, it would spoil his solution to Zeno's paradox of the dichotomy in *Phys* 8.8. In the latter case, we know from *DA* 417a26–7 that a man can be said to be a (potential) knower in virtue of the fact that *τὸ γένος τοιοῦτον καὶ ἡ ὕλη*, and *this* fact could hardly require actualisation of the potentiality in each individual case for its constitution.

[29] *In An Pr CIAG* II.1, 184.10–18.

[30] *In De Gen et Corr CIAG* XIV.2, 302.30–303.2. Cf. *In An Pr CIAG* XIII.2, 169.21–3.

[31] Alexander, *In An Pr* 183.34–184.10; Philoponus, *In An Pr* 169.17–21; Simplicius, *In Cat CIAG* VIII, 195.33–196.24; Boethius, *In De Int* 2.234.10–235.9 (=Döring, frr.135–138). Cf. Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', p.91. Simplicius (*In Cat* 195.31–196.24 = fr. 137 Döring, in part) attributes a range of positions to Aristotle, from the Philonian to the Diodorean. The position which I am finding in *Met* Θ.7 is mentioned by Simplicius (196.2–4), and although he does not label it explicitly as an Aristotelian position, he probably means to attribute it to him. On this passage, see Sharples, art. cit., pp.94–5 with n.61.

[32] Cf. Sharples, *Alexander of Aphrodisias On Fato* (London, 1983), p.136.

[33] Cf. *DI* 22b39–23a1; *NE* 1113b7–8, 1140a10–16, *EE* 1226b31–3. In this they are distinguished from moral states of character (*ἕξεις*): *NE* 1129a11–17. Cf. Donini, *Ethos*, ch.4, on the problem of reconciling this text with *NE* 1113b7–14.

characterisations as alternative ways of designating the same thing:[34] presumably what entitles a desire to count as 'overriding' is just its ability to realise itself in action, and in other contexts Aristotle makes clear that choice is itself constituted by suitable orectic (as well as cognitive) elements (*NE* 1139b4–5, *EE* 1227a3–5). When this feature (however characterised) is present, we know from other contexts[35] as well as the present one (1048a11–15) that in Aristotle's view the action (given suitable circumstances, including a capacity to realise the choice/decision in action)[36] automatically ensues.[37] Aristotle's language does not permit the gloss that the potentiality cannot be said to be in place until all the circumstances necessary for actualisation, including a suitable desire or choice, are in place. That gloss, combined with the claim that rational potentialities are for opposites, would precipitate the contradiction.[38]

[34] Donini, *Ethos*, p.83.

[35] *NE* 1147a25–31; *MA* 701a8–25; *Rhet* 1392b19–24.

[36] *Met* 1048a14: *ὅταν ὀρέγεται οὗ ἔχει τὴν δύναμιν καὶ ὡς ἔχει.*

[37] '*εὐθύς*': *NE* 1147a28; *MA* 701a8–25 *passim*. In the case of rational action, the occurrence of the desire or choice is itself constituted by the putting together of major and minor premisses of the practical syllogism. The conclusion (which is an action) is automatically (i.e. as a matter of logic) drawn. If it is not drawn (if there is no action), that means that the premisses were not put together, or perhaps not put together in the right way (*akrasia* raises special problems here). There is no logical gap between suitable cognition and action: see my 'Do Homeric Heroes make Real Decisions?' *CQ* 40, 1990, 1–15.

[38] Cf. Stallmach, 'Vertritt Aristoteles *Metaphysik IX.5* selbst den megarischen Möglichkeitsbegriff?', *AGPh* 47, 1965, 190–205, p.196f. Aristotle has said (1048a5–7) that when irrational agents and patients approach one another *in a way appropriate to their potentialities* (*ὡς δύνανται*, 1048a6), the one must act and the other must be acted upon. The qualification I have emphasised might be taken to imply that these potentialities are antecedently constituted. There is a parallel provision for rational potentialities: 1048a12. But in the latter case at least it seems clear that such is not the intended meaning, for Aristotle goes on to say that the potentiality of the agent is only constituted when the patient is present and the agent and patient are suitably related to each other (1048a15–21). Stallmach tries to interpret this passage (and in particular the sentence '*εἰ δὲ μή, ποιεῖν οὐ δυνήσεται*') in such a way that the agent still retains his *δύναμις* in the absence of the patient. That must indeed be Aristotle's considered view (he cannot mean to say that a doctor loses his power to heal when he is alone); but unfortunately it is not what he here says. However, for my purposes this is immaterial. My point is that there is nothing in the passage which commits Aristotle to the view that the *δύναμις* cannot be constituted until the onset of the decisive *προαίρεσις/ὄρεξις* (by which time it is too late to do anything else). So, rightly, Stallmach: '[Die] Nicht-Notwendigkeit der Aktuierung selbst bei Erfüllung aller Bedingungen außer der einen, dem Willensentscheid, gehört ja gerade zu den spezifischen Unterschiedsmerkmalen der rationalen Vermögen.'

Aristotle does, in *Met* Θ.5 and at *DA* 417a28, restrict the scope of rational potentialities to circumstances from which external hindrances are lacking.[39] But the situation is not precisely parallel to that which, in commenting on *Met* Θ.7, we observed obtained in the case of irrational potentialities. For at *NE* 1147a30–1 and *MA* 701a6–25 hindrances (in general) to action seem to affect not the constitution of the potentiality but its actualisation. And, at *Met* Θ.5 and *DA* 417a28, it is important to stress that the restriction on hindrances operates only to effect the exclusion of *external* hindrances from the constitution of the possibility (*Met* 1048a16–21; cf.1049a5–14).[40] That suggests that a rational potentiality may be constituted, so long as *external* hindrances are absent, even if *internal* hindrances are present. By 'internal hindrance' I mean primarily a contrary overriding desire or decision. Since the connection between decision and action is immediate for Aristotle, a decision to perform A could be regarded as a (decisive) hindrance to performance of not-A. Now it is crucial to note here that Aristotle does not countenance the assimilation of internal factors, so understood, to external ones: the failure to elect to perform A does not constitute an external hindrance to the performance of A.[41] If Aristotle were to count *internal* necessary conditions for action (in particular: the decision to act) as requisite for the constitution of the potentiality to act, he would not only, as observed, be in conflict with his doctrine that rational potentialities are for opposites, but would also fall victim to his own criticism of the Megarians in *Met* Θ.3.[42]

The point of his criticism there is that the Megarians find no gap between possibility and actuality: what is not actual cannot become actual. Aristotle attacks this position on several grounds, the most important and successful of which is that it abolishes change (1047a10ff),

[39] In *DA* 417a21–30 Aristotle distinguishes two senses in which a man has knowledge. In one sense someone has knowledge if he has learnt, say, grammar, even if he is not applying it. In this case Aristotle says that he has the capacity to contemplate (the objects of his knowledge) so long as nothing external prevents him. In another sense, one is able to exercise knowledge in virtue of being a human being who can learn. This latter sense is obviously not hospitable to the Principle of Plenitude (cf. n.28 above).

[40] Cf. *Top* 138b30–7 (where absence of breathing creatures seems to be regarded as an external hindrance inhibiting the constitution of the breathability of air in the absence of such creatures). Hintikka recognizes this restriction at *Met* 1048a16–21 (*AMD* ## 3, 12), but nevertheless regards the passage, wrongly in my view, as committing Aristotle to the Principle of Plenitude (#11). The passage is similarly misinterpreted by Bärthlein ('Untersuchungen zur aristotelischen Modaltheorie', *AGPh* 45, 1963, 43–67, p.54ff) and, following him, by Seel (*DAM*, pp.306–7); as is the parallel discussion at *Met* 1049a5–18 by Seel (pp.309–12), though not by Bärthlein (p.64), who concedes that *Met* Θ.7 (indeed, all of *Met* Θ apart from Θ.5) treats of the constitution of possibilities which do not have to be realised. In his response to Bärthlein, Stallmach convincingly argues that not even *Met* Θ.5 supports the Principle of Plenitude ('Vertritt Aristoteles'); but, as I have indicated above (n.38), I think Stallmach is over-optimistic in his assessment of the extent to which possibilities can be constituted in the absence of necessary conditions for their actualisation.

At *Met* 1046b21-2 it is said of the reasoning soul that it *ἄμφω ἀπὸ τῆς αὐτῆς ἀρχῆς κινήσει πρὸς ταὐτὸ συνάψασα*, i.e. it will [be able to] actualise both eventualities [i.e. either eventuality: cf. *Met* 1046b15–6, 1048a8–10, 21–4 with Seel, p.417 n.6] on the basis of the same [internal] principle and when in contact with the same [external] circumstance. This seems to me to be a clear expression of the view that a rational potentiality for opposites can exist in the same external circumstances (*πρὸς ταὐτὸ*) and is constituted in advance of the entry of the decisive factor (i.e. desire or choice: *Met* 1048a16) which determines which of the opposites is realised. Seel moots the possibility (p.304) of construing '*πρὸς ταὐτὸ συνάψασα*' as 'only when ...' rather than, as one would more naturally take it, '(even) when ...' But his construal is ruled out by the fact that the participial phrase must bear the same force as '*ἀπὸ τῆς αὐτῆς ἀρχῆς*', which cannot mean 'only from ...'

1048a21–4 might seem awkward for my line. But it is not. The presence of a suitable desire is sufficient (in suitable circumstances) for action, so that in saying that the presence of conflicting desires (desires for contraries) is not sufficient for action (*οὐ ποιήσει*) and not sufficient even for the constitution of a potency to act (*οὐ γὰρ οὕτως ἔχει αὐτῶν τὴν δύναμιν*), Aristotle can only mean (on any view) that no one can have the ability to perform, or actually perform, two contrary actions (at the same time, *ἅμα*). That requires us to read '*οὐδέ*' (1048a23) epexegetically (cf. Stallmach, pp.197–8). The final phrase (*ἐπεὶ ὧν ἐστὶν* [sc. *δύναμις*] *οὕτως ποιήσει*) we may read as *restricting* action to what one has the potential to do (so not opposites, for example): a man will perform *only* those actions which he has a capacity to perform (cf. Stallmach, pp.198–9). We need not understand 'all and only' (*contra* Bärthlein, pp.56–7).

[41] This is clear from *Met* 1049a5–7. See Stallmach, 'Vertritt Aristoteles', pp.202–3. Note also *NE* 1147a30–2. The akratic man is presumably capable (at least in the period before he becomes an *ἀκόλαστος*: *NE* 1114a15) of pursuing either course of action constituting the conclusions of competing syllogisms. But one syllogism (the worse one), backed by desire, prevents him from drawing the conclusion of the better syllogism (cf. my 'Do Homeric Heroes Make Real Decisions?', #4). Aristotle describes the major premiss (of the 'better' syllogism: of course the structure of competing syllogisms applies equally to the case of continence as to that of incontinence) as '*κωλύουσα*' (1147a32). In the context, it is clear that the hindrance presented by the worse syllogism constitutes an internal hindrance: lack of hindrance is mentioned at 1147a30 as a separate requirement – additional to ability – if action is to be achieved: so, given *Met* 1048a16–21, external hindrance cannot be in question in *akrasia*. Hence *akrasia* is not an exception to the principle that failure to decide to perform A does not inhibit the constitution of the (anterior) possibility of performing A.

[42] See here Hintikka, *AMD* #17; Hartmann, 'Der megarische and der aristotelische Möglichkeitsbegriff', *Sitzungsberichte der Preussischen Akademie der Wissenschaften*, Berlin 1937, 44–58, at pp.52–4.

not merely in the sense of movement from possibility to actuality, but also in the sense of the obtaining of different kinds of state of affairs at different times: for if we suppose that $\neg p_t$ but that $p_{t'}$ where $t'>t$, then we must also suppose that $M_t p_{t'}$; but the Megarians reject the possibility of this combination.[43] Since, on Aristotle's view, rational potentialities dependent on desire and choice are realised immediately when all the necessary conditions for actualisation are in place, it follows that Aristotle cannot suppose that such potentialities are only constituted when all those necessary conditions are in place without succumbing to his own criticism of the Megarians.

At this point it is useful to locate the issue before us with respect to a piece of traditional terminology: the distinction between the doctrines of total and partial possibilities. The distinction has not always been drawn in the same way, but my practice will be as follows: the doctrine of total possibilities states that the obtaining at t_2 of a state of affairs counts as possible at t_1 ($t_1 \leq t_2$) if and only if *all* necessary conditions (at any time) for its realisation are in place at t_1. This doctrine is not as such equivalent to the Principle of Plenitude: that depends on exactly how the phrase 'necessary conditions' is construed. But the two doctrines will be equivalent if we make the plausible assumption that the obtaining of all necessary conditions for a state of affairs is tantamount to the obtaining of a sufficient condition for that state of affairs. I shall take the doctrine of partial possibilities to be the negation of the doctrine of total possibilities, in that sense: i.e. that some kinds of state of affairs are such that the obtaining at t_2 of such a state of affairs counts as possible at t_1 ($t_1 \leq t_2$) even although not all necessary conditions for its realisation at t_2 are in place at t_1.[44] Now it is of crucial importance that in these definitions I have *not* indexed the phrase 'necessary conditions' to a time. On any view it is clearly true that, if it is to be possible at t_1 that 'p' obtain at t_2, then all conditions *necessary at* t_1 for the

[43] I deal with *Met* Θ.3 in more detail below in #9.

[44] Seel, following Hartmann, defines the doctrine of partial possibilities as stating that 'die Realmöglichkeit eines Sachverhalts bereits dann gegeben ist, wenn lediglich eine Teilbedingung dieses Sachverhalts gegeben ist.' (*DAM*, p.84). (Seel does not in fact adhere consistently to this definition – see here Weidemann, 'Die Aristotelische Modaltheorie: eine Auseinandersetzung mit dem gleichnamigen Buch von Gerhard Seel' – but it is this definition which Seel means to engage with in his book.) This definition is unhandy, because it is fairly easy to see that Aristotle did not accept the doctrine of partial possibilities in the sense which it specifies. The interesting question is whether he accepted it in the sense defined in the text.

obtaining of 'p' at t_2 must obtain at t_1. Otherwise a sufficient condition for the obtaining of '$\neg p$' at t_2 would obtain at t_1. So far as necessary conditions *at a time* go, there is no distinction to be drawn between total and partial possibilities: we must say that the obtaining at t_2 of a state of affairs is possible at t_1 if and only if all necessary conditions at t_1 obtain at t_1.[45] But that is not yet to say that *all* its necessary conditions *simpliciter* have to obtain at t_1.[46] The doctrine of total possibilities now claims that all necessary conditions (*simpliciter*) do have to obtain at t_1 for the possibility to be constituted then (as opposed to later); the doctrine of partial possibilities rejects this.

There are two general ways in which one might attack the application of the doctrine of total possibilities to Aristotle. Firstly, one might concede that Aristotle recognizes only total possibilities, but seek to preserve contingency by finding a gap (*contra* my 'plausible' assumption above) between the obtaining of all necessary conditions and the obtaining of a sufficient condition. This is the strategy pursued by Seel, who argues that in the case of rational potentialities for opposites, all necessary conditions can be in place for a course of action or its opposite, but not yet any sufficient condition.[47] This strategy must fail for the reason that one necessary condition for the pursuance of a course of action is the overriding desire (decision) to pursue that course of action. Once that element is in place, and given the obtaining of all other necessary conditions (including the absence of hindrances), there can be no question that, on Aristotle's view, a sufficiency of conditions for action obtains. So for Aristotle the doctrine of total possibilities, as I stated it, would be tantamount to the Principle of Plenitude. That leaves

[45] Weidemann, 'Die Aristotelische Modaltheorie', *passim*, e.g. p.112: 'Das Erfülltsein *aller* fur sein (gegenwärtiges oder zukünftiges) *Bestehen* gegenwärtig *notwendigen* Bedingungen ist für einen Sachverhalt die zugleich notwendige und zureichende Bedingung der gegenwärtigen *Möglichkeit* seines (gegenwärtigen bzw. zukünftigen) Bestehens.' The word which makes my point (the indexing of the necessary conditions) is 'gegenwärtig' (tenth word).

[46] Weidemann, 'Die Aristotelische Modaltheorie', pp.113–4 (with further reference to relevant pieces by McCall). In view of the fact that Weidemann makes this point clearly, it is puzzling that he jumps from the correct point concerning *indexed* necessary conditions, as expressed in the quotation of the previous note, to the incorrect and inconsequential conclusion that the doctrine of partial possibilities is, quite generally (even in its *unindexed* form), inconsistent, i.e. in the form stating: 'ein Sachverhalt sei bereits dann möglich, wenn lediglich ein Teil [sc. aller] seiner notwendigen Realbedingungen gegeben sei.' (p.113)

[47] *DAM*, ch.5, esp. pp.456–67.

the alternative strategy of attacking directly the claim that Aristotle adhered to the doctrine of total possibilities, taken now as equivalent (in the form in which I stated it, i.e. with the phrase 'necessary conditions' *unindexed*) to the Principle of Plenitude.[48] On this approach, the obtaining of *all* necessary conditions (*simpliciter*) at t_1 for the realisation of 'p' at t_2 is indeed sufficient for the obtaining of 'p' at t_2. But while the obtaining of all conditions *necessary at* t_1 is obviously necessary at t_1 to the constitution of the possibility at t_1 that 'p' obtain at t_2, it is not the case that the obtaining of all necessary conditions *simpliciter* is necesssary at t_1 to the constitution of the possibility at t_1 that 'p' obtain at t_2.

I return to *Met* Θ.3. My point, expressed in the new terminology, was that Aristotle cannot embrace the doctrine of total possibilities without himself succumbing to his criticism of the Megarians in that chapter. Let us take an example. If I am fit to walk, there are no hindrances etc., and I decide to walk (I judge that it is good for me here and now to walk), then I immediately walk. Since there is no logical gap in the normal case between my decision to walk and my walking, Aristotle cannot afford to count that decision as a necessary condition of my ability to walk (the possibility of my walking); for then it would follow that whenever I was not walking I could not subsequently walk – precisely the position of his Megarian opponents which Aristotle attacks (*Met* 1047a22–4). More precisely: I can at t_1 walk at t_2 as long as I am fit and external hindrances to my walking are lacking. What determines whether I walk at t_2 is whether I make a decision to walk at t_2. Given the lack of logical gap between decision and action, and given Aristotle's repeated insistence that the action is immediate ('εὐθύς') to the putting together of premisses in a practical syllogism, we should locate the decision at t_2 itself.[49] In the context of this constraint, the doctrine

[48] This equivalence was assumed by Hartmann: Seel, *DAM*, p.90.

[49] That is the force of '*ἅμα*' at *NE* 1147a31: the occurrences of '*εὐθύς*' should be construed in the light of it. So it seems to me that a three-stage temporal analysis of action, such as is offered by Seel (*DAM*, p.406) is incorrect. It might be thought that Aristotle's concession (*MA* 701a16; cf. *NE* 1147a30–1) that my decision to act may be thwarted forces a three-stage analysis on us. But that cannot be so, for if the concession were allowed to have that effect, it would also insert a logical gap between the conclusion of a practical syllogism and action. In the case of *akrasia*, the decision to pursue the course of action recommended by the 'better' syllogism is not reached, and so not thwarted. More generally, we could help Aristotle here by distinguishing between tryings and doings. In cases of thwarted action, the conclusion of a practical syllogism would be a (mere) trying; but where external circumstances do not hinder, the conclusion is an action. (That does not mean that the conclusion should *always* be thought of as a trying, it being the 'highest common factor' between success and failure in action. It is open to Aristotle to agree with Wittgenstein that when I raise my arm I do not normally try to raise it.) We are really interested only in this latter scenario, since it is agreed that if external circumstances are unfavourable, the possibility of action is not constituted: the question for us is the role of decision in cases where external hindrances to action are *lacking*.

of total possibilities would have the consequence that at t_1 I cannot, after all, walk at t_2 since a necessary condition of the actualisation of this purported possibility (my decision at t_2) is lacking.[50]

If we look again at *Met* Θ.5, we can see that this account fits what is said there about human action. Before the point at which the decisive factor (variously characterised by Aristotle as 'overriding desire' and 'decision') enters, the agent enjoys potentiality for opposites, not indeed

[50] Seel claims (*DAM*, p.321) that Aristotle could only be taken to embrace the doctrine of partial possibilities in *Met* Θ.3 if his target there were the necessity of the present. I agree with Seel that this position is *not* his target; indeed, as I argue in #9, Aristotle's method of confronting the Megarians shows that he *accepts* the necessity of the present. Of course, the necessity of the present imports a doctrine like the doctrine of total possibilities (as I defined it), but restricted to a single instant: for it is a consequence of the necessity of the present that the possibility at t of p_t coincides with the actuality, and necessity, at t of p_t. But the sufficiency of '$M_t\, p_t$' for 'p_t' is quite distinct from the doctrine of total possibilities, which, as I defined it (and given the extra plausible assumption), is equivalent to the Principle of Plenitude, i.e. the sufficiency, quite generally, of '$M_t p_{t'}$' for '$p_{t'}$' where $t \leq t'$. The necessity of the present is only a special case of this sufficiency (the case where $t = t'$). There is no warrant for the supposition that Aristotle's argument in *Met* Θ.3 is compatible with (still less requires) the doctrine of total possibilities, as I have defined it. Seel thinks that while Aristotle is prepared to attack the view that the possible is what is actual, he is not willing to attack – because he agrees with – the view that the possible is what is either actual or about to become actual (p.327 n.70). If Seel were right in his claim (ibid) that Aristotle is exclusively concerned in *Met* Θ.3 with transitions from potentiality to actuality which involve a process of *becoming*, then no doubt the chapter would be compatible with (but still not require) the doctrine of total possibilities. But rational potentialities involving desire and choice are not realised through a process of becoming. Seel seems to take the Megarian position as *admitting* partial possibilities of the form '$M_t p_{t'}$ & $\neg p_t$' where $t' > t$, but as ruling out total such possibilities. In combatting this position, Aristotle would then be defending total possibilities. But the Megarian position does not admit *any* possibilities of the form '$M_t p_{t'}$ & $\neg p_t$' where $t' > t$. Of a piece with Seel's misinterpretation is a misunderstanding of 1047a10–14, which he takes to commit *Aristotle* to the equivalence of the impossible with what neither is nor will be (and hence to the Principle of Plenitude). But it is his Megarian opponents who are (*per absurdum*) committed to this position: '*τὸ μὴ γιγνόμενον ἀδύνατον ἔσται γενέσθαι*' is precisely their position, as attacked by Aristotle. *Met* Θ.3 is similarly misinterpreted by Bärthlein ('Untersuchungen zur aristotelischen Modaltheorie', p.59), who fails to see that Aristotle's attack on the Megarians is *not* an attack on the necessity of the present: see further #9.

in all circumstances in which he might think he does (and try accordingly to act), but in those in which he is suitably constituted for action and external hindrances are lacking. As soon as he decides to perform one of the alternative actions, given these circumstances, he performs it, and the other alternative loses its status as a possible course of action.[51] The agent deliberates about alternative courses of action;[52] the alternatives must therefore both be possible for him if the act of deliberation is not to be vain.[53] But only one of the possible courses of action is going to be realised. So the Principle of Plenitude does not apply to rational possibilities available to a deliberator. The possibility of pursuing either of alternative courses of action is fully constituted in advance of the decision which to pursue (*Met* 1048a5–8). More generally, knowledge places the knower in a position to pursue opposites: for example, a doctor may either cure his patient, or worsen his condition (1046b6–7).[54]

If we now look again at irrational potentialities, the position is not in fact as clear as might appear from a mere reading of *Phys* 8.1. The Principle of Plenitude cannot, in fact, be taken as applying, quite generally, to the category of irrational potentialities. For although *Met* Θ.5 seems to restrict potentialities for opposites to rational potentialities, other passages – and this is important for our interpretation of *DI* 9 – allow some irrational potentialities to be for opposites. Although it is

[51] On the role of '*ὄρεξις*' in action, *DA* 3.10, *NE* 6.2, with Seel, *DAM*, ch. 5 (on the role also of *νοήσις* and *προαίρεσις* in action).

[52] *NE* 1112a16–20; *DA* 434a7–10.

[53] *DI* 18b30–33, *NE* 1111b20–4, 1112a18–b11, *MA* 701a23–5.

[54] It might be objected that the doctrine of partial possibilities I am ascribing to Aristotle is trivial. In counting the decision to act as a necessary condition of action, and locating the decision at the moment of action itself, I thereby disqualify the doctrine of total possibilities, as I have defined it, from representing Aristotle's view. (On the threat of trivialisation for the distinction between total and partial possibilities, see Hintikka, *AMD*, #3.) But the crucial point which removes any danger of trivialisation, and which I keep on stressing, is that there is, for Aristotle, no logical gap between decision (*προαίρεσις*) and action. That means that, in the present context, instead of regarding the decision as a necessary *condition* of the action, we might better regard it as an *aspect* of the action itself. The doctrine of total possibilities, as applied to rational potentialities for opposites, now emerges clearly as non-trivially false for Aristotle, on the view I ascribe to him, for it can very well be the case that all necessary conditions (*simpliciter*) for '*p*' at t_2 are in place at t_1 (the decision at t_2 to realise '*p*' at t_2 not now counting as such a necessary condition), but that the agent decides *not* to realise '*p*' at t_2 (i.e. does not realise '*p*' at t_2, and this as a matter of *action*: he does something else).

not a straightforward matter to reconcile all of Aristotle's pronouncements on this question with one another, I propose the following as a compromise interpretation.[55]

Sometimes Aristotle states that all potentialities are for opposites.[56] Irrational potentialities are potentialities for opposites in the rather artificial sense that they can be productive of opposite effects depending on whether their bearers are present or absent (*Met* 1050b30–4).[57] Rational potentialities are potentialities for opposites not only in that sense but also in the stronger sense that they can, when their bearers are present, produce opposite states of affairs.[58] Most sublunary irrational potentialities, on the other hand, and all celestial potentialities,[59] have only one possible activity when their bearers are present (*Met* 1046b4–7; *DI* 22b36–23a26). At *Met* 1048a8 Aristotle says that all irrational potentialities are like this, but that cannot be his considered view; it is reversed in *DI* (23a3–4) where he states that some irrational poten-

[55] Cf. here Seel, *DAM*, p.390 n.45; Bärthlein, 'Untersuchungen zur aristotelischen Modaltheorie', pp.65–66; Ross, *Aristotle's Metaphysics* vol.2, p.265.

[56] *DI* 21b10–36; *Met* 1050b8–12, 1051a5–11, *Rhet* 1392a8–12. Cf. *Met* 1047a20–4, where the claim is general, but the example (walking) is of a rational potentiality.

[57] Cf. *Met* 1013b11–3, *Phys* 251a28–b1. Stallmach (*Dunamis und Energeia*, p.94) thinks these texts cannot bear the simple meaning I have accorded them, and Seel agrees (*DAM*, p.393). But Seel's interpretation of the sense in which irrational potentialities can be for opposites (what they act on can be present or absent to them) seems to me to differ from the simple interpretation only verbally. Whichever way round the matter is viewed, Aristotle has in mind the fact that fire heats water when in contact with it, and not when not. So Alexander in his commentary on the *Metaphysics*, *CIAG* I, 593.15–22.

[58] Cf. *EE* 1223a4–9. But *Met* Θ.2 enters the rider that a state of knowledge may not be potentially productive of opposite states of affairs in the same sense. A doctor's ability, based on his medical knowledge, to heal, is primary (*καθ'αὐτό*); his ability to harm, based on the same knowledge, is incidental (*κατὰ συμβεβηκός*). This point does not affect his *ability* to do either: but if he harms rather than heals, he does not do so (in the primary sense) *qua* doctor.

[59] If they can be called such: *DI* 23a21–6 suggests not. But the passage sits uneasily in its context (Ackrill, commentary, p.153); in particular, it seems to conflict with the conclusion just reached, that necessity implies possibility (cf. Whitaker, 'An Analysis of Aristote's *De Interpretatione*', p.139). The passage indicates the precariousness of Aristotle's insights into the distinction between contingency and possibility proper. Here he seems to revert to thinking of potentialities as essentially for opposites (when their bearers are present), and so as characterised by contingency, rather than possibility proper. In effect, he is reiterating his claim (*Met* 1050b6–12, 1071b12–26, and elsewhere; cf. n.17 above) that primary substances must exist *ἐνεργείαι rather* than *δυνάμει*, because potentialities can fail to be realised, and so cannot (because they are not guaranteed to) support eternal motion. Cf. Dancy, 'Aristotle on the Priority of Actuality', pp.79, 99.

tialities (e.g. the potentiality of a cloak to be cut up, or not; the potentiality of a visible object to be seen, or not) are potentialities for opposites (19a12–16; 21b12–17; 22b33–23a4).[60] These potentialities cannot be thought of as conforming to the Principle of Plenitude,[61] any more than can rational potentialities, on pain of contradiction.

The potentiality of a cloak to be cut up or not is of course something which depends on human choice and desire.[62] Its failure to conform to the Principle of Plenitude is accordingly overdetermined – by the fact, witnessed in *DI* itself, that irrational potentialities can be for opposites, in their own right, as it were; and because this potentiality depends on the fact, witnessed not only in *DI* but in many other places in the Aristotelian corpus, that rational potentialities are for opposites.[63]

[60] Cf. the potential of a human being to be healthy or sick, of a physical thing to be in rest or in motion, of a house to be built up or fall down (*Met* 1051a5–11). An especially clear account of the point is found in Boethius' commentaries *In De Int*: see below #11. Cf. also *Quaestio* 1.18, attributed to Alexander, esp.30.25–31.13, which emphasises that potentialities for opposites are only constituted in the absence of circumstances preventing realisation of either of the opposites.

[61] In spite of Aristotle's explicit statement of the contrary at 21b15: see #12 n.108 below.

[62] In Aristotle's discussion of potentialities for opposites in *DI* 12–13 the collocation '*τέμνεσθαι ἢ βαδίζειν*' is not accidental: the central case of a potentiality for opposites is a rational potentiality or an irrational potentiality which depends on the exercise of a rational potentiality for its activation.

[63] In spite of differences of interpretation, my conclusion is in accord with Seel's in his *DAM*, that Aristotle does accept the Principle of Plenitude for some natural processes, but not in the domain of the contingent – either the 'natural' contingent or the 'free-action' contingent. Seel's discussion embraces wider considerations than the Principle of Plenitude: in particular, he conflates the issue of total/partial possibilities with the issue of causal determinism, so that the question whether and to what extent Aristotle believes in total possibilities becomes the question whether and to what extent he accepts universal causal determinism. Perhaps these questions cannot ultimately be kept separate: at some point the question of the correct analysis of 'can' must be faced. But they do not need to be conflated straight away; and it confuses matters to do so. It is true that, given that Aristotle regards external hindrances as inhibiting the constitution of a possibility, he is committed on my interpretation to rejecting determinism of merely *external* causes to the extent that he believes in potentialities for opposites. (For the operation of a cause would constitute a hindrance to the obtaining of an incompatible state of affairs.) But we have seen that internal hindrances to action (such as the absence of an appropriate desire) do not inhibit the constitution of the potentiality for opposites; so Arisotle *could* be a psychological determinist about action consistently with his possibilism. Of course, whether such a position would be stable under pressure is another matter. The Stoics attempted to defend a generalised version of such a position (that something could be possible even though it would never happen, and was determined not to happen: *SVF* 2.202, 283, 954), and met with fierce criticism as a result. The criticism is merited if, as the Stoics believed, something is possible only if it is not prevented (DL 7.75 = LS 38D with Frede, *Die Stoische Logik*, pp.107–12). For the operation of an incompatible cause would constitute just such a prevention. Cf. Boethius, *In De Int* 2.235.4ff. See here Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', pp.92–3; Sorabji, *NCB*, ch.4.

That is the case we are ultimately concerned with, for whether an event like a sea battle occurs or not depends on whether certain rational potentialities are realised.[64]

Further Remarks on the Principle of Plenitude

The Principle of Plenitude is attested by *DC* 1.12, but only for the case of existence: what *does* exist forever *must* exist forever (e.g. 282a21–2); what is *capable* of having been generated (of being destroyed) *must* at some time have been generated (be destroyed) (e.g. 283a27–8); in my view it is also attested by *Top* 115b17–8 (but, again, only for the possibility of non-existence. Cf. 145b25–28; *Met* 1050b11–14). *GC* 327a11–13 is a problematic case. Waterlow adduces five further passages (*Met* 1025a20–1 with 1026b31–3, 1047a11–14, 1049b17ff, 1051b13–17, *Phys* 221b28–9, 222a8–9),[65] but I agree with Judson that they provide no support.[66] The implication from the everlasting to the necessary is attested by *DC* 1.12; *DI* 19a9–18; *Phys* 196b10–21, 203b30, 221b25–222a9; *GC* 335a33–b3, 337b7–13,[67] 337b35–338a3 (note that in this passage the implication emerges twice: not only in the explicit '*εἰ ἀΐδιον, ἐξ ἀνάγκης*' but also in the supposed

[64] Contingencies which depend crucially upon human deliberation thus represent Aristotle's central cases in *DI* 9 (Waterlow, *PP*, p.79). That suggests that Aristotle's purported generalisation away from such instances at 19a9–10 (*ὅλως ἔστιν ἐν τοῖς μὴ ἀεὶ ἐνεργοῦσι τὸ δυνατὸν εἶναι καὶ μή*) is ill-conceived: perhaps a statistical point is covertly present in this part of the text too. Donini argues that the cloak example need not be understood as essentially involving human deliberation (*Ethos*, ch.3), but it is hard to see how a cloak could be *cut up* (*διατμηθῆναι*) without it. Donini translates '*διατέμνειν*' as 'tear' (strappare, lacerare), but that is incorrect. Boethius translates with 'secare', which is closer to the right sense. If a statistical point is incipient at 19a9–10, its emergence is at any rate postponed until 19a18–22: meanwhile Aristotle reverts to his most favourable case, that of human deliberation. Other sorts of contingency are liable to be interpreted statistically by Aristotle; rational potentialities for opposites cannot be: they must be construed as having the form '$M_t p_{t'}$ & $M_t \neg p_{t'}$'.

[65] *PP*, p.2 n.1.

[66] 'Eternity and Necessity'.

[67] See Williams, *Aristotle's De Generatione et Corruptione* (Oxford, 1982), ad loc.

absurdity of the conclusion '*συμβήσεται ἀεὶ εἶναι τὸ ἐνδεχόμενον μὴ ἀεὶ εἶναι*'); *Met* 1025a15 (by implication), 1026b27–8, 1027a7–8, 1050b6–30 (by implication), 1051b15–18, 1064b32–3, 1088b23–5; *Top* 112b1–20; *An Pr* 32b4–22; *PA* 639b23–4.[68]

Hintikka suggests, against Owen and Kneale, that the Principle of Plenitude is to be found at *Met* 1047b3–6,[69] but this is certainly to misconstrue the passage.[70] The point there is not that all possibilities must be realised, nor even (what would cohere with my interpretation of *DI* 9) that the possibility that *Fp* cannot consist with the fact that ¬*Fp*, but rather, as Aristotle makes clear (1047b5ff),[71] that the impossible cannot be destroyed by assimilating it to the merely false (which could then be taken to consist with the possible). The sense is: one cannot say that something is possible, but will not be, *in such a way as* to avoid altogether the category of the impossible, i.e. one cannot say that whatever is false is nevertheless possible. Such an extreme possibilism ignores the fact that some falsities are (also) impossibilities.[72] Nor is the Principle to be found in Aristotle's subsequent treatment in *Met* Θ.4 of his claim that what is possible can be assumed to be actual without incoherence.[73] That claim only yields the Principle if the future is held to be already determinate – precisely what is at issue.[74] Note that the general entailment at *Met* 1047a10–12 – from non-occurrence to impossibility – is one that Aristotle's Megarian opponents are committed

[68] See in general Hintikka, *TN*, ch.5; Dancy, 'Aristotle and the Priority of Actuality'.

[69] So too Sambursky, *Physics of the Stoics* (London, 1959), p.73; Seel, *DAM*, p.337; Knuuttila, 'The Statistical Interpretation of Modality in Averroes and Thomas Aquinas', *Ajatus* 37, 1978, 79–98, p.81; Sainati, *Storia dell' organon aristotelico*, p.243.

[70] See here Mansion, *Le Jugement d'Existence chez Aristote* (Louvain, 1976), pp.316–7; Sorabji, *NCB*, p.136; Burnyeat et al eds., *Notes on Books Eta and Theta of Aristotle's Metaphysics* (Oxford: Sub-faculty of Philosophy, 1984), ad loc; Celluprica, 'Necessità megarica e fatalità stoica', *Elenchos* 3, 1982, 361–85.

[71] *Pace* Seel, 'Diodore domine-t-il-Aristote?', pp.311–12. Cf. Frede, 'Sea Battle', p.63; Weidemann, 'DSM', p.35.

[72] Note that the principle enunciated at 1047b8–9 – *οὐδὲν κωλύει δυνατόν τι ὂν εἶναι ἢ γενέσθαι μὴ εἶναι μηδ' ἔσεσθαι* – is relied upon by the opponent, not put forward by Aristotle *in propria voce* (so, rightly, Ross, on *Met* vol.2, p.244). Does Aristotle nevertheless accept the principle? It depends on how it is read. If it is read as stating that the possibility that '*p v Fp*' can consist with the fact that '¬[*p v Fp*]', then Aristotle rejects it (Frede, *Seeschlacht*, p.110); if read as stating that a possibility can fail to be realised Aristotle accepts it. See further #25 below on Aristotle's likely response to the Master Argument.

[73] Hintikka, *TN*, pp.109–110.

[74] Cf. Schofield *apud* Sharples, commentary on Alexander *De Fato*, p.136, and my reconstruction of the Master Argument, #22 below.

to, and is rejected by Aristotle himself.[75] His subsequent remark (13–14) that the impossible *means* (*ἐσήμαινεν*) what neither is nor will be need not be taken as better than a one-way entailment.[76]

A further argument of Hintikka's, that potentialities can only exist unfulfilled in the form of a change towards fulfilment, is unsuccessful.[77] His argument rests mainly on *Phys* 3.1 (201a9–b5): but I think he misinterprets this passage. It is said there (201a27–9) that the *ἐντελέχεια* of what exists *δυνάμει*, whenever it is operating (*ἐνεργῆι*) as a thing in *ἐντελεχείαι* not *qua* itself but *qua* changeable thing (*κινητόν*), is change (*κινήσις*). Hintikka argues that '*ἐντελέχεια*' must mean 'actuality' here and in similar contexts (as against Ross's 'actualisation'). But even if we take this point, Hintikka has ignored the force of the '*qua*' qualification. The actuality *qua* changeable thing of what is potentially *F* is change to being *F*; but it does not follow that the actuality *simpliciter* of something that is (it so happens) potentially *F* is change. So potentialities may exist but not be in operation (i.e. be realised). This may also be implied by '*ὅταν ἐντελεχείαι ὂν ἐνεργῆι*' (201a28), which perhaps allows for something potentially *F* to be actual but not operative (i.e. changing to *F*), the sense being 'whenever, *already* actual, it operates.' But probably the participial phrase is too infirm a rock on which to rest a case. However, the possibility that potentialities may exist without being in operation is explicit at *DA* 412a22–27 and 417a21–b2, passages in which Aristotle distinguishes sharply between having knowledge as a potentiality and exercising it.[78] Hintikka himself recognizes the problems with his posi-

[75] But he accepts the restricted form of the entailment from non-occurrence at a time to impossibility at that time of occurrence at that time, i.e. the necessity of the present, as well as the more general incompatibility of the *truth*, at *t*, that ¬*p* at *t'* with the possibility, at *t*, of '¬*p*' at *t'* (where *t* and *t'* may stand in any temporal relation to one another). What he rejects is the Megarian claim that if '*p*' obtains at *t*, '¬*p*' is impossible at any *subsequent* time: see ##8 and 9 below.

[76] *Pace* Hintikka, *TN*, p.104; *AMD*, p.46; Seel, *DAM*, p.323.

[77] *TN*, p.106, *AMD*, ch.4.

[78] Cf. *Phys* 201b29–32, with Hussey ad 201a9–b5. Aristotle distinguishes in many passages between different senses in which one can have knowledge, including one in which one can have it without exercising it. See also *Phys* 255a30–b13, where at 255a35 some MSS. read '*ἐνίοτε*', and this is surely required by the sense: it would be extraordinary for Aristotle to maintain that if one has knowledge potentially and nothing hinders its exercise one automatically exercises it, regardless of choice or desire (cf. *Met* 1048a33–4; *Top* 130a19–22). *Akrasia* (*NE* 7.3) is a particularly poignant case in point (cf. Hintikka, *AMD* ##19–20). The akratic man has knowledge (of what he should do) in one sense and in another he does not have it: his power of acting on the basis of his knowledge therefore remains unrealised.

tion, and offers to restrict its scope to the so-called total possibilities (*AMD*, #23). That would in turn have the effect of restricting the scope of the Principle of Plenitude to irrational potentialities (so removing *DI* 9 from its purview), but even there, as I have indicated, it is quite unclear to what extent Aristotle recognizes the concept of total possibilities.

Further: *MA* 699b17–22 (the men on the moon can be seen but will not be); *DI* 23a21–6 (there exist *δυνάμεις* which are *never ἐνέργειαι*; cf. *Met* 1065b5–7, *Phys* 200b26, but in these cases the MS. authority is insufficient: Hintikka, *TN*, p.101); *Cat* 7b28–8a11 (the knowable and perceivable would still exist even if every living creature were removed from the world. Note Aristotle's example of the squaring of the circle as a case in point: if this is knowable, it is certainly not known yet, and although Aristotle does not say so, it seems clear that he would not wish to say that it must at some time be known).

8 From Truth to Necessity: the Theory

Some care is required in the formal representation of the necessity of the present and past (*necessitas consequentis*) which, I have suggested, is accepted by Aristotle at *DI* 19a23–7. For, as D. Frede has shown, we cannot simply formalise this necessity as '$p \rightarrow Lp$'.[1] The formula is supposed to embody the ineluctability of the present and past, but as it stands it allows for the substitution-instance '$Fp \rightarrow LFp$'. That in turn yields its contrapositive '$\neg LFp \rightarrow \neg Fp$', which says that if a future event is not now unpreventable, it will not occur. The consequent of this conditional can itself be subjected to necessitation in virtue of the further substitution-instance of the original formula '$\neg Fp \rightarrow L\neg Fp$', so that if a sea battle tomorrow is now preventable, it turns out that its failure to happen tomorrow is unpreventable. But we need to explain the contingency of tomorrow's sea battle in terms of its preventability now. We must accordingly restrict, or adapt, '$p \rightarrow Lp$'.

That the formula cannot be allowed to stand is anyway clear if we try to interpret it in a three-valued system. When 'p' is true or false, '$p \rightarrow Lp$' is true, but, on any plausible semantics for the trivalent '$\rightarrow$', it will not be true or false when 'p' lacks a truth-value, or has a third value.[2] Interpreted in a two-valued logic '$p \rightarrow Lp$' would lead to the collapse of the modal distinctions we are deploying.[3] For given also '$Lp \rightarrow p$', it is easy to derive '$p \equiv Lp \equiv Mp$'. The fact of modal collapse is not as such an objection to '$p \rightarrow Lp$': for as far as the present and the past go, the modal distinctions we are deploying do collapse, on Aristotle's view, given the interpretations of the operators we are working with.[4]

Frede's own suggestion is that we recast '$p \rightarrow Lp$' in a mixed tensed and dated symbolism as

$$p_t \rightarrow L_t p_t.$$[5]

[1] 'Omne quod est quando est necesse est esse'.
[2] See Prior, 'Three-valued Logic and Future Contingents', *PQ* 3, 1953, 317–26, p.325.
[3] Łukasiewicz, *Aristotle's Syllogistic*, p.153.
[4] Frede, 'Omne quod est', p.163.
[5] So too Waterlow, *PP*, pp.89–90; Vuillemin, *NC*, p.162.

But that hardly obviates the difficulty, for just so far we have done nothing to outlaw the substitution-instance

$$[Fp]_t \rightarrow L_t\,[Fp]_t.$$

An approach which looks more promising is to restrict substitution into the '*p*' position in the bare formula '$p \rightarrow Lp$'. The restriction takes the form of banning substitution of all formulae which are about the future. Prior operates such a restriction in his so-called Ockhamist model of time, as a way of retaining the contingency of the future in the context of an acceptance of the necessity of the past.[6] Unfortunately, Prior's method of restriction fails because he tries to give a syntactic characterisation of the formulae the substitution of which he wishes to disallow. But it is impossible to do this. The best such charaterisation one can propose is: formulae which are future in content are just those which are logically equivalent to formulae whose sole tense-operator is an initial '*F*'. But, given that we have no syntactic access to the content of the '*p*' governed by the tense-operators, this test yields a characterisation which is certainly not necessary for futurity of content ('This signpost is temporary') and not sufficient for *exclusive* futurity of content ('Next year will see the 100th Anniversary of the Russian Revolution'). In any case, the test is subject to trivialisation, for by suitable invention of non-standard 'grue'-like predicates,[7] *any* sentence can be rendered logically equivalent to another sentence with a sole initial *F*-operator. The characterisation of what it is that makes a sentence genuinely *about* the future has then to be unashamedly semantic.[8]

But even if we adjust Prior's method of restriction so as to incorporate the insight that futurity is a matter of content and not of form, the method is still not satisfactory. I shall argue in ##12–13 that the Ockhamist model does not accurately reflect the Aristotelian position. My objection there will be that it is too liberal: it allows in the unacceptable '$p \rightarrow PFp$' as a theorem. Here, however, it would appear

[6] *PPF*, pp.124–5.

[7] See here Goodman, *Fact, Fiction and Forecast* (Harvard, 1983).

[8] Such a semantic characterisation might be: a sentence about the future is one whose truth at a time is incompatible with the ending of the entire universe, and hence of time, immediately after that time. (I here rely on discussion of 'hard' facts in the literature concerning Ockhamist solutions to the problem of reconciling divine foreknowledge with future contingency: see my 'Fatalism, Foreknowledge and the Reality of the Future', *The Modern Schoolman* 71, 1994, 83–113, #2).

that the suggested restriction on '$p \rightarrow Lp$' is too restrictive. For Aristotle believes that there are some future truths (non-contingencies). So, given that he accepts the fatalist's inference, there can be no objection to substituting any such future truth into '$p \rightarrow Lp$', and thereby deriving its necessity. Of course, the derivation will be pointless, since we already know that the truth in question is necessary (that was what licensed its substitution into the formula in the first place). But the pointlessness of the derivation does not affect its validity. A *general* ban on substitution of propositions whose content is future into this axiom would therefore appear to go too far: it would be insensitive to the fact that it is not futurity in a substituend which makes trouble for the implication, but lack of a truth-value. The upshot of these considerations is that we do not want to restrict substitution into the axiom so that only formulae with a particular syntactic form may go into the '*p*' slot, nor do we even want to impose the (semantic) constraint that only formulae which are future in content may be substituted in, but rather impose the (semantic) constraint that only *truths* may go in to that slot.

Aristotle accepts the fatalist's argument from the antecedent *truth* of a statement about the future to its necessity. He is therefore committed to the contrapositive: if a statement about the future is not now necessary, it is not now true. But this metalinguistic position is not equivalent to the acceptance of the object-language theorems

$$Fp \rightarrow LFp$$

and

$$\neg LFp \rightarrow \neg Fp.$$

As far as the latter implication is concerned, '$\neg Fp$' (where '*Fp*' is a **FCS**) will, like '*Fp*', fail to be true, and will fail to be false. Whatever interpretation of *DI* 9 we follow, it is at least clear that Aristotle does not treat the two members of a **FCA** differently. On the interpretation I have supported, he refuses to allow *either* member to take one of the standard truth-values. In consequence, he must be construed as operating with choice negation: '$\neg Fp$' is true just in case '*Fp*' is false, and hence, if '*Fp*' is neither true nor false, so is '$\neg Fp$' and *vice versa*. Anyone who either, like the later Prior,[9] takes '*Fp*' to be in general false (for

[9] 'The Formalities of Omniscience', in *Papers on Time and Tense*, p.38ff. Prior is followed by Denyer, *Time, Action and Necessity* (London, 1981), p.67ff.

FCSs), or who allows that **FCS**s may be neither true nor false but adopts exclusion negation ('$\neg Fp$' is true just in case 'Fp' is not true),[10] can preserve the equivalence of object-language and metalanguage derivations of '$\neg LFp \rightarrow \neg Fp$'.[11] On both these alternative approaches there would be no embarrassment in accepting '$\neg LFp \rightarrow \neg Fp$', since for any **FCS**, '$\neg Fp$' comes out *true*.[12] But Aristotle, to repeat, holds that '$\neg Fp$' is true just in case 'Fp' is *false*, and he does not regard 'Fp' as, in general, false. Since he rejects an unrestricted **PB**, that allows him to reject '$p \rightarrow Lp$', just as it stands, while adhering, in the metalanguage, to the entailment from truth to necessity.[13]

In general, the position is that while Aristotle accepts

$$Fp \models LFp$$

he rejects

$$\models Fp \rightarrow LFp.$$[14]

[10] On this strategy, Sorabji, *NCB*, p.94.

[11] As well as the truth of **LEM** in the form '$Fp \vee \neg Fp$' (in virtue of the truth of the right-hand disjunct).

[12] The supporter of exclusion negation who treats 'Fp' as neither true nor false cannot maintain the equivalence of '$Fp \rightarrow LFp$' and '$\neg LFp \rightarrow \neg Fp$'. His approach to negation requires him to restrict application of the rule of *modus tollens*.

[13] Waterlow's interpretation of *DI* 9 in *PP*, ch.5, is that Aristotle permits **FCS**s to be true but not *false*; **FCS**s may be not-true, however, so Waterlow is operating with exclusion negation, but without truth-value gaps: every statement is either true or not-true. Waterlow's reason for distinguishing between falsity and non-truth is that she thinks '*ψευδής*' has connotations not merely of falsity in what she calls the 'semantic' sense, but of pragmatic incorrectness, in the sense that an utterer should not have made the assertion. But, she argues, in the case of assertions concerning agents' intentions, subsequent frustration of the intention does not warrant characterising the original statement of intent as '*ψευδής*'. Waterlow gets into difficulties over 19a36–b4, where she takes 19a36–7 to state that one member of a **FCA** is true-as-opposed-to-false, and 19a39 to state that the one member is true rather than the other, but *not* true-as-opposed-to-false. (This passage is also a problem for **AR**: it can only satisfactorily be interpreted by **C**: see #12 below.) There is obviously no basis in *DI* 9 for Waterlow's interpretation: Aristotle does not regard the falsity of a **FCS** as more problematic than its truth, and there is no hint of anything other than the purely 'semantic' sense of '*ψευδής*'. (In any case, statements of intent are statements of *present* intent, not predictions – i.e. they are about the present, not the future – so of course subsequent frustration does not, in general, warrant characterising the original statement as '*ψευδής*': that observation is no help with the semantics of statements which *are* about the future.) For some relevant criticisms of Waterlow, see Weidemann's review of *PP*, *AGPh* 67, 1985, 303–313.

[14] White, 'Necessity and Unactualised Possibility', *Philosophical Studies* 38, 1980, 287–93, p.297, n.17; Thomason, 'Indeterminist Time and Truth-value Gaps', *Theoria* 36, 1970, 264–81, p.273.

The former says that any model which makes 'Fp' true makes 'LFp' true. The latter says that '$Fp \rightarrow LFp$' is true in all models. This implication fails because in some models 'Fp' will lack a truth-value (and in those models 'LFp' will be false). Denial of **PB** precisely breaks the equivalence between implication and semantic entailment. In proof-theoretic terms that means Aristotle must restrict application of the rule of Conditional Proof, the rule entitling us to move from

$$Fp \vdash LFp$$

to

$$\vdash Fp \rightarrow LFp.$$

The distinction between object-language and metalanguage derivations can be cast entirely in object-language terms if we introduce semantic vocabulary into the object-language in the style of von Wright's alethic logic.[15] The above point can then be expressed as follows. While Aristotle accepts as a theorem

$$Tp \rightarrow Lp$$[16]

he does not accept, in general,

$$p \rightarrow Lp.$$

'$Tp \rightarrow Lp$' can now serve as formulation of the type of necessity which *DI* 19a23–7 introduces.[17] The contingency of the future (on which

[15] See 'Truth and Logic', in his *Truth, Knowledge and Modality*, 26–41.

[16] Or, putting it at its most general, '$T_t p \rightarrow L_t p$': see here Weidemann, 'Überlegungen zu einer temporalen Modalanalyse', p.418. 'T' works in a parallel way to 'L' (cf. #1): 'Tp' means 'It is true now that p'; we may replace the 'now' in this formulation with a variable, so: '$T_t p$'.

[17] The camps do not split neatly on the issue of the sense of 19a23–7. Anscombe ('Aristotle and the Sea Battle', pp.49–50) and Hintikka (*TN*, p.183, *AMD*, p.16) favour interpretations of 19a23ff close to the one I defend: that it distinguishes the necessity of the present from absolute necessity. At *TN*, pp.151–9, however, Hintikka seems to favour a slightly different interpretation, according to which *DI* 19a23–7 distinguishes the absolute necessity of *dated* sentences from the contingency (in a statistical sense) of undated ones. Now the 'when it is' of 19a23 is surely meant to stand in for a time-variable, rather than a date. But a time-variable is simply a variable date, so that the difference between Hintikka's two interpretations is not as great as is implied by Waterlow (*PP*, p.122) and Sorabji (*NCB*, p.134). Hintikka is wrong, however, to suppose that the *absolute* necessity of dated sentences is in question at 19a23–4: rather, the necessity is indexed by Aristotle to the same time as the sentence, i.e. $T_t p \rightarrow L_t p$. (See here Weidemann, 'Überlegungen zu einer

Aristotle insists in *DI* 9) is now obviously incompatible with the *truth* of a **FCS**.[18] If, in any particular case, we have '*TFp*', then Aristotle can happily accept the consequent necessity, i.e. the substitution-instance

$$TFp \rightarrow LFp.$$

The contrapositive of this implication is of no embarrassment to Aristotle, because there is no equivalence, in general, between '$\neg TFp$' and '$T\neg Fp$'. The latter implies the former, but not *vice versa*. In this notation, the contingency of a **FCS** will be expressed as

$$\neg TFp \;\&\; \neg T\neg Fp.$$

It might be objected that this expression is a mere notational variant of Prior's way (in his Peircean model) of expressing contingency, i.e.

$$\neg Fp \;\&\; \neg F\neg p.$$

But that would only be so if we were availing ourselves of a distinction between '$\neg Fp$' and '$F\neg p$', and the deployment of that distinction leads to the view that a relevant instance of **LEM** would be true in virtue of the truth of one of the disjuncts ('$\neg Fp$'), whereas Aristotle makes it clear that he regards the relevant instance of **LEM** as holding in spite of the failure of either disjunct to take a standard truth-value. (We could not construe the relevant instance of **LEM** as being of the form '$Fp \vee F\neg p$', understood in Peircean terms, because for the Peircean both disjuncts are false.) The right way to model Aristotle's approach will therefore be to hold to the truistic character of

$$Fp \vee \neg Fp$$

while insisting on the failure of both disjuncts to take a standard truth-value. That means not only that we must interpret '$\neg$' as choice negation, but also that we must reject the equivalence between

temporalen Modalanalyse', p.416 n.42.) I come to the nature of the contrasting notion of absolute necessity (at 19a24–5) below in this section. Given my rejection of **S**, a statistical sense will not be in question.

Ockham, whose overall interpretation of *DI* 9 is in conformity with both **AR** and **C** (see Appendix 1) nevertheless interprets 19a23–7 as rejecting the inference from '$L\,[p \rightarrow p]$' to 'Lp' (*Tractatus*, pp.109–110); cf Frede, 'Omne quod est quando est necesse est esse', p.156ff. This, as Frede remarks (p 167), is somewhat surprising, given Ockham's belief in the necessity of the past (and indeed of the present).

[18] Cf. Frede, *Seeschlacht*, p.57.

$$T\,[Fp \vee \neg Fp]$$

and

$$TFp \vee T\neg Fp$$

or generally between

$$T\,[p \vee \neg p]$$

and

$$Tp \vee T\neg p.$$

Aristotle accepts the former but not the latter of each of these pairs of formulae. The equivalence of the latter pair is itself equivalent to the Tarskian equivalence

$$T\,[Tp \equiv p]$$

which is precisely the thesis, reduced to its simplest terms, which Aristotle must reject.[19] It is possible that this axiom indeed appeared among the fatalist's explicit premisses, in his first argument (18a39–b3), unless, as I speculated (#4), 18b1 is meant to contain the fatalist's inference, i.e. '$Tp \rightarrow Lp$', rather than '$L\,[Tp \rightarrow p]$'. Even so, 18b1–2 is naturally

[19] See van Fraassen, 'Singular Terms, Truth-value Gaps and Free Logic', *JPhil* 63, 1966, 481–95, at pp.493–5; cf. Vuillemin, *NC*, p.175. For those familiar with the details of the system developed in von Wright's paper 'Truth and Logic', this adjustment entails dropping his fourth axiom:

$$T\neg[p \,\&\, q] \equiv [T\neg p \vee T\neg q].$$

This axiom is easily shown to be equivalent to

$$T[p \vee q] \equiv [Tp \vee Tq].$$

In von Wright's system, while **LEM** and **PB** are equivalent, neither is a theorem. Aristotle can accept von Wright's formulations of these principles, but he diverges over their status, accepting **LEM** and rejecting **PB**. Hence he must reject their equivalence. For both Aristotle and von Wright

$$Tp \vee \neg Tp$$

will be a theorem, but Aristotle could not accept this as a formulation of **LEM**, since, in the substitution-instance '$TFp \vee \neg TFp$' (for contingent '*p*'), it will be true in virtue of the truth of the right-hand disjunct, and Aristotle treats the disjuncts of a **FCD** as on a level. Note that the claim that Aristotle's restriction of **PB** commits him to rejection of the Tarskian equivalence holds *only* if '*T*' is itself bivalent: Haack, *Deviant Logic*, pp.68–71. But a trivalent '*T*' would be inappropriate for the case where the third truth-value is *indeterminate* (as opposed to undecidable): Haack, p.71. I assume throughout that '*T*' is bivalent.

taken as asserting '$p \rightarrow Tp$' (i.e., in full, '$[p \rightarrow Tp]$ & $[\neg p \rightarrow T\neg p]$', rather than '$[p \vee \neg p] \rightarrow T[p \vee \neg p]$'), which is the part of the Tarskian equivalence which Aristotle must reject. ('$Tp \rightarrow p$' is uncontroversial.) Although the equivalence seems to the causal glance harmless enough, it is in fact the central issue of contention between Aristotle and his opponent.[20]

In opposition to Aristotle on this point, the Stoics maintained this equivalence as part of their general defence of unrestricted **PB**. In the passage in question,[21] it is clear that the Stoics are directly answering Aristotle's position in *DI* 9:[22] they pick up his point that **PB** applies to the members of present and past antiphases, and claim that it also applies to future antiphases. They add: 'If there will be a sea battle tomorrow, it is true to say that there will be one; if on the other hand there will not be one, it is false to say that there will be one. [But] either there will be one or there will not be one; so each [assertion] is either true or false.' The Stoics are clear that adherence to unrestricted **PB** requires acceptance of the equivalence '$T[Tp \equiv p]$'.

The distinction between the acceptable and unacceptable formulations of the thesis of 19a23–7 was in effect made by Ockham in his commentary on *DI* 9. Ockham suggests that Aristotle would say that 'If A will be, then God knows that A will be' does not hold because if the antecedent is neuter the consequent will be false. But, he continues, if the antecedent is determinately true or false, then the consequence does hold: 'If it is true that A will be, then God knows that A will be' is a true conditional.[23]

[20] Kneale castigates Aristotle for rejecting the Tarskian equivalence (*DL*, p.51), but her criticism presupposes just what is in question – the unrestricted validity of **PB**. It is possible that 18a39-b3 should be read as asserting the convertibility of *facts* and truth, i.e. $p \dashv\vdash Tp$ rather than $\vdash p \equiv Tp$; in that case it is harmless. (This is how I read 19a33: see below.) The issue turns on whether '*ei*' at 18a39, 18b1 and 18b3 introduces implication or entailment. Philosophical interest in the semantics of natural language conditionals post-dated Aristotle (see #16 below): I do not suppose our issue here admits of a clear solution. Note that in rejecting the *equivalence* of '*p*' and 'It is true that *p*' Aristotle does not need to disagree that an *assertion* of '*p*' is (functionally) equivalent to an *assertion* of 'It is true that *p*'. Compare '*p*'/ 'I believe that *p*': these are not logically equivalent, but their assertions are normally functionally equivalent.

[21] *SVF* 2.198, a fragment of Simplicius' commentary on *Cat.* Stoic adherence to **PB** is attested by Cicero, *De Fato* 21, [Plutarch], *De Fato* 574d (=*SVF* 2.912).

[22] Cf. Nuchelmans, *Theories of the Proposition*, p.77.

[23] Cf. Prior, *Formal Logic*, pp.240–50. What the qualification 'determinately' amounts to will be the theme of #12.

Aristotle's adherence to unrestricted **LEM** might seem sufficient, even in the context of restricted **PB** and restricted Conditional Proof, to yield necessitarianism.[24] The proof proceeds from the substitution-instance '$Fp \vee \neg Fp$', or – equivalently – '$Fp \vee F\neg p$':

(1)	$Fp \vee \neg Fp$	**LEM**, 19a28
(2)	Fp	Assumption
(3)	LFp	19a23–4
(4)	$LFp \vee L\neg Fp$	3, $\vee$-Introduction
(5)	$\neg Fp$	Assumption
(6)	$L\neg Fp$	19a23–4
(7)	$LFp \vee L\neg Fp$	6, $\vee$-Introduction
(8)	$LFp \vee L\neg Fp$	1,2,4,5,7, $\vee$-Elimination.

According to **R**, the *point* of 19a27–32 is indeed to ban the inference from '$L[Fp \vee \neg Fp]$' to '$LFp \vee L\neg Fp$'. I have rejected that line, but there is no question but that Aristotle cannot accept '$LFp \vee L\neg Fp$': he must regard both disjuncts here as false, since '$\neg LFp$ & $\neg L\neg Fp$' (equivalently: '$M\neg Fp$ & MFp') must be exactly his way of expressing the contingency of the future (19a9–10; 19a34; 19b3–4). Restriction of Conditional Proof is not sufficient to circumvent this proof, since it relies on '$Fp \vdash LFp$', not '$\vdash Fp \rightarrow LFp$'. Hence, to avoid the conclusion of the proof Aristotle must restrict the rule of Disjunction Elimination.[25]

Here it is germane to note a divergence between the kind of trivalent system to which Aristotle is implicitly committed, and that propounded by Łukasiewicz. For Łukasiewicz, an implication with neuter antecedent and neuter consequent is true. But we surely do not want Aristotle to be committed to the truth of 'If there will be a sea battle tomorrow, then there will be a land battle tomorrow'. Kleene's truth-table for '$\rightarrow$' reflects the intuition that where '*p*' and '*q*' are neuter, '$p \rightarrow q$' should be neuter.[26] But there is a problem with Kleene's table

[24] This is pointed out by Haack, *Deviant Logic*, pp.83–4, and by Fine, 'TN', n.23.

[25] Cf. Haack, *Deviant Logic*, pp.84–7. Disjunction Elimination is restricted in van Fraassen's system (although for a different reason): see 'Singular Terms, Truth-value Gaps and Free Logic', 'Presupposition, Implication and Self-Reference', *JPhil* 65, 1968, 136–52, and especially 'Presuppositions, Supervaluations and Free Logic'. Cf. Hintikka, *TN*, pp.210–3. Hintikka infers the Principle of Plenitude from the principle that modality must be taken relative to the facts; but the inference goes through only on the assumption of unrestricted **PB**.

[26] *Introduction to Metamathematics* (Amsterdam, 1967), p.332ff.

for '→'. For while a formula like '$Fp \rightarrow Fq$', for contingent 'p' and 'q', very properly comes out neuter, Aristotle would surely want to say that '$Fp \rightarrow Fp$' is true, not neuter. Here it looks as though his approach to '→' must be non-truth-functional.

Again, Aristotle is committed to the truth of '$Fp \vee \neg Fp$', even where 'p' is contingent and the disjuncts are in consequence neither true nor false. But Prior is surely right to say[27] that redefining the truth-table for '$\vee$' so that '$p \vee q$' always takes the value true when 'p' and 'q' each take a neuter value is not a good way of capturing Aristotle's position. It would be absurd to commit Aristotle to the truth, in general, of '$p \vee q$' for neuter 'p' and 'q'. He could not think that 'Either there will be a sea battle tomorrow or there will be a land battle tomorrow' is true. Rather, in the special case of '$p \vee \neg p$', the fact that the disjuncts are contradictories renders the disjunction as a whole true, whichever of the three values 'p' takes. Again, the impression is gained that Aristotle's approach to the connectives is not entirely truth-functional.

One solution to both problems, posed by the apparent non-truth-functionality of '$\vee$' and '→', would be to adopt a suggestion of Prior's,[28] and construe Aristotle's adherence to **LEM** in respect of **FCS**s not as

$Fp \vee \neg Fp$ (or $Fp \vee F\neg p$)

but as

$F[p \vee \neg p]$.

In fact, we can stipulate that all three expressions are to be equivalent. I have already argued that we should allow 'F' to commute with '¬'. If we also allow 'F' to distribute into disjunction, we achieve the needed equivalence, while retaining the usual interdefinitions of the propositional connectives.[29] 'F' is of course non-truth-functional anyway; and there now seems to be no pressure to permit non-truth-functionality to spread beyond the tense-logical operators themselves to the logical connectives.

It might be objected that the formula '$Tp \rightarrow Lp$' cannot be the sense of 19a23–7 since Aristotle expresses himself there in the material (ontological), not the formal (linguistic), mode: whatever is, necessarily

[27] *Formal Logic*, p.244.
[28] *Formal Logic*, p.244.
[29] See here Dummett, *Frege: Philosophy of Language* 2nd ed. (London, 1981), p.395.

is, whenever it is.[30] I am in effect construing the sense of this passage as: whatever is true, is necessarily true, whenever it is true; in particular, if it is true (now) that p, then it is unpreventable (now) that p. Hence it is unimportant whether we construe '*ὅταν*' and '*ὅτε*' at 19a23–7 as bearing a temporal or a conditional sense. McKim argues that since 19a23–7 is expressed in the material mode, Aristotle can avoid the entailment from anterior truth to necessity: it can be true that a sea battle will occur tomorrow, but not necessary, since that necessity will only attach to the occurrence of the sea battle when it occurs.[31] But Aristotle goes on to point out (19a33) that discourse in the material mode entails suitable discourse in the formal mode (i.e. '$p \dashv\vdash Tp$', not '$\vdash p \equiv Tp$'). Hence, if something necessarily is whenever it is, then a suitable statement about that thing is necessarily true whenever it is true.[32] But what form will that suitable statement take? It could still be maintained that necessity attaches only to truths about the present and past, not to truths in general, regardless of time of instantiation. It has to be conceded that Aristotle's text at 19a23–7 is compatible with such a restricted reading: the ambiguity of '*εἶναι*' does not allow us to declare, on the basis of these lines alone, that the sense in question must be the veridical sense ('is true'), or the predicative sense ('is F') as opposed to a strictly ontological one ('exists'). But the wider context (integration with the fatalist's argument, as well as with the solution about to be proposed) gives us a reason to prefer the reading '$Tp \rightarrow Lp$' to the restricted reading in terms of the necessity of the present (and past), narrowly construed.

There are, in any case, good philosophical grounds to adopt the more general entailment from truth to necessity as our reading. For it is plausible that any appearance of a logical gap between the necessity of the present and the general entailment from truth to necessity (in the

[30] Cf. Frede, *Seeschlacht*, pp.64–5, 'Sea Battle', pp.72–3.
[31] 'Fatalism and the Future'.
[32] *Contra* Frede, *Seeschlacht*, pp.70–1, who interprets 19a33 as saying merely: 'Wenn die Sachverhalte feststehen, so sind auch die Wahrheitswerte 'fest'; sind die Sachverhalte dagegen noch undeterminiert, so müssen es auch die Wahrheitswerte der Aussagen sein.' This sense is certainly present, but it is not the only sense of the line. The stress on '*ὁμοίως ... ἀληθεῖς*' must mean that statements about things derive their modality from the modality of the things. (Frede here re-iterates her claim that Aristotle does not understand the modalitites as qualifying the *truth* of statements; but I have rejected that position: #3 n.9.)

sense of the formula '$Tp \rightarrow Lp$', as interpreted)[33] is illusory. Not only does '$Tp \rightarrow Lp$' entail the necessity of the present (as well as the necessity of the past, and those regions of the future stocked with truths); there is a good case for saying that the entailment runs in the opposite direction too. The argument is that there can be no principled basis for accepting the inevitability of the way things now are, but refusing to extend this inevitability to present truths in general (including those about the past and future). Such a refusal would have to be grounded in a Scotist – later Leibnizian – rejection of the fatalist's inference from truth to necessity, on the basis that it is always logically possible that a contingently true 'p' might have been false.[34] But this reasoning not only undermines the necessity of the future; it also undermines the necessity of the present: however things are, it is logically possible that they might be otherwise. On the other hand, if one insists on the necessity of the present, it seems very hard to ground this in anything other than the *truth* of statements about the present; but then we are in effect resting the necessity of the present on '$Tp \rightarrow Lp$'.[35] I shall return to this point shortly.

The type of necessity embodied in the theorem '$Tp \rightarrow Lp$' has attracted various labels. Frede calls it 'relative semantic necessity',[36] Waterlow 'relative temporalised necessity'.[37] Each of these labels has something to offer: 'relative semantic necessity' draws attention to the fact that the thesis must be formalised as '$Tp \rightarrow Lp$', and not merely as '$p \rightarrow Lp$'; 'relative temporalised necessity' stresses the relevant interpretations of the operators: if it is *now* true that p, then it is *now* unpreventable that p. Truth and preventability are not given once for all, but change over time: what was once neither true nor false, and hence preventable, may later become true (or false) and hence unpreventable. A further label which is helpful is 'necessity relative to the facts'; I shall mostly use this label, abbreviating it sometimes to 'relative necessity'. This third label emphasises both that the necessity in question is a kind of factual necessity, and that the modal status of a statement is not simply a consequence of its alethic status, but must also be assessed in the context of the surrounding facts: this will be important in what follows.

[33] I shall henceforth omit this qualification, treating it as understood.

[34] Scotus, *Ordinatio* 1.d.39 in Balić ed., *Opera Omnia* (Civitas Vaticana, 1963), vol.6, *Lectura* 1.d.39 (ibid., 1966), vol.17; Leibniz, *Die Philosophischen Schriften* (Berlin, 1875–90): *Discourse* #13 (vol.4, pp.436-9), *Theodicy* ##36–7 (vol.6, pp.123–4), *Causa Dei* #43 (vol.6, p.437ff), *Fifth Letter to Clarke* #4ff (vol.7, p.389ff). See Knuuttila, 'Modal Logic', in Kretzmann et al ed., *Cambridge History of Later Medieval Philosophy* (Cambridge, 1982), 342–57, pp.353–5. The outline of Scotus' position had already been anticipated by Gilbert of Poitiers, Peter Lombard, Aquinas and possibly also by Abelard (although his position is beset by unclarity): see here Knuuttila, *Modalities in Medieval Philosophy* (London, 1993), chs. 2–3 and p.100, and cf. #9 n.41 below (on Aquinas).

[35] The connection between the necessity cf the present and '$Tp \rightarrow Lp$' seems to be accepted by Boethius (e.g. *In De Int* 2.210.18–22) and Ammonius (*In De Int* 141.4–18). There is a clear statement of the connection in Peter Damian's *De Divina Omnipotentia in Reparatione Corruptae et Factis Infectis Reddendis*, *PL* 145, 602D–603B, and in Gregory of Rimini's *Sentences* commentary, d.38.q.1, p.237. Gregory rejects both the necessity of the present and '$Tp \rightarrow Lp$' (a.3, pp.258–71), and interprets 19a23–7 as distinguishing *necessitas consequentiae* rather than *necessitas consequentis* from simple necessity. But his overall interpretation of Aristotle is a paradigm case of **C**: see Appendix 1. The connection is rejected by Buridan, who draws a distinction between 'omne quod est necesse est esse' – which he accepts – and 'omne quod erit necesse est fore' – which he rejects (*Quaestiones Longe Super Librum Perihermeneias* ed. van der Lecq, *Artistarium* 4 (Nijmegen, 1983), 56.4–10).

[36] *Seeschlacht*, p.21 and *passim*, 'Sea Battle', pp.35–40 (a discussion of 18b34–5). Frede's treatment of relative semantic necessity in both studies is unclear. Although she formalises it as '$Tp \rightarrow Lp$', she sometimes writes as if the necessity in question were *necessitas consequentiae*; in one place ('Sea Battle', p.69) she offers '$L\ [Tp \rightarrow p]$' as if it were equivalent to '$Tp \rightarrow Lp$'); in the context of Carneades' realist solution to the problem of future contingency she writes as if relative necessity were compatible with contingency (*Seeschlacht*, pp.100–1). *Necessitas consequentiae* might also seem to be at issue in a sentence such as '[Relative semantic necessity] means no more than that a definite truth-value requires definite facts and *vice versa*' ('Sea Battle', p.40). But sometimes Frede – in a thoroughly Aristotelian way – treats *facts* as essentially non-negotiable: 'In the case of future events the contingency is eliminated if one hypostasizes them as 'facts'' ('Sea Battle', p.56). Of course this is precisely what is at issue between the fatalist and his opponent. So it is better to operate with a neutral, unmodalised notion of 'fact', and register the fatalist's inference (if one accepts it) separately; we do not want to legislate the fatalist's opponent into silence. And it is certainly better to avoid characterising the necessity in question as 'logical' ('Sea Battle', p.41). Frede's response to Ryle's criticism of fatalism (*Dilemmas*, ch.2) at 'Sea Battle', pp.49–51 (cf. pp.55–60) – 'Relative semantic necessity is not a practical necessity at all' – is mistaken: the necessity in question is indeed a kind of practical necessity in the sense that it is what the agent can do nothing about. It is also correct to characterise it as a 'factual' necessity (as Frede recognized in her earlier piece 'Omne quod est', p.160): it supervenes purely on the facts. Cf. Weidemann, 'Überlegungen zu einer temporalen Modalanalyse', pp.408–9, 419. Frede also follows von Wright ('Determinismus, Wahrheit und Zeitlichkeit', pp.174–77) in distinguishing between temporalised and atemporal truth and conceding to the fatalist that necessity is entailed by the former ('... 'is true already today' implies certainty', 'Sea Battle', p.60), but excepting the latter from the entailment. But see #12 n.98.

[37] *PP passim*.

The theorem '$Tp \rightarrow Lp$' has as an acceptable substitution-instance not only '$TFp \rightarrow LFp$' but also the formula embodying the necessity of the past: '$TPp \rightarrow LPp$'. The expression of the necessity of the past has to take this form, not

$$Pp \rightarrow LPp$$

which allows for the substitution-instance

$$PFp \rightarrow LPFp$$

and, in particular, the metric

$$PmFnp \rightarrow LPmFnp.$$

For where $m < n$ we have

$$F(n - m)p \rightarrow LF(n - m)p$$

which takes us straight back to our difficulties with the formula '$p \rightarrow Lp$'. The solution to this problem which Ockham favoured was to distinguish between sentences genuinely about the past and sentences which although past-tensed are really about the future. Necessity would then attach only to the former type of sentence (however tensed). But, as I have indicated, Aristotle would have no objection to the necessity of *truths* of the form '$PmFnp$', $m < n$. What matters is not the tensing of the sentences, but whether they express facts. Those that do express facts are relatively necessary. Of course the past is stocked with facts, whereas the future is partly empty. Anything which is, in Ockham's sense, genuinely past, is now necessary.

Taylor has argued that the principle of the necessity of the past provides us with our strongest motive for accepting the fatalist's argument: for we accept the entailment from truth to necessity in the case of truths about the past. Why not then also in the case of truths about the future?[38] In effect, I have accepted Taylor's claim on Aristotle's behalf, for I have argued that there is no logical gap between the necessity of the present and the fatalist's inference from truth to necessity, and that we should so construe *DI* 19a23–7. But the motivations

[38] 'The Problem of Future Contingencies'. Dummett makes a related point when he stresses that our rejection of backwards causation on the ground that the past is fixed is really the fatalist's argument reversed (*Truth and Other Enigmas* (London, 1978), chs. 18 and 19).

for adherence to the necessities of the present and past are identical: in each case, the thought is that if it is *true* that things are (have been) a certain way, it is now too late to change them. Hence also (on Taylor's argument), if it is true that things *will be* a certain way, it is now too late to change them. There is no logical gap between the necessities of present, past and future: in so far as it is determinate what happened, is happening or will happen, it is also necessary. But talk of what is (was, will be) determinate is equivalent, in an obvious way, to talk of what is (was, will be) true: *res et veritas convertuntur.*[39]

The necessity of the present has long been recognised to be a highly controversial doctrine;[40] what has been less often acknowledged is that the necessity of the past is equally controversial. Either necessity imports the fatalist's general inference from truth to necessity and hence, in the context of unrestricted **PB**, the necessity of the future. The price of rejecting the fatalist's inference and retaining **PB** is the rejection not only of the necessity of present – a price which, since Scotus, many have been prepared to pay – but also of the necessity of the past (a price which most, including Scotus, have not been willing to pay, or

[39] Cf. here Weidemann, 'Überlegungen zu einer temporalen Modalanalyse', p.412. It is tempting to object that the necessities of present and past may be grounded on some principle – such as the anisotropy of causation – which fails to yield a comparable necessity for the future. Apart from the direction of causation, it is hard to think of a suitable condidate for this grounding role; but the direction of causation cannot play this role because, as Dummett has stressed, it is precisely what is in question when we raise the question whether the present and past are necessary but not the future. Anyone who rejects the fatalist's argument is committed to the possibility of backwards causation. (See further my 'Fatalism, Foreknowledge and the Reality of the Future'.) Frede echoes Albritton's point (in criticism of Taylor) that temporal necessity cannot be *transferred* from the present and past to the future, since it is the necessity of what *is* or *has been* the case (*Seeschlacht*, pp.41–4; Albritton, 'Present Truth and Future Contingencies', *PR* 66, 1957, 29–46). There is a similar complaint in Zagzebski, *The Dilemma of Freedom and Foreknowledge* (Oxford, 1991), ch.1). But there is no problem here: what is temporally necessary is what is *now* unpreventable. Taylor's point is just that *facts* are now unpreventable, whether these are past, present or future facts.

[40] At least, the necessity of the specious present is controversial, the necessity of the instantaneous present less so (see here Wiggins, 'Temporal Necessity, Time and Ability: a Philosophical Commentary on Diodorus Cronus' Master Argument', in Brittan ed., *Causality, Method and Modality* (Dordrecht, 1991), 185–206). But for most non-scientific purposes, we make use of the notion of the specious present. The necessity of the instantaneous present is overdetermined: it is guaranteed not only by the principle '$Tp \rightarrow Lp$', but also by the fact that changes take time (Seel, *DAM*, p.244 n.130). But 19a23–7 cannot sensibly be taken to concern merely the instantaneous present.

rather have not seen that they need to pay).[41] But the possibility of backwards causation – that we might be able, quite generally, to bring about the past – seems a hard doctrine to swallow. The basis of Scotus' rejection of the necessity of the present is the *logical* possibility that things might be otherwise than the way they are, i.e. that no formal contradiction is involved in the assumption that they are otherwise. Such an argument is obviously extendable to both the past and the future. But the Scotist manoeuvre seems to offer small comfort. For what philosophers have wanted for the present and past is not their logical but their *real* necessity (i.e. inevitability for the agent), and equally what they have feared in the case of the future is not its logical but its real necessity. The point we require for present purposes is that the real necessities of present and past are not available independently of the generalised inference from truth to necessity.

If now, as I have claimed, the fatalist's inference should be represented as '$Tp \rightarrow Lp$', how should the contrasting concept of simple, or absolute, necessity ('*τὸ ἁπλῶς εἶναι ἐξ ἀνάγκης*', 19a26) be represented? It might seem here that a risk of trivialisation (general modal collapse) threatens the integrity of my formalisation of relative necessity. That would indeed be so if simple necessity could be captured by the bare 'Lp'. For then, given the truth of any statement, combined with relative necessity, we could detach the absolute necessity of that statement. But 19a23–7 clearly seeks to rule out an inference from the relative necessity of a statement (or fact) to its absolute necessity. (All true statements/facts are relatively necessity, but not all are absolutely necessary.)

What then does Aristotle have in mind for absolute necessity? There are several possibilities here. One is

$$\forall t[p_t \rightarrow \forall t' \ [L_{t'}p_{t'}]].$$

Another is

$$\forall t[p_t \rightarrow \forall t' \ [L_t p_{t'}]].$$[42]

[41] It was on just this point that Ockham responded to Scotus: see Normore, 'Future Contingents', in Kretzmann et al ed., *The Cambridge History of Later Medieval Philosophy*, 358–381, at p.371.

[42] On both of these formulae see Waterlow, *PP*, p.41, who favours the first of them. Cf. von Wright, *Truth, Knowledge and Modality*, pp.72–3.

Further variations of these basic formulae can be arrived at by restricting the ranges of the time-variables in obvious ways. But the conditional form of these formulations is surely antithetical to their prospects for expressing *absolute* necessity. Perhaps then Aristotle has in mind '$\forall t \ [L_t p]$'. But even this suggestion is a little tame. It is most likely that Aristotle has an utterly general form of necessity in mind, such as is captured by

$$\forall t \forall t' [L_t p_{t'}]$$

('It is always unpreventable that p always'). This formula expresses the simple unpreventability of 'p' in its widest possible terms. Aristotle's point at *DI* 19a23–7 is now surely that what is *now*-unpreventable need not be, in this sense, unpreventable *simpliciter*. The fatalist's argument, which collapses truth with the now-unpreventable, leaves the unpreventable *simpliciter*, in this sense, untouched.

We may regard the general formula '$\forall t \forall t' \ [L_t p_{t'}]$' as capturing the strongest form of necessity known to Aristotle.[43] It is not as strong as logical necessity, in the modern sense of that phrase, according to which a statement or proposition is logically necessary just if its negation contains a formal contradiction. This was the sense introduced by Scotus. But the presence in Aristotle's thinking of modality relative to the facts indicates that he did not dispose of the concept of logical necessity in that sense. Of course he operated with the Principle of Non-contradiction, and also with a notion of a necessity which attaches to definitions and to the inferential structures of valid syllogisms. But he did not regard these necessities as introducing a *stronger* interpretation of the modal operators than relative modality. Otherwise he would have permitted (say) the non-contradictoriness of 'You are not sitting' to yield the possibility (now) that you are not sitting, even in the face of the fact that you are sitting.[44]

In several passages Aristotle distinguishes the false from the impossible (e.g. *DC* 281b2–25, *An Pr* 34a25–33). Although it is tempting

[43] Here I concur with Waterlow, *PP*, ch.3. Her verbal statement of this necessity (p.42) implies not '$\forall t \forall t' \ [L_t p_{t'}]$' but rather '$\forall t \forall t' > t \ [L_t p_{t'}]$'. But if '$p_{t_1}$' is necessitated at any time t_0, it cannot subsequently to t_0 acquire the status of a contingency (Weidemann, 'Überlegungen zu einer temporalen Modalanalyse', p.415 n.41), so the restriction on the range of t' does not introduce a significant deviation from my formalisation.

[44] See further #9.

to suppose that Aristotle has in mind a distinction between the false and the *logically* impossible in these passages, it is not necessary to do so: it suffices to construe the distinction as one between the false (which, given relative necessity, is equivalent to the now-unpreventable that not) and the impossible *simpliciter* (i.e. the unpreventable, at any time, that, at any time, not). With this distinction in place, no general modal collapse ensues. What modal collapse occurs attaches to the simple '*L*' ('Now unpreventably') in respect of the past, present and certain sectors of the future. But none of these domains are (as such) *absolutely* necessary: yesterday's sea battle is unpreventable now, but it was not unpreventable the day before yesterday. Hence the formula '$Tp \rightarrow Lp$', and the consequential detachment of 'Lp' in respect of truths, does not bring in its train a general modal collapse.[45]

I have argued that 19a23–7 is an expression of Aristotle's commitment to the inference from truth to necessity. But we must strengthen our argument by casting our net more widely in Aristotelian and Peripatetic texts. We shall look for cases both of the necessity of the present and of modality relative to the facts, regarding (in view of the argument of the present section) commitment to one as tantamount to commitment to the other.

[45] I do not think it is either necessary or desirable to formalise relative necessity in a special symbolism such as is proposed by von Wright in his 'A New System of Modal Logic', *Logical Studies* (London, 1957), 89–126. Von Wright treats '*p* is necessary relative to *q*' as primitive, symbolised by $N(p/q)$, and proceeds to define the absolute modalities in terms of relative modalities. For example, '*p*' is absolutely necessary if it is necessary relative to a tautology. My approach treats necessity in the sense of unpreventability now as primitive and constructs relative necessity out of it using ordinary material implication. That means that we can detach the necessity (in the sense of unpreventability now) of an event, given the truth of a suitably related statement and the validity of the fatalist's argument; clearly, in von Wright's system no such detachment is possible. But this detachment is just what the fatalist is aiming at; our symbolism should reflect that fact. (Note that, as I have stressed, the detached necessity is not absolute.) Von Wright's formalisation (pp.121–2) of the type of hypothetical necessity introduced by 19a23–7, '$p \rightarrow N(p/p)$', seems to me just a notational variant of '$L\,[p \rightarrow p]$', which I have argued is not the sense of that passage, and which is certainly useless to the fatalist.

9 From Truth to Necessity: Aristotelian Texts

It has long been recognized that the necessity of the past is well-attested in Aristotle's writings. What has been less often acknowledged is that the necessity of the present and the generalised inference from truth to necessity are equally well attested. But one of the passages witnessing Aristotle's commitment to the necessity of the past also clearly commits him to the necessity of the present.[1]

> *ἡ δὲ περὶ ὄντων ἢ μὴ ὄντων, οὗ μᾶλλον ἀποδειξίς ἐστι καὶ ἀνάγκη· ἔχει γὰρ τὸ γεγονὸς ἀνάγκην.*
>
> [Forensic oratory] concerns the things which are or are not, which are better susceptible of demonstration, being necessary. For what has come to be has necessity. (*Rhet* 1418a4–5)

Another piece of evidence, which we have already encountered (#7), is Aristotle's restriction, in some contexts, of possibility to circumstances from which external hindrances to the realisation of the possibility are absent (e.g. *Met* 1048a16–21). For the obtaining, at the present moment, of circumstances incompatible with the realisation of a purported possibility at that moment already constitutes such an external hindrance sufficient to inhibit the establishment of any such possibility.[2]

Two clear cases where the doctrine occurs are *Met* E.3 and *GC* 2.11. I shall further argue that *Met* Θ.3 and that *DC* 1.12 need to be included in this list. In *Met* E.3 Aristotle argues that there must be 'fresh starts' in nature, otherwise universal (efficient) causal determinism would obtain. The interpretation of this chapter gives rise to difficulties comparable to those of *DI* 9 itself: I shall examine it in #14. For our present purposes, however, the important point is the (surely uncontroversial) one that Aristotle's argument presupposes the necessity of the present as well as the necessity of the past.[3] The argument works by transfer of

[1] Hintikaa, *TN*, p.183.
[2] Cf. Seel, *DAM*, p.335; Moline, 'Provided Nothing External Interferes', *Mind* 84, 1975, 244–54.
[3] Cf. Weidemann, 'APkD', pp.35–36; Kirwan, Commentary, p.196. Cf. *Met* 1065a17–21.

necessity from a necessary antecedent over a necessary consequence to the consequent.[4] Aristotle explicitly states that either a present or a past event can function as the subject-matter of the antecedent (1027b1–10): given the occurrence of such an event, if it necessitates a further event, then that event is likewise necessary.

The second passage is *GC* 2.11 337a34–b9.[5] Here, too, the argument presupposes the inference from truth to necessity, and in a way which is highly relevant to *DI* 9. Observing the phenomena of generation and corruption, Aristotle asks what role contingency plays. He affirms that there is such a thing as contingency and gives two arguments to this conclusion. The first of these arguments (337b3–7) is the one which concerns us. Here Aristotle makes a distinction, which we encounter elsewhere,[6] between what will happen (*τὸ ἔσται*). and what is going to happen (*τὸ μέλλον*). The second category is the one which saves contingency, for (even) if it is true to say that something is going to happen, nothing prevents it from not happening. It is clear that this is an example of things which are which can also not be (*ἐνδέχεται ἔνια τῶν ὄντων καὶ μὴ εἶναι*), which then form the basis of the second argument (that things which come to be fall into this category). Contrasted with the category of *τὸ μέλλον*, which allows for contingency, is the category of *τὸ ἔσται*, which by implication does not; if something will be (*ἔσται*), then something *does* prevent its not happening. Of this category Aristotle affirms that if it is true to say that something will be, it is necessary that it be at some time true to say that it is: *ὃ μὲν γὰρ ἀληθὲς εἰπεῖν ὅτι ἔσται, δεῖ τοῦτο εἶναί ποτε ἀληθὲς ὅτι ἔστιν*. If one were to read this sentence in isolation, one might be inclined to give the word '*δεῖ*' wide scope, in spite of its attachment to the consequent, so taking the sentence to record simply the necessary equivalence of truth-value linked statements. But the context rules this interpretation out. Aristotle thinks that the general category of *τὸ ἔσται destroys* contingency. Hence his reliance on *τὸ μέλλον* to save it. The passage is as unambiguous evidence as one could require that Aristotle accepts the fatalist's inference from the truth of a **FCS** to its necessity.

[4] Weidemann, 'APkD', pp.30–5.

[5] My discussion of this passage is indebted to Williams' commentary ad loc. Cf. Frede, *Seeschlacht*, pp.22–3, 'Sea Battle', p.41 (but I do not see that 'the necessity of the event [sc. given the truth of the prediction] is implied only indirectly'); Seel, *DAM*, pp.243–4. Note also Philoponus, *In GC* 302.24–303. 5, esp. 302.27: *ἀληθοῦς γὰρ ὄντος τοῦ ἔσται ἀνάγκη εἶναί ποτε ὅπερ ἔφαμεν ἔσεσθαι*.

[6] *Div* 463b22–31. Cf. *EE* 1248a38–9.

In view of this passage, one might suspect that '*μέλλειν*' at *DI* 18a33 is rather carefully chosen. Ammonius argues that in making the point that **PB** applies to **FCS**s differently from the way it applies to statements about the present and past, Aristotle selects '*μέλλειν*' rather than '*ἔσεσθαι*', because his point will be that what will be is necessary, whereas what is going to be (present tendency) is still contingent.[7] But Ammonius' point is misguided for three reasons. Firstly, Aristotle is not in general sensitive to the distinction between '*μέλλειν*' and '*ἔσεσθαι*' announced in *GC* 2 .11.[8] Secondly, '*μέλλειν*' is not in general neutral on the likelihood of its subject's happening: it implies that its subject is at least more likely to happen than not. But Aristotle is concerned in *DI* 9 with future contingencies which are no more likely to happen than not.[9] Thirdly, and most importantly, Ammonius has got matters precisely the wrong way round. Statements about present tendencies are perfectly bivalent; it is statements about what *will* be that raise a problem for **PB**. So if Aristotle had been observing the *GC* distinction between '*μέλλειν*' and '*ἔσεσθαι*' in *DI* 9 one would have expected him to use the latter verb at 18a33, not the former.

At *SE* 166a22–30 Aristotle is discussing ambiguity, and he notes that sentences such as 'a sitting man can walk' or 'a man not writing can write' are ambiguous as between 'composed' and 'divided' senses:

> *παρὰ δε τὴν σύνθεσιν τὰ τοιάδε, οἷον τὸ δύνασθαι καθήμενον βαδίζειν καὶ μὴ γράφοντα γράφειν. οὐ γὰρ ταὐτο σημαίνει ἂν διελών τις εἴπηι καὶ συνθεὶς ὡς δυνατὸν τὸ 'καθήμενον βαδίζειν'·[10] καὶ τοῦθ' ὡσαύτως, ἂν τις συνθῆι τὸ 'μὴ γράφοντα γράφειν'· σημαίνει γὰρ ὡς ἔχει δύναμιν τοῦ μὴ γράφων γράφειν· ἐὰν δὲ μὴ συνθῆι, ὅτι ἔχει δύναμιν, ὅτε οὐ γράφει, τοῦ γράφειν.*
>
> The following examples [of false illusion] derive from combination of words: a sitting man can walk and a man who is not writing can write. For

[7] *In De Int* 138.34–139.6.

[8] Cf. e.g. *NE* 1139b8. *DI* 9 indeed contains at least two cases in point, one of which we have already adverted to: '*οὐ διατμηθήσεται*' at 19a13, which ought to be '*οὐ μέλλει διατμηθῆναι*' (cf. #7); '*τῶν ἐσομένων*' at 19a8. The occurrences of '*ἔσεσθαι*' at 19a28–30 do not introduce necessity, but they probably do not constitute a counterexample to the distinction of *GC* 2.11, because they figure in disjunctions: no doubt the distinction is between '*ἔσται*' and '*μέλλει*' when they occur in non-disjunctive contexts (i.e. bare assertions that X *ἔσται/μέλλει*).

[9] Donini, *Ethos*, pp.19–23.

[10] Deleting '*καὶ 'μὴ γράφοντα γράφειν''* with Wallies.

> one does not signify the same thing if one divides as if one combines the words, as that it is possible that a-sitting-man-walk. And it is the same if one combines 'a-not-writing-man-[can]-write'; for this means that he has the ability to write-while-not-writing. But if one does not combine, it means that he has the ability, when he is not writing, to write.

Unfortunately this passage does not quite say enough for us to be sure of Aristotle's meaning.[11] The combined sense (or, as it was later known, the composed sense) is clear enough: one cannot write and not write at the same time. Presumably we can take this widely as

$$\neg \exists t \exists t' \, [M_t[W_{t'} \, \& \, \neg \, W_{t'}]].$$

But what does Aristotle mean when he says of the divided case that one has the power, when one is not writing, to write? Does he mean that if one is not writing at t, one nevertheless has the power, at t, to write at t? Or does he mean – what would import the necessity of the present – that if one is not writing at t then one has the power, at t, to write *only* at times *other than* t? It is a pity that Aristotle does not declare. But in the somewhat parallel discussions in *Met* Θ.3 and *DC* 1.12 the question is settled in favour of the necessity of the present.

In *Met* Θ.3 Aristotle confronts Megarian opponents who argue that possibility and actuality coincide: *ὅταν ἐνεργῇ μόνον δύνασθαι, ὅταν δὲ μὴ ἐνεργῇ οὐ δύνασθαι* (something can only have potentiality when it is activating it; when it is not activating it, it does not have it either: 1046b29–30). This thesis is ambiguous. Perhaps the Megarians subscribed, on Aristotle's view, to the necessity of the present:

$$\forall t \, [p_t \rightarrow L_t p_t].$$

Or perhaps they rejected change:

$$\forall t \, [p_t \rightarrow \forall t' \forall t'' > t \, [L_{t'} p_{t''}]].$$

They may indeed have adopted a combination of these positions:

$$\forall t \, [p_t \rightarrow \forall t' \forall t'' \geq t \, [L_{t'} p_{t''}]].$$[12]

[11] *Pace* Sorabji, who calls this passage 'clear-headed' (*NCB*, p.205). Cf. *Met* 1047b13–4 and *Top* 115b17–8. See Hintikka, *AMD*, p.49. *SE* 177b22–26 seems to be similarly ambiguous.

[12] Cf. Seel, *DAM*, pp.314–5. Seel finds a fourth possible meaning, that one only possesses a capacity when engaged in the corresponding activity. But this is simply a narrower version of the Megarian thesis in its pre-processed form (since capacity is a species of possibility), and is accordingly itself ambiguous as between the three interpretations specified in the text. It is not possible to interpret the Megarians as having subscribed to the Diodorean thesis that only what is or will be actual is possible (cf. Knuuttila, 'The Statistical Interpretation of Modality', p.80). But perhaps Diodorus' position represents a *retreat* from the Megarian claims of *Met* Θ.3: see #25.

If our argument has been sound so far, we should not expect Aristotle to attack the necessity of the present. And indeed he does not do so, but rather the rejection of change. What is significant for us is that his way of doing so does not call in question the necessitarianism of his opponents as far as possibilities at an instant are concerned; his main objection (1047a10ff) is that their position bars the possibility, given 'p' at t, of '$\neg p$' at times *other than* t:

> *... οὗτοι οἱ λόγοι ἐξαιροῦσι καὶ κίνησιν καὶ γένεσιν. ἀεὶ γὰρ τό τε ἑστηκὸς ἑστήξεται καὶ τὸ καθήμενον καθεδεῖται· οὐ γὰρ ἀναστήσεται ἂν καθέζηται· ἀδύνατον γὰρ ἔσται ἀναστῆναι ὅ γε μὴ δύναται ἀναστῆναι.*
>
> These reasonings [of the Megarians] remove change and coming-to-be. For what is standing will always stand and what is sitting will always sit. For it will not stand up if it is sitting. For it will be impossible that what cannot stand up should stand up. (1047a14–7)

This passage is not ambiguous in the way *SE* 166a22–30 was. Indeed, the distinction between composed and divided senses is irrelevant to *Met* Θ.3.[13] We are concerned exclusively with the divided sense. The passage shows that Aristotle implicitly allows that 'a sitting man can walk' is false not merely in the composed sense of

$$M \, [p_t \, \& \, \neg p_t]$$

but also in the divided sense of

$$M \, [p_t \, \& \, M_t \, [\neg p_t]].$$

(The unindexed 'M' in indexed contexts may be regarded as shorthand for '$\exists t' \, M_{t'}$'.) What is objectionable in the Megarian position is that on their view the sitting man cannot *stand up*, i.e. not sit at some *other* time. Aristotle has no quarrel with the suggestion that a sitting man cannot, at the time when he is sitting, fail to sit at that time.[14]

[13] *Pace* Hintikka, *AMD*, p.48; Knuuttila, 'The Statistical Interpretation of Modality', p.83f.

[14] The same manoeuvre is found in Boethius: see #11. At *DI* 23a7–11 Aristotle distinguishes between two ways in which something may possibly walk: in one sense, it may possibly walk if it is (already) walking; in another sense, it may possibly walk if it (is not already walking but) may walk (*at another time*). Cf. Seel, *DAM*, p.234, with whose interpretation of this passage mine is in agreement.

I see no warrant for Hintikka's claim that Aristotle's rejection of the Megarian position commits him to the statistical model of modality.[15] There is, in general, no reason to suppose that if the sitting man is to be able to stand up he *must* at some time do so. What is objectionable is that he should be *unable* to stand up; in avoiding that commitment, one does not incur an equally onerous and unwelcome commitment to the Principle of Plenitude. It would be a mistake to suppose that the necessity of the present imports the Principle of Plenitude.[16] Certainly there is an implication running in the reverse direction: if it is possible at t that 'p' obtain at t then, on the statistical model, this possibility must at some time be realised; and of course possibility-at-t can only be realised at t. The implication from possibility-at-t of 'p' to actuality-at-t of 'p' then imports (by contraposition and substitution $\neg p/p$) the necessity of the present. But this implication cannot be strengthened to an equivalence.[17]

Aristotle's conclusion against the Megarians reads as follows:

[15] *TN*, pp.196–9; *AMD*, p.46. He is supported by Knuuttila, 'The Statistical Interpretation of Modality', p.82. I have already rejected Hintikka's interpretation of the lines immediately preceding the ones quoted in the text (1047a10–14): #7 'Further Remarks'. A puzzling feature of Hintikka's account is that (if I understand him correctly at *TN*, pp.197–8) he has Aristotle derive, from the necessity of the present (the position ascribed to the Megarians), and the Principle of Plenitude, the absurd conclusion that there is no change. But elsewhere Hintikka agrees that Aristotle believes in the necessity of the present, and argues that he subscribes to the Principle of Plenitude, so that Aristotle ought, on Hintikka's view, to be committed to the absurd conclusion. We extricate ourselves from this morass when we recognize that Aristotle is not attacking the necessity of the present, but the Megarian denial of change; and that he does not appeal to the Principle of Plenitude in so doing.

[16] The mistake is made by Knuuttila in the following passage, for instance: 'For Aristotle and his followers the truth of a modal sentence as analysed *in sensu diviso* is based on the supposition that he who is not standing can only stand if he actually stands at some other time, because in every instance of time what then is, is necessary' ('The Statistical Interpretation of Modality', p.84). What the necessity of the present involves is that if a man sitting a t is to stand, he must do so at some time other than t; but it certainly does not follow that if such a man is to *be able* (at t) to stand at some other time, he must actually stand at another time. Whatever the position as regards some of Aristotle's followers, there is no warrant for attributing Knuuttila's mistake to Aristotle himself. Knuuttila makes precisely the same mistake in respect of Boethius: see #11.

[17] A feature of *Met* Θ.3 which will be important in our discussion of the Master Argument is that Aristotle here defines the possible as that which can be assumed to be actual without impossibility, in a context which presupposes the necessity of the present.

> *... φανερὸν ὅτι δύναμις καὶ ἐνέργεια ἕτερόν ἐστιν ... ὥστε ἐνδέχεται δυνατὸν μέν τι εἶναι μὴ εἶναι δέ, καὶ δυνατὸν μὴ εἶναι εἶναι δέ, ὁμοίως δὲ καὶ ἐπὶ τῶν ἄλλων κατηγοριῶν δυνατὸν βαδίζειν ὃν μὴ βαδίζειν, καὶ μὴ βαδίζειν δυνατὸν ὃν βαδίζειν.*
>
> It is clear that potentiality and activity are different things, ... so that it is possible for something which can be not to be, and for something which can not-be to be, and similarly in the case of the other categories it is possible that something capable of walking not walk, and something capable of not walking walk. (1047a18–24)

In the light of 1047a14–17, we must say that the sense of this is that what can at t be $\langle F \rangle$ at t can also at t not-be $\langle F \rangle$, but only at times *later* than t.[18]

Turning to *Met* Θ.4, our argument so far suggests that we should also disambiguate 1047b13–14 (*τὸ γάρ σε ἑστάναι νῦν ψεῦδος μέν, οὐκ ἀδύνατον δέ*) as

$$\exists t > t_0 \, [\neg p_{t_0} \,\&\, M_{t_0} p_t]$$

where t_0 = now, rather than as

$$\neg p_{t_0} \,\&\, M_{t_0} p_{t_0}.$$

The target of *Met* Θ.4 is an extreme possibilism which claims that everything is possible: this doctrine assimilates the impossible to the (merely) false, and argues that (mere) falsity can consist with possibility. Against this, Aristotle contends that some falsities are (not merely false but) impossible. In the light of his approach to the Megarians in Θ.3, it is clear that Aristotle could have employed the necessity of the present against the opponent of Θ.4: he could have produced an impossibility of the form

$$\neg M \, [p_t \,\&\, M_t \neg p_t].$$

Instead, he chooses a geometrical impossibility, no doubt because that is easier to grasp. But it is important to recall (#8) that Θ.4's distinction between the false and the impossible is not inconsistent with the

[18] Waterlow points out that the Megarians may have arrived at their doctrine (the rejection of change) by confusion with the necessity of the present (*PP*, p.27 n.7). For without symbolic notation it is easy to slide from 'If p_t then it is necessary at t that p_t' to 'If p_t then it is necessary at t that $p_{t'}$' (or indeed to 'If p_t then it is necessary (sc. at all times) that p (at all times)').

necessity of the present: although the false is impossible in the sense of the above formula, it is not impossible *simpliciter*.

I turn to *DC* 1.12. The overall purpose of this chapter is to argue that the world is both ungenerated and incorruptible, in opposition to the Platonic thesis that the world is incorruptible but had a beginning in time. It is not my aim to provide a full analysis of this difficult chapter,[19] but to point to two important passages which presuppose the necessity of the present, and the generalised inference from truth to necessity. The first passage is 281b2–33. The general aim of this passage is to argue that if something[20] is eternal it is indestructible, or conversely, if it is destructible then it will at some time cease to exist. For suppose not. Then it will exist eternally. But we can suppose that its potentiality for perishing is actualised at some time. But then at that time it will both exist (because, *ex hypothesi*, it is eternal) and not exist (because we are supposing that it perishes at that time). This argument is evidently meant to be supported by preceding considerations relating to standing and sitting. How does the connection work? The important claim here is the following:

> (1) *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 ἄλλοι χρόνωι.*
>
> [A man] has at one and the same time the capacity to sit and to stand, because when he has the one capacity, he also has the other: but not in such a way that he has the capacity to sit and stand at the same time, but at another time. (281b15–18)

Kirwan has pointed out that (1) is three-ways ambiguous.[21] Aristotle might simply be saying that capacities for contraries cannot be exercised simultaneously:[22]

$\neg M_t$ [A sits at t & A stands at t]

so that the point of the '*ἐν ἄλλοι χρόνωι*' remark is to contrast this with

[19] See here Williams, 'Aristotle and Corruptibility', *Religious Studies* 1, 1965, 95–107, 203–15.

[20] The argument applies to things in all categories (*DC* 281a30–3): my talk of 'thing', 'object' etc. is to be understood accordingly.

[21] 'Aristotle and the Necessity of the Present', p.180.

[22] So Judson, 'Eternity and Necessity'; Williams, 'Aristotle and Corruptibility', pp.98–9; Fine, 'TN', p.27 with n.14; Dancy, 'Aristotle and the Priority of Actuality', p.80.

M_t [A sits at t & A stands at t'].

But that cannot be the only intended contrast, otherwise the stated conclusion of the argument would be a blatant non-sequitur.[23] Secondly, (1) might be taken as saying that capacities for contraries cannot be possessed simultaneously if they are capacities for simultaneous exercise.[24] But that, as Kirwan rightly observes, is unattractive because it commits Aristotle to determinism in a way which runs counter to *DI* 9, and many other passages (cf. #7) which provide for the compossibility of '$M_t p_{t'}$' and '$M_t \neg p_{t'}$', $t' > t$. Thirdly, the passage can be read as committing Aristotle to the necessity of the present. Read in this way, the claim made by (1) is

$\neg M$ [A sits at t & M_t [A stands at t]].

This principle does look as if it would allow Aristotle to infer that what exists for an infinite time cannot not exist.[25]

It might be objected that the distinction drawn in the first part of 281b2ff between the impossible and the merely false rules out, or at least conflicts with, the supposition that (1) contains a commitment to the necessity of the present (which has as consequence that the false is impossible).[26] But, as I have indicated (#8), we do not need to read the text in this way. There would be a clash if Arisotle intended in the first part of the passage to allow the falsity of 'p' at t to consist with the possibility at t of 'p' at t. But the sense may equally be – and this would import no contradiction with what follows – that the falsity of 'p' at t can consist with the possibility *in general* of 'p', i.e. both the possibility, at times other than t (these would obviously be earlier times) of 'p' at t, and the possibility, at t, of 'p' at times other than t. It is false that you

[23] Note that this interpretation also leaves room for

M_t [A sits at t & M_t [A stands at t]]

i.e. the rejection of the necessity of the present. But Aristotle needs the necessity of the present if his conclusion is to go through: see below.

[24] So Sorabji, *TCC*, pp.277–9. Knuuttila claims – equivalently – that (1) contains a commitment to the Principle of Plenitude ('The Statistical Interpretation of Modality', p.83 n.16).

[25] Cf. Waterlow, *PP*, ch.2. Both Williams and Judson are aware that Aristotle's argument *requires* modality relative to the facts – they criticise it on that ground – but they take that dependence to be imported illicitly into the argument, rather than openly stated. The *de facto* dependence of the argument on modality relative to the facts (whether or not announced by (1)) is the point I am concerned with.

[26] This is suggested tentatively by Williams, 'Aristotle and Corruptibility', p.102.

are standing at *t*, but not impossible (281b9–10), in the sense that it was possible, before *t*, for you to stand at *t*, and in the sense that it is possible, at *t*, for you to stand at times other than *t*.

Kirwan argues that although the necessity of the present is the sense of (1), it does not license the conclusion which Aristotle seeks to prove in this passage. There are two components to his claim: (i) that (1) expresses (or at any rate that the argument depends on) the necessity of the present, and (ii) that the necessity of the present cannot yield the absolute indestructibility of an eternal thing.[27] I shall agree that both of these claims are correct; but I shall claim that although the necessity of the present cannot *as such* yield the absolute indestructibility of an eternal thing, it can do so in the context of the passage as a whole. In seeing how this works, we can not only rescue Aristotle from incoherence but provide support for the line on *DI* 9 which I am defending.

What Aristotle seeks to prove is stated by him at 281b25: everything which exists for ever is absolutely indestructible (*ἅπαν ἄρα τὸ ἀεὶ ὂν ἁπλῶς ἄφθαρτον*). But, the objection runs, the necessity of the present (as captured in the above formula) warrants no more then the inference that at each moment when X exists it cannot at that moment fail to exist at *that* moment. But *that* does not yet amount to – what Aristotle surely wants – the conclusion that there is never a moment at which X can, at that moment, fail to exist at *any* moment. For, if '*p*' is some suitable assertion of the existence of a thing which is in fact eternal, (1) seems to license at best

$$\neg \exists t\, M_t\, [p_t \,\&\, M_t\, [\neg p_t]]$$

whereas the conclusion which Aristotle needs to extract from the passage if he is to reach his general conclusion that everything which exists for ever is absolutely indestructible is surely the stronger

$$\neg \exists t\, [p_t \,\&\, \exists t' \exists t''\, [M_{t'} \neg p_{t''}]].$$[28]

[27] Cf. Waterlow, *PP*, p. 50.

[28] This formula is equivalent to

$$\forall t\, [p_t \rightarrow \forall t' \forall t''\, [L_{t'} p_{t''}]]$$

which is a strengthened version of the second and third suggested ways above of interpreting the Megarian denial of change. In its utterly general form, Aristotle of course rejects it; but in the present context, with the announced restriction on substituends for '*p*', it captures the most general sense of 'absolute indestructibility' available to Aristotle.

Obviously the indestuctibility, at a moment, of a thing at *that* moment does not yet amount to the indestructibility, at a moment, of that thing at *any* moment. And it is surely this latter property which Aristotle is aiming at in his conclusion that anything eternal is *absolutely* indestructible.

In the first part of the passage we are concerned with (281b2–25), we do not get a precise definition of absolute indestructibility. But it is clear from Aristotle's very next words (281b25–33) that he understands that phrase in such a way as to rule out the possibility that an eternal object might yet have the potentiality, at some moment, to be destroyed at some other moment. The destructible figures here as that which has, at some earlier time (*πρότερον*), the potential not to exist at a later time (*ὕστερον*); and the generable as that which has (sc. at some time) the potential not to have existed at some earlier time (*πρότερον*) . But there is no time in which an eternal thing can not be. So what has the power of existing eternally does not also have the power of not existing. Clearly, it is the aim of the argument to establish that an eternal object is absolutely indestructible in the strong way canvassed above: it lacks, at *every* moment, the potential to perish at *any* moment.[29]

But now given that the thesis argued for in (1) can be regarded, in context, as an expression of the necessity of the present, is it true that, as Kirwan claims, that thesis is insufficient to yield absolute indestructibility in the required sense? Well, it would be true if, for example, we could make sense of the distinction between its now being a fact that *Gp*, and its not now being a fact that *Gp*, but its nevertheless being in some shadowy way true that it will always turn out that *p*. For if it is not now a fact that *Gp*, the necessity of the present cannot be deployed to render '*Gp*' necessary; hence '*Gp*' remains contingent. If, at the same time, it is still in some shadowy way true that '*p*' will always obtain, the object whose existence '*p*' affirms can count as eternal, but contingently so, and so destructible. But this line of thought fails: I rejected the coherence of the distinction on which it is based in my discussion of the cloak passage in #7.

Alternatively, one might suppose that Kirwan's objection would work if we were dealing with objects of which it is as yet unknown (and

[29] Strictly, in 281b25–32, at any *subsequent* moment. But the necessities of the past and present can be adduced to license the more general conclusion.

unknowable) whether they will last for ever or not. Perhaps we can imagine, of some object, that at any (or every) moment of its existence it indeed has the power of destructibility at some other moment, but that as time goes by it does not get destroyed, and in fact *never* gets destroyed. That is, as long as we do not build into the scenario that it is *given ab initio* that the object in question is eternal, then perhaps we can make sense of an object which is destructible but *turns out* to exist for ever. If Aristotle were prepared to countenance that sort of eternal object, it would indeed be fallacious to move from the materials which he gives us in (1) to absolute indestructibility in the required sense.

But Aristotle does not believe that it could merely turn out that an object is eternal.[30] For *when* would it so turn out? It could not transpire *at any point in time* that an object is eternal, because at any point in time the infinite series of moments is incomplete. But nor can we imagine that there might be an atemporal perspective on the whole time-series from which it could be ascertained that some object is eternal, for that would be to imagine a perspective on an actual, completed infinity (by addition); but on Aristotle's view such infinities exist only potentially. Hence it could only 'turn out' that an object is eternal if it were guaranteed *ab initio* that it would last for ever. But if it is guaranteed *ab initio* that an object is eternal, the necessity of the present is indeed adequate to yield its absolute indestructibility in the required sense. For the necessity of the present, as I argued in #8, is not logically distinguishable from the generalised inference from truth to necessity.[31]

[30] For Aristotle, the only eternal objects are thinge like celestial bodies such as the sun and stars engaged in cyclic processes which are guaranteed to be eternal by their very nature. Matter is also eternal, but again that it is so is metaphysically guaranteed. There could not be a thing which was merely accidentally eternal. Cf. 283b29ff. (This is Aquinas' line of defence of the argument of *DC* 1.12 (*In Lib I De Caelo* ed. Spiazzi (Turin, 1955), lectio xxvi.6): Mansion, *JEA*, p.72, n.63, p.74; Williams, 'Aristotle and Corruptibility', pp.99–100; cf. Waterlow, *PP*, ch.4, who correctly observes (p.75 n.26) that Aristotle's reliance on such considerations in *DC* 1.12 does not conflict with his implicit claim at 283b17 that the proof has not proceeded *φυσικῶς*.) At *An Po* 1.4 Aristotle might seem to make room for such a possibility. He distinguishes mere universality (*τὸ κατὰ παντός*) from necessity (*τὸ καθ'αὐτό*). The former category is explicitly said to lack temporal parameters (cf. 1.8). But he does not mean to distinguish these categories ontologically: there are no connections which obtain universally and eternally but not essentially (Aristotle's examples of the *κατὰ παντός* are 'All men are animals' and 'All lines contain points', which record essential connections), though such connections need not, on Aristotle's view, be definitional (*Top* 102a18–30; Sorabji, *NCB*, p.189). Rather, the category of the *κατὰ παντός* is introduced to serve the theoretical purpose of helping in the definition of the *καθόλου* (which is partly constituted by the *κατὰ παντός*: 73b25ff). Cf. Kneale, *DL*, p.94.

An object could only be eternal if it were *guaranteed* (i.e. true) *now* that the object would always exist: application of the generalised inference then yields the absolute indestructibility of eternal objects in the required sense. At any moment, an eternal object lacks the potentiality for destruction not only at *that* moment, but at *any* moment, because at any moment the proposition that the object is eternal is true.[32] The principle '$Tp \rightarrow Lp$' is exactly what is needed to take us from the materials of (1) to the absolute indestructibility of eternal objects. Accepting that something like this principle is what is intended by the reflections on standing and sitting in (1), we have it that Aristotle commits no fallacy in his argument from those reflections to the absolute indestructibility of eternal objects. Since, for an eternal object, it is true at every moment that it exists at every moment, the supposition that it ceases to exist at any moment leads, as Aristotle says, to a contradiction.

The necessity of the present is also presupposed in a curious argument for the thesis of *DC* 1.12 which Aristotle includes at the end of the chapter (283b6ff). The argument depends in an obvious way on the

[31] Kirwan's mistake emerges clearly in an example he gives of the fallacy which he takes himself to detect: '[G]iven that pain is always with us, there might still, consistently with the Necessity of the Present, be a possibility, and in fact a perpetual possibility, of pain's not being always with us. For there might be a possibility on some day, and in fact on each day, of some other day's being painless, even though because pain is always with us there is, by the doctrine, no possibility on any day of *that* day's being painless' ('Aristotle on the Necessity of the Present', p.176). To make the argument work, Kirwan must understand the phrase 'given that pain is always with us' as 'it will turn out that pain is always with us.' But either it is given to us from the beginning that pain will always be with us, in which case the distinction is spurious (and the necessity of the present – or rather '$Tp \rightarrow Lp$' – yields the generalised conclusion that it is never possible that pain ever not be with us); or it is not so given – it only becomes a fact at the end of the world that pain *was* always with us (cf. Waterlow, *PP*, pp.68–9) – in which case the conception of eternity in question is non-Aristotelian.

[32] This solution to the difficulty is considered but rejected by Waterlow, *PP*, pp.50–2, on the ground that if **PB** is restricted in *DI* 9 it can hardly be applied unrestrictedly in *DC* 1.12. But **PB** is restricted in *DI* 9 only for contingencies; and in *DC* 1.12 we have to do with sectors of the future which are non-contingent. The formula '$Tp \rightarrow Lp$' is run forwards in *DC* 1.12 (in the form '$\forall t \forall t'$ $[T_t p_{t'} \rightarrow L_t p_{t'}]$'), backwards (i.e. contraposed) in *DI* 9. However, Waterlow subsequently (pp.74–5) connects the always and the necessary in much the same way as I propose, i.e. if something is eternal, then it is at all moments of its existence (guaranteed to be) eternal, in which case by relative necessity it is (at all moments) necessarily eternal.

necessity of the past, but it also depends on the necessity of the present. It is impossible, Aristotle claims, for anything generated to exist for ever. For what is generated has the potential not to exist (since it at one time did not exist). If it has that potential, we can suppose it to be actualised.[33] But we cannot suppose it to be actualised in the future, since we are given that it exists throughout the future. So we must suppose its potentiality realised in the past:

> (2) *ἔξει γὰρ ὕστερον καὶ τὴν τοῦ μὴ εἶναι δύναμιν, πλὴν οὐ τοῦ τότε μὴ εἶναι ὅτε ἔστιν (ὑπάρχει γὰρ ἐνεργείαι ὄν), ἀλλὰ τοῦ πέρυσιν καὶ ἐν τῶι παρελθόντι χρόνωι.*
>
> It will have hereafter the potential to not-exist as well [as to exist], except not the potential to not-exist at the time when it exists (for then it obtains in actuality), but last year and in the past. (283b8–11)

But that is impossible: there is no potentiality of the past.[34] The absurdity to which potentiality for the past leads is that it should be true to say now that something is last year, or in general is in the past (283b6–7, 16–18). It is not entirely clear what Aristotle means here, although we can probably safely say that the interpretation of this move does not affect the correctness of my construal of the central part of the argument. The most likely construal is that if there were potentiality with respect to the past, that potentiality could be realised *now* (or at a later date). Before that moment, it would not be true to say 'It was last year', say; but it would *become* true at the moment of realisation. This generates an incoherence. One way of expressing this incoherence is to say, with Aristotle, that what becomes true is 'It is last year' (since otherwise 'It was last year' would have to have been true in the interim). What Aristotle is gesturing towards is the incoherence of anti-realism about the past. The incoherence of supposing that the past might remain metaphysically indeterminate until a later date is registered by insisting on the 'is' in the formulation 'It is true last year'.[35]

The crucial phrase in this argument for our purposes is (2). Given the context, (2) is not ambiguous as between a composed and a divided

[33] Cf. *An Pr* 32a18–21 with #22 below.

[34] But at 281b28 Aristotle had characterised *τὸ γενητόν* as *'ὃ ἐνδέχεται πρότερον μὴ εἶναι'*. Cf. Williams, 'Aristotle and Corruptibility', p.207.

[35] There is a useful discussion of this passage in Seel, *DAM*, p.235f. Cf. also Vuillemin, 'L'Argument Dominateur', *Revue de Métaphysique et de Morale* 84, 1979, 225–57, pp.243–5.

sense: it must be taken in the divided sense, that a thing which exists at *t* does not, at *t*, have the power not to exist at *t*. The phrase in parenthesis indicates that the modality is being understood to obtain relative to the facts, in particular the fact that the thing is (at every future moment) in actuality (*ἐνεργείαι ὄν*).[36]

Arlstotle's statement of the necessity of the past is: *οὐδεμία γὰρ δύναμις τοῦ γεγονέναι ἐστίν, ἀλλὰ τοῦ εἶναι ἢ ἔσεσθαι* (there is no potentiality of having been, but [only] of being or going to be, 283b13–14). This seems at first sight to conflict with my claim that the passage depends on the necessity of the present. Does not Aristotle say that there is a potentiality of the present? The argument that the passage as a whole requires the necessity of the present for its validity stands, and is not upset by this claim. For we do not need to suppose that Aristotle thought of potentialities in respect of the present and of the future in the same way. Potentiality for the future is double-sided potentiality for opposites: it is the kind of potentiality which the necessity of the present rules out (for the present). Potentiality for the present is the one-sided capacity to do what one is doing anyway (cf. *DI* 23a7–11). It is the capacity to act either in or into the past which Aristotle is ruling out here. The present is such that one cannot now make it otherwise than it is; but one does have the capacity to act *in* it. (We act *into* the future.) The distinction may seem somewhat artificial: in the sense in which I can now do what I am doing, surely I can have done what I did. But the distinction has some intuitive force: there is nothing I can do now to bring it about that I did such-and-such; whereas I can bring it about that I am doing what I am actually doing now, namely, by doing it. The past is a domain of the *possible* (*δυνατόν*), but not of the *potential* (*δύναμις*).[37]

The principle of modality relative to the facts might seem strange to us. For us progency of Scotus and Leibniz there is no incoherence in supposing, for any moment, and for any *'p'* true at that moment, that *'p'* might not be true at that very moment. But Aristotle makes it clear that this is not a supposition which he is willing to entertain: for example, if someone were at all times sitting, then the hypothesis that he might at some time stand leads, on his view, *not* to the counterfactual supposition that he stands at that moment instead of sitting, but to the impos-

[36] Cf. Seel, *DAM*, p.246.

[37] Cf. Seel, 'Diodore domine-t-il-Aristote?', p.301.

sibility that he should at that time be both standing and sitting. If he is at all times sitting, there is 'no time left' for him to stand. Aristotle is not willing to allow the fact that p_t to consist with the possibility that $\neg p_t$.[38]

Of course, ancient languages have the resources to express subjunctive conditionals, and so to entertain counterfactual possibilities in the sense that they can suppose, given different facts, different consequences. The thought that, had it rained, we would have got wet, presents no difficulty to an ancient thinker.[39] In other words,

$$\neg p_t \,\&\, [PnMFnp]_t$$

can be true for contingent 'p'.[40] But the thought that, quite generally, alternative possibilities might consist with the facts (*when* they are the facts) seems not to have been seriously promulgated by any ancient philosopher.[41] The thought that facts might be different is not equivalent to the thought that facts might have been different. The former thought entails, but is not entailed by, the latter.[42]

[38] I.e. whenever (and for as long as) it is a fact that p_t, then (and for so long) it is not possible that $\neg p_t$. The fact, at t, that p_t *can* cohere with the possibility, at times earlier than t, that $\neg p_t$ (so long as it was not a fact at those earlier times that p_t).

[39] Cf. Boethius, *In De Int* 2.235.22–26, quoted below, #11. See Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', p.96 with notes ad loc.

[40] Kirwan ('Aristotle on the Necessity of the Present', p.172) notes that the necessity of the present allows for contingency in the sense of 'might have been'. Just this sort of contingency is denied by determinism, which he formalises as:

$$p_t \rightarrow \forall t'\ L_{t'} p_t$$

[41] Aquinas and Buridan in their commentaries on *DC* 1.12 reject modality relative to the facts and accordingly reject the argument of 281b20–5: the relevant passages are usefully excerpted by Williams, 'Aristotle and Corruptibility', pp.99–102. The more modest thesis that a thing can at t be in a state at t other than its actual state at t *as far as its nature allows* (i.e. not reckoning in external circumstances, in particular not reckoning in the fact that it is *not* in that state at t) is not unfamiliar to ancient and early medieval thought: see, e.g., [Alexander], *Quaestio* 1.19 at 33.10, 21 with Sharples, 'Aristotelian and Stoic Conceptions of Necessity in the *De Fato* of Alexander of Aphrodisias', *Phronesis* 20, 1975, 247–74, p.254 n.16; Anselm, *De Libertate Arbitrii*, in ed. Schmitt, *Opera Omnia* (Edinburgh, 1946), vol.1, chs.3 and 7 (1.213.5–25, 219.24–31) with Serene, 'Anselm's Modal Conceptions', in Knuuttila ed., *Reforging the Great Chain of Being* (Dordrecht, 1981), 117–162. Cf. too Plato, *Timaeus* 41a7–b6; Macrobius, *Commentarii in Somnium Scipionis* 2.13.7 (cf. Augustine, *De Civitate Dei* 13.17). These passages do not (*pace* Vuillemin, *NC*, ch.9) envisage a rejection of relative necessity, but merely make the point that although the children of the Demiurge (Plato) or the world (Macrobius) are mortal *ex sua natura*, they will not corrupt, because they will be permanently held in existence by a power stronger than their nature. Absolutely speaking, there is no possibility that they will corrupt (given that it is true that they will not); that is compatible with asserting that their nature would permit corruption.

[42] Cicero's defence of the Carneadean combination of future contingency with unrestricted **PB** in *De Fato* constitutes a limited exception to the claim in the text. But we have no evidence that these thinkers embraced in consequence the contingency of the present and past. Philo's conception of possibility as arising on the basis of bare suitability of the subject (*κατὰ ψιλὴν . . . ἐπιδεκτότητα τοῦ ὑποκειμένου*: Alexander, *In An Pr* 183–4 = fr.135 Döring; cf. frr.136–8) might also seem to constitute an exception, but we know too little of Philo's intention, and of the context in which his definition was promulgated, to say whether he had a genuine conception of logical possibility in mind, or simply intended to reinforce the point (cf. previous note) that even in circumstances where, all things considered, a certain outcome is impossible, it may still be possible just as far as the nature of the relevant subject is concerned. This latter interpretation is suggested by Boethius' and Simplicius' reports of Philo's definition (*In De Int* 2.234.10ff = fr.138 Döring; *In Cat* 195.31ff = fr.137 Döring), where the absence of external hindrances seems to occur as a necessary condition of the constitution of the possibility that, say, I read Theocritus today ('Hoc si nil extra prohibeat, quantum in se est, potest veraciter praedicari'; '*. . . τὸ ἐν τῶι Ἀτλαντικῶι πελάγει ξύλον καυστόν ἐστιν ὅσον ἐφ' ἑαυτῶι καὶ κατὰ τὴν ἑαυτοῦ φύσιν*'.) But it is also possible that we have here a confusion of Philo's definition of possibility with that of the Stoics, which, in both Boethius' and Simplicius' accounts, follows. The Stoic definition of possibility ('That which admits of truth and which is not prevented from being true by external circumstances': DL 7.75 = LS 38D. Cf. Alexander, *De Fato* 176.14ff, *Quaestio* 1.4, 11.5–6, 9.6–7: see further on this *quaestio* Appendix 3) is excellently adapted to accommodate modality relative to the facts. (Cf. Kneale, *DL*, p.124. But she misstates the Stoic definitions of the modalities: she has 'or' in place of 'and' as the principal connective in the definitions of possibility and non-necessity. On these definitions see Frede, *Die Stoische Logik*, pp.107–17.) But it would seem that Chrysippus did not use it to do so: cf. #16.

A lively appreciation of how perverse the philosophical world initially found the notion of sheer logical possibility can be gained from reading Ockham's discussion of the issue at *Ordinatio* 1.d.38.q.1.Eff, in Etzkorn and Kelley eds., *G de Ockham: Opera Theologica* (New York, 1979), vol.4 (cf. *Tractatus* q.3.A–B). To Scotus' claim that if X wills A then X can simultaneously will not-A Ockham responds with the traditional line that the capacity to will opposites can only be exercised over time, not at an instant. Ockham can find no construal of Scotus' claim other than the absurd one that X should (simultaneously) will A and not-A. Note that '$\neg p_t$ & $[PnMFnp]_t$' is verified in Prior's Ockhamist model of time whereas '$\neg p_t$ & $M_t p_t$' is not. See further #13 below.

10 Simple and Hypothetical Necessity

The passage from *DC* 1.12 which I discussed in the previous section (281b2ff) introduces a distinction, which I did not discuss, between simple and hypothetical truth, falsity, possibility and impossibility. It is not entirely clear from this passage how the distinction is to be understood: the examples Aristotle gives of the hypothetically impossible at 281b5–6 (that the angles of a triangles might not possibly equal two right angles, or the diagonal not possibly be commensurate with the side, if such-and-such conditions were fulfilled) do not help. Elsewhere in Aristotle's writings, the concept of hypothetical *necessity* plays a significant role. It is frequently distinguished from simple, or absolute, necessity (i.e. what is necessary *ἁπλῶς*), and it remains a matter of controversy whether at such points the distinction is, in general, between the absolute necessity of a *conditional* and the absolute necessity of its *consequent* (i.e. between '$L\ [p \rightarrow q]$' and 'Lq'),[1] or between the *relative* necessity of the consequent of a conditional and the *absolute* necessity of that consequent (i.e. between '$Tp \rightarrow Lq$' – in full, '$\forall t\ [T_t p_t \rightarrow L_t q_t]$ – and '$\forall t \forall t'\ [L_t q_{t'}]$'). Let us make some terminological stipulations. What Aristotle calls necessity *ἐξ ὑποθέσεως* or necessity *τίνων ὄντων* (or *τούτων τεθέντων* etc.) I shall call hypothetical necessity. I have already labelled the type of necessity embodied in the formula '$Tp \rightarrow Lq$' relative necessity; that embodied in the formula '$L\ [p \rightarrow q]$' I shall call conditional necessity. The question before us is whether talk of hypothetical necessity is to be disambiguated as referring to relative necessity or as referring to conditional necessity. Examination of this question will give us a further fix on the sense of DI 19a23–7, where a distinction between simple and (some sort of) hypothetical necessity is clearly at issue.[2]

[1] For the sake of simplicity, I employ this formulation of the distinction, rather than the stronger '$\forall t\ [L_t [p_t \rightarrow q_t]] / \forall t\ [L_t q_t]$'. What is at issue for this distinction is the placing of the necessity operator rather than its interpretation; hence the simpler and weaker formulation will suffice.

[2] Alexander draws a connection between the hypothetical necessity introduced by *DI* 19a23–7 and necessity *τούτων ὄντων* at *An Pr* 30b31 (*In An Pr* 141.1–6).

There is no particular reason to suppose in advance that a uniform account of hypothetical necessity will apply to all contexts in which the concept occurs.[3] These contexts can be divided into two main groups: logical and physical.[4]

In logical contexts, Aristotle frequently makes a distinction between two senses in which the conclusion of a syllogism may be necessary: on the one hand, we have the absolute necessity of a conclusion, which it enjoys in virtue of expressing a necessary connection between subject-term and predicate ('definition' in Aristotle's sense), and which accrues to the sentence independently of its figuring as a conclusion in a syllogism.[5] On the other hand, there is the necessity which a conclusion

[3] Fine argues ('TN', pp.25–7) that Aristotle deploys a uniform distinction between absolute and hypothetical necessity in all the main contexts where it occurs, claiming (but without argument) that talk of hypothetical necessity is to be disambiguated as (in my notation) '$L\ [p \rightarrow p]$' rather than '$Tp \rightarrow Lp$.' (So too Kneale, *DL*, p.92–4.) She does not seem (p.28) to regard '$Tp \rightarrow Lp$' as a form of hypothetical necessity, and does not realise that the necessity of the present/past, which she correctly (against Sorabji, *NCB*, p.22) regards as a form of hypothetical, not absolute, necessity, is an *instance* of the necessity in '$Tp \rightarrow Lp$'.

[4] Cooper claims ('Hypothetical Necessity', in Gotthelf ed., *Aristotle on Nature and Living Things* (Pittsburgh and Bristol, 1985), 151–167) that hypothetical necessity is restricted by Aristotle to teleological contexts. But this is not so. Even if we confine our attention to contexts where the expression '*ἐξ ὑποθέσεως*' is explicitly attached to modal operators, *DC* 281b5 is a clear counterexample to Cooper's claim. In logical contexts, Aristotle speaks of necessity *τούτων/τίνων/ἐκείνων ὄντων* as well as necessity *ἐξ ὑποθέσεως*. Note that Alexander calls the type of necessity contrasted with simple necessity at *DI* 19a23–7 necessity '*ἐξ ὑποθέσεως*' (*In An Pr* 141.6). My use of the phrase 'hypothetical necessity' is broad enough to cover all cases where (to put it at its most general) something is necessary *given* something else, and so includes material and efficient causation (both species of so-called *a tergo* necessitation) and final causation (*a fronte* necessitation). With my terminological policy cf. Mansion, *JEA*, p.71; Sorabji, *NCB*, p.22; Frede, 'Aristotle on the Limits of Determinism: Accidental Causes in *Metaphysics* E.3', in Gotthelf ed., op. cit., p.208 (Frede calls the broad category 'conditional necessity'). Something which is hypothetically necessary may also, and independently, be simply necessary. An example of this is the conclusion of an apodeictic syllogism (*An Pr* 30b31–3, 38–40, 40b23–5, 50a16–28, *An Po* 72b13–15, *Met* 1015b6–9 with Kirwan ad loc.). The issue of both sorts of necessity attaching to the same thing also arises in a passage in *GC* 2.11 which I discuss below. The main cases of simple necessity are what is eternal (*GC* 2.11) and what belongs *per se* to something (*An Po* 1.4); cf. here Frede, 'Aristotle on the Limits of Determinism', pp.208–9.

[5] *An Po* 1.4: a sentence is absolutely necessary if the predicate applies to all objects referred to by the subject and if it applies as such (*καθ' αὑτό*), i.e. as a matter of definition. Aristotle adds a gloss on this condition – that the object introduced by the subject should be the thing to which the predicate *primarily* applies – but this is not required elsewhere (nor indeed is it always required that the predicate should apply as a matter of definition: *Top* 102a18–30; Sorabji, *NCB*, p.189).

enjoys *as such*, i.e. the necessity of the conclusion given the premisses. These two kinds of necessity may come apart in obvious ways: for example, a sentence which is not absolutely necessary may, if it figures as the conclusion of a syllogism, be necessary given the premisses. Aristotle's example here is 'No white thing is a man', which is, in itself, not absolutely necessary (indeed it is false), but which is necessary relative to the premisses 'All men are animals' and 'No white thing is an animal'.[6] Patzig has pointed out that Aristotle generally (and especially rigorously in the Modal Syllogistic) uses different expressions for these different species of necessity ('*ἐξ ἀνάγκης ὑπάρχειν*' for absolute necessity; '*ἀνάγκη ὑπάρχειν*' for necessity *τίνων ὄντων*), and he has further argued that Aristotle understands necessity *τίνων ὄντων* as, in my terminology, relative rather than conditional necessity.[7]

Patzig has a number of criticisms of the category of relative necessity which turn on his failing to take seriously that what is in question is not a species of absolute necessity. The relatively necessary is what the agent can do nothing about, in the context of the (assumed or actual) facts. In arguing that 'No white thing is a man' is necessary relative to the premisses 'All men are animals' and 'No white thing is an animal', Aristotle is not to be criticised for trying to attach an absolute necessity to 'No white thing is a man' which, being a contingency, it will not bear. He is seeking to do no such thing. But, supposing Patzig to be right that what is in question is relative rather than conditional necessity, if it were a fact (and as long as it were a fact) that no white thing is an animal, and given also the truth (as it happens, absolute necessity) of 'All men are animals', then the truth of 'No white thing is a man' would be something which the agent could do nothing about. It would be factually, or practically, necessary (though still absolutely contingent).[8] That factual necessity should play a role in logic need not occasion surprise: one of logic's most basic functions is, and always has been, as a tool for refuting opponents in real situations where the facts are as relevant as the formalities.[9]

[6] *An Pr* 30b31–40; see further *An Po* 94a21–7, 91b14–7.

[7] *Die Aristotelische Syllogistik*, ch.2.

[8] Hence, *pace* Patzig, *Die Aristotelische Syllogistik*, ch. 2., Aristotle's treatment of relative necessity does not, *per absurdum*, make available to him a disproof of *Barbara*, by finding terms A, B and C which would render the premisses true but the conclusion non-necessary (an easy enough task in the case of the assertoric syllogism). To disprove *Barbara* understood in the context of relative necessity, one would need to produce a conclusion which was non-*relatively* necessary in relation to its premisses (not, as Patzig supposes, non-absolutely necessary), i.e. a conclusion, the truth of which, assuming the premisses, was still negotiable for the agent.

The distinction to which Patzig has drawn attention between '*ἐξ ἀνάγκης ὑπάρχειν*' and '*ἀνάγκη ὑπάρχειν*' is obviously exemplified by *DI* 19a23–7, where the former phrase applies to absolute necessity, and the latter to some sort of hypothetical necessity. If Patzig were right in his contention that hypothetical necessity in the *Analytics* is to be construed as relative rather than conditional necessity, that would obviously be of significance for our understanding of *DI* 9. (Patzig himself makes the connection with *DI* 9, which he accordingly interprets as subscribing to '$Tp \rightarrow Lp$'.) But so far as I can see nothing in either part of the *Analytics* compels Patzig's reading; the relevant passages will equally bear an interpretation which construes necessity '*τίνων ὄντων*' as conditional necessity, and which accordingly construes Aristotle as working with one notion of necessity (absolute necessity) applied to two different kinds of linguistic item, namely individual sentences (of the form: A belongs to B), and sets of sentences constituting syllogisms (of the form: if ϕ then χ).[10] This objection has indeed been raised by a number of writers.[11] Not that the opposite interpretation is compelled either: there simply is nothing in Aristotle's text to disambiguate the language of hypothetical necessity. The mere fact that Aristotle places '*ἀνάγκη*' next to the conclusion rather than at

[9] Cf. Wieland, 'Zur Deutung der aristotelischen Logik', *Philosophische Rundschau* 14, 1966, 1–27, p.8 n.20.

[10] Cf. *An Pr* 34a22–4, *An Po* 53b12–24.

[11] Ackrill in his review of Patzig, *Mind* 71, 1962, 107–17, pp.109–110; Wieland in his review, 'Zur Deutung der aristotelischen Logik', pp.7–13. Perhaps we should say that the category of absolute necessity which Aristotle on this alternative interpretation should be conceived as deploying in fact splits into two sub-categories: metphysical necessity (attaching to definitions) and formal (i.e. structural) necessity (attaching to syllogisms): so Wieland, ibid., against Patzig (cf. Kneale, *DL*, pp.91–6). But both sorts of necessity arise in virtue of meaning, whether of the subject- and predicate-terms, or of the logical constants: the uniformity of the overall category is at least as impressive as the distinctness of the sub-categories. Seel (*DAM*, pp.216–7) and Wieland (ibid.) are both of the view that Patzig can be right to disambiguate 'necessity *τίνων ὄντων*' as relative rather than conditional necessity *only* if Aristotelian syllogisms have the form of arguments rather than conditional sentences, on the ground that the conclusion of a syllogism is not self-standing and so cannot attract the necessity operator in its own right. Whether Aristotelian syllogisms do have the form of arguments or of conditional sentences is an interpretive crux (Seel and Wieland take opposite stands on the question). But without becoming embroiled in this issue, we can simply observe that the point on which Seel and Wieland are agreed cannot be well taken: it would destroy the category of *necessitas consequentis*.

the beginning of the whole conditional does not constitute evidence that he understood it as indicating relative, rather than conditional, necessity. Patzig notes that necessity '*τίνων ὄντων*' is often expressed by Aristotle not by using '*ἀνάγκη*' but by using the future '*ὑπάρξει*'. For the future tense can express necessity (cf. #9). But this evidence is not conclusive either. Since there is no way of tensing the logical connectives themselves, we do not know whether the tensing of the verb in the conclusion in such a way as to express necessity is to be taken at face value (relative necessity), or is simply a device for strengthening the connective (conditional necessity).

I turn to physical contexts. Here Aristotle sometimes argues that in certain cases it is necessary that A come about (earlier), if B is to come about (later): for example, if there is to be a cutting, it is hypothetically necessary that saws be made of iron;[12] if there is to be a house, it is hypothetically necessary that there be foundations.[13] This type of necessity is often called *a fronte* necessity, and is to be contrasted with so-called *a tergo* necessity: if A comes about, then B will necessarily come about (simultaneously or later). In many passages, particularly in his biological works, Aristotle claims that a natural process comes about *both* for an end (i.e. by hypothetical *a fronte* necessity) *and*, as he puts it, of necessity (i.e. by hypothetical *a tergo* necessity, located in the matter).[14] How should we construe these hypothetical necessities – as conditional or as relative necessities? Aristotle's cryptic remark, in connection with the saw example, that the hypothetical necessity is actually *in* the matter (*ἐξ ὑποθέσεως δὴ τὸ ἀναγκαῖον ... ἐν γὰρ τῇι ὕληι τὸ ἀναγκαῖον*; *Phys* 200a13–14), meaning that the material – iron – is hypothetically necessary if the 'that for the sake of which' – the saw – is to come about, suggests that he understands teleological necessity as relative necessity.[15] That Aristotle does indeed intend talk of teleological hypothetical necessity to be disambiguated as relative necessity rather than conditional necessity is clear from the crucial discussion of *GC* 2.11.337b14–25:

[12] *Phys* 200a10–13; cf. *PA* 642a9–11.

[13] *GC* 337b14ff; *An Po* 95b32–6; *PA* 639b21–640a9; Bonitz 324a55–61.

[14] *GA* 738a33–b4, 739b26–30 (with Cooper, 'Hypothetical Necessity', p.160), 767b8–15, 776b31–4; cf. 734b37–735a3, *An Po* 94b27–37; *PA* 658b2–7, 663b12–14, 672a12–15, 694a5–b12. Cf. Cooper, p.165 n.10.

[15] So Williams in his commentary on *GC* at pp.202–3.

(1) *εἰ δὴ τὸ πρότερον ἀνάγκη γενέσθαι, εἰ τὸ ὕστερον ἔσται (οἷον εἰ οἰκία, θεμέλιον, εἰ δὲ τοῦτο, πηλόν), ἆρ' οὖν καὶ εἰ θεμέλιος γέγονεν, ἀνάγκη οἰκίαν γενέσθαι*; (2) *ἢ οὐκέτι, εἰ μὴ κἀκεῖνο ἀνάγκη γενέσθαι ἁπλῶς*; (3) *εἰ δὲ τοῦτο, ἀνάγκη καὶ θεμελίου γενομένου γενέσθαι οἰκίαν*· (4) *οὕτω γὰρ ἦν τὸ πρότερον ἔχον πρὸς τὸ ὕστερον, ὥστ' εἰ ἐκεῖνο ἔσται, ἀνάγκη ἐκεῖνο πρότερον*. (5) *εἰ τοίνυν ἀνάγκη γενέσθαι τὸ ὕστερον, καὶ τὸ πρότερον ἀνάγκη*· (6) *καὶ εἰ τὸ πρότερον, καὶ τὸ ὕστερον τοίνυν ἀνάγκη, ἀλλ' οὐ δι' ἐκεῖνο, ἀλλ' ὅτι ὑπέκειτο ἐξ ἀνάγκης ἐσόμενον*. (7) *ἐν οἷς ἄρα τὸ ὕστερον ἀνάγκη εἶναι, ἐν τούτοις ἀντιστρέφει, καὶ ἀεὶ τοῦ προτέρου γενομένου ἀνάγκη γενέσθαι τὸ ὕστερον*.

(1) Since the earlier necessarily comes to be if the later is to be[16] (for example, if a house, then foundations, and if these, then clay), is it therefore the case that if foundations have come to be, a house necessarily comes to be? (2) Or is this not so, unless it is necessary *simpliciter* that the latter[17] come to be? (3) But if this [=the coming to be of the house] is [necessary *simpliciter*], then it is necessary that if the foundations have come to be the house also come to be. (4) For this was the relation of the earlier to the later, so that if this [=the later] is to be, it is necessary that that [=the earlier] precede it. (5) If therefore the later necessarily comes to be, then so does the earlier necessarily [come to be], (6) and if the earlier [necessarily comes to be], then so too does the later necessarily [come to be], but not because of that [=the earlier] but because it was assumed that [the later] would come to be of necessity. (7) So in these cases where the later necessarily is, in such cases there is reciprocation [of the implication 'if the later, then the earlier'] and whenever the earlier has come to be the later necessarily comes to be.

The argument of this passage is somewhat obscurely expressed, but the point seems to be that *a tergo* hypothetical necessity does not attach to a sequence of two events (to take the simplest case) unless simple necessity attaches to the later event: unless the coming to be of a house is simply necessary, the existence of the house will not be hypothetically necessary given the existence of the foundations. In contradistinction, *a*

[16] I follow the standard practice of translating '*ἔσται*' in these contexts by 'is to be' (cf., e.g., Charlton's translation of *Phys* 2.9 in his *Aristotle's Physics I, II* (Oxford, 1970), Williams' of *GC* 2.11; cf. Cooper, 'Hypothetical Necessity', p.164 n.2). Aristotle has just argued (337a34–b13) that '*ἔσται*' imports necessity (cf. #9); but he could not have thought that a house 'will be' in any sense which imports necessity, for the coming to be of a house is a contingency: 337b30–4. Hence the tensing of '*ἔσται*' must simply indicate the *relative* temporal positions of the relevant events: the coming to be of the house is later than the coming to be of the foundations, and so, from the temporal point of view of the latter, is something which 'will be'.

[17] The reference of '*κἀκεῖνο*' to the house, rather than to the foundations, is secured by '*ἀλλ' ὅτι ὑπέκειτο ἐξ ἀνάγκης ἐσόμενον*' in (6). See Sharples, 'If What is Earlier, then of Necessity What is Later? Some Ancient Discussions of Aristotle, *De Generatione et Corruptione* 2.11', *BICS* 26, 1979, 27–44, p.41 n.80.

fronte hypothetical necessity may attach to such sequences, whether or not the earlier (or later) event is simply necessary.

The question now is this: what does Aristotle understand the form of hypothetical necessity (*a tergo* or *a fronte*) to be? Is it conditional or relative necessity? As usual, Aristotle attaches the modal operator in his hypothetical necessities ('*ἀνάγκη*') to the consequent. But in the above passage, and I think elsewhere in *GC* 2.11, it can be shown that '*ἀνάγκη*' is used in hypothetical contexts to qualify the consequent (or the antecedent) absolutely, not conditionally. Look first at (5)–(6). This sentence would not make sense if the initial '*ἀνάγκη*' in (5) were understood to attach to the whole conditional 'If the foundations have come to be, a house will come to be'. For, on that reading, '*εἰ τοίνυν ἀνάγκη γενέσθαι τὸ ὕστερον ...*' would mean: 'If the conditional '*p → q*' is necessary ...'. But that construal renders the first clause of (6) pleonastic. In (5)–(6), therefore, '*ἀνάγκη*' attaches exclusively to the antecedent (or, as the case may be, the consequent) of the conditional, not the conditional as a whole: it is a stylistic variant of '*ἐξ ἀνάγκης*', as that phrase functions in the same sentence. Working outwards from (5)–(6), we can say that in (7) '*ἀνάγκη*' in its first occurrence must attach absolutely to '*τὸ ὕστερον*', since the first clause of (7) is picking up and repeating the content of the final clause of (6), where '*ἐξ ἀνάγκης*' indisputably attaches absolutely to '*τὸ ἐσόμενον*' (since the '*ἀλλ' ὅτι ὑπέκειτο ...*' clause takes us back to '*κἀκεῖνο ἀνάγκη γενέσθαι ἁπλῶς*' of (2)). So in (5)–(7) '*ἀνάγκη*' in its occurrences attaches absolutely to its clause. Now we can work back. The adverb '*τοίνυν*' in (5) tells us that the occurrence of '*ἀνάγκη*' in (4) must also indicate relative necessity. The '*γὰρ*' in (4) performs the same function for the '*ἀνάγκη*' in (3) . But (3) tells us that the question posed in (1) (can there be hypothetical *a tergo* necessity?) may be answered affirmatively, as long as the proviso of (2) (that the consequent be independently necessary *simpliciter*) is met. Hence the occurrences of '*ἀνάγκη*' in (1) also indicate relative necessity.

Accordingly, starting from the occurrences of '*ἀνάγκη*' in (5), which must indicate relative, not conditional, necessity, we can work outwards and show that, in the whole passage, hypothetical necessity is to be construed as relative, not conditional, necessity.[18] The purport of the passage will then be this: whereas relative *a fronte* necessities are unexceptionable, relative *a tergo* necessities only obtain where the later event is independently necessary *simpliciter*. In the rest of the chapter, the words '*ἀναγκαῖον*', '*ἀνάγκη*' and '*ἐξ ἀνάγκης*' must be read as attaching absolutely to what they govern, and so as indicating relative necessity where they are attached to consequents of conditionals, if the chapter as a whole is to be consistent.[19]

Williams objects that Aristotle would not 'take the trouble to deny that there are truths of the form 'if the earlier, then necessarily the later' where these are understood as exemplifying the form '*p → Lq*'. No one would wish to assert this.'[20] As I have argued, Aristotle's position in *DI* 19a23ff is best represented not by '*p → Lp*' but by '*Tp → Lp*'. I accordingly carry this point over to the present context and suggest we formalise the position Aristotle is seeking to reject (except where '*q*' is independently necessary *simpliciter*) as '*Tp → Lq*': but I presume Williams' claim is unaffected by this detail. Since, as I have argued (#9), Aristotle subscribes to '*Tp → Lp*' not only at *DI* 19a23–7 but in a number of other passages, and since indeed Aristotle has just, in *GC* 337a34–b7, assumed that '*Tp → Lp*' holds for statements about the future, he would by no means regard it as a trivial matter to rule out cases of '*Tp → Lq*' in the present (or any other) context.[21] Williams further objects that such an interpretation loses any asymmetry between *a tergo* and *a fronte* conditional necessities. But it does not. Hypothetical *a fronte* necessities may (and do) obtain, whether or not the later event is absolutely necessary; hypothetical *a tergo* necessities only obtain where the later event is absolutely necessary. This asymmetry will obtain *however* we disambiguate the language of hypothetical necessity: it is no less available to the '*Tp → Lq*' reading than to the '*L* [*p → q*]' reading.

It is not to be supposed that Aristotle, while ruling out hypothetical *a tergo* necessities of the form '*Tp → Lq*' (except where '*q*' is independently absolutely necessary), is leaving open the possibility that

[18] Sharples in effect (his terminology is slightly different from mine) makes the suggestion that the hypothetical necessities in question *might* be relative necessities ('If What is Earlier ...', p.32: he credits the idea to G.E.R.Lloyd); but he does not go as far as asserting that they *must* be relative necessities.

[19] So too the occurrences of '*ἀνάγκη*' in the parallel discussion of *An Po* 2.12 at: 95b19, 20, 21, 27, 32, 33, 35; 96a3, 5.

[20] Commentary on *GC*, p.200.

[21] Indeed Williams' own interpretation of *GC* 337a34–b7 coheres with my own. It is remarkable that Williams appears to have forgotten his own interpretation of the immediately foregoing passage. The mystery is deepened by his subsequent acceptance (p.203) that Aristotle probably intends the phrase 'the necessary is in the matter' (*Phys* 200a14) to indicate relative rather than conditional necessity.

there may be hypothetical *a tergo* necessities of the form '$L\ [p \rightarrow q]$'.[22] Aristotle cannot be taken to be explicitly contemplating both forms of hypothetical necessity and making comparisons between them. Rather, whether either form of hypothetical necessity is to be found in Aristotle's works is precisely the question. Perhaps indeed both are; but if they are, Aristotle certainly shows no awareness of the fact. If, as here, he purports to disallow hypothetical necessity in some context, our task is to establish which sort of hypothetical necessity he has (must have) in mind; it will then certainly not be an option to suppose that he means to be saying anything at all about the other sort of hypothetical necessity.

It is a matter of dispute what role *a tergo* necessity plays in Aristotle's philosophy, and how he thought it could be reconciled with his teleology.[23] In spite of certain difficulties, there is good evidence that Aristotle did believe that *a tergo* necessities exist in nature.[24] As I have observed, in some contexts he favours a double explanation of natural phenomena in terms both of teleology and material necessity. In other contexts he suggests that material necessities operate at the level where teleology gives out: it is teleologically necessary that men have eyes, but eye-colour is determined by the nature of the materials case by case.[25] The difficulties include two passages in *PA* 1.1 (639b21–640a9 and 642a1–9), where Aristotle seems to restrict natural necessity to *a fronte* hypothetical necessity, and *Phys* 2.9, which in discussing hypothetical necessity in nature considers only cases of *a fronte* necessities, and rejects the suggestion that the end is necessary (200a13–4). But it is surely right to say that *a tergo* necessities are recognized by *Phys* 2.9: it is only because things have material natures from which *a tergo* necessities flow that *a fronte* necessities, subserving natural and human goals, can be constituted at all.[26] As we have seen, *GC* 2.11 (337b14ff) allows for hypothetical *a tergo* necessities where the necessitated item is *also* simply

[22] So, I take it, Sharples, 'If What is Earlier ...' p.32.

[23] See in general on this question Balme, 'Greek Science and Mechanism', *CQ* 33, 1939, 129–38; Sorabji, *NCB*, ch.9 (with further references to relevant literature); and Mansion, *JEA*, pp.78–89.

[24] See esp. *PA* 642a31–7 (and other passages listed in n.14 above); *An Po* 94b27–95a9 with Barnes, *Aristotle's Posterior Analytics* (Oxford, 1975), ad loc; *Met* E.3.

[25] *GA* 778a29–b19. Cf. *PA* 677a17–19.

[26] So Cooper, 'Hypothetical Necessity', pp.160–1. Cooper's article is an ingenious attempt to defend Aristotelian commitments to both material (*a tergo*) and teleological (*a fronte*) necessities. See further Sorabji, *NCB*, pp.150–2, for an attempt at making sense of some of the apparently contradictory strands here in Aristotle's thought.

necessary, but not, apparently, otherwise.[27] Aristotle's unwillingness (in *GC* 2.11, *Phys* 2.9 and the parallel discussion in *An Po* 2.12, which I examine below in #12) to acknowledge hypothetical *a tergo* necessities, except where the necessitated event is independently simply necessary – which in the case of something like housebuilding it will of course not be – must be influenced by the kind of example chosen, and in particular by the involvement of human deliberation in the production of artefacts such as houses and saws. The cases where Aristotle does allow *a tergo* necessity all seem to involve material necessities in the natural world. But deliberation cannot be integrated into the natural world.[28]

In view of the fact that in *GC* 2.11 it is said that the later event can only be hypothetically necessary (given the earlier) if it is independently simply necessary, it may be somewhat misleading to speak of hypothetical *a tergo* necessity, rather than simply of *a tergo* necessity. Cooper argues[29] that material necessities in nature (which are *a tergo* in form) are not to be conflated with hypothetical necessities (which are always teleological and *a fronte* in form), and Balme, retracting his earlier position, agrees.[30] But there is no difficulty here, just a difference of terminology. I am construing 'hypothetical necessity' broadly, so as to include *a tergo* necessity. Translated into my terminology, Cooper's warning comes out as a warning against conflation of hypothetical *a tergo* necessity with hypothetical *a fronte* necessity. Balme's mistake in his commentary (convincingly exposed by Sorabji)[31] was to construe material necessities as hypothetical *a fronte* necessities.[32] But the dualism of *a fronte/a tergo* is not reducible to any single category of hypothetical necessity. The crucial distinction in physical contexts is between the *a tergo* and the *a fronte*. So long as we are clear on this distinction, no harm is

[27] Cf. Sorabji, *NCB*, p.144, Seel, *DAM*, p.363ff.

[28] Cf. *An Po* 95a3–6.

[29] In his article 'Hypothetical Necessity'.

[30] The earlier position: *Aristotle's De Partibus Animalium I and De Generatione Animalium I* (Oxford, 1972), p.76ff; the later position: 'Teleology and Necessity', in Gotthelf and Lennox eds., *Philosophical Issues in Aristotle's Biology* (Cambridge, 1987), 275–285, at p.285.

[31] *NCB*, pp.149–50.

[32] But it should be noted that some of Balme's remarks were intended to stress the logical dependence of material necessities in nature on the existence of ends: see, e.g., *PA* 677a17–19; *DA* 434a31–2 (cf. his 'Greek Science and Mechanism', pp.134–6). In that derivative sense, material necessities indeed enjoy *a fronte* hypothetical necessity. But material necessity is not as such *a fronte* in form.

done by regarding them both as, at a higher level, species of the hypothetical.

The *a tergo* is not to be conflated with the *a fronte*, but perhaps necessities in nature, as well as being hypothetical in my broad sense, also exemplify simple necessity.[33] That this is *prima facie* a coherent possibility is indicated by the fact that at *GC* 337b14ff Aristotle allows at least the theoretical availability of a position according to which the second member of a two-stage causal series is both independently simply necessary and hypothetically necessary given the occurrence of the first member. (A parallel position was not, we saw, available in the case of conclusions of syllogisms.) Further, at *PA* 639b25 Aristotle implies that eternal things enjoy hypothetical as well as (*καὶ*) simple necessity. And in *DC* 1.2 the rotational movement of the heavenly bodies is accounted for by their possession of a fifth element which naturally moves in a circle. Now it would be a mistake to deny the status of simple necessity to material necessities on the ground that material necessities depend for their existence on the existence of ends in nature.[34] For the movement of the heavens is also goal-directed without thereby ceasing to be simply necessary.[35]

It is not an entirely straightforward matter to construe material necessities as simple necessities. The phrase used to introduce material necessities at *An Po* 94a21–2 – *τὸ τίνων ὄντων ἀνάγκη τοῦτ' εἶναι* ('that something should necessarily be so on such-and-such conditions'; cf. *Phys* 198b5–6) – is indicative rather of hypothetical necessity in my broad sense.[36] *An Po* 2.11.94b37ff makes a two-fold distinction between natural *a tergo* necessity (*κατὰ φύσιν καὶ τὴν ὁρμήν*, according to nature and impulse) and constraint (*βίαι ⟨καὶ⟩*[37] *παρὰ τὴν ὁρμήν*, by force ⟨and⟩ against impluse). This latter type of necessity recurs in *Met* Δ.5 in the context of a three-fold classification of necessity, where the other two varieties are hypothetical *a fronte* necessity and 'what cannot be

[33] That material necessities are simple is suggested by Cooper, 'Hypothetical Necessity', pp.165–6 n.12, in connection with *An Po* 2.11. Cf. Balme, 'Teleology and Necessity', p.285; Charlton, commentary on *Physics* 1 and 2, p.115ff. Efficient-causal necessities can be simple: *Phys* 198b5–6.

[34] So Balme in his commentary. pp.79–80.

[35] See here Kahn, 'The Place of the Prime Mover in Aristotle's Teleology', in Gotthelf ed., *Aristotle on Nature and Living Things*, 183–205.

[36] See here Balme, commentary on *PA*, pp.83–4.

[37] For this reading, see Barnes' commentary, p.67.

otherwise' (*τὸ μὴ ἐνδεχόμενον ἄλλως ἔχειν*). Necessity *κατὰ φύσιν καὶ τὴν ὁρμήν* certainly includes material necessity, as the examples in *An Po* 2.11 make clear (and cf. *PA* 642a34–5), and no doubt Cooper is right (following Ross)[38] to see a connection between this type of necessity and the necessity of what cannot be otherwise in *Met* Δ.5. Now this connection cannot amount to an identity, because the necessity of what cannot be otherwise includes the simple necessity of conclusions of syllogisms whose premisses are necessary,[39] whereas necessity *κατὰ φύσιν καὶ τὴν ὁρμήν* is obviously a variety of natural necessity. But the prospects for construing material necessity as a type of simple necessity are not thereby impaired, because the necessity of what cannot be otherwise is not to be identified with simple necessity, which is only a species of it. Indeed, as Aristotle makes clear in *Met* Δ.5, the other two types of necessity (hypothetical *a fronte* necessity and constraint) are themselves cases of 'what cannot be otherwise'.[40] So material necessity and simple necessity are both species of 'what cannot be otherwise'. They may therefore intersect with each other. Relevant here is *Phys* 2.9.

When we turn to this chapter we are immediately confronted with a serious difficulty in the first sentence, which takes the form of a question, to the answering of which the chapter as a whole is addressed: *τὸ δ' ἐξ ἀνάγκης πότερον ἐξ ὑποθέσεως ὑπάρχει ἢ καὶ ἁπλῶς*; (Does what happens of necessity obtain on a hypothesis or also absolutely?) The problem is the word '*καὶ*'. On the usual translation – 'also' – Aristotle and his opponents would be agreeing on the existence of hypothetical (including *a fronte*) necessities in nature, the dispute turning on whether there are *also* simple necessities. But that does not square with what is clearly going on in this part of the *Physics*. The dispute between Aristotle and the old physicists centres rather on the question whether nature exemplifies teleology. In the rest of the chapter, Aristotle argues that

[38] Commentary on the *Metaphysics*, vol.1, p.299.

[39] See here Kirwan's commentary ad loc.

[40] Hypothetical *a fronte* necessity is so in an admittedly somewhat perverse sense: Mansion, *JEA*, p.68. It follows, incidentally, that Cooper must be wrong ('Hypothetical Necessity', p.165 n.11) to take the reference in *PA* 642a5–6 to be to *Met* Δ.5: at *PA* 642a1ff hypothetical *a fronte* necessity is said not to intersect with either of 'the other two types of necessity', which cannot therefore include the necessity of what cannot be otherwise; they are more plausibly to be identified with the types of necessity introduced at *An Po* 2.11. Cf. Balme, commentary, p.100; 'Teleology and Necessity', p.285; Barnes, commentary, p.22; Sorabji, *NCB*, p.146 (who does not commit himself on the identification).

nature contains not merely material necessities, but also teleological necessities. Now it is by no means part of Aristotle's design to detrude material necessities from the *rerum natura*: on the contrary, the realisation of goals in nature and art indeed depends on the fact that things have a 'necessary nature' (*ἀναγκαίαν φύσιν*, 200a8–9).[41] That suggests that we should follow Cooper in rendering '*καὶ*' as 'in fact' rather than 'also'.[42] What we really want in place of '*καὶ*' is a word meaning 'only' or, better, that the occurrences of '*ἐξ ὑποθέσεως*' and '*ἁπλῶς*' be reversed. For, in allowing (as elsewhere) the presence in nature of things with a necessary nature, Aristotle does seem to be conceding to his opponents that simple necessities do exist in nature, but arguing that (in addition) teleological necessities exist in nature. *Phys* 2.9 thus constitutes evidence (if admittedly of a rather unsatisfactory kind) that Aristotle regarded material necessities as simple.

In any case, Aristotle must recognize the presence of simple necessities in the sublunary world. Wherever there is eternal cyclicality, there is simple necessity.[43] The recurrence of species is an obvious case in point (*GC* 338b14–9).[44] But then material necessities surely form components of processes which are simply necessary. Are they not therefore themselves simply necessary? Here the answer must be equivocal. No doubt Aristotle is committed to the simple necessity of *specific* material necessities.[45] But the *individuals* linked by chains of material necessity do not recur, so the individual material necessities are not cases of simple necessity.[46] It seems then that within the general category of material necessity we can distinguish one type (specific) which does overlap with the simply necessary, and another (individual) which does not. The latter type will then be (merely) hypothetical.

If the above is right, it follows that cases of hypothetical *a tergo* necessity which are not also simply necessary are to be construed as cases of relative rather than conditional necessity. For if an individual material necessity were conditionally necessary it would also be simply necessary. In general conditional necessity is distinct from simple necessity, but only because simple necessities can embrace contents which are non-complex in form. There can be no bar, however, to regarding a conditional necessity as the simple necessity of a conditional, so that material necessities – which are necessarily hypothetical in form[47] – would, if they were conditionally necessary, be simply necessary also. Hence to reject the simple necessity of individual material necessities in favour of their hypothetical necessity is to commit oneself to their *relative* necessity. I conclude that Aristotle's references both to hypothetical *a fronte* necessities, and to individual hypothetical *a tergo* necessities, are to be disambiguated as references to cases of relative necessity in the sense defined. That provides further support for my claim that *DI* 19a23–7 introduces a distinction between *relative* and absolute necessity, not between *conditional* and absolute necessity.

[41] On the correct interpretation of this phrase, see Cooper, 'Hypothetical Necessity', p.166 n.14, and in general on this point, p.161ff.

[42] 'Hypothetical Necessity', p.166 n.16.

[43] Note that the necessity of the eternally recurring but not always present (e.g. one of the seasons) cannot have the simple form '$\forall t \mathcal{A} t'$ $[L_t p_{t'}]$', if '*p*' is, say, 'It is Spring', but rather something like '$\forall t \mathcal{A} t'$ $[L_t [Fp \,\&\, Pp]_{t'}]$'.

[44] See here Cooper, 'Hypothetical Necessity and Natural Teleology', in Gotthelf and Lennox eds., *Philosophical Issues in Aristotle's Biology*, 243–274, #1; Mansion, *JEA*, p.88; further examples and texts are afforded by Sorabji, *NCB*, p.145, who distinguishes between recurrence in the realm of coming-to-be and in the realm of being, and shows that Aristotle recognizes simple necessity in both realms. Cf. [Alexander], *Quaestio* 2.5 with Sharples, 'Alexander of Aphrodisias: Problems about Possibility II', *BICS* 30, 1983, 99–110, who points to an apparent clash between the official Aristotelian position (that the cyclical recurrence of man *as species* is absolutely necessary) as endorsed by *Quaestio* 3.5, and the end of *Quaestio* 1.23 (37.9–13), which seems to express a restriction of this point. (But perhaps the author of this *quaestio* is reverting, in his claim that man exists *ἐξ ὑποθέσεως* not *ἁπλῶς*, to talk about *individual* men rather than the species, man. Cf. Sharples, *Alexander* of *Aphrodisias: Quaestiones 1.1-2-15* (London, 1992), pp.78–9 nn.237–8). Cf. also *Quaestio* 2.22.

[45] A consequence perhaps recognized with greater clarity by Aquinas than Aristotle. Mansion (*JEA*, p.87) quotes the following passage from his commentary on *An Po* 1.8: 'Quaedam enim non sunt semper secundum tempus, sunt autem semper per comparationem ad causam, quia nunquam deficit, quin posita tali causa, sequatur effectus.' *Quaestio* 3.35 is also clear about the contribution of matter to the recurrence of the seasons: see esp. 89.5–18 (the point there being that the involvement of matter makes that recurrence slightly less than regular).

[46] Cf. *GC* 338b16–18, *GA* 731b31–732a1, with Sorabji, *NCB*, pp.148–9 and Frede, 'Aristotle on the Limits of Determinism', pp.210–11.

[47] They are of the general form: if the conditions are such-and-such, then so-and-so will follow. For example, if the earthy material in birds courses upwards, it produces a hard or large beak; if it courses downwards, it produces either spurs on the legs or large, strong claws (*PA* 694a22ff).

11 From Truth to Necessity: Peripatetic Texts

Common to **AR** and **C** is the claim that 19a23–7 introduces relative rather than conditional necessity, as I have defined those terms. In the last two sections we have seen that this claim can adduce support from other Aristotelian texts. Before we turn to examine **C**, it is relevant to extend our consideration of relative necessity to some texts in the Peripatetic tradition bearing more or less closely on *DI* 9. I start with some passages in which Boethius distinguishes between simple and hypothetical necessity. The question which confronts us in interpreting these texts is again whether the distinction is between '$L\ [p \rightarrow p]$' and 'Lp' or between '$Tp \rightarrow Lp$' and '$\forall t \forall t' [L_t p_{t'}]$'.[1] Consider first a passage from *Consolatio* 5.pr.6, where Boethius deploys one of these distinctions in order to reconcile God's foreknowledge of human actions with the freedom of those actions: if God foreknows that p, then it is hypothetically, not absolutely, necessary that p. The relevant passage is the following:

> There are two kinds of necessity, the one simple (una simplex), such as that it is necessary that all men are mortal, the other conditional (altera condicionis), as for instance if you know that someone is walking, it is necessary that he walk (ut si aliquem ambulare scias, eum ambulare necesse est). For what one knows cannot be otherwise than as it is known (quod enim quisque novit, id esse aliter ac notum est nequit), but this condition in no way imports the simple variety of necessity. This [conditional] necessity is not constituted by its own nature but by the addition of a condition; for no necessity forces a man who is freely walking to walk, although it is necessary that he walk at the time when he is walking (quamvis eum tum cum graditur incedere necessarium sit). So, in the same way, if providence sees something in a present moment, it is necessary that that thing be, although it has no necessity of nature. Now God sees those future things which proceed from free will as present. Therefore these things, when referred to divine vision, become necessary on condition of divine knowledge; but considered in themselves they do not lose the complete freedom of their nature. (27–31)

[1] The suggestion of Patch ('Necessity in Boethius and the Neoplatonists', *Speculum* 10, 1935, 393–404, at p.402) that what is really in question in these Boethian texts is hypothetical *teleological* necessity is obviously mistaken.

Sorabji[2] and Fine[3] think that the distinction here being made is (in my notation) that between '$L\ [p \rightarrow p]$' and 'Lp'.[4] Knuuttila opts rather for the distinction between *necessarium temporale* (i.e. the necessity of the present) and *necessarium simplex* (i.e. absolute necessity),[5] which (given the argument of #8)[6] we can represent as the distinction between '$Tp \rightarrow Lp$' and '$\forall t \forall t' [L_t p_{t'}]$'. No doubt Knuuttila is thinking particularly of the phrase 'tum cum graditur'. But Boethius uses a purely conditional formulation in two other places in the above passage. In any case, even if 'cum' carries its temporal sense in that phrase, and not a vestigial conditional sense, the question remains whether the distinction is between '$L[p$ when $p]$' and 'Lp' or between 'When p, Lp' and '$\forall t \forall t' [L_t p_{t'}]$'. I find the passage, taken on its own, impossible to disambiguate

In a parallel passage in *De Syllogismo Hypothetico* Boethius draws a distinction between three types of necessity, including the necessity that Socrates be sitting while he is sitting. Once again we are confronted with the question: what sort of necessity attaches to Socrates' sitting *while* he is sitting? This passage too seems to me impossible, taken on its own, to disambiguate.[7] The matter is happily otherwise, however, with

[2] *NCB*, p.122 n.7.

[3] 'TN', n.24.

[4] Strictly speaking, the passage concerns knowledge rather than simple truth (Sharples, commentary, p.230). But the general structure of the rival interpretations is not affected by this point.

[5] 'Time and Modality in Scholasticism', in Knuuttila ed., *Reforging the Great Chain of Being* (Dordrecht, 1981), 163–257, pp.170–8. The terminology is drawn from Boethius, *In De Int.* 1.121.20ff. The gloss on the terminology (especially: *necessarium temporale* = necessity of the present) is Knuuttila's and is of course controversial as an interpretation of Boethius: but I shall shortly agree with Knuuttila that the commentaries are committed to the necessity of the present; that will provide a justification of the gloss.

[6] Note here especially Boethius, *In De Int* 2.210.14–211.15.

[7] 'Ea vero quae ex necessitate aliquid inesse designat tribus dicitur modis: uno quidem quo ei similis est propositioni quae inesse significat, ut cum dicimus, necesse est Socratem sedere, dum sedet. Haec enim eandem vim obtinet ei qui dicit, Socrates sedet. Alia vero necessitatis significatio, cum hoc modo proponimus, hominem necesse est cor habere dum est atque vivit: hoc enim significare videtur haec dictio, non quoniam tandiu necesse sit habere quandiu habet, sed quoniam eum necesse est tandiu habere quandiu fuerit ille qui habet. Alia vero necessitatis significatio est universalis et propria, quo absolute praedicat necessitatem, ut cum dicimus, necesse est Deum esse immortalem, nulla conditione determinationis opposita' (*PL* 64, 839D–840B). Again, even if it be insisted that 'dum' in the phrase 'dum sedet' must be temporal, not conditional (and the occurrences of 'tandiu ... quandiu' surely settle the matter for the second occurrence of 'dum' and therefore, plausibly, for the

Boethius' second commentary on *DI* 19a23–7 itself. Boethius discusses the distinction between simple and hypothetical necessity at length. I extract the relevant conclusion:

> Sed ista cum condicione quae proponitur necessitas non illam simplicem secum trahit (non enim quicumque sedet simpliciter eum sedere necesse est, sed cum adiectione ea quae est tunc cum sedet) ... non simpliciter ex necessitate sedet [Socrates], sed contingenter, potest enim surgere.
>
> The type of necessity which is put forward under a condition does not import the simple variety with it (for if anyone sits it is not necessary *simpliciter* that he sit, but only [necessary] with the addition which runs 'at the time when he is sitting')... It is not necessary *simpliciter* that Socrates sit, but contingent, for he can get up. (2.241.20–4; 243.4–6)[8]

Again, Sorabji and Fine claim that this passage makes a distinction between '$L\ [p \rightarrow p]$' and 'Lp',[9] Knuuttila that the distinction is between *necessarium temporale* and *necessarium simplex*, i.e. '$Tp \rightarrow Lp$' and '$\forall t \forall t' [L_t p_{t'}]$'.[10] But this time Knuuttila is surely right:[11] Socrates' sitting (at t) is not necessary *simpliciter* because he can (at t) stand *at another time* (*surgere*). Again, as in the case of *Met* Θ.3, there is no warrant for the supposition that Boethius is working with a statistical model of modality in this passage. As I have indicated, the statistical model entails the necessity of the present; but there is no reverse entailment.[12] I shall

first), the problem remains that we still have to choose between '$L\ [p$ while $p]/Lp$' and 'While p, $Lp/\forall t \forall t'\ [L_t p_{t'}]$'. Cf. also *In De Int* 2.206.8–23, where again it is unclear whether Boethius thinks of the semantic necessity in question as '$Tp \rightarrow Lp$' or as '$L\ [p \rightarrow p]$'.

[8] Cf. 1.122.1–7: 'Quando enim sedeo, non potest fieri ut non sedeam et necesse est mihi tunc sedere cum sedeo, sed ipsum sedere mihi non ex necessitate inest, possum enim surgere. Rursus cum non sedeo, tunc mihi necesse est non sedere, sed ipsum non sedere mihi ex necessitate non inest, possum enim sedere.'

[9] Ibid. Cf. Henry, *The Logic of St. Anselm* (Oxford, 1967), p.173ff.

[10] Ibid.

[11] *Pace* Sharples, 'Temporally Qualified Necessity and Impossibility', *Liverpool Classical Monthly* 3, 1978, 89–91, who assimilates the three Boethian passages to one another.

[12] Unclarity on this point – which threatens to upset the thesis which it is obviously my purpose here to lodge (namely that Boethius correctly interprets 19a23–7 *without* recourse to the statistical model) – vitiates Knuuttila's otherwise outstanding and definitive piece 'Time and Modality in Scholasticism'. (Cf. his 'Statistical Interpretations of Modality', p.87 n.8, where also Knuuttila cites the passages from Boethius' two commentaries which I have referred to, evidently under the impression that they contain a commitment to the statistical conception of modality.) But Knuuttila may be correct in his claim that, until Scotus, the statistical model often went hand in hand with the necessity of the present, and was not clearly distinguished from it.

address the question of the extent to which the statistical model is present in Boethius shortly, but first I wish to provide further evidence for the claim that Boethius subscribes to the necessity of the present.

The necessity of the present is clearly to be found in a passage in Boethius' second commentary on *DI* 9 where it is linked with the necessity of the past and both are contrasted with the openness of the future:

> According to Aristotle's view the contingent is whatever happens by chance, or occurs by somebody's free decision and proper will, or is what can by natural ability move in either of two ways, that is to say what can happen and not happen. So those things which belong to the past or the present have a definite and settled outcome (definitum et constitutum ... eventum). For what has happened cannot not have happened, and what happens now cannot not happen now, when it is happening. But in the case of future contingencies, something can happen and not happen. Having put forward three modes of contingency above,... let us append examples of each. If I left home yesterday and came across a friend whom I had in mind to seek out, but was not looking for at that moment, then it was possible, before I found him, not to find him, but when I found him or after I had found him, it was [lit. is] not possible not to have found him. Again, if I walked last night of my own accord into the countryside, before I did this it was possible for me not to set out, but after I had set out or when I set out it could not happen that what was being done was not being done, or that what had been done had not been done. Furthermore, it is possible that this cloak which I am wearing be cut up: if it was cut up yesterday, then when it was cut up or after it had been cut up it was not possible that it not be cut up or not have been cut up, but before it was cut up, it was possible that it not be cut up. (2.190.1–191.2)

Since, in the case of the past, the necessity of the *consequent* is clearly in question, and not the necessity of the *consequence*, i.e. '$TPp \rightarrow LPp$', not '$L\ [Pp \rightarrow Pp]$' – for adverting to the necessity of the consequence would yield no contrast with the future – we must say the same too of the present, i.e. what is here in question is '$Tp \rightarrow Lp$', not '$L\ [p \rightarrow p]$'. That relative (semantic) necessity, and not the necessity of a conditional, is in question is also clear from Boethius' discussion in the second commentary of 18a39ff:

> If a statement, uttered about anything, is true, it is necessary that the matter of which it treats be [that way]. For if someone says that snow is white, and if this is true, then the necessity of the thing follows upon the truth of the statement (veritatem propositionis sequitur necessitas rei) ... If some state of affairs obtains, it is true to say of it that it obtains, and if it does not obtain, it is true to say of it that it does not obtain. Hence ac-

> cording to the truth of the affirmation or the denial necessity follows the substance of the thing, and the necessity of things accompanies the necessity of statements (Ita secundum veritatem adfirmationis et negationis necessitas rei substantiam sequitur et rerum necessitas propositionum comitatur necessitatem). (2.206.9–13, 206.18–23. Cf. 221.1–4)

The passage from 2.190 also provides us with a convenient way of raising the question: to what extent do we find the statistical interpretation of modality in Boethius? I must justify my claim above that we should not interpret Boethius' commitment to the necessity of the present in statistical terms. Now there is no question but that the statistical interpretation of modality is present in both commentaries, particularly the first. Following Aristotle, Boethius identifies the necessary with what is always the case.[13] In his interpretation of 19a18–22, where we have already conceded that statistical ideas predominate, Boethius in his first commentary gives an explicitly statistical interpretation not only of necessity, but also of contingency.[14] In the second commentary, however, matters are more complicated. A statistical element is admittedly present: Boethius gives the standard example of grey hair usually but not universally accompanying old age (2.240.14–21). But his analysis is now complicated by the fact that, as we saw in the passage quoted above (2.190–1), he is now working with three types of contingency: chance, free will, and natural potentialities for opposites. In his remarks in the second commentary on 19a18–22 he gives an example of contingency drawn from the domain of free action:

> Of those things which can happen either way some hold themselves equally towards the affirmation and the denial, as for instance that I will read Virgil today and that I will not read him (lecturum me esse hodie Vergilium et non lecturum): for both [statements] are in both ways [i.e. are equally contingent]. That is what [Aristotle] means when he says 'Neither the affirmation nor the denial is more [true]'. For I can equally read Virgil now and I can not read him (Aequaliter enim et possum legere Vergilium nunc et possum non legere). (2.240.8–14)

What is striking here is the insertion of temporal indexing in two places (*hodie*, *nunc*).[15] We can see the significance of these qualifications, and

[13] E.g. 1.105.24–27, 2.243.13–16.

[14] 1.120.21–121.15. Cf. Knuuttila, 'Time and Modality in Scholasticism', p.177.

[15] Knuuttila ignores the time-indexing of many of Boethius' examples in his 'Time and Modality', pp.170–8; hence his excessive confidence in the adequacy of the statistical interpretation to Boethius. Cf. Mignucci, 'Truth and Modality in Late Antiquity: Boethius on Future Contingent Propositions', *Atti del Convegno Internazionale di Storia della Logica, Le teorie della modalità* (Bologna, 1989), 47–78, p.56 n.25 and pp.69–70.

banish the impression given by the latter part of this passage that Boethius is here rejecting the necessity of the present, if we compare another passage where Boethius is responding to Diodorean necessitarianism:

> Si enim mihi omnia nunc suppeditent ut Athenas eam, etiamsi non vadam, posse me tamen ire manifestum est; et cum iero potuisse non ire ... indubitandum est.
>
> If everything needful to go to Athens is now at my disposal, even if I do not go, it is nevertheless clear that I can go; and it is unquestionable that when I (shall) go, I was able not to go. (2.235.22–26)

This passage gives us the indexing of the modal operator: I have the ability, at *t*, to go to Athens or not to go to Athens. That we should also index the modalised sentence (I go to Athens) is clear not only from the previous passage (I can read Virgil today, or now), but also from a number of other passages in which the sentence is explicitly time-indexed, such as this from the first commentary:

> Potest enim fieri, ut hodie Alexander prandeat, et rursus potest fieri, ut hodie non prandeat.
>
> It can happen that Alexander dines today, and on the other hand it can happen that he does not dine today. (1.106.11–13)

This passage gives us the indexing of the modalised sentence: Alexander has the ability to dine at *t* and not to dine at *t*.[16] Putting the evidence together, we can say that Boethius construes contingency based on free will non-statistically, as a potentiality (at at time) for the realisation of opposites (at another time). Each opposite can be realised at the same time as the other opposite (although they cannot be realised simultaneously), but not both at the same time as the time of the potentiality (given the necessity of the present). The realisation of one opposite excludes the realisation of the other, which remains unrealised; we reject the Principle of Plenitude, and the associated statistical model of modality in respect of potentialities of this sort. In other words, Boethius accepts the following characterisation of free action, where '*p*' holds place for any proposition specifying a free action: there must be a time *t* such that

[16] Cf. 1.105.28–106.3; 2.188.2–10; 192.16–18.

$M_t p_{t'}$ & $M_t \neg p_{t'}$ where $t' > t$.[17]

Boethius' analysis of contingency based on natural potentialities of things for opposites also contains non-statistical as well as statistical elements:

> This piece of wood (lignum hoc) can be cut, but it none the less has an affinity for the opposite, for it can be not cut, and water can become warm, but nothing prevents it from being joined with cold. (2.236.22–26)

The water example is no doubt intended statistically: this is indeed confirmed by the following words.[18] But the example of *this* piece of wood cannot be intended statistically, because of the involvement of *particularity*.[19] We saw that Aristotle's own example of the cloak cannot be interpreted statistically because of the particularity of the example (if this cloak is cut up it cannot realise its potential to wear out); precisely the same point applies here. Indeed the passage occurs in Boethius' remarks on the cloak passage, and Boethius goes on to discuss Aristotle's own example (2.237.21ff). In the passage from 2.190–1 quoted above, Boethius' example of a thing with capacities for opposites was the familiar example of the cloak, and there too it is quite clear that the cloak's potential to be cut up or not is to be interpreted non-statistically.[20]

Finally, and somewhat remarkably, Boethius is even capable of interpreting contingency based on chance non-statistically. That emerges from the same quoted passage (2.190–1). Boethius' example of a chance event contains the authentically Aristotelian components that the chance event answered to a purpose that I had, but did not come

[17] Arguably, the full picture of double indexing is present in the following passage: 'Haec quidem quae utrumlibet vocamus talia sunt, quae cum nondum sunt facta et fieri possunt et non fieri, si autem facta sint, non fieri potuerunt, ut hodie me Vergilii librum legere, quod nondum feci, potest quidem non fieri, potest etiam fieri, quod si fecero, potui non facere' (2.207.18–23). Here it seems clear that the last three words are to be taken so: $potui_{t_1}$ $non\ facere_{t_2}$ (where t_2 = the time when I read Virgil). Obviously we have also: $potui_{t_1}$ $facere_{t_2}$.

[18] 'Quaecumque neque semper sunt neque semper non sunt, sed aliquotiens sunt, aliquotiens non sunt, ea per hoc ipsum quod sunt et non sunt habent aliquam ad contraria cognationem' (2.237.1–4).

[19] Cf. [Alexander of Aphrodisias], *Quaestio* 1.18, where the statistical sense seems not to be present: see especially 30.25–31.13, where the potentiality for opposites of *particular things* is in question.

[20] Cf. 2.197.18–23 ('this reed').

about purposively.[21] But Boethius now adds to this characterisation the point that before I met my friend it was possible for me not to meet him. This claim has no counterpart in Aristotle's account of chance. It must be reckoned to be a non-statistical consideration, in view of the fact that its wording is similar to that in the accounts of freedom: the claim is that it was *then* (when I set out) possible for me not to meet my friend (when I did); and obviously it was then possible for me to meet him when I did, since that is just what happened (cf. *DI* 19a12–16). So we have once more: $M_t p_{t'}$ & $M_t \neg p_{t'}$, where $t' > t$. In a context where one would most expect a purely statistical account of contingency, we find a non-statistical conception intruding. Indeed Boethius does not even trouble to mention here – though he would no doubt accept – that irregularity (or rather failure of guarantee of regularity) is a crucial feature of chance events.

In summary we can say that while it is undeniable that in some passages Boethius gives a statistical account of modality (particularly of necessity), and in other passages is simply confused as between statistical and non-statistical interpretations of modality,[22] there is, at least in the second commentary, a marked tendency to give an account of contingency in terms of a non-statistical potentiality for opposites as captured in the formula I have given.

Like Boethius, Ammonius includes a discussion of chance in his commentary with many authentic Aristotelian features (*In De Int* 142.1–143.6). But, unlike Boethius, his account seems to be purely statistical (and so closer to Aristotle's account). He divides events into those which happen for the most part, those which happen for the lesser part, and those which happen equally often either way. Chance is ranged in the second category. The contingent based on human choice is placed in the third category (143.1–6). There seems to be no role envisaged in Ammonius' discussion at this point for a non-statistical conception of

[21] Only the latter of these components is mentioned by Boethius when he defines chance later at 2.194.2ff. Cf. 2.203.5–7.

[22] An especially notorious case being the final remarks in the first commentary, 124.14–126.21. Boethius' talk of 'variabilis veritas' at 125.7 looks statistical; but in the very same line the insertion of 'semper' takes us from the variation of truth-values of *sentences* over time, to the evaluation of *statements* at times. But then we return to the statistical interpretation at 125.12. In many other passages Boethius simply juxtaposes statistical and non-statistical ways of thinking about contingency: see, e.g. 1.105.24–106.3; 2.188.2–14; 192.16–22; 236.22ff; 240.8–25.

contingency. Ammonius' treatment of the cloak, however, does implicitly employ a non-statistical conception of contingency,[23] as does his treatment of the sea battle example itself (154.21–4).

Ammonius' commentary on 19a23–7 can be disambiguated in the same way as could Boethius' commentary:

> *τὸ ἐξ ἀνάγκης καθέζεσθαί σε ἢ βαδίζειν, ἕως ἄν τι τούτων ὑπάρχηι σοι, ἀληθές, ἁπλῶς δὲ οὐκέτι· οὔτε γὰρ ἀεὶ βαδίζομεν ἢ καθεζόμεθα, οὔτε μὴν ἕως ἂν τοῦ εἶναι μετέχωμεν.*
>
> It is true that you sit or walk of necessity, as long as you are doing either, but not yet of necessity *simpliciter*. For we do not always walk or sit, not even as long as we partake of being. (153.24–6)

Although your sitting at *t* is inevitable *at t*, it is not inevitable *simpliciter* because we do not spend our lives sitting; you can stand at *another* time. The stress on the fact that we are not *always* sitting suggests that the necessity of the present is here embedded in a statistical context. I think that this is indeed the case.

It might be suggested that we should construe 'we do not always walk or sit' as 'we do not always walk or sit [in the same circumstances]', i.e. as positing liberty of indifference. Statistical irregularity in that sense would be sufficient for lack of causal determinism (although it would still provide no answer to the fatalist). But the suggested gloss is ruled out by Ammonius' examples of statistical (ir)regularity. His examples of regularity (153.15–19) are the movement of the sun and the equality of the angles of a triangle to two right angles; these regularities do not depend on relativisation to circumstances. Admittedly he gives two further examples which do require relativisation: the heat of fire and the animality of Socrates require relativisation to the existence of fire and of Socrates respectively. But relativisation to the existence of the subject does not consititute relativisation to *circumstances*. Further, and most importantly, his examples of irregularity include the eclipse of the sun by moon or cloud (153.22–3), which is a prime candidate for the status of a regularity once relativisation to circumstances is understood. Hence Ammonius must intend his examples of (ir)regularities to be taken absolutely, not relatively.

[23] 151.25–7: *πᾶσι μὲν οὖν τοῖς ἐνδεχομένοις τοῦτο ὑπάρχει τό δύνασθαι καὶ εἶναι καὶ μὴ εἶναι· ὥστε καὶ πρὸ τῆς ἐκβάσεως αὐτῶν ὑπάρξει αὐτοῖς τὸ δύνασθαι καὶ γενέσθαι καὶ μὴ γενέσθαι.*

At 154.29–31 Ammonius characterises future contingencies in the following terms:

> *το κατηγορούμενον ποτὲ μὲν ὑπάρχει τῶι ὑποκειμένωι ποτὲ δὲ οὐχ ὑπάρχει ...*
>
> What is predicated of the subject is sometimes present and is sometimes not present ...

At 154.35–7 he notes that Aristotle relates necessity to what is '*ἀεὶ ὄν*' and impossibility to '*ἀεὶ μὴ ὄν*' (cf. 153.14–19), evidently taking these relations to be equivalences. Finally, his gloss on Aristotle's '*οὐ μέντοι ἤδη ἀληθῆ ἢ ψευδῆ*' is:

> *οὔτε μέντοι τὸ ἀληθεῦον ἀεὶ ἀληθεῦον οὔτε τὸ ψευδόμενον ἀεὶ ψευδόμενον.*
>
> The [member of a **FCA**] which is true is not however always true, nor is the false [member] always false. (155.5)

Hence Ammonius combines the necessity of the present with the statistical model of modality. Ammonius' overall solution is, as I shall argue below (#12), non-statistical. His treatment of the examples of the cloak and the sea battle, involving as they do particularity, are non-statistical. But the close proximity of statistical language to these examples and to his solution indicate that Ammonius was, to a much greater extent than Boethius (at least in the second commentary), confused about the role of statistical considerations.[24]

Theophrastus' version of hypothetical necessity, reported by Alexander, is, taken in itself, ambiguous as between conditional and relative necessity:

> *ὅτε γὰρ ὑπάρχει, τότε οὐχ οἷόν τε μὴ ὑπάρχειν.*
>
> When it is present, at that time it cannot not be present. (Alexander, *In An Pr* 157.2)

As with Boethius' use of 'tum cum' in the passage from the *Consolatio*, there is nothing in the phrase itself to disambiguate '*ὅτε ... τότε*'. But the context disambiguates it, at least as far as Alexander's understanding of the phrase is concerned. For Alexander quotes Theophrastus in order to support an interpretation of *An Pr* 32a18–21 according to which the actual ('*τὸ ὑπάρχειν*') is necessary, as long as it is actual (156.26–29). On this interpretation, Aristotle would be defining

[24] Cf. Bosley, 'An Interpretation of *On Int* 9', n.8.

the contingent as that which, not being necessary (and hence not being actual either), can be assumed to be actual without impossibility resulting. So Alexander adduces Theophrastus in support of an interpretation which depends on the necessity of the present (or, generally, modality relative to the facts).[25]

A text where the statistical model and the necessity of the present seem both to be present is Alexander's *De Fato* 9. That the statistical model is present is clear from Alexander's characterisation of contingency as involving the possibility of *change* from one state to another:

> *ὁρῶμεν γοῦν τῶν ὄντων τὰ μέν τινα οὐδεμίαν ἔχοντα δύναμιν τῆς εἰς τὸ ἀντικείμενον τοῦ ἐν ὧι ἐστι μεταβολῆς, τὰ δ' οὐδὲν μᾶλλον αὐτῶν ἐν τῶι ἀντικειμένωι ἢ ἐν ὧι ἐστι εἶναι δυνάμενα.*
>
> We see that of the things that are some have no ability to *change* into the opposite state to the one they are in, while others of them are no more able to be in the opposite state than in the state in which they are. (175.16–18)[26]

There follow examples of fire and snow, incapable of receiving (respectively) cold and heat, and of water which 'even if it is cold, can *lose* (*ἀποβαλὸν*) this [property] and *take on* (*δέξασθαι*) the opposite property to this, heat' (175.20–1). The words I have emphasised indicate that the statistical model (and a *fortiori* the necessity of the present) is in question in both these passages.[27] As a further confirmation, Alexander adds the familiar thesis that a sitting man can stand, and supplements this with the further examples that a moving thing can rest and a speaking man can be silent. These examples must accordingly be interpreted as: a moving thing can *come to rest*; a speaking man can *fall silent* (176.22–30).[28]

Alexander does not unambiguously interpret contingency in terms of the statistical model in *De Fato* 9. Elsewhere in *De Fato*, he is aware that to combat necessitarianism about human action, more is required

[25] The passage is usefully discussed by Sharples, 'Alexander of Aphrodisias: Problems about Possibility I'. See further #22 n.9.

[26] Sharples rightly observes ('Aristotelian and Stoic Conceptions of Necessity', p.251 n.8) that '*ἧττον*' would make better sense that '*μᾶλλον*'; but the point is clear. He adds: 'Contrast 176.10' (which I quote below). I am not sure what the contrast is meant to be: the cases seem to me parallel.

[27] Cf. [Alexander], *mantissa* 184.13–27.

[28] Cf. *Top* 102b7, 128b20, and other passages collected by Sharples, 'Aristotelian and Stoic Conceptions of Necessity', p.249 n.5.

than contingency in the statistical sense: liberty of indifference is required (i.e. the possibility of different courses of action issuing from the same attendant circumstances).[29] The references, in the passages I have referred to, to *change* from one state to another, rule out the possibility that Alexander there has in mind liberty of indifference (or what one might more generally call 'contingency of indifference'). But elsewhere in ch.9 he does have contingency of indifference in mind.[30]

In fact the passages I referred to above in which the statistical meaning comes to the fore are flanked by passages which point unambiguously to a non-statistical refutation of determinism. While these passages do not force the necessity of the present on us, they are consistent with it. First, Alexander states that it would be absurd to extend necessity so far as to deny that someone can make a bodily movement

> *ἣν κίνησιν καὶ μὴ κινεῖσθαι τότε οἷόν τε ἦν, ἀλλὰ τὴν τυχοῦσαν τοῦ τραχήλου περιστροφὴν καὶ τὴν δακτύλου τινὸς ἔκστασιν καὶ τὸ ἐπᾶραι τὰ βλέφαρα ἤ τι τῶν τοιουτῶν προηγουμέμαις τισὶν αἰτίαις ἑπόμενον ἄλλως ὑφ' ἡμῶν μὴ δύνασθαι γίνεσθαί ποτε . . .*
>
> which he was also able not to make *at that time* (i.e. at the time when he made it), and [to say that] the slightest turning of the neck and stretching of a finger and raising of eyelids or any such thing follows upon certain antecedent[31] causes settled in advance, and can not be made by us to happen otherwise *at some particular time*... (175.10–13)

Here the crucial words are '*τότε*' and '*ποτε*', which I have emphasised. I interpret the first clause as indicating that the man in question was able-at-t to make-a-movement-at-t', and was equally able-at-t *not* to make-a-movement-at-t' ($t' > t$). The text would also bear being interpreted as rejecting the necessity of the present (i.e. letting $t = t'$). But that reading is not forced on us. What is clear is that the modalities in question are non-statistical. The point here is not that sometimes a man raises his eyelids and sometimes not; but that, at the very moment when he is able to raise his eyelids at some (other) time, he is at that same moment

[29] E.g. 185.7–186.3; 192.22–5. See Sharples, 'Aristotelian and Stoic Conceptions of Necessity', p.250, p.258 n.24; Donini, 'Stoici e Megarici nel *De Fato* di Alessandro di Afrodisia?', in Giannantoni ed., *Scuole socratiche minori e filosofia ellenistica* (Bologna, 1977), 174–94, p.185.

[30] And cf. *mantissa* 181.22–28, where fate seems to be located in the operation of deterministic causal sequences; Sharples, 'Aristotelian and Stoic Conceptions of Necessity', part IV.

[31] See my 'Alexander's Sea Battle', p.77 n.12.

also able not to raise them at that (other) time. Alexander's point is that the antecedent causes do not determine him one way or the other. There is a potential ambiguity in '*ποτε*': on a statistical reading, Alexander would be rejecting the suggestion that the eyelid-raiser is unable not to raise his eyelids at *any* time. This interpretation is rendered unlikely by the stress on antecedent causes, which must be particular (dateable) causes. For Alexander's opponents could hardly be arguing that because the raising of my eyelids is (now) caused, those causes operate to prevent me from lowering them at any other time. It is possible, however, that the potential ambiguity in '*ποτε*' eases the path to the statistical considerations in the immediately following passage. After those considerations have surfaced, in the passage I have already quoted (175.16ff), Alexander returns to a non-statistical stance in his confrontation with the determinist; probably at 176.1–4 (note the occurrences of '*ἦν*'), and certainly at 176.9–11:[32]

> *ἄτοπον γὰρ ὁμοίως ἐξ ἀνάγκης εἶναι λέγειν ἔν τινι τά τε ἀνεπίδεκτα τῶν ἐναντίων τούτοις ἐν οἷς ἐστι καὶ τὰ μηδὲν μᾶλλον καθ' ὁντινοῦν χρόνον τούτων ἢ τῶν ἐναντίων αὐτοῖς δεκτικά.*
>
> It would be strange to talk of 'being in a certain state of necessity' both in the case of things with cannot receive opposite states to those they are in, and in the case of things which are not able to receive, *at any particular time*, these [properties] any more than they are able to receive their opposites [sc. *at that time*].

The crucial phrase here is the emphasised '*καθ' ὁντινοῦν χρόνον*'. Were that phrase not present, the words would be capable of bearing a statistical meaning. But the insertion of the phrase indicates that Alexander has in mind the ability to receive opposites in respect of the same time, i.e. the ability, at t, to receive, at t', either of two opposite conditions. (Again, the passage does not rule out that $t = t'$, but nor does it force that equation on us.) I am in effect referring '*καθ' ὁντινοῦν χρόνον*' to t' rather than to t, i.e. to the time of exercise of the ability rather than to the time of its possession. On the alternative construal, relating the phrase to t (which would admittedly accommodate the statistical interpretation), the phrase would be otiose, and the argument lame: if the statistical interpretation were in play, the simplest way to rebut the claim that all things happen of necessity (=in the same way always)

[32] Cf. Sharples, 'Aristotelian and Stoic Conceptions of Necessity', p.252.

would be to point out that some things actually *do* happen sometimes in one way, sometimes in another (eyelids are sometimes raised, sometimes not); to claim instead that they are merely *capable* of opposite conditions would be to substitute a weaker point for a stronger one. The text makes much better sense if it is taken non-statistically.[33] The overall verdict on ch.9 must be that both statistical and non-statistical approaches to the problem of determinism are antinomically present.[34]

Alexander's partial reliance on a statistical conception of modality in his polemic against the Stoics in ch.9 is surprising in view of the fact that in ch.10 he rejects an argument, which he ascribes to his opponents, to the effect that tomorrow's sea battle is not necessary in a statistical sense (the sentence 'There will be a sea battle tomorrow' is not always true) and therefore not necessary in *any* sense. He counters, correctly, that tomorrow's sea battle can still be (logically) determined,

[33] A comparison with *Quaestio* 1.19, 32.21–30 might suggest that Alexander need only be speaking of potentiality for opposites as far as the nature of the thing is concerned (cf. Sharples, 'Aristotelian and Stoic Conceptions of Necessity', p.252 n.12), so that a thing might not have a potentiality for opposites when all the circumstances are taken into account. But there is no hint of this in the *De Fato* passage: it seems more likely that '*καθ' ὁντινοῦν χρόνον*' is meant to serve the same function as '*τότε*' at 175.10.

[34] I agree here with Sharples (Commentary, p.133; 'Aristotelian and Stoic Conceptions of Necessity') and Long ('Stoic Determinism in Alexander of Aphrodisias *De Fato* (i–xiv)', *AGPh* 52, 1970, 247–68, pp.252–4) against D.Frede ('Could Paris (Son of Priam) Have Chosen Otherwise?', *OSAP* 2, 1984, 279–92, p.283f). Frede does not notice the passages in ch.9 I have referred to, which show conclusively that the statistical interpretation of modality *is* present in that chapter. She is in general too optimistic about the prospects for a uniform non-statistical interpretation of Aristotle and Alexander. Although I believe that the non-statistical interpretation of *DI* 9 makes the best sense of that chapter, and (as I have argued in my 'Alexander's Sea Battle') the *only* sense of *De Fato* 10, it cannot be denied that statistical elements are present in both Aristotle and Alexander. (Frede's optimism extends to a mistaken claim (p.284) that Alexander observes the distinction of *GC* 2.11 between '*ἔσται*' and '*μέλλει*'; but in chs. 30–1 there is no such distinction to be sensed. On these chapters, see Appendix 2.) In view of the fact that *both* statistical and non-statistical considerations are confusedly present in ch.9, I find Donini's suggestion ('Stoici e Megarici') that Alexander's opponents in ch.9 are the Megarians attacked by Aristotle in *Met* Θ.3, rather than the Stoics, implausible, in spite of certain verbal similarities between *Met* Θ.3 and *De Fato* 9, noted by Donini. The conclusion sought by Alexander – that not everything happens by predetermined causes – is irrelevant against the Megarian rejection of change, even if, as Donini conjectures (pp.190–1), the Megarians took the impossibility of change to *entail* causal determinism; for if Alexander's response is to work, the entailment must be conceived to run in the opposite direction.

even if it is not necessary in a statistical sense.[35] If he was clear about the point in respect of logical determinism in ch.10, how is it that he is so confused about the case of causal determinism – where a precisely parallel move is called for – in ch.9? Perhaps Alexander is unwittingly influenced by the fact that, as I shall argue in #14, a confusion between statistical and non-statistical approaches to causal determinism is present in Aristotle's discussion of determinism in *Met* E.3.[36]

The confusion seems, indeed, to be endemic in the Peripatetic tradition. For example, in *Quaestio* 1.19 and 2.15, attributed to Alexander, where the topic is potentiality for opposites,[37] both statistical and non-statistical approaches are present. Sometimes it is envisaged that potentialities for opposites are realised successively or alternately;[38] at other times that a thing can, at t, enjoy potentialities for opposites in

[35] Sharples, 'Aristotelian and Stoic Conceptions of Necessity', pp.255–6. See my 'Alexander's Sea Battle'.

[36] White makes the suggestion ('Causes as Necessary Conditions: Aristotle, Alexander of Aphrodisias and J.L.Mackie', *Canadian Journal of Philosophy* Supp. vol.10, 1984, 157–189, p.177 n.36) that we can connect Alexander's two approaches to determinism in ch.9, and hence resolve the apparent antinomy, by adducing the Aristotelian principle that the consequent of an *a tergo* necessity must itself be absolutely necessary in a statistical sense (eternally recurring): *GC* 2.11. The suggestion is that, given this link, Alexander can legitimately argue against causal determinism by pointing, as he does, to variability in the cosmos. But the phenomena Alexander adduces are simply examples of *change*. As such, they are not inconsistent with eternal recurrence; for example, if man as a species is eternal (*GC* 338b7ff; *Quaestio* 3.5), sitting and standing will be as eternally recurrent as the cycle of the seasons is. So White's suggestion does not provide Alexander with the basis of a *modus tollens* argument.

[37] See in general on these texts Sharples, 'Alexander of Aphrodisias: Problems about Possibility I'.

[38] 32.23–4 (reading '*δὴ οὕτως ἔχειν*' as suggested by Bruns, rather than '*μὴ οὕτως ἔχειν*' of the MSS. (Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', says he agrees with '*δὴ*'; but he translates '*μὴ*'; so too in his *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.70)); 32.30–33.2 (note here especially '*πρῶτον*', 32.30); 33.12–18; 33.20–4 (note *προειληφέναι*; reading '*τὸ μὲν ἔχον τὸ δὲ ἔξον*' not '*ἐξόν*': see Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', n.131); 60.3–9 (note the occurrences of *μεταβάλλειν, ἀποβάλλειν, παρὰ μέρος* – the states are enjoyed 'in turns'); 60.25–8. The text of this last passage is problematic. Schwartz registers a lacuna in 27, but I do not think Sharples' conjectural supplement (*Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.118) can be right, since it conflicts with the immediately succeeding clause (27–8). It is preferable to follow Victorius' proposal to transpose the first '*δὲ*' in 28 so that it follows '*παρουσίας*' in 27, thereby closing the lacuna. In that case the author would be considering, and *not* necessarily rejecting (*pace* Sharples, ibid.), the view that matter does not have potentialities for opposites at a time, but only potentialities for opposites at different times (i.e. the statistical view).

respect of the *same* future moment t', i.e. $M_t p_{t'}$ & $M_t \neg p_{t'}$ where $t' > t$.[39] The necessity of the present is recognisably present in both *Quaestiones*: certainly in 1.19 at 33.12–18 (note the occurrences of '*μεταβάλλειν*'), and arguably also in 2.15 at 60.18–22:

> Opposites cannot belong to the same thing at the same time, but powers for opposites exist at the same time in the thing which can take them on, whenever somehow neither state is actualised in it. For when the wax tablet can take on the form of triangle, it can then also take on the form of circle. Before being in either of these shapes, it is no more able to *change* (*μεταβάλλειν*) into one of them [than into the other].

Again, the occurrence of '*μεταβάλλειν*' carries the implication that if a thing is in a certain state, it must undergo *change* if it is to realise its potential to be in a different state. But the passage raises a difficulty. The argument seems to be that a thing must already be in *none* of the states it can be in if it is to have the potential to be in *any* of them (the wax-tablet must not already be inscribed with a circle or triangle). The passage seems to rule out:

p_t & $M_t p_{t'}$ & $M_t \neg p_{t'}$ where $t' > t$.

But that conflicts with the clear acknowledgement elsewhere in both *Quaestiones* that possibilities may be alternatively realised: for that could only happen if 'p_t' was compossible with '$M_t \neg p_{t'}$'. The sticking-point is then probably not 'p_t & $M_t \neg p_{t'}$',[40] but rather 'p_t & $M_t p_{t'}$', which looks innocent enough, but seems to have generated opposition in the Peripatetic tradition. There is a passage in Alexander's commentary on *An Pr* where he objects to allowing that something which is in a certain state *can* be in that state (at a later date): *In An Pr* 161.3–26.[41] For, he argues, contingency requires that the contingent *not* be already actual: 'p_t & $M_t \neg p_{t'}$' and '$\neg p_t$ & $M_t p_{t'}$' are permitted combinations, but not 'p_t & $M_t p_{t'}$' or '$\neg p_t$ & $M_t \neg p_{t'}$' (161.3–12). Now contingency certainly

[39] 32.25–6; 33.6–10 (with Bruns' supplement; note the past tenses and cf. Sharples, *Alexander of Aphrodisias: Quaestiones 1.1-2-15*, p.71 n.208); 33.19–20; 60.14–15 (reading here, as Bruns suggests, '*ἢ εἰ δύναται, τοῦτο δυνήσεται τότε, ὅτε μὴ ἔχειν αὐτὸ δύναμιν ἕξει*': cf. Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', n.153); 60.18–22, 60.24–5.

[40] Boethius explicitly permits this: 2.233.26–234.2, and 2.234.6–7.

[41] On this passage, see Sharples, 'Alexander of Aphrodisias: Problems about Possibility I'. My interpretation is not in agreement with Sharples' on all points. But I am not entirely confident of my interpretation.

requires that the contingent thing not be actual in respect of *the time when* it is contingent;[42] but double-indexing precisely allows us to suppose that the time at which something is actual and in respect of which it is contingent can come apart. As long as we keep these two times clearly distinct, there is no difficulty in acknowledging that 'p_t' is compossible with both '$M_t p_{t'}$' and '$M_t \neg p_{t'}$'. Alexander's first solution to the problem is rather obscure, but it seems to depend on the necessity of the present (12–23).[43] His second solution *may* make precisely the needed point, that if it is not already true at t that '$p_{t'}$' or that '$\neg p_{t'}$' (where $t' > t$), then both possibilities remain open at t (23–6),[44] i.e.

$$[M_t p_{t'} \,\&\, M_t \neg p_{t'}] \rightarrow [\neg T_t p_{t'} \,\&\, \neg T_t \neg p_{t'}]$$

which is equivalent to

$$[T_t p_{t'} \vee T_t \neg p_{t'}] \rightarrow [L_t p_{t'} \vee L_t \neg p_{t'}].$$

So although *Quaestio* 2.15, 60.18–20 certainly raises a difficulty, I suggest that the most plausible solution to that difficulty (*via* Alexander) reinforces the commitment to the necessity of the present. At worst, the insistence that what has potentiality for opposites should, at the time when it has the potentiality, be in neither of the states for which it has the potentiality, goes too far: the insistence is irreconcilable with many of the standard examples of potentiality for opposities, e.g. that something may be seen or remain unseen (*DI* 21b12–17); that Dion may become literate or remain illiterate (*Quaestio* 1.18, 30.31–2). These examples concern potentiality for *contradictory* opposites; the insistence works only for potentiality for *contrary* opposites. But the important point for our purposes is that this erroneous insistence does not upset the commitment to the necessity of the present.[45]

[42] Cf. Alexander, *In An Pr* 156.11–157.10, discussed below in #22 n.9. But, as Sharples points out ('Alexander of Aphrodisias: Problems about Possibility I,' n.122), the present text seems to reject that point (161.13–18). But it does so only in one of the two solutions offered to the problem. Alexander may mean to reject the first solution in favour of the second.

[43] The sense is probably that whereas 'p_t' and '$M_t p_{t'}$' are not compossible, 'p_t' and '$M_t \neg p_{t'}$' are compossible. The solution envisaged, spelt out in full, is a reciprocal alternation between possibility and actuality of the following form: $[p_t \,\&\, M_t \neg p_{t'}] \,\&\, [\neg p_{t'} \,\&\, M_{t'} p_{t''}] \,\&\, [p_{t''} \,\&\, M_{t''} \neg p_{t'''}]$ etc. (For this kind of reciprocal change, see *Quaestio* 2.20 with Sharples, 'Alexander of Aphrodisias: Problems about Possibility II'.) But the solution is introduced in such a way as to presuppose the correctness of the thesis which posed the problem, i.e. that 'p_t' and '$M_t p_{t'}$', are incompossible. But in that case, assuming we have 'p_t' we will have '$M_t \neg p_{t'}$' but not '$M_t p_{t'}$'. But then when t' arrives '$\neg p_{t'}$' must be necessary at t' (since otherwise '$p_{t'}$' would previously have been possible).

[44] But Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', p.97, offers another interpretation: what is not yet in either of two *contrary* (as opposed to contradictory) states can come to be in either. If this were the solution envisaged by Alexander, it would lack generality. Many of the standard examples of potentialities for opposites concern *contradictory* states (see here *Quaestio* 1.18, where no such restriction as is envisaged in our passage is imposed on potentialities for opposites).

[45] Also relevant to the topics of this section is the discussion of *mantissa* XXII in Sharples, 'Responsibility, Chance and Not-Being (Alexander of Aphrodisias *mantissa* 169–172)', *BICS* 22, 1975, 37–64.

12 The Commentators' Interpretation of *De Interpretatione 9*

There has been some confusion in the literature relating to Ammonius' and Boethius' commentaries on *DI* 9 over the question whether their version of Aristotle's argument is closer to **AR** or to **R**. The reading they adopt is at least verbally distinct from both versions, and Boethius at one point distances himself from the Stoic understanding of Aristotle which resembled, at least in part, what I am calling **AR**. Ammonius and Boethius are followed in their interpretation by the Arabic commentators and most of the important medieval commentators (see Appendix 1). In this section I shall argue that while Boethius was right to suppose that his interpretation of Aristotle, which I call '**C**',[1] offers a genuine alternative to the Stoic interpretation of Aristotle, according to which Aristotle simply denied that **PB** applies to **FCS**s, it does not constitute a genuine, logically distinct, alternative to **AR**, which combines rejection of **PB** in respect of **FCS**s with preservation of unrestricted **LEM**. **C** is nevertheless *rhetorically* closer to Aristotle than **AR**, and so may claim to be the correct interpretation of *DI* 9. It has been suggested that **C** was developed as a response to those who attacked Aristotle as denying that **FCS**s have any truth-value at all;[2] but if so, I shall claim, **C** does no more than extract from *DI* 9 a position which is already implicitly there.[3]

According to **AR**, the members of a **FCA**, and the propositions which they express, do not *now* have truth-values; the propositions expressed (and the corresponding present-tensed statements) acquire appropriate truth-values when the relevant event occurs (or not). Now Boethius clearly rejects the view, which he ascribes to the Stoics, that Aristotle thought that the members have no truth-value at all.[4] Rather,

[1] Recall that the sense of '**C**' is fixed to the *particular* interpretation of Ammonius' and Boethius' interpretation of Aristotle which I offer in this section.

[2] Sharples, commentary on Alexander *De Fato*, p.12.

[3] *Pace* Łukasiewicz, 'Many-valued Systems of Logic', in McCall ed., *Polish Logic*, at p.64.

[4] *In De Int* 2.208.1ff. The Stoics regarded **PB** as universally valid, and accordingly embraced determinism: Cicero, *Academica Priora* 95, *De Fato* 20. According to Cicero, some Epicureans embraced the precise position favoured by **AR** (*De Fato* 37). Cicero seems to have been unaware of Aristotle's position. Cf. Donini, *Ethos*, ch.6. Since the Stoics accepted **PB**, they presumably drew no relevant distinction between **PB** and **LEM**: we may therefore take it that in supposing that Aristotle restricted **PB**, they also supposed that he restricted **LEM** (thereby in effect distinguishing their position from **AR**).

he claims, they have a truth-value, but not definitely (*definite*).[5] Ammonius likewise claims that the members are indeed true or false, not however definitely or determinately so (*ἀφωρισμένως*), but indefinitely or indeterminately (*ἀορίστως*).[6] There is some evidence that **C** represents the general Peripatetic position.[7] In what follows I shall mainly concentrate on Boethius' exposition of the position, since it is fuller; but we shall see that the crucial elements of **C** are to be found also in Ammonius.

In contrast to statements about the present or past, which are definitely true (false),[8] statements about the future are not. What does the claim that the members of a **FCA** are not definitely, or determinately,[9] true mean? A typical passage in which the interpretation is put forward is the following:

> Necesse est enim ut aut adfirmatio vera sit aut negatio, sed non ut definite quaelibet earum vera sit, altera falsa definite. Nam quod dicimus 'Alexander lavandus est',[10] id si alius neget dicatque 'Alexander lavandus non est', totum quidem hoc necesse est evenire, ut aut lavetur aut non lavetur, et necesse est unam esse veram, alteram falsam, aut affirmationem, si lotus

[5] E.g. *In De Int* 1.106.30; 2.191.5, 208.11ff, 245.9, 249.25–250.1.

[6] E.g. *In De Int* 130.20–6, 131.2–4, 138.13–17, 139.14–15, 154.34–155.3.

[7] I agree with Frede (*Seeschlacht*, p.26; 'Sea Battle', p.44), Kretzmann ('Boethius and the Truth about Tomorrow's Sea Battle', in De Rijk et al. ed., *Logos and Pragma* (Nijmegen, 1987), 63–97, at p.87) and Sharples ('Alexander of Aphrodisias, *De Fato*: some Parallels', *CQ* 28, 1978, 243–66, p.263), against Sorabji (*NCB*, p.92), that Simplicius (*In Cat* 406.6ff) regarded the Boethian position as Peripatetic.

[8] Boethius, 1.107.20–108.11, 2.188.30–189.19.

[9] Boethius generally uses the adverb 'definite'. But he does in one place (1.125.9) employ 'determinate', which became the standard expression in medieval discussions of the issue.

[10] On this curious use of the gerundive construction, which must mean 'Alexander will (but not necessarily) be bathed', see Becker-Freyseng, *Die Vorgeschichte des philosophischen Terminus 'contingens'. Eine Untersuchung über die Bedeutungen von 'contingere' bei Boethius und ihr Verhältnis zu den Aristotelischen Möglichkeitsbegriffen* (Heidelberg, 1938), p.30 n.64. Becker-Freyseng speculates that Boethius may be (mis)translating a Greek text which had '*μέλλειν*' at this point (cf. Ammonius, *In De Int* 139.6; Stephanus, *In De Int* (*CIAG* XVIII.3) 36.1f), and which Boethius wrongly takes to bear the sense 'sollen': this is a sense of '*μέλλειν*', but would not be its sense here. If Boethius' source did indeed have '*μέλλειν*', perhaps it misunderstood the occurrence of that verb at *DI* 18a33, just as Ammonius does (#9).

> fuerit, aut, si non lotus fuerit, negationem, sed non necesse est ut definite affirmatio vera sit, idcirco quod in huiusmodi rebus poterit evenire negatio. Sed nec umquam est definitum, ut negatio vera sit, falsa adfirmatio, idcirco quoniam potest non evenire negatio.
>
> It is necessary that either the affirmation or the denial be true, but not necessary that definitely one of these be true. For suppose we say 'Alexander is to be bathed', and someone else denies that and says 'Alexander is not to be bathed', it is necessary that this whole [disjunction] come about, namely that either Alexander be bathed or not be bathed, and it is necessary that one [disjunct] be true, and the other false, either the affirmation – if he will have been bathed – or the denial – if he will not have been bathed – but it is not necessary that definitely the affirmation be true, because in matters of this kind the denial can be realised. But nor is it ever definite that the denial is true, and the affirmation false, because the denial can fail to be realised. (1.106.30–107.12)

The problem with this passage, and many others like it, is that it is ambiguous. Two meanings suggest themselves. According to one interpretation, 'definite' is simply a variant of 'necessario'.[11] If that were right, Boethius' interpretation of Aristotle could be construed as coinciding with **R**: the above passage would insist that the disjuncts of a **FCD** are indeed bivalent, but that they (unlike the disjunction as a whole) lack a necessity-value.[12] Although it must be conceded that many passages in Boethius can be read in this way, I shall show shortly that not all can; so the interpretation must be rejected. Rather, we should assimilate Ammonius and Boethius to the Arabic and the majority of medieval interpreters, who read Aristotle as insisting that although **FCS**s are indeed in some sense either true or false, they are not one or the other determinately, i.e. it is not metaphysically determinate

[11] In his 'Truth and Necessity', Rescher makes this suggestion in respect of the Arabic commentators; there is no significant difference between the way they handle the qualification 'definitely' and the way Ammonius and Boethius handle it (*pace* Rescher, who takes Ammonius and Boethius to follow **AR**).

[12] This is Mignucci's interpretation of Boethius ('Truth and Modality'). He wishes to interpret Boethius as combining the 'simple' truth (falsity) of **FCS**s with their 'indefinite' truth (falsity), 'definite' truth being construed as 'inescapable' or 'unalterable' truth, and 'indefinite' truth as the contradictory notion (see especially pp.63–5). 'Indefinitely true' then means 'true but not necessarily true'. Mignucci stresses that on his view Boethius does not restrict **PB** (p.52) and rejects, on Boethius' behalf, the 'curious doctrine according to which a disjunction can be said to be true without its members being true or false' (p.68). Mignucci's interpretation has recently been supported by Knuuttila in his *Modalities in Medieval Philosophy*, pp.45–62.

whether this member of a **FCA** is true and that false, or *vice versa*.[13] Unlike its alternative, this interpretation can make sense of all the relevant passages.

This position gives the appearance of preserving **PB**, because it continues to be insisted that the disjuncts of a **FCD** are either true or false. But since it is not metaphysically possible to attach either truth-value to either disjunct, the disjunction 'either true or false' must be understood non-truth-functionally. From now on I shall, for convenience, hyphenate this phrase whenever the non-truth-functional reading of it is in question ('either-true-or-false'); the unhyphenated phrase I shall treat as ambiguous as between truth-functional and non-truth-functional readings; where a truth-functional sense is required I shall write 'either true, or alternatively false'. Then the position to be ascribed to the commentators in their interpretation of Aristotle is that the disjuncts of a **FCD** are either-true-or-false, but not either true, or alternatively false. This position is really just a variant of **AR**. There is no logical distinction between rejecting **PB** in respect of **FCS**s while preserving **LEM**, and preserving **PB** in the somewhat etiolated form favoured by the commentators, i.e. as claiming that every statement is either true, false or either-true-or-false (that is: either true, or alternatively false, or alternatively either-true-or-false). The former (anti-realist) policy has the effect of rendering the phrase 'either-true-or-false', as applied to **FCS**s, non-truth-functional anyway (assuming that negation is *choice* negation);[14] the latter policy, that of the commentators, achieves the appearance of distance from **AR** by (in effect) redefining **PB** (but I shall charitably continue to speak of them as extending or adapting **PB** rather than redefining it). The logical equivalence of the two versions does not, however, prevent them from being rhetorically distinct, and I shall argue in due course that Boethius is right to regard his version of the position as closer than the Stoic interpretation to Aristotle.

But first I must justify my claim that the above position is indeed Boethius' and Ammonius'. Unfortunately, we do not encounter as clear

[13] Cf. Frede, *Seeschlacht*, pp.24–7; 'Sea Battle', pp.42–5; Talanga, *Zukunftsurteile und Fatum*, pp.144–6; Talanga's review of Zimmermann, *Al-Farabi's Commentary and Short Treatise*, *AGPh* 68, 1986, 306–7, p.307.

[14] But recall that we are not forced by this strategy to regard *disjunction* as such as non-truth-functional (#8).

a statement in either writer of the above position as we later find in, say, Gregory of Rimini.[15] There are, however, three points which together render it certain that the interpretation I have ascribed to Ammonius and Boethius is indeed theirs.[16] The first point is the obvious one that Ammonius and Boethius would be unlikely to use 'definitely' at all, rather than 'necessarily', if 'necessarily' were the concept being aimed at. The use of 'definitely', frequently in very close proximity to 'necessarily', does at least create a presumption that the concepts are distinct.[17] Secondly, both '*ἀφωρισμένως*' and 'definite' are derived from verbs ('*ἀφορίζω*', 'definire') whose core sense lies in the area of 'delimit', 'mark off', 'distinguish', 'separate', 'make precise' etc.[18] Thirdly, and most importantly, there are passages in both commentators which have to be interpreted in the proposed way. These passages show that 'definite' does not have modal force but is a syntactic distributor of truth-values in the way indicated. I take Boethius first.

Sometimes Boethius expresses his interpretation using epistemic language: he will say that it is not known (*notum*) or certain (*certum*) which member of a **FCA** is true.[19] As he repeatedly makes clear, however, Boethius does not, in using this epistemic terminology, intend to lodge the epistemic claim that **FCS**s are true/false, but that we do not know which. For the claim is not merely that which member is true is unknown to us, but that it is, as Boethius puts it, unknown *to nature*, which must mean that it is simply metaphysically indeterminate which member is true.[20] Further, Boethius claims that it is not possible (i.e.

[15] An indication of this is that whereas Boethius is prepared to say that of the members of a **FCA** 'haec quidem vera, illa falsa, non tamen una ipsarum definite, sed quaelibet illa contingenter' (2.215.25–6), Gregory says, more precisely, that we have 'altera vera ... altera falsa', but not 'haec vera ... haec falsa' (see Appendix 1).

[16] I omit from consideration the fact that in the text as we have it Boethius sometimes omits 'definite' from places where, according to his official interpretation, it belongs. This is probably due to carelessness on Boethius' part or textual corruption. See, e.g., 1.117.16–17, 123.26; 2.217.2–3 (Boethius' translation of 18b29; cf. 219.28 and 220.24ff where (220.28) Boethius adds 'definite' in glossing the translation), 219.4, 220.6, 221.2f, 232.15 and especially 249.6–7. Cf. Sharples, 'Alexander of Aphrodisias *De Fato*: Some Parallels', p.264 n.216.

[17] See, e.g., Boethius, 2.200.18–24, 203.13–20; Ammonius, 139.12–17, 154.32–155.1.

[18] White suggests translating '*ἀφωρισμένως*' as 'separately': *Agency and Integrality* (Dordrecht, 1985), p.60.

[19] E.g. 2.184.22–5, 191.21–2, 200.11–18; and note the frequent labelling of the members of a **FCA** as *dubitabiles* (e.g. 1.125.11).

[20] See 2.192.3–15: a future contingent event is 'indefinitus ... et incertus, nec solum nobis ignorantibus, sed naturae.' Note here that Boethius bends the epistemic terminology to suit his metaphysical purpose: future contingent events are not like the number of the stars, which while *nobis ignoratum* is *naturae notissimum*. 'Known to nature' means 'metaphysically determinate'. See further 1.107.20–108.5; 2.193.6–21, 199.28, 200.25–201.2, 208.17–18; cf. Kretzmann, 'Boethius and the Truth about Tomorrow's Sea Battle', p.72; Frede, 'Sea Battle', p.45 n.27.

not metaphysically possible) to *divide* a **FCA** and call one member true and the other false.[21] This is the decisive point. For to claim that the members of a **FCA** are not divisible into a true one and a false one is to claim that they are not either true, or alternatively false, i.e. are not strictly speaking bivalent (which leaves open that they may be bivalent in the extended sense of being either-true-or-false).[22]

As an alternative to 'indefinitus' as a way of characterising future contingent events Boethius uses 'indiscretus',[23] which surely must have syntactic rather than modal force (similarly with other equivalents of 'definite' such as 'constitute'[24] and especially 'simpliciter'[25]), and in one place Boethius expands 'definite' with 'divise'.[26] In contrast to the stable and constituted nature of the present and past,[27] the contingent future is unstable[28] and liable to turn out either way.[29] When these pieces of evidence are put together, there can be no doubt that Boethius does indeed intend to offer the interpretation of Aristotle which I have ascribed to him. As we have seen, in both commentators there is an unfortunate tendency for statistical considerations to intrude into the

[21] E.g. 1.107.20–108.11, where Boethius claims that Aristotle distinguishes the future from the present/past, on the grounds that in the latter case an antiphasis 'in veritatem falsitatemque dividitur'; whereas in the case of a **FCA** 'totum quidem corpus contradictionis veritatem falsitatemque partitur, sed haec veritas atque falsitas indiscreta est atque volubilis. Nullus enim potest dicere quoniam affirmatio vera est'; 111.17–20: '[S]i in futurum omnis affirmatio vel negatio definite semper dividunt veritatem et falsitatem, erit rerum quae praedicuntur necessarius eventus et omnia ex necessitate contingent vel non contingent'; 123.16–22: 'In futuris vero propositionibus non idem est, in his scilicet quae contingentia significant. Ut si dicam Philoxenus cenaturus est, Philoxenus cenaturus non est, in tota quidem contradictione una vera est, altera falsa, sed nullus potest dividere, ut dicat aut adfirmationem constitute et definite veram esse aut negationem.' In the second commentary an especially clear passage is 245–6, quoted below.

[22] This indeterminacy is well expressed at 1.113.1–2: 'Nihil se magis sic habet vel sic non habet.'

[23] 1.108.4, 112.23; 2.246.14 (quoted below), 248.1.

[24] 1.123.20, 124.6, 20–4; 2.189–91 *passim*.

[25] 1.124.5 (quoted above, #5 n.30), 2.213.12.

[26] 1.126.7–8.

[27] 2.189.7, 190.7, 191.4–5.

[28] 1.108.2; 2.200.27, 214.9, 247.6–7.

[29] 2.191.7 ('in utramque partem vergere'), 213.25–8.

argument: Boethius will sometimes speak of variable[30] or mutable[31] truth-values of the members of a **FCA**, as if what was in question was the evaluation of sentences over time, rather than statements at a time.[32] But Boethius' examples correct this tendency: they are all time-indexed in such a way as to indicate that what is in question is the evaluation of statements at a time. One passage which includes most of the distinctive locutions of **C** – including the invasion of extraneous statistical considerations – is 2.245.3–246.15:

> [Things which are generated and corrupted] have an affinity for opposites, and so in their case it is not possible to take one part of a contradiction and assert that it necessarily (necessario) is, and on the other hand to contend that the other part necessarily (necessario) is not, although some one part (una quaelibet pars) is true, and the other false, but unknowably (incognite) and indefinitely (indefinite), and dubitably (dubitabilis) – not [merely] for us, but in virtue of the very nature of these things which are asserted, as for example in the sentence 'Socrates is going to read today – Socrates is not going to read today.' Of this whole contradiction, one [member] is indeed true and one false (for either he is going to read or he is not going to read), and this is visible confusedly (confuse) in the whole expression, but no one can divide (dividere) and say that it is true that he is going to read, or [divide and say] that it is certainly true that he is not going to read. This is not because we, the audience, do not know about the future, but because the same thing can both be and not be. Otherwise, if this situation resulted from our ignorance rather than from the variable (variabili) and indefinite (indefinito) outcome of the events themselves, the impossibility of necessity ordering everything would again ensue. For what will come about of necessity (ex necessitate) does not do so on account of our knowledge, but rather even if we were ignorant, the issue of some [such] event would still be settled (constitutus) and indubitable (indubitus): it would be necessary that that thing come about. So since this cannot be so, and there are some events which do not happen of necessity (ex necessitate), but contingently (contingenter), although in the case of such [events] truth or falsity is found in one or other part (in qualibet parte) of the whole contradiction, they are not found in such a way that someone could divide and say that this part is true and that false. [Aristotle] showed this with an example of the following sort: it is necessary that there will be a sea battle tomorrow or not, but it is not the case that [a sea battle] will happen tomorrow of necessity (ex necessitate), or not happen of necessity, in such a way that someone could divide and assert that it will happen tomorrow, so that he thereby speaks truly and it happens in a definite way (ex definito), or again [divide and assert] that it will not happen tomorrow, and things come about in the corresponding way. This cannot come about, but one or other part (quaecumque una pars) of the contradiction is true, and the other false, only indefinitely (tantum indefinite) – it is not definitely (definite) true or false which part will happen.[33] Their outcome is not distinguished (indiscretus): both the one and the other will be able to happen.

[30] E.g. 1.108.2, 123.23, 125.7, 126.20; 2.247.8–11.

[31] E.g. 1.120.22, 125.10, 126.19; 2.193.21, 208.16–17. These passages are sufficiently numerous to render it pointless to adopt the alternative reading '*incommunabiliter*' at 2.208.16–17 (mooted by Mignucci, 'Truth and Modality', p.69).

[32] I think we can dismiss the possibility that Boethius thinks of the truth-values as assigned, but changing up to the relevant time. Cf. Mignucci, 'Truth and Modality', p.68.

Boethius does indeed say twice in the above passage that the members of a **FCA** are not *necessarily* true, and once that if the future contingent event is settled (*constitutus*) and indubitable (*indubitatus*) – obvious variants of 'definitus' – then it is necessary. But these pronouncements should not be read in such a way as to accommodate **R**. In the context of a passage quoted earlier (2.190–1), where Boethius is arguing for the necessity of present and past, that necessity is clearly inferred from the fact that statements about the present and past are, like the events they record, *stabiles* and *definitae*, and those events are in turn conceived in the first instance as simply happening or having happened.[34] Truth entails definiteness, which in turn entails necessity. No gap is left for statements to be true, but not also necessary. Boethius does not make a distinction between the (mere) truth of **FCS**s – available without any implication to necessity – and the *definite* truth of **FCS**s (carrying such an implication). The definite truth (falsity) of the members of a **FCA** just is the truth (falsity) of either member taken separately. (But the proximity of these notions is such that Boethius can also reverse the direction of explanation and ground the 'definite and constituted event' of present or past in the necessity of present or past.)[35]

Further, there is here a serious dialectical problem for **R**. Not only do Ammonius and Boethius both, as we have seen, accept the necessity of the present and provide statements of the connection between the necessity of the present and the generalised inference from truth to

[33] Reading 'sed non definite vera vel falsa quae evenerit'; cf. Meiser ad loc.

[34] Cf. 2.189.5–20, 191.17–18.

[35] 2.190.6–10; cf. 1.123.8–16. At 2.244.16ff it is said that no one can divide a **FCA** and say that one member is *ex necessitate* true and the other *ex necessitate* false. Here the inference from truth to necessity has been built into the statement of the position. Cf. also 246.15–19.

necessity, they also both laboriously argue, on the fatalist's (and Aristotle's) behalf, for an inference from definite truth to necessity.[36] But if 'definitely' already means 'necessarily', as **R** proposes, why the argument? The interpretation makes no sense of the fact that the commentators plainly think there is some epistemic distance to traverse between definite truth and necessity. Of course the fatalist's argument works by refusing to find a *logical* distance between (definite/determinate) truth and necessity; but for an argument to be required, there must at least be some *epistemic* distance between them: the two terms cannot simply be synomymous.[37] Hence we should register the entailment from (definite) truth to necessity as a separate corollary in the dialectic. If we insisted on building 'necessarily' into the sense of 'definitely', we would have to build the fatalist's inference into its sense. But that would not cohere with the fact that Boethius feels the need to argue for the inference; nor would it in any case help **R**, for it would not *eo ipso* make available a conception of simple truth which fails to support such an inference.

Boethius speaks not only of definite truth (falsity), but also of indefinite truth (falsity),[38] and it might be thought that this is not compatible with the construal I have offered. But this is not so. Wherever Boethius refers to indefinite truth (falsity) the intended point, as the language of division makes clear (in particular the equivalence of 'definite' and 'divise'), is not that there are two varieties of truth – definite and indefinite – which would imply that *modalities* of truth are in question, but that definite truth just is (divided) truth,[39] and 'indefinitely true' means 'divides truth and falsity indefinitely with its negation'.[40] Indefinite truth is not a species of truth. If one wanted, while respecting this point, to admit the intelligibility of ascribing indefinite truth (falsity) to statements taken individually, i.e. not considered as members of contradictory pairs, one could do so provided one's ascription conformed to the following constraint: a statement is indefinitely true if and only if it is indefinitely false (it is not the case that a statement is indefinitely true so as not to be indefinitely false). That constraint just builds into the notion of indefinite truth (falsity) the essential point that what it is for a statement to be indefinitely true (false) is to divide truth and falsity with its negation.[41] The sheer phrase 'aut vera aut falsa' does not of course tell us whether it is to be read truth-functionally or non-truth-functionally. (It is worth emphasising this point since it is common to suppose otherwise.)[42] But the non-truth-functional interpretation makes better sense of Boethius' exposition as a whole.

[36] Boethius, 1.108.24ff, 109.24ff, 111.17–20, 28ff, 113.14ff, 114.9ff, 117.6ff, 118.3ff, 119.10ff, 126.14ff; 2.203.13ff, 206.9ff, 208.18ff, 209.23ff, 210.4ff, 221.1ff, 222.21ff, 225.1ff, 227.2ff, 228.23ff, 230.1ff. Boethius' commitment of Aristotle to the fatalist's inference comes out especially clearly at 2.204.8–12: 'Aristoteles vero sumens istam hypotheticam propositionem, si omne quod in futuro dicitur aut verum definite aut falsum est definite, omnia ex necessitate fieri et nihil casu nihil iudicio nihil possibilitate, ea convenienti ordine monstrat.' Cf. 210.14ff, 228.1ff, 229.18ff.; Ammonius, 140.17–21, 141.31–142.1, 143.6–26, 144.9–14, 146.17–22, 147.20–5, 148.5–12, 149.15–34 (especially 28–34).

[37] Abelard states that 'necessary' in *DI* 9 means 'unavoidable' not 'determinate'. His main argument is that if 'necessary' meant 'determinate' 19a23–7 would be false: what is so is (unconditionally) determinate. (*Glosses on DI* 9, in his *Logica Ingredientibus*, in Geyer ed., *Peter Abaelards Philosophische Schriften* (Münster, 1927) part 3, 437.35–438.17). But Abelard's interpretation of Aristotle seems to conform to **R** rather than **C**: see Appendix 1.

[38] See 1.115.5; 2.213.26–7, where 'utrisque secundum veritatem et falsitatem indefinitis' is expanded by 'aequaliter ad veritatem mendaciumque vergentibus'.

[39] Of particular importance is 'simpliciter' at 1.124.5; 2.213.12. This latter passage is misinterpreted by Mignucci, who ignores the force of this crucial word. Mignucci writes: 'If a truth-teller says that tomorrow there will be a sea battle, we can say that he is right only if we do not take his forecasting as implying that the event will take place necessarily' ('Truth and Modality', p.74). But the point Boethius makes at 213.12–15 is that in simply making the prediction that such-and-such will happen, one thereby predicts that it will happen necessarily: 'Quod si quis simpliciter id quod fortasse contingenter eveniet futurum esse praedixerit, ille rem contingentem necessarie futuram praedicit.' Boethius does not allow prediction of the simple truth of **FCS**s, compatibly with their contingency. (I return to Boethius' treatment of prediction, and to the special case of divine foreknowledge, below in this section.)

[40] Cf. Zimmermann, *Al-Farabi's Commentary and Short Treatise*, p.lxviii.

[41] Hence it is clear why I cannot accept Mignucci's claims that 'the indefinite distribution of the truth-values among '*p*' and '¬*p*' does not amount to an uneffected distribution... Truth and falsity are at any rate distributed... To have an indefinite truth-value implies having a [i.e. a *particular*] truth-value' ('Truth and Modality', p.51, my parenthesis). As the rest of Mignucci's paper makes clear, his view is that to have an indefinite truth-value implies having one of the two standard truth-values (but non-necessarily), so as not to have the other. So indefinitely true (false) statements are 'simply' true (false). Mignucci seeks to enlist Sharples ('Alexander of Aphrodisias *De Fato*: Some Parallels', pp.263–4) and Sorabji (*NCB*, pp.93–4) as allies for his position. But Sharples' position on the commentators, while not entirely clear in the above article, has subsequently been clarified (see *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.35 n.81) and coincides with the line I favour. Although Sorabji does not directly discuss the question of the sense of 'definitely', a remark on p.107, where he appears to draw a distinction between the truth of predictions and their definite truth, suggests that he does understand 'definitely' in the same way as Mignucci ('necessarily').

[42] See, e.g., Mignucci, 'Truth and Modality', p.68.

I turn now to Ammonius. In his remarks on 18a28ff Ammonius, following Aristotle, distinguishes various kinds of sentence in respect of whether such sentences always (*ἀεί*) divide[43] the true and false, as Ammonius puts it.[44] The location of the temporal quantifier in this phrase is crucial.[45] The question is not whether these types of sentence divide the always true and the always false, but whether they always divide the true and the false, i.e. whether all the *statements* they can be used to express divide the true and the false. It is clear from Ammonius' discussion that the meaning of the phrase 'divide the true and the false' is: one member (of an antiphasis constructed out of the relevant statements) takes the value true, the other taking the value false.[46] Hence we have fixed a sense for 'division' before the case of **FCS**s and the crucial qualification 'definitely' are introduced.

The qualification 'definitely' is introduced casually, in a way which indicates that it does no more than reinforce the notion of division. Ammonius has moved on to sentences about particulars:

> Aristotle says that statements about particulars concerning a necessary or impossible subject-matter in respect of every time[47] divide the true and the false definitely (*ὡρισμένως*). (130.2–5)

'Definitely' here simply stresses (in effect) that one member of an antiphasis of the relevant sort is true and the other false (and not *vice versa*). Ammonius further observes, in a passage which clearly demonstrates the meaning of 'division', that sentences about the present and past, even when contingent, conform to the same rule:

> In the case of a contingent subject-matter [Aristotle] denies that [statements] of all temporal sorts[48] behave in the same way with respect to division of the true and the false. For since in the case of the past and the present the event referred to in the statement has come about, it is clear which is the true one of the statements concerning particulars and which the false one. (130.9–14)

Ammonius then gives examples. His example of a present-tensed sentence is 'Socrates bathes', and of a past-tensed sentence 'Socrates bathed yesterday'. The insertion of the time-index here confirms that what is at issue is whether sentences always divide the true and the false, i.e. whether statements divide the true and the false, not whether sentences divide the always true and the always false: for the sentence 'Socrates bathed yesterday' is not either always true or always false (as Ammonius makes clear), but is always either true or false. Ammonius says that if Socrates bathes (bathed yesterday) then 'Socrates bathes (bathed yesterday)' will be true and its negation false. That is what is meant by the claim that these statements divide the true and the false. But with **FCS**s it is different.

In the following passage (130.20–6),[49] Aristotle, on Ammonius' interpretation, says that **FCS**s do divide the true and the false just as present- and past-tensed statements do (*διαιρεῖν μὲν καὶ οὕτως ... τό τε ἀληθὲς καὶ τὸ ψεῦδος*), that is: one member of the relevant antiphasis is true and the other false. But they do not divide the true and false in the same way (*οὐκέτι μέντοι ὁμοίως*). For unlike the case of statements about the present and the past, it is not possible to say definitely which member is true and which false (*οὐ γὰρ ἔτι ὡρισμένως ἔστιν εἰπεῖν ποτέρα μὲν αὐτῶν ἀληθεύσει ποτέρα δὲ ψεύσεται*).[50] That impossibility cannot be merely epistemic: Ammonius, like Boethius, has no interest in offering an epistemic reading of *DI* 9, although, unlike Boethius, he does not explicitly say so. (In any event, it is equally the case that in matters present and past we do not always know which member of an antiphasis is true.) Rather, the claim must be that it is *in principle* impossible to assign truth to one member of a **FCA** and falsity to the other: it is metaphysically indeterminate which way round the truth-values go. But Ammonius has just said that the members do divide the true and the false as do statements about the present and the past, Hence the position must be that **FCS**s divide the true and the false to the extent of being either-true-or-false, but not to the extent of being either true, or alternatively false. Hence the final clause of the above passage should not be taken to leave room for the contingent truth/falsity of **FCS**s, taken separately.[51] Rather, the reference to contingency

[43] Ammonius normally uses '*διαιρεῖν*'; but at 138.20 he also uses '*μερίζειν*.'
[44] 128.21ff; cf.138.17.
[45] 128.23, 129.10, 148.9.
[46] 129.5ff. Ammonius alternates between these two modes of expression, thereby bringing out their equivalence. Cf.130.9–14, quoted below.
[47] That is, whether they are about past, present or future: cf.128.26–9.
[48] See previous note.
[49] Cf.139.12–20, which repeats the main points of this passage.
[50] I do not think anything can be made of the future tenses of '*ἀληθεύσει*' and '*ψεύσεται*'. This is the 'will' of argument: it has already been used in connection with statements about the present and past (130.15, 17).
[51] Cf. 145.9–19, a passage which deals with prediction, and where the points made in n.39 above on Boethius' treatment of prediction apply. Taken on its own, this

here shows that the fatalist's inference from truth to necessity is worked into the argument: because future contingent events are still contingent (as Ammonius goes on to stress), **FCS**s cannot be true/false in the way present and past statements (which are non-contingent) are.[52]

With these points in place, we can disambiguate the final passage in which Ammonius presents his construal of Aristotle's solution:

> It is necessary that at all events (*πάντως*) there will be a sea battle tomorrow or not, but we cannot safely split off just one part of the antiphasis and declare that [a sea battle] will at all events (*πάντως*) be or will at all events (*πάντως*) not be. (154.32–4)

As in the context of Ammonius' report of the Mower Argument, which I discuss in Appendix 2, we should say that this passage does not on its own constrain a unique interpretation of the word '*πάντως*'. But given my rejection of an interpretation of Ammonius along the lines of **R**, we should probably take '*πάντως*' as meaning 'truly, really' rather than 'necessarily', hence as simply reinforcing, without modalising, its context, and register the fatalist's inference as a separate feature of the dialectic.

Ammonius is closely followed by the Anonymous commentator.[53] Anonymous is clear that the fatalist's inference is based on (simple) truth:

> When someone says that this particular [future event] will be, it is necessary, if he is to be speaking truly, that [the event] at all events (*πάντως*) ensue (or not, if he is to be speaking falsely). But if this is how it is, contingency is destroyed. (54.3–6)

passage could be read in the way favoured by **R**. But such an approach cannot be integrated into the rest of Ammonius' treatment of future contingency. Compare especially 149.28–34. (Similar remarks apply to the phrase '*δεκτικὰ ψεύδους τε καὶ ἀληθείας*' at 155.2–3: but the phrase should probably be read statistically in any case.)

[52] Cf.137.7, where '*ὡρισμένως*' and '*ἐξ ἀνάγκης*' are taken to be co-extensive. The Mower Argument follows (131.25ff). A question which I consider in Appendix 2 is whether '*πάντως*' in this argument means '*ὡρισμένως*' or '*ἐξ ἀνάγκης*'. The context, which allows for an epistemic but not a logical distinction between the two, does not settle the matter (cf. too 139.4, 145.10, 154.34, 154.37). Ammonius' subsequent rejection of the Mower Argument (131.32–132.7) would, taken on its own, admit of an interpretation along the lines of **R**, but such an interpretation conflicts with what we have seen Ammonius' view to be. The contingency of 'You will mow' consists in its not being definitely true or false that you will mow. Similar remarks apply to the interpretation of 136.11–15, 27–30, where the gods' knowledge of future contingencies is in question: '*ἢ τοῖον ἢ τοῖον*' at 136.29 should be interpreted non-truth-functionally. (This raises a difficulty for divine foreknowledge of contingencies: see below in this section.)

[53] Tarán, *Anonymous Commentary on Aristotle's De Interpretatione*, pp.53–67.

At one point, early in his commentary, he even seems to support **AR** (53.13–16), but this impression is corrected when he comes to comment on the third part of *DI* 9. 19a23–7 he understands as introducing the necessity of the present:

> Just as, [Aristotle] says, we say that what is (*τὸ ὄν*) is of necessity (*ἐξ ἀνάγκης*) whenever it is, so also we say that what is not is, of necessity, not whenever it is not. But, we say, it does not have to be the case that it is of necessity [sc. *simpliciter*] not : for it is possible for it to come to be at some [sc. *other*] time (*ἐγχωρεῖ γὰρ αὐτό ποτε γενέσθαι*). (65.1–4)

The little word '*ποτε*' is decisive here: what is not happening now can happen, but only at some other time.[54] Anonymous' interpretation of the solution indicates that he follows **C**:

> [Aristotle] wishes to say that the whole antiphasis necessarily divides the true and the false, but it is not necessary that one of the members be definitely (*ὡρισμένως*) true or false, but [it is] as it may chance, and it is not possible to say in the case of things that will be (*ἐπὶ τῶν ἐσομένων*) that the assertion is at all events (*πάντως*) true or the denial. (65.6–10)

Given Anonymous' acceptance of the fatalist's inference from simple truth to necessity, we should not construe '*ὡρισμένως*' here as 'necessarily', with a view to leaving room for **R**. '*πάντως*' we may take either modally (the fatalist's inference built into the dialectic; separate truth entails necessary truth), or non-modally (reinforcing '*ὡρισμένως*': the members of a **FCA** are not separately assertible): the second option yields the cleaner sense. The initial claim that a **FCA** does divide truth and falsity (for one or other member must be true) should then be read non-truth-functionally.

We have now fixed the meaning of **C**, and justified the claim that **C** captures the commentators' interpretation of Aristotle; it remains to justify it as an interpretation of Aristotle. The interpretation has no explicit anchorage in *DI* 9: Aristotle does not use '*ἀφωρισμένως*' or an equivalent at any point.[55] This is recognised by both commentators: on

[54] Cf. 64.14–17.

[55] Unless perhaps '*ἤδη*' at 19a39 is such an equivalent? (This is suggested by Becker, 'Bestreitet Aristoteles', p.73 n.3.) On '*ἤδη*' see n.71 below.

18b4 Ammonius argues that '*ἀφωρισμένως*' has to be understood;[56] Boethius makes a parallel point on 18a34.[57]

One passage which Boethius regards as justifying his line is 18b17–25. In recent times this part of the text has been argued to refute the anti-realist interpretation, on the grounds that it explicitly rules out a 'neither member true' view of **FCA**s.[58] Anti-realists have counter-attacked by pointing out that Aristotle immediately replaces his initial 'neither true' formulation with 'both false'. And the consequence which the whole passage is designed to brand as absurd – that a sea battle will neither take place nor not take place tomorrow – follows from the falsity of both members, not from their lacking (as yet) truth-values.[59]

In his first commentary, Boethius writes briefly but in a way which clearly rejects the anti-realist line: he regards 'neither true' as equivalent to 'both false'.[60] In his second commentary, he maintains that those who thought that Aristotle embraced a 'both false' solution would never have made that mistake if they had read the passage carefully, adding 'neque enim est idem dicere neutra vera est quod dicere neutra vera est definite' (It is not the same to say that neither [member] is true as to say that neither is true definitely) (215.16–21).

What point is he aiming at? In particular, who are those who thought that Aristotle was offering a 'both false' solution? I suggest that there can be only one answer: the Stoics.[61] Surely no one could possibly think that Aristotle was offering a 'both false' solution *expressis verbis*. Boethius must be attacking a 'neither true' solution which, as he has argued and argues again, *amounts to* a 'both false' solution. Now on Boethius' own showing elsewhere, as we have seen, the Stoics accused Aristotle of taking **FCS**s to be neither true nor false.[62] In effect Boethius is conflating the Stoic view of Aristotle (that **FCS**s are neither true nor false) with a view according to which both members of a **FCA** are

[56] 141.20.
[57] 1.108.23. Cf. 1.125.20, 2.204.24.
[58] See here Strang, 'Aristotle and the Sea Battle', p.452f.
[59] Frede, *Seeschlacht*, pp.87–9; Sorabji, *NCB*, p.95. Although Frede's interpretation is probably closer to **C** than to **AR**, she does not follow Boethius in his interpretation of *DI* 18b17ff.
[60] 1.115.14–21; cf. 2.214.27–8.
[61] *Pace* Sorabji (*NCB*, p.93), who considers the friends of 'both false' to be yet a third category of interpreters.
[62] 2.208.1ff.

false. The awkwardness of this conflation is somewhat mitigated by the tactic of representing the (as I conjecture) Stoic view of Aristotle as a 'neither member true' view (in accordance with Aristotle's text: *οὐδέτερον ἀληθές*). The further disjunct 'nor false' is quietly dropped from the characterisation of his opponents' position. But, in any case, for anyone who, like Boethius, finds truth-value gaps repugnant (at least that is his official line, although as we have seen he cannot strictly avoid them), the postulation of such gaps, or of a third truth-value, is likely to be heard in bivalent terms, the gap, or the third value, being assimilated to one of the two standard values. Boethius thus recognises no difference between a 'neither member true' and a 'both members false' solution.[63] He distinguishes 'neutra vera', which he interprets Aristotle as repudiating because it is equivalent to 'utraque falsa', from 'neutra vera definite', the interpretation of *DI* 9 which he favours. If Boethius is interpreting Aristotle correctly, anti-realists are wrong to explain away Aristotle's initial 'neither true' formulation as an incautious gesture towards 'both false'; rather it is its equivalent.[64] Ammonius agrees that the only alternative to the members of a **FCA** dividing the true and the false is (absurdly) that they are both true or both false. There is no room for a 'neither true nor false' option.[65]

Support for **C** can be derived from *Cat* 13a37–b35. There Aristotle considers the effect on the truth-values of various types of statement if a presupposition fails to be met, in particular if the referent of the main subject-term fails to exist. In the case of contraries ('Socrates is well' – 'Socrates is ill') he says that both contrary statements are *false* (*ἀμφότερα ψευδῆ*, 13b18) if Socrates fails to exist. He immediately justifies this claim (*γὰρ*, 13b18) on the grounds that neither 'Socrates is ill' nor

[63] 'Nec illud ... dici potuerit, quod contingentium propositionum neutra vera sit in futuro. Hoc autem nihil differt dicere quam si quis dicat utrasque esse falsas' (2.214.25–8). Cf. 2.216.7ff. Cicero agreed: *De Fato* 38. But Cicero took this to show that **FCS**s are either true, or alternatively false; Boethius merely that they are either-true-or-false.
[64] Boethius' interpretation is followed, if more cryptically, by Aquinas in his comments on the passage (*In Libros Perihermeneias* ed. Spiazzi (Turin, 1955), lectio XIII.12). Aquinas equates 'neither true' with 'both false' and suggests that Aristotle 'ostendit quod veritas non omnino deest in singularibus futuris utrique oppositorum.' So too Abelard in his glosses on *DI* 9 in part 3 of his *Logica Ingredientibus*, 433.23ff, 436.17ff. Cf. Wippel, 'Divine Knowledge, Divine Power and Human Freedom in Thomas Aquinas and Henry of Ghent', in Rudavsky ed., *Divine Omniscience and Omnipotence in Medieval Philosophy* (Dordrecht, 1985), 231–41, pp.213–41.
[65] 139.32–140.13, 145.29–146.5, 146.9–11.

'Socrates is well' is *true* if Socrates does not exist (13b18–19). Then he moves on to statements expressing possession and privation, e.g. 'Socrates is sighted' – 'Socrates is blind'. Here Aristotle first says that if Socrates does not exist, or does exist but is too young to be either blind or sighted, neither statement is true (13b21); but he immediately changes the locution and claims that both statements are *false* (*ψευδῆ ἀμφότερα*, 13b25, 26). It is plain in this passage that 'neither true' is just equivalent to 'both false'. Aristotle does not recognise a way of being not true distinct from being false.

In *Met* Γ.7–8 Aristotle rejects the Anaxagoran thesis that both members of an antiphasis (and so every statement) might be false. At one point, however, he expresses what is clearly the same thesis in the form 'No statement is true' (1012a31); he goes on to give as a parallel the claim that the diagonal might be commensurate with the side, which is a standard Aristotelian case of a falsehood. Here again, Aristotle seems to be prepared to go further and identify the claim that some (or all) statements are neither true nor false with the claim that they are false. Indeed the opponents' position, which Aristotle interprets throughout Γ.7–8 as the claim (in effect) that some (or all) statements are false, is presented as a claim that they are neither true nor false at 1011b28–9 and 1012a5–9.[66] This tactic might be seen as vindicating Boethius' treatment of the Stoic interpretation, as I have construed it. In general, there seems to be a willingness on the part of both Aristotle and Boethius to conflate 'neither member [of a **FCA**] true' with 'neither member true or false' and 'both members false'.[67]

[66] *Pace* Frede, *Seeschlacht*, p.79 n.14.

[67] Hence I cannot agree with Frede (*Seeschlacht*, pp.87–8; 'Sea Battle', p.57 n.41) that Aristotle keeps '*οὐδέτερον ἀληθές*' clearly separate from '*οὔτε ἀληθὴς οὔτε ψευδής*' or '*οὐδέτερον οὔτε ἀληθές οὔτε ψεῦδος*'. She cites *DI* 17a4 and *Cat* 13b6 as passages where the latter two expressions are (respectively) used, in order to suggest that Aristotle is familiar with the expression 'neither true nor false', so that the fact that he does not use it at *DI* 18b17 means that the expression which he uses instead must have a distinct meaning. But this argument fails. At *DI* 17a4 and *Cat* 13b6 Aristotle is talking about things which *are not assertions*: his point is that the categories 'true' and 'false' do not apply to such things, and he very naturally expresses this by saying that they are neither true nor false. Obviously, he would not regard this as tantamount to a claim that they are false. But *assertions* are different. Since, officially, he rejects truth-value gaps (on **C**), he is inclined, like Boethius, to hear 'not true' as equivalent to 'false', not only when it stands alone, but even in the phrase 'neither true nor false'.

C gains its most decisive support from the crucial passage in *DI* 9 in which Aristotle gives his solution to the problem: 19a36–b2. For convenience I give the text again (cf. #5).

> (1) *ἀνάγκη μὲν θάτερον μόριον τῆς ἀντιφάσεως ἀληθὲς εἶναι ἢ ψεῦδος*, (2) *οὐ μέντοι τόδε ἢ τόδε ἀλλ' ὁπότερ' ἔτυχεν*, (3) *καὶ μᾶλλον μὲν ἀληθῆ τὴν ἑτέρου*, (4) *οὐ μέντοι ἤδη ἀληθῆ ἢ ψευδῆ*. (5) *ὥστε δῆλον ὅτι οὐκ ἀνάγκη πάσης καταφάσεως καὶ ἀποφάσεως τῶν ἀντικειμένων τὴν μὲν ἀληθῆ τὴν δὲ ψευδῆ εἶναι.*

As Strang points out, this passage looks at first sight as if it is self-contradictory: (1) seems to say that it is necessary that each member be either true or false, (5) to deny just that.[68] Boethius argues that in (5) 'deest definite atque ideo subaudiendum est' ('The word 'definitely' is missing and should be understood', 1.125.20).[69] If we follow this lead, we can harmonise (1), (2), and (5). (1) and (2) state that within a **FCA** one member must be true and the other false, not however *this* one true and *that* one false; (5), on Boethius' view, simply reiterates (part of) this position. I have already noted that the locution '*τὴν μὲν ... τὴν δὲ*' is not as such equivalent to '*τόδε ἢ τόδε*'. But if we understand '*ἀφωρισμένως*' in (5), (5) does come to the same as the negative part of (1) and (2). That is, each member of a **FCA** is, in some sense, either true or false, but it is not possible to say that *this* member is true and *that* false (i.e. it is either-true-or-false). The non-equivalence, in general, of the two locutions '*τὴν μὲν ... τὴν δὲ*' and '*τόδε ἢ τόδε*' does not seem to me a significant objection to the commentators' view.[70] (4) will also be understood to contain an implicit 'definitely': each member of a **FCA** is not yet definitely (i.e. dividedly) true or false.

For the sake of clarity, let us set down how the commentators' line on (5) differs from the realist and statistical interpretations of it. On the latter two views, Aristotle does not restrict **PB**. **R** takes '*ἀνάγκη*' either narrowly or widely, in which latter case it construes '*τὴν μὲν ... τὴν δὲ*' as meaning '*this* one ... *that* one'. We have ruled against the narrow reading on the ground that it cannot cohere with a wide-scope reading of '*ἀνάγκη*' in (1); the wide construal we have excluded on the ground

[68] 'Aristotle and the Sea Battle', p.460. Becker despaired of resolving the apparent contradiction and proposed the excision of (5) ('Bestreitet Aristoteles'. Cf. Sorabji *NCB*, p.95). But that resort is unnecessary.

[69] Soo too the Anonymous Commentary on *DI*, 66.7–15. Cf. Ammonius, 141.20.

[70] There is an especially clear exposition of this way of harmonising (1), (2) and (5) in Gregory of Rimini's commentary on the *Sentences*, d.38.q.1: see Appendix 1.

that it does not in fact achieve what **R** seeks: for on **R**, it *is* necessary that of a **FCA** on any particular occasion of use one of the members (*this* one) be true and the other (*that* one) be false. **S** must understand an implicit 'always' qualifying each member, so that while on any particular occasion just one of the *statements* that a sea battle will take place tomorrow and that a sea battle will not take place tomorrow must be true and the other false ((1)), it is not *always* the case that the former of these members (taken now as a *sentence*) is true (false) and the latter false (true). But this way with (5) fails for the reason that it eliminates any distinction between future and present or past. In default of an alternative, that would leave **AR** in possession of the field.

However, it emerges now that **AR** cannot do justice to this passage. There are two ways in which (3) and (4) can be construed by **AR**. They can be read as claiming that at the time when the relevant event happens or fails to happen, (the proposition expressed by) one member of a **FCA** will be true *rather than* the other, but that it was not *already* true before those events happened (i.e. at a time when either member of the the **FCA** could, as such, be asserted). On that reading (3) and (4) relate to *different* times, (3) to the time of occurrence (or not) of the relevant event, (4) to the time of prediction. Alternatively, and preferably (given 19a18–22; cf. #5), (3) and (4) can be construed as relating to the same time if '*μᾶλλον ἀληθῆ*' at 19a38–9 is construed along the lines of 'more likely to be true'. On that interpretation, (3) says that one member of a **FCA** may be more likely to be true, but is not *thereby* true. The problem for **AR** comes over (1), (2) and (5). (1) and (2) surely require that *at the time when* it is necessary that each of the members of a **FCA** be true or false, at *that* time it is not the case that *this* one is true and *that* one false (or *vice versa*). But whichever time we relate (1) and (2) to – whether the time of prediction or the time of realisation – **AR** cannot make sense of this simultaneity. If we relate (1) and (2) to the time of prediction, (1) seems to claim just what **AR** denies – that (the propositions expressed by) **FCS**s are true or false in advance; if instead we relate them to the time of realisation, (2) is straightforwardly false. And the problem with which we started, namely the incipient contradiction between (1) and (5), remains unaddressed.

C makes much better sense of this passage. On this approach (1) says that the members of a **FCA** are indeed either-true-or-false, (2) that they are not (definitely) one or the other; (3) adds that one of the members is true rather than the other (or: one of the members is more likely to be true), but (4) confirms that it is not yet (or: thereby)[71] (definitely) true (or false). In (5), **C** again understands an implicit 'definitely' in each member – it is not necessarily the case that one member of a **FCA** is definitely true and the other definitely false – and so reconciles it with (1). Equivalently, we may say that **C** takes the implied disjunction in (1) non-truth-functionally, and the implied disjunction in (5) truth-functionally.[72] Aristotle can claim that **FCS**s do after all conform, in a sense, to **PB**, but not in the same way (*οὐχ ὁμοίως*) as statements about the present or past.

There is another passage in *DI* 9 which **C** can interpret better than its rivals. At the end of the fatalist's first argument Aristotle states the following conclusion:

> *οὐδεν ἄρα οὔτε ἔστιν οὔτε γίγνεται οὔτε ἀπὸ τύχης οὔθ' ὁπότερ' ἔτυχεν, οὐδ' ἔσται ἢ οὐκ ἔσται, ἀλλ' ἐξ ἀνάγκης ἅπαντα καὶ οὐχ ὁπότερ' ἔτυχεν.* (18b5–7)

The interpretation of the emphasised phrase has, as far as I know, been neglected by commentators. Does it belong with the previous clause or not? It has been assumed that Aristotle lists '*ἔσται*' and '*οὐκ ἔσται*', as if by afterthought, as two more things, alongside '*ἔστιν*' and '*γίγνεται*',

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[71] The fact that the commentators concentrate on the question of distribution of truth-values within a **FCA** does not mean that they ignore temporal considerations: they are quite clear that the truth-values are *not yet* distributed. See Boethius, 1.126.5–8 ('non tamen iam divise ac definite'), 2.191.18–22, 200.11–18, 207.17–23; Ammonius, 130.20–6, 143.24–6, 154.21–31. And note that Boethius translates '*ἤδη*', at 19a39 as 'iam'. It is true that 'iam' can, like '*ἤδη*', have logical rather than temporal force, but an examination of these passages shows that the commentators have a temporal point in mind in using words like 'iam', 'nondum', '*ἤδη*', '*οὐκέτι*' etc. (Cf. Anonymous Commentary, 59.16: '*ἤδη καὶ τότε*'.) **AR** and **C** are in any case committed to rejecting the statistical line on the linguistic items which 19a39 concerns: those cannot be (temporally indefinite) *sentences*. But if we translate '*ἤδη*' as 'already' or 'yet', the items in question cannot be statements either, as I have defined that notion, but must be propositions (or temporally definite sentences). For what *becomes* true with the advent of tomorrow is the proposition expressed (today) by 'There will be a sea battle tomorrow', not the statement (still less that sentence). (Cf. here Sorabji, *TCC*, p.51; Frede, *Seeschlacht*, pp.72–3.) It is surely unclear in Aristotle's text how '*ἤδη*' is to be understood, but as far as **AR** and **C** are concerned the question may be left unsettled, for although the meaning 'already' or 'yet' is incompatible with **R** and **S**, the meaning 'thereby', which these interpretations favour, is not incompatible with **AR** and **C**. (**AR**'s construal of 19a39 obviously does not envisage – and is not committed to – a *restriction* of the solution to more usual events (those keyed to **FCA**s where *μᾶλλον ἀληθῆ τὴν ἑτέραν*): the point is that *even* (not: only) in these cases, **PB** fails to hold (*pace* Whitaker, 'An Analysis of Aristotle's *De Interpretatione*', p.106).)

[72] An implicit 'definitely' must presumably also be understood at 18b29.

which succumb to the fatalist's argument, and which will consequently not turn out as chance has it. That is how Ackrill takes it:

> It follows that nothing either is or is happening, or will be or will not be, by chance or as chance has it, but everything of necessity and not as chance has it.[73]

But this interpretation is odd for two reasons. Firstly, '*ἔστιν*' and '*γίγνεται*' are surely meant to exhaust the field: nothing, in general, *happens* (is or comes to be) by chance (cf. 19a18–19). So the purported afterthought is otiose. Secondly, the interpretation introduces an imbalance: three positive verbs are followed by one negative one. **C** can offer a more plausible interpretation of the problematic phrase. Instead of taking it with the preceding clause, we may construe it as introducing a new point which draws obliquely on the solution to be offerred. On this line, the whole phrase '*ἔσται ἢ οὐκ ἔσται*' falls within the scope of '*οὐδὲ*', and is to be read non-truth-functionally. The point is that, if the fatalist is right, we will not be able to say of a contingency 'It will be or will not be', without being also committed to the truth now either of 'It will be', or alternatively of 'It will not be'. In other words, we will be forced to give the disjunctive phrase a truth-functional reading. Aristotle will want to occupy a position in which a sea battle merely *ἔσται-ἢ-οὐκ-ἔσται*, but the fatalist threatens to unseat him by insisting on the truth, and hence necessity, of either '*ἔσται*', or alternatively '*οὐκ ἔσται*'. A translation-cum-paraphrase of 18b5–7 could then run:

> Nothing therefore either is or comes to be either by chance or as it happens, nor is it the case that anything [merely] will-be-or-will-not-be, but rather everything will [determinately be, or alternatively determinately not be, and so] happen of necessity ...[74]

Frede's interpretation of 19a36ff in her studies of the Sea Battle problem is unfortunately unclear.[75] In defending the combination of

[73] Commentary, p.50; so too Boethius, *In De Int* 2.201.21–4.

[74] In his 1268 translation, William of Moerbeke has: 'Nichil ergo neque est neque fit a fortuna neque quodcumque contingit, non autem erit vel not erit, sed ex necessitate omnia ...' (*Aristoteles Latinus II.1–2: De Interpretatione vel Periermeneias*, eds. Verbeke and Minio-Paluello (Bruges/ Paris, 1965). William's method of translating Aristotle is to place a Latin equivalent for each Greek word in the same order as the original. One cannot therefore attribute to him a high degree of sensitivity to issues such as the present one. Nevertheless his version preserves Aristotle's sense here better than those of more intelligent translators.

[75] *Seeschlacht*, p.70ff; 'Sea Battle', p.75ff.

LEM with restricted **PB** against the criticisms of Quine[76] and Kneale[77] she writes: 'Weil nach dem Satz vom ausgeschlossenen Dritten nicht alle Sachverhalte 'schon immer' feststehen müssen, das Prinzip der Bivalenz dagegen das Feststehen der Wahrheitswerte fordert, kann Aristoteles einen Unterschied zwischen diesen beiden Prinzipien machen, solange es sich um kontingente Sachverhalte handelt.'[78] If 'feststehen' is supposed to have modal force, the statement of **PB** is incorrect; on the other hand, if it just means 'be determinate', then the statement of **LEM** is precisely what is in question in Quine's and Kneale's criticism of Arisotle: on their view, the truth of a disjunction is sufficient for the true/falsity of its disjuncts. But Frede's interpretation broadly coincides with mine: 'Das Prinzip der Bivalenz bleibt 'im Prinzip' ebenso bestehen wie der Satz vom ausgeschlossenen Dritten [$p \vee \neg p$], nur eine Entscheidung über Eintritt und Nichteintritt bzw. Wahrheit und Falschheit ist nicht möglich.'[79] 'Entscheidung' has unfortunate epistemic connotations, but the point is presumably a metaphysical one: no decision is (even in principle) possible, because the truth values are not determinately assigned between the disjuncts.[80]

[76] 'On a So-called Paradox'.

[77] *DL*, p.45ff.

[78] *Seeschlacht*, p.75.

[79] *Seeschlacht*, pp.71–2.

[80] Cf. *Seeschlacht*, p.71: 'Nach der Art, wie er sich ausdrückt, hat man den Eindruck, die Wahrheitswerte 'seien' in gewisser Hinsicht schon 'bei' den Aussagen und nur noch nicht verteilt.' Frede's interpretation is not clarified in 'Sea Battle' (p.75ff), where continuing confusion about **LEM** in particular (p.77, cf. *Seeschlacht*, pp.79–80) vitiates her statement of **C**. (Cf. von Fritz's review of *Seeschlacht*, p.248.)

The interpretation of *DI* 9 offered recently by Whitaker ('An Analysis of Aristotle's *De Interpretatione*', pp.96–112), while differing in terminology from mine, seems to me to be substantially the same. Whitaker interprets Aristotle as claiming that 'one member [of a **FCA**] is true and the other false, but we cannot say which is which' (p.111). That an epistemic indeterminacy is not intended by this incautious formulation is made clear by Whitaker's further gloss that 'it is not fixed which member of the pair is true and which is false' (ibid.), and '... if one were to pose the question 'Will there be a sea battle tomorrow?', it would not be the case that one answer was true, and the other false' (p.112). But if it is not fixed which member is true, how can it nevertheless be the case that one member *is* true? Whitaker does not address this question. As far as I can see, his position can only be rendered coherent if it is equated with **C**'s claim that the members of a **FCA** are either-true-or-false, but not either true, or alternatively false. Whitaker invites us to see *DI* 9 as containing an exception (the third exception: *DI* 7 and 8 present the first two exceptions) to the principle 'Of every contradictory pair, one member is true and the other false'. This principle is of course ambiguous as it stands, as between a reading which understands 'definitely' in appropriate places (the reading

C's appeal to the notion of definite, or determinate, truth, receives no explicit support from *DI* 9 itself: Aristotle does not use the word '*ἀφωρισμένως*' to qualify his thesis. But a number of other passages in Aristotle's writings can be adduced in the commentators' favour. At *Met* 1007b26–9 Aristotle claims, in the context of a dispute with Heracliteans, that '*τὸ γὰρ δυνάμει ὂν καὶ μὴ ἐντελεχείαι τὸ ἀόριστόν ἐστιν*' (that which is potentially and not in actuality is the indefinite). That seems to cohere well with the commentators' line: for in *DI* 9 future events have potentiality but not yet actuality (19b2–4), and Aristotle here explicitly labels that class of things *τὸ ἀόριστον* (the indefinite).[81] At *NE* 1112b8–9, Arisotle locates deliberation in the domains of the 'for the most part' (*ὡς ἐπὶ τὸ πολύ*) and the indeterminate (*ἀδιόριστον*). Since the products of deliberation constitute Aristotle's central case of contingency in *DI* 9, we have a further confirmation of the appropriateness of the commentators' terminology.[82]

C can be further supported from the discussion of privation and possession at *Cat* 12a27ff, where Aristotle seems to be appealing to the same considerations as move him in *DI* 9. The discussion is cast ontologically rather than linguistically, but given the general equivalence between the two modes of discourse (*DI* 19a32–3), any conclusions from one mode should be transferable to the other. The passage is worth considering in further detail.

Aristotle has already explained that some contraries have an intermediary state, others not (11b32ff). Of those which do not, things which naturally possess the contraries must (*ἀναγκαῖον*) be in either one of the contrary states or the other, e.g. numbers must be either odd or even (12b27–32). In the case of contraries with an intermediary, some things capable of receiving them need not be (*οὐδέποτε ... ἀνάγκη*) in either of the two contrary states: they can be in the intermediary state, e.g. a thing may be neither black nor white but grey (12b32–5). But in some cases one of the two contrary states admitting of an intermediary inheres naturally in some things, e.g. fire is hot. In such cases, one of the contraries definitely necessarily (*ἀφωρισμένως ἀναγκαῖον*, 12b39; cf. 13a2, 13a15) belongs to the thing; it is not as chance has it (*οὐχ ὁπότερον ἔτυχεν*, 12b39–40, 13a2–3).

But in the case of the contraries possession and privation, the situation is more complicated. On the one hand, a creature capable of receiving the contraries is not necessarily in either of the contrary states (13a4–5). For before a creature, of the sort which can be sighted, becomes either blind or sighted, it is not said to be either blind or sighted (13a5–6); so the blind/sighted dichotomy is not one of those pairs of contraries without an intermediary, i.e. it is not always applicable even to those creatures who can receive these contraries (13a6–7); but that does not mean that such a creature has some third characteristic between blindness and sightedness (13a8); for it is necessary (*ἀναγκαῖον*) that it *at some time* (*ποτέ*) be one or the other (13a8–9); when the time comes (*ἤδη*) for its capability to be activated, *at that time* (*τότε*) it will be said (sc. correctly) to be blind, or alternatively sighted (13a9–10); neither of these two possibilities is definitely (*ἀφωρισμένως*) going to be realised, but it will turn out as chance has it (13a11); for the creature is not necessarily (*ἀναγκαῖον*) either blind or sighted, but it will be as chance has it (13a12–13).[83]

The argument has placed great stress on temporality: the creature can be said to be blind (or sighted) *only when* its capacity to be one or the other gets activated. That might suggest that the force of '*ἀφωρισμένως*' is also temporal: but while the text makes sense with that gloss, there is a better way of reading the word.[84] I suggest that '*ἀφωρισμένως*' functions here syntactically: it serves to indicate *distribution* of truth-values within a disjunction. The truth-values are already *there* in the disjunction, but not yet distributed. We can again make the needed distinctions by means of hyphenation to indicate non-truth-functionality. The creature is either-going-to-be-blind-or-going-to-be-sighted, but it is not either going to be blind, or alternatively going to be

apparently adopted by Whitaker himself), and one which does not. In terms of this principle, the solution is that while it is not the case that of every contradictory pair one member is *definitely* (i.e. separately) true and the other *definitely* (i.e. separately) false, it is the case that of every contradictory pair one-member-is-true-and-the-other-false (i.e. [this one true and that one false]-or-[that one true and this one false]). The language of **C** is just what is needed to bring out the acceptable and unacceptable versions of Whitaker's principle.

[81] See further Frede, *Seeschlacht*, p.79; 'Sea Battle', pp.82–3. Cf. *An Pr* 32b10–13, *Met* 1039b27–1040a8 (but there is an admixture of statistical considerations here).

[82] Cf. Donini, *Ethos*, ch.3.

[83] The future tenses in my rendering of 11–13 are mine; but they are necessary for the sense. At the time when the creature is blind or sighted, it is definitely (and necessarily, given the necessity of the present) one or the other.

[84] Better because, given that temporal language is so prominent at this point, Aristotle would presumably have been unlikely to introduce a different word if he had meant to be making the same temporal point.

sighted. That in turn implies that the '*ἀναγκαῖον*'-clause of the last step (13a12) must also be understood as containing an implicit 'definitely',[85] for Aristotle has expressly stated (13a8) that the creature is not in some third state before the capacity is activated, so that the description 'either-going-to-be-blind-or-going-to-be-sighted' must indeed apply to it, and it must be wrong to say (as an anti-realist would) that the descriptions 'going to be blind' and 'going to be sighted' fail, as yet, to apply to the creature *tout court* (then it would be in a third state).

Of course the simple descriptions 'blind' and 'sighted' do not apply at this earlier stage. That is why Aristotle later says that the statements 'Socrates is blind' and 'Socrates is sighted' are both false before Socrates is such as to be naturally one or the other (*Cat* 13b24–5). But that is compatible with the position – which I take *Cat* 13a to defend – that the descriptions 'going to be blind' and 'going to be sighted' do in some way apply in advance. The difficulty of making this phrase 'in some way' precise leads Aristotle at this point into his awkward claim that in one sense there is nothing 'between' the descriptions, and in another sense there is (13a6–8). The inclusion of '*ἀφωρισμένως*' at 13a11 is another attempt at expressing this precarious insight: a creature at the relevant stage is either-going-to-be-blind-or-going-to-be-sighted, but not *ἀφωρισμένως θάτερον*, i.e. either going to be blind, or alternatively going to be sighted. On my interpretation, there is an exact correspondence between *Cat* 13a11 and *DI* 19a37–8 (= (2) above): *καὶ τούτων οὐκ ἀφωρισμένως θάτερον, ἀλλ' ὁπότερον ἔτυχεν = οὐ μέντοι τόδε ἢ τόδε ἀλλ' ὁπότερ' ἔτυχεν*. The word '*ἀφωρισμένως*', explicitly stated in the former passage, needs to be understood in the first clause of the latter.

The only alternative I can think of to this construal of *Cat* 12b27ff seems unattractive. We could treat '*ἀφωρισμένως*' simply as a variant of '*ἀναγκαῖον*'. But the fact that Aristotle deploys both terms in this passage of careful distinctions suggests that they are distinct in meaning. In particular, at 12b39 he employs the terms together:

> *ἐπὶ δὲ τούτων ἀφωρισμένως ἀναγκαῖον θάτερον ὑπάρχειν, καὶ οὐχ ὁπότερον ἔτυχεν.*
>
> In the case of these [i.e. contraries with an intermediary but where one contrary belongs naturally to a thing, e.g. heat to fire] it is necessary that each [contrary] should belong definitely, and it is not as chance has it. (*Cat* 12b38–40)

[85] So too at 13a4–5. That is, unless we give '*ἀναγκαῖον*' narrow scope. But in no other occurrence in the passage under discussion does '*ἀναγκαῖον*' have narrow scope in disjunction. In particular, in the immediately following 13a14 it has wide scope.

We should avoid finding pleonasm here if we can. On my interpretation, '*ἀναγκαῖον*' has wide scope (as elsewhere in the passage), and '*ἀφωρισμένως*' attaches closely to '*θάτερον*'. The claim is that in the case of these contraries, it is necessary that determinately one of the contraries apply to the thing, i.e. it is not merely necessary that fire be either hot or cold: it is further necessary that it be hot. My interpretation is confirmed by 13a13–15:

> *ἐπὶ δέ γε τῶν ἐναντίων, ὧν ἔστιν ἀνὰ μέσον τι, οὐδέποτε ἀναγκαῖον ἦν παντὶ θάτερον ὑπάρχειν, ἀλλὰ τισίν, καὶ τούτοις ἀφωρισμένως τὸ ἕν.*
>
> In the case of contraries with an intermediary, it is never necessary that, in all cases, one contrary belong, but [it is necessary] in some cases, and in these cases [it is necessary that] determinately a particular one [contrary belong].

If '*ἀφωρισμένως*' meant '*ἀναγκαῖον*' here, the last five words would be entirely superfluous.[86]

We should distinguish carefully between the terminology of definite/indefinite truth as it occurs in the discussion of Aristotle's solution to the problem of fatalism, and similar terminology occurring in the Neoplatonists' doctrine (adopted by Ammonius and Boethius) that god has definite foreknowledge of indefinite events, or (alternatively) that god has necessary foreknowledge of contingent events.[87] The claim is

[86] Note too the occurrences of '(*ἀφ*)*ωρισμένως*' and '*ἀορίστως*' at *Cat* 8a35ff. There is no prospect here of understanding these words as bearing a modal sense.

[87] Proclus, *De Decem Dubitationibus*, Quaestio 2; *De Providentia* cap.12.63 (where the correct position, that god has determinate knowledge of the indeterminate, is contrasted with the view of the Stoics who 'determinatam cognitionem attribuentes deo admiserunt necessitatem in omnibus que fiunt'; = *SVF* 2.942); *Institutio Theologica* 124; *In Timaeum* 1.351.20–353.29; *In Parmenidem* p.957.14ff Cousin; Ammonius, *In De Int* 135.12–137.11, especially 136.11–15, 136.25–137.1; Stephanus, *In De Int* 35.19–33 (both Ammonius and Stephanus claim the authority of Iamblichus; but in both cases it is unclear how much of the doctrine is in fact Iamblichus' responsibility: see Huber, *VgV*, p.42 n.19); Boethius, *Cons Phil* 5.pr.4–6; *In De Int* 2.226.9–13. There is no contradiction between the two Boethian passages – *pace* Huber, p.18 n.45 – but Obertello rightly remarks that the Neoplatonic influence is clearer in the later *Consolatio* than in the commentary: 'Proclus, Ammonius and Boethius on Divine Foreknowledge', p.147). In the commentary, Boethius is not claiming that divine foreknowledge of contingencies is itself characterised by contingency. He is simply insisting that foreknowledge of contingencies does not threaten the contingent status of the foreknown. Of the modality attaching to the foreknowledge

sometimes put in the former way, sometimes in the latter; but it is clear that the same point is being made by both formulations. This doctrine *does* conflate 'definite' with 'necessary' and 'indefinite' with 'contingent'.[88] The claim that god has definite foreknowledge of events which are in themselves indefinite should not be construed in such a way as to import unrestricted **PB** in respect of **FCS**s. That would conflict with my interpretation of Ammonius and Boethius as seeking to restrict **PB** in some way, since both Ammonius and Boethius adopt the Neoplatonic doctrine on divine foreknowledge. But part of the Neoplatonic doctrine is that god stands outside time (or – as both Ammonius and Boethius put it – exists in an eternal present), so that his knowledge of (what are from our point of view) future contingencies is not genuine *fore*knowledge.[89] Hence god's necessary, or

nothing is said in the commentary. So the position of the commentary is consistent with the doctrine of the *Consolatio*, that divine foreknowledge, whether of contingencies or necessities, is itself necessary. See in general Huber, chs. 2 and 4. Sharples interprets Boethius' position in the second commentary as already Neoplatonic (*Cicero: On Fate and Boethius: The Consolation of Philosophy*, pp.28–9). But, strictly speaking, Boethius does not there commit himself to the view that divine foreknowledge of future contingent actualities is *necessary*, as opposed to contingent. But Sharples is right to say – following Courcelle (*La Consolation de Philosophie dans la Tradition Littéraire*, pp.213–4; *Late Latin Writers and Their Greek Sources* (Cambridge (Mass), 1969), p.309), and against Gegenschatz ('Die Gefährdung des Möglichen durch das Vorauswissen Gottes', *Wiener Studien* 79, 1966, 517–30, p.529), Zimmermann (*Al-Farabi's Commentary and Short Treatise*, p.lxxxvi), and perhaps Chadwick (*Boethius*, p.159), though his account is confused – that Boethius in his second commentary on *DI* does *not* adopt the view favoured by Alexander, namely that god has no knowledge of future contingent *actualities*, but only of future contingent *possibilities*: see Appendix 2. Rather he allows (2.226.12–13) that God does know future contingent *actualities* (but not – Boethius will make clear in the *Consolatio* – *as future*: that removes a possible ambiguity in the commentary: see below in text).

[88] Huber, *VgV*, p.23 n.12.

[89] Ammonius, *In De Int* 133.13ff, 136.1ff; Boethius, *Consolatio* 5.pr.6 *passim*. See Huber, *VgV*, pp.46–50. In Boethius' treatment, the doctrine that God exists (and so knows) in an eternal present is precisely what *explains* and *justifies* the claim that God (fore)knows in a definite or necessary way things that are in themselves indefinite or contingent. Ammonius and Proclus draw no connection between god's timelessness and his definite knowledge of the indefinite (see, e.g., Proclus, *De Providentia* 64.7–11; Ammonius, *In De Int* 136.15–17). A further feature of Boethius' treatment, which is so far as we can tell original, is his application of the distinction between simple and hypothetical necessity to the problem of reconciling divine foreknowledge with human freedom: Huber, pp.52–8 (cf. Sharples, commentary, p.45; Sorabji, *TCC*, pp.255–6, *NCB*, p.125). As Huber shows, the solution in terms of the distinction between two kinds of necessity presupposes the distinctively Boethian conception of God's knowledge of human affairs as residing in a timeless *present*: just as when I see you sitting, my vision imports no (simple) necessity into your act of sitting, so God's knowledge that I freely perform an action, located as that knowledge is in a timeless present and so in some sense simultaneous with my action, equally imports no (simple) necessity into that action. Hence it is unsurprising that Boethius is the first Neoplatonist to apply the distinction between the two kinds of necessity to the problem of foreknowledge and freedom. The distinction between simple and hypothetical necessity is not enough on its own to reconcile divine foreknowledge and contingency, because if god has *fore*knowledge, his foreknowledge will be necessary (with the necessity of the past) and this necessity will be transferred to the foreknown event (cf. Sharples, commentary, p.44). But this point seems not to have been explicitly noticed by Boethius himself (Sorabji, *NCB*, p.125). See in general on Boethius' solution Gegenschatz, 'Die Freiheit der Entscheidung in der *Consolatio Philosophiae* des Boethius', *Museum Helveticum* 15, 1958, 110–29.

definite, knowledge of what is in itself contingent, or indefinite, should not be taken to accommodate **R**'s approach to future contingency; there is no inconsistency between the Neoplatonic doctrine of divine (fore)knowledge and **C**.[90]

[90] Mignucci cites *Consolatio Philosophiae* 5.pr.4.17–20 in justification of his claim that, according to Boethius, **FCS**s are bivalent and can be foreknown by God ('Truth and Modality', p.75): 'Quae igitur cum fiunt carent exsistendi necessitate, eadem prius quam fiant sine necessitate futura sunt. Quare sunt quaedam eventura quorum exitus ab omni necessitate sit absolutus. Nam illud quidem nullum arbitror esse dicturum, quod quae nunc fiunt prius quam fierent eventura non fuerint; haec igitur etiam praecognita liberos habent eventus. Nam sicut scientia praesentium rerum nihil his quae fiunt, ita praescientia futurorum nihil his quae ventura sunt necessitatis importat.' The passage is, on its face, in sharp conflict with Boethius' rejection in the commentaries on *DI*, on Aristotle's behalf, of the axiom '$p \rightarrow PFp$' (see below). The claim which Lady Philosophy thinks no one will lodge – that things which happen were, before they happen, not *going* to happen – is indeed lodged by Boethius in the commentaries. But the solution to this apparent antinomy is not far to seek. The view set forth by Lady Philosophy is not Boethius' considered view. Indeed if it were, the dialogue would end at this point. But Lady Philosophy goes on to argue that God does not, strictly speaking, *fore*know contingencies, but rather knows them in an eternal present. We may therefore infer that foreknowledge *would* import necessity and hence that Boethius rejects the view set out in the above passage. Indeed Lady Philosophy immediately goes on to concede that what she has claimed is exactly what is in question. Of course, it may be that the Boethius of the *Consolatio* no longer sees a problem in unrestricted **PB** (so agreeing with Lady Philosophy's 'Nam illud quidem nullum arbitror esse dicturum ...') but only in foreknowledge. But the position of the *Consolatio* is at least consistent with (as I construe it) the earlier position of the commentaries, that **PB** (strictly taken) already imports necessitarianism (so that the necessity of *foreknown* events is overdetermined), and hence that it must be adapted, if it is to be preserved, to incorporate the option that a statement may be either-true-or-false. Ammonius, relying on Syrianus, draws a distinction between oracular utterances and prophecies on the one hand, which can only make available a doubtful (*ἀμφίβολον*) knowledge of the future, and divine knowledge on the other, which is not so trammelled (137.12–25). Presumably he has in mind that oracles and

What the Neoplatonic claim *means* is a difficult matter to assess. I take the claim to be that god's foreknowledge is necessary in the sense that whatever he foreknows, he necessarily foreknows *that*, rather than merely that it is necessary that he foreknow the future (which leaves it open that *particular* pieces of foreknowledge may be contingent). The line I favour in effect ascribes to the Neoplatonists rejection of the principle that necessity is closed under entailment; the alternative interpretation would allow the Neoplatonists to anticipate Ockham's contention that divine foreknowledge of contingencies (i.e. contingent actualities) is itself contingent: on this view it is necessary that *if Fp*, then God foreknows that *Fp*, but God's foreknowledge that *Fp* will itself only be necessary if '*Fp*' is necessary; otherwise it will be contingent.[91] But nothing of relevance to our present concerns turns on settling this issue, and I shall not pursue it further here.

The crucial grammatical difference between **C** and the Neoplatonic doctrine is that in the former case what is in question is the distribution of truth-values within an *antiphasis*, whereas in the latter case the subject-matter comprises *simple* statements. To repeat: the claim that the members of a **FCA** are not definitely true/false cannot mean that the members are not necessarily true (false), if that construal is designed to leave open the possibility that they might be *simply* true (false), i.e. that truth-values might be distributed in the **FCA** (the view of **R**). We cannot take **C**'s rejection of the assignment of definite truth-values to the members of a **FCA** to constitute a *mere* rejection of necessity-values for those members. Further, although we should accept the mutual entailment, which **R** rejects, between distributed truth-values in a **FCA** and the necessary truth/falsity of the members, it is still unsatisfactory to find room for 'necessarily' within the *meaning* of '*ἀφωρισμένως*' and 'definite'; we should rather locate the inference from truth to necessity in the fatalist's argument. There is no semantic coincidence between 'definitely' and 'necessarily'. The role which the 'definite'/'indefinite' terminology plays in the Neoplatonic doctrine of divine foreknowledge is distinct, then, from its role in **C**.

prophets cannot foresee what *will* happen, but only what is likely to happen, or perhaps what will happen if advice is followed (or not) – but not then whether advice will be followed. The contrast with divine foreknowledge should not be taken to imply that the gods *fore*see, rather than see in an eternal present.

[91] Cf. Ockham, *Ordinatio*, in Etzkorn and Kelley eds., *G de Ockham: Opera Theologica* (New York, 1979), 1.d.38 O (p.587.5–19) = Boehner, *Tractatus*, p.100.

It is worth observing that there is a connection of thought between statistical considerations and the Neoplatonic doctrine of divine foreknowledge. The Neoplatonic god is changeless; his knowledge of the changing world is made possible by the fact that he stands outside time, and so can embrace the entire changing course of human history at a single glance. He sees all changes in a (non-temporal) instant, so undergoing no change himself. In the context of this picture, it is natural to think of the distinction between non-contingency and contingency as a distinction between immutability and statistical variation. The contingency of tomorrow's sea battle would consist *not* in its not now being a determinate fact that there will be a sea battle tomorrow (that sort of fact is *temporal*), but rather in the fact that in the course of history, considered atemporally as a series of linearly arrayed instants, sea battles occur at some points in the series and not at others.

Such a connection between the Neoplatonic understanding of divine foreknowledge and the statistical model of modality is suggested by a remark of Ammonius' in his discussion of divine foreknowledge, to the effect that even we can have definite knowledge of the contingent. His example is that of a ball resting on a plane.[92] If the plane is horizontal, the ball can be moved by someone or not. But if the plane is tilted, the ball must roll downwards. The idea is that in the latter case we can have determinate knowledge of the ball's motion. The example is infelicitous in a number of respects, one of which Ammonius concedes: he agrees that in the case where the plane is tilted, the ball's movement is not genuinely a contingent matter, since there is a sufficiency of antecedent causes. So it is hard to see how the example can really support Ammonius' claim.[93] But the point for our purposes is that it looks as if the distinction between the two cases in the example is statistical. Balls

[92] *In De Int* 137.1–11.

[93] Perhaps the point is that the movement of balls resting on surfaces is, in general, a contingent matter. When we specify circumstances more closely, we may remove contingency, as when we consider the movement of balls on *sloping* surfaces, which is not, strictly speaking (*κυρίως*, 137.3) a contingent matter. No doubt Ammonius is confused here between causal contingency and statistical contingency. He wants to say that the movement of balls on sloping surfaces both is contingent (*via* its connection with the statistical contingency of movement of balls on surfaces in general), and that it is non-contingent (i.e. not causally contingent). Hence we can have definite knowledge of an indefinite reality: the knowledge acquires its definiteness from the sense in which its object is non-contingent; but the object remains, in the other sense, contingent.

resting on horizontal planes are sometimes moved and sometimes not, whereas balls on sloping planes always roll down those planes (assuming no hindrance). The unvarying behaviour of balls on sloping planes allows even creatures of change to possess determinate knowledge of their behaviour in such conditions; whereas the varying behaviour of balls on horizontal planes can only be known by a being which is able to observe *all* such changes, and that requires that the being exist outside the temporal order in which such changes occur, and observe them in one determinate and unchanging act of knowledge (*μιᾶι καὶ ὡρισμένηι καὶ ἀμεταβλήτωι γνώσει*, 136.3).[94]

Kretzmann has recently proposed a new interpretation of Boethius.[95] He proceeds by distinguishing between truth *at* a time and truth *for* a time. The distinction is applied in this way: the proposition expressed by a **FCS** may lack a truth-value until the relevant time comes (when the event to which it is keyed either occurs or fails to occur); *at* any earlier time it is neither definitely true nor definitely false, but it has the disjunctive property of being either true or false; when it acquires a truth-value it becomes retrospectively true (false) *for* all times. Accordingly, Kretzmann defines a notion of 'broad bivalence' which he claims represents Boethius' position: '*For* any given time every proposition eventually has exactly one of these two truth-values: true or false; and so *at* any time at which it does not yet have one of those truth-values it has the disjunctive property either-true-or-false'.[96] The problem with this account is that it commits Boethius to a dubiously coherent antirealism about time for which, as far as I can see, there is no evidence. For the consequence of the distinction between truth-assessment *at* a time and truth-assessment *for* a time is that there will be no unequivocal answer to the question, posed at the time when the proposition expressed by a **FCS** acquires a truth-value: what truth-value did this proposition have at an earlier date? But surely an assessment correctly made at a time cannot be subsequently corrigible *in respect of that same time*.[97]

[94] Boethius has this point too: 'Quoniam igitur omne iudicium secundum sui naturam quae sibi subiecta sunt comprehendit, est autem deo semper aeternus ac praesentarius status, scientia quoque eius omnem temporis supergressa motionem in suae manet simplicitate praesentiae infinitaque praeteriti ac futuri spatia complectens omnia, quasi iam gerantur, in sua simplici cognitione considerat' (*Consolatio* 5.pr.6.15). Davies finds the statistical model present at 5.pr.6.37–40 ('Boethius and Others on Divine Foreknowledge', *Pacific Philosophical Quarterly* 64, 1983, 313–29), but the reading is not mandatory: see my 'Fatalism, Foreknowledge and the Reality of the Future', n.53.

[95] 'Boethius and the Truth about Tomorrow's Sea Battle'.

[96] 'Boethius and the Truth about Tomorrow's Sea Battle', p.78 (my emphasis).

We must be careful here. A proposition can indeed be, say, neither true nor false from one temporal standpoint, and true, or false, from another (later) temporal standpoint The acceptability of this position is fundamental to the whole approach to future contingency favoured, on **AR**, by Aristotle and those (such as the earlier Prior) who agree with him, so interpreted.[98] (**C** is arrived at by changing 'neither true not false' above to 'either-true-or-false'.) But that is a long way from the surely incoherent view that a proposition might be neither true nor false at t_1 (from the point of view of t_1) and also true (or false) at t_1 (from the point of view of t_2). Such a view entails a radical and de-stabilising antirealism about time, committed to the paramountcy of the present in a

[97] 'Cannot' here must be given wide scope (i.e. we have to do with *sensus compositus*, not *sensus divisus*).

[98] Kneale, *DL*, p.48ff, locates Aristotle's mistake at just this point, as does Saunders ('A Sea Fight Tomorrow?'). The suggestion is that the idea that truth can be assessed *at times*, as opposed to eternally, or once and for all, is a logical solecism. But does it make sense to suppose that a proposition is timelessly true, rather than that it is true at all times? (There is an epistemological problem about how beings in time can have cognitive attitudes to things outside time. See here Frege, 'Der Gedanke', p.52: 'Welchen Wert könnte das ewig Unveränderliche für uns haben, das Wirkungen weder erfahren noch auf uns haben könnte? Etwas ganz und in jeder Hinsicht Unwirksames wäre auch ganz unwirklich und für uns nicht vorhanden. Selbst das Zeitlose muß irgendwie mit der Zeitlichkeit verflochten sein, wenn es uns etwas sein soll.' I am grateful to Robert Lockie for drawing my attention to this passage.) And that would be sufficient for the fatalist. In a later piece ('Eternity and Sempiternity', *PAS* 69, 1968–9, 223–238, Kneale argues that eternity (=timelessness) and sempiternity (=omnitemporality) imply one another. But in any case, the fatalist's argument is not dependent on temporalised truth and can be restated in the atemporal form favoured by Kneale: even if truth is not in time, expressions of truths certainly are, and that is enough for the fatalist (see my 'Fatalism, Foreknowledge and the Reality of the Future', #1). Hence I agree with Vuillemin's remark: 'Or la question de savoir si une *proposition* portant sur le futur possède une valeur de vérité avant l'événement demeure même quand on a décidé, comme le propose Mme Kneale, d'éliminer les énoncés en faveur des propositions' (*NC*, p.168 n.28). Frede responds to Kneale by claiming that Aristotle does not in fact work with temporalised truth (*Seeschlacht*, pp.50–2). Frede's argument here is obscure, and the claim is surely incorrect: cf. Celluprica, *Il capitolo 9 del De Interpretatione di Aristotele*, pp.61–2. (Frede seems to seek to distinguish between '$\forall t < t_0$ $[T_t p_{t_0} \rightarrow L_t p_{t_0}]$' and '$\forall t$ $[T\ [p_{t_0}]_t \rightarrow L_t p_{t_0}]$', accepting only the former as a formalisation of the fatalist's argument. But the only difference between these formulae is the irrelevant one – given that the necessities of present and past are agreed on all sides – that the range of t is restricted to moments before t_0 in the first formula.)

way which fails to register the position of the present moment in a series of moments which are themselves either going to be, or have been, present in exactly the same sense as that in which the present moment is present.[99]

The acceptable position is that one and the same proposition may acquire different truth-assessments depending on the time at which it is assessed. The unacceptable position is that the truth-assessment of a proposition or statement *at a time* is itself liable (in the composed sense) to re-assessment at a later time. Not only is there an absence of textual support for Kretzmann's claim, there is indeed adequate evidence against it. Boethius not only says that fatalism follows from the supposition that **FCS**s are true, with no hint of a distinction between being true at a time and for a time; he also embraces the view that I was (earlier) able to do something which I subsequently did not in fact do. But, given relative necessity, it is an implication of Kretzmann's position that if I do not read Virgil at t_2, it will not be true either at t_2 or subsequently that *for* t_1 I was able to read Virgil at t_2. Boethius rejects this view as clearly as he could in view of the fact that he does not employ the distinction between truth at a time and truth for a time.[100]

In effect, Kretzmann ascribes to Boethius certain features of what Prior called an 'Ockhamist' model of time. To be precise, Kretzmann's Boethius subscribes *both* to an open future *and* to the axiom '$p \rightarrow PFp$'. It is this combination which generates the anti-realism about time itself: although it is now neither true nor false that I shall read Virgil tomorrow, if I *do* read Virgil tomorrow, then it will tomorrow be the case that it was true the day before that I would read Virgil on the next day. But neither Aristotle nor Boethius accepts the axiom '$p \rightarrow PFp$'. For Aristotle, this is clear from *DI* 18b9ff, where the fatalist offers his second argument. The fatalist's claim is that if something is white now, then it was true to say earlier that it would be white, and hence it was necessary (at any time) earlier that it would be white. In symbolic terms the fatalist is moving from the innocent-looking '$p \rightarrow PTFp$' to the necessitarian '$p \rightarrow PLFp$'. Since, as we have seen, Aristotle accepts *that*

[99] This anti-realism is set out in Dummett, 'On the Reality of the Past', in *Truth and other Enigmas*, pp.358–74. Note that the anti-realism which is here in question is an anti-realism about *time*, as opposed to an anti-realism about *the future* (along the lines or **AR** or **C**). The latter species of anti-realism does not import the former.

[100] 2.207.18–23. Cf. 2.212.14–15, 2.235.22–5.

part of the fatalist's argument, his view must be that the premiss is not so innocent after all. If Kretzmann's proposal were right about Boethius, Boethius would have misinterpreted Aristotle. But Boethius argues that contingency is destroyed not only by the antecedent truth of a **FCS** whose realisation lies in the future with respect to the present moment, but also by the antecedent truth of a **FCS** which was due to be realised in the present, or even in the past.[101] In fact contingency can be preserved in the presence of '$p \rightarrow PFp$'. But the cost is high: the combination of an open future and the axiom '$p \rightarrow PFp$' generates a problematic anti-realism about time; Aristotle and Boethius avoid paying that cost by rejecting '$p \rightarrow PFp$'.

In contradistinction to '$p \rightarrow PFp$', which Aristotle could accept, compatibly with future contingency, provided he were willing to embrace anti-realism about time, Aristotle *must* reject the Tarskian equivalence '$T\,[Tp \equiv p]$'. That allows him to adhere to **LEM** in respect of **FCS**s without having to affirm a disjunction of truths and, thence, of necessities. It is equally clear that Aristotle must reject any proposed assimilation of the bare disjunctive property 'either-true-or-false' to 'either-necessary-or-impossible'. Necessity is a metaphysical consequence of *definite* (distributed) truth, and the property 'either-true-or-false' precisely records the *absence* of definite truth in a **FCA**. Of course, as I have stressed, the insistence on 'either-true-or-false' over 'neither true nor false' does not affect the fact that the *logic* of **FCS**s must in either event be three-valued (given that Prior's distinction between '$Fn\neg p$' and '$\neg Fnp$' has not been adopted).[102] But there is still some point in refusing to assimilate **C**'s claim that **FCS**s are merely either-true-or-false to **AR**'s claim that they are neither true nor false (combined with unrestricted **LEM**). The latter characterisation may have a wide range of applications in contexts which have nothing to do with future contingency (e.g. statements containing bearerless names), and to propositions which are never going to possess one of the two standard

[101] See, e.g., 1.113.14–18: 'Et ait [sc. Aristoteles] providendum esse ne forte necesse sit suspicari id quod iam factum est vere dici potuisse antequam fieret esse faciendum, ut si Socrates hesterna cenavit nocte, verum fuit hesterna matutina dicere, quoniam cenaturus est.' Cf. 1.114.9–13, 2.209.20–214.13, 228.23–229.1, 230.1–8.

[102] As I have indicated (#2), there is no conceptual distinction to be drawn here between refusing to apply the standard truth-values to all propositions, and applying a third truth-value to just those (excluded) propositions (*pace* Patzig, 'Hegels Dialektik', p.455).

truth-values; the concept 'either-true-or-false', on the other hand, is tailor-made for **FCS**s and their corresponding propositions. It encodes the special way of failing to possess one of the two standard truth-values enjoyed by just such statements.

Is it possible, on this approach, to reconcile *DI* 9 with Aristotle's contention elsewhere that it is the mark of an assertion (*κατάφασις*) – as opposed to, say, a prayer – to be true or false?[103] In some of these contexts 'true or false' can, without undue strain, be read as 'true, false, or true-or-false'. In other passages, the claim need not be construed as a claim that *all* statements are either true or false, but rather that *only* statements are true or false.[104] *Met* Γ.7–8, where Aristotle defends **LEM**, might appear to raise a problem in this regard. The argument of these chapters is that there is nothing 'in the middle of' (*μεταξύ*) an antiphasis. This might at first glance seem to rule out the possibility that a statement should be either-true-or-false. But it becomes apparent during the course of the argument that what Aristotle has in mind is the possibility that both members of an antiphasis should be neither true nor false, which, as I have noted, he equates with their being both *false*. *Met* Γ.3–6 rule out the Heraclitean thesis that both members can be true; Γ.7–8 rule out the Anaxagoran thesis that both members can be false (1012a24–27, Γ.8 *passim*). (Hence this text is arguing the same case, though at a higher level of generality, as *DI* 18b17–25.) That leaves untouched the possibility that the members should be either-true-or-false. At 1012b10–11, for example, the reason given why both members of an antiphasis cannot be false is that one of them must be true (*ἀνάγκη γὰρ τῆς ἀντιφάσεως θάτερον εἶναι μόριον ἀληθές*). To deny that both members can be false one does not need to go further than to assert that the members are either-true-or-false, and this text is compatible with that reading (it is almost identically worded to *DI* 19a36 which, in accordance with **C**, I so interpret).

There is however a problem when we try to connect truth and falsity with assertion and denial. The text I have just quoted goes on to make such a connection ('It is necessary to assert or deny everything':

[103] *Cat* 2a7–8, 13b2–3, *DI* 17a2–3; cf. *DI* 20a34–6, *Met* 996b26–30, 1008a2–7, 1011b23–4, 1012b10–13; *Phys* 235b15–16; *An Po* 71a13–14, 72a13–14. Cf. Sorabji *NCB*, p.95; McKim, 'Fatalism and the Future'.

[104] E.g. *DI* 17a2–3 with Whitaker, 'An Analysis of Aristotle's *De Interpretatione*,' p.111; Kneale, *DL*, p.47; *contra* Frede, *Seeschlacht*, pp.80–81. Cf.16a11.

πᾶν ἢ φάναι ἢ ἀποφάναι ἀναγκαῖον). And at 1011b24 Aristotle had claimed that it is necessary to assert or deny any one thing of one thing (*ἓν καθ' ἑνὸς ὁτιοῦν*). There are other passages in the Aristotelian corpus – including a number in *DI* itself – where the expression of **LEM** takes a similar form.[105] But it is difficult to suppose that in such passages Aristotle is leaving room for the option that one might merely assert-or-deny that x if F, without doing one or the other determinately. What would such a speech-act look like?[106] Kirwan notes that Aristotle's statement in 1011b24 is too strong: Aristotle ought at least to allow that one might suspend judgement on whether x is F; and this would seem to be the appropriate policy to adopt in the case of future contingencies.[107] No doubt it is fruitless to try to render *DI* 9, interpreted in the manner of **C**, compatible with everything Aristotle says elsewhere about truth, falsity, assertion and denial. In claiming that one *must* assert or deny any one thing of one (i.e. each) thing, Aristotle simply does not consider cases where one is entitled to (and indeed must) suspend judgement. As Frede points out, there is in any case an unavoidable conflict between Aristotle's handling of the Principle of Non-contradiction in *Met* Γ (*ἀδύνατον ἅμα κατηγορεῖσθαι τὰς ἀντιφάσεις*: it is impossible to assert antiphases – i.e. both members thereof – simultaneously, 1007b18), and his concession in *DI* 7 that both members of an antiphasis constructed out of universals not taken universally may be true.[108]

[105] E.g. *DI* 22b12–13. For further references, see Frede, *Seeschlacht*, p.77 n.11; 'Sea Battle', p.79 n.77. Frede rightly connects this form of **LEM** with a probable origin in dialectic (*Seeschlacht*, pp.79–80, 'Sea Battle', pp.79–80).

[106] Cf. Frede, *Seeschlacht*, p.77.

[107] Commentary, pp.116–7. Kirwan notes (in effect) that Aristotle's position in *DI* 9 is the combination of unrestricted **LEM** with restricted **PB**. But on p.118 he states that this position is incompatible with the definition of truth given in *Met* Γ.7. It is not clear to me why Kirwan supposes that there is such an incompatibility, unless he is (question-beggingly) treating the disjunction in 'Either there will be a sea battle tomorrow or not' as truth-functional.

[108] Frede, *Seeschlacht*, pp.78–80. Whether this contradiction arises because *DI* is later than *Met* Γ, and Aristotle has not revised the earlier work, or because Aristotle simply does not trouble to take the exception of *DI* 7 into account in other contexts, is a question which does not seem to me to admit of a clear answer. Contradictions obtain not only between *DI* and other works of Aristotle, but also within *DI* itself. Although, as I have indicated, it is not mandatory to follow Frede in setting *DI* 4 against *DI* 9, I have conceded that 18a28–31 does not sit happily with 17b28–9; a worse case is the direct contradiction between *DI* 7, which allows both disjuncts of an antiphasis constructed out of universals not taken universally

Boethius went as far as to say that someone who makes a prediction of a future contingency, without appending the rider 'contingently' to his prediction, has said something false.[109] What can this mean? Should he not say that the predictor has said something either-true-or-false? No. It is a corollary of the Aristotelian position that whereas 'There will be a sea battle tomorrow' is either-true-or-false, 'It is true that there will be a sea battle tomorrow' must count as false.[110] But the Boethian point is that the *act of assertion* of the one statement is equivalent to the *act of assertion* of the other. By 'equivalent' I mean that the speech acts have the same force: the one is correct if and only if the other is. The claim is that the assertions are, in that sense, equivalent, and that they are both incorrect. 'There will be a sea battle tomorrow' is, in itself, either-true-or-false; but to *assert* that there will be a sea battle tomorrow is to assert that it is *true* that there will be a sea battle tomorrow. *That* statement is false; so the assertion-act counts as incorrect. The moral is that you cannot simply assert that *Fp* without thereby asserting that it is true that *Fp*. Hence Boethius is right to say that the content of your assertion is false. A guess, on the other hand, would enjoy a similarly indeterminate

to be true, and 21b17–23, which rules, quite generally, that the members of an antiphasis cannot both be true (cf. Whitaker, 'An Analysis of Aristotle's *De Interpretatione*, pp.131–2, 148). Further, 21b12–15 states that something which can be cut and can fail to be cut must at some time be cut and at some time fail to be cut (the Principle of Plenitude): but that is in direct contradiction with 19a7–22. (Note the '*καί*' at 21b15: *both* the *κατάφασις and* the *ἀπόφασις* will obtain.)

These considerations, if converted into arguments for a chronology, would suggest that *DI* 7–9 is later than the rest of *DI*, and that *DI* 9 is still later than *DI* 7–8. But I am not sure that they bear that conversion. Even the oft-cited fact that reference is made in *DI* to other works of Aristotle (*DA*, *Poet*, *Rhet*), but that there is no reference elsewhere to *DI* (cf. Celluprica, *Il capitolo 9 del De Interpretatione di Aristotele*, p.16) does not point unequivocally to the lateness of *DI*: perhaps *DI* was a relatively early essay which Aristotle found unsatisfactory and set aside without publishing, and which was subsequently found in his *Nachlaß*. The late dating of *DI* is defended by Magris, 'Aristotele e i Megarici. Contributo alla storia del determinismo antico', *Atti della Academia delle scienze di Torino* 111, 1977, 113–133, p.123, and by Maier, 'Die Echtheit der aristotelischen Hermeneutik', *AGPh* 6, 1899, 23–72 (who also defends the thesis that *DI* 9 is later than the rest of *DI*, as does Frede, *Seeschlacht*, pp.80–4). But these writers are partly motivated by a desire to construe *DI* 9 as a response to Diodorus' Master Argument, a line which I reject in #25 below.

[109] 1.114.8–24; 2.209.23–6, 211.24–6, 211.29–213.18, 219.2–11. On many aspects of Boethius' discussion of contingency see most helpfully Kretzmann, 'Nos ipsi principia sumus', in Rudavsky ed., *Divine Omniscience and Omnipotence in Medieval Philosophy* (Dordrecht, 1985), 23–50.

[110] Given that the *T*-operator is bivalent: #8 n.19.

status to the content of the guess: until the appropriate time arrived, it would count as either-correct-or-incorrect. The locution 'You guessed correctly' would, on this approach, be tantamount to 'Your guess has *turned out* to be correct.' Although more no doubt needs to be said in defence of this Boethian treatment of assertion, it is clear at least in outline how it would go. Anyone who makes an assertion is warranting that assertion: in making an assertion, you are putting forward the truth of the asserted statement. Hence, in the case of a statement about a future contingency, your assertion-act is incorrect because its content is false.

Can we find any echo of Boethius' approach in Aristotle? In *An Po* 2.12, Aristotle argues that causal explanation must take an *a fronte* form (95a22ff). I have noted that this cannot be regarded as Aristotle's final word on the matter, but it is instructive to see how he argues for the claim in this case. His reason for rejecting *a tergo* causal explanation (30–4) is that – in the case, say, of two events which are both past – between the earlier occurrence of the cause and the later occurrence of the effect it will be *false* to say that the effect occurred. The same reasoning applies to two events the later of which is in the future (34–6). In their commentaries on this passage, Ross and Barnes suggest that Aristotle has a point about tenses in mind, but that explanation is unsatisfactory, as Williams has demonstrated.[111] Williams argues, following Aquinas and Mansion, that Aristotle may have the indeterminacy of the future in mind. If that is so, we need not find any inconsistency with *DI* 9. It is false (*ψεῦδος*) to say that the later event will occur, not because the **FCS** asserting the occurrence of the later event is itself false – it is either-true-or-false – but because in asserting that **FCS** one commits oneself to its *truth*, and *that* commitment is false.

In offering this interpretation of *An Po* 2.12, I have said nothing about Aristotle's insistence that the middle term (i.e. the explanans: 95a11–12) must be coeval (*ὁμόγονον*, 95a37) with the explanandum.

[111] Commentary on *GC*, pp.201–2. The presumed point about tenses is this: in the interval between Socrates' drinking hemlock and his dying, 'Socrates drank hemlock' will be true but 'Socrates died of hemlock' false, so that the latter cannot be inferred from the former during that interval. But, as Willaims points out, the argument cannot work against inferring 'Socrates died, is dying or will die' from 'Socrates drank, is drinking or will drink hemlock'. In any case, as Barnes has pointed out (commentary, p.223), the argument doesn't work against inferring 'Socrates will die of hemlock' from 'Socrates will drink hemlock'.

Why does Aristotle insist on this requirement? It is not met by *a tergo* causation, as Aristotle points out (95a38–9), but then, one is inclined to object, surely it is not met by *a fronte* explanation either. One attractive suggestion is that Aristotle was influenced by the fact that the Greek perfect tense is not really a preterite, but connotes rather a present state of completion.[112] So '*γέγονε*' means 'It has come to be' not 'It came to be'. In that case two references to what *has been* the case can be linked *a fronte* by a middle term which has reference to a present state of affairs (perhaps the state of something's having been the case). No such linkage is available in the case of the future, because the Greek future tense does not share this aspectual feature of the perfect. The gap is not filled by the verb '*μέλλειν*' because '*μέλλειν*' records only present tendencies, which may be frustrated (*GC* 2.11, 337b6–7), whereas what has come about – given the necessity of the past – can no longer be undone.[113]

Aristotle's insistence that the middle term be 'coeval' can then be explained as the direct upshot of his refusal to allow '*ἔσται*' to be true but not necessary. '*μέλλει*' is not a suitable candidate to supply us with a middle term, because whatever *μέλλει* can be frustrated. Hence, in the case of future contingency, there is nothing which can function *now* as a suitable middle term in an explanatory inference. That contrasts with the past, where the (unfrustratable) fact about what *has* (now) happened can function as a middle term in the required way. Note how crucial it is, if '*μέλλει*' is not to spoil the linguistic asymmetry, that we insist on the necessity of the past. There is a symbiosis here between the linguistic point and Aristotelian metaphysics.[114]

[112] White, 'Causes as Necessary Conditions', p.162f.

[113] White speculates that this linguistic asymmetry, which seems to be by no means peculiar to Greek, may reflect some deeper metaphysical asymmetry. Whether this is so in general I do not know; but it certainly seems to hold in Aristotle's case.

[114] Cf. White, 'Causes as Necessary Conditions', pp.168–9. But White seems to regard the necessity of the past as an *independent* consideration in favour of the prevalence of *a fronte* over *a tergo* necessities. My claim is that the doctrine of the necessity of the past must be read into the argument of *An Po* 2.12 if a coherent doctrine is to emerge from that chapter.

13 Some Formalities

If the account of *DI* 9 which I have given is correct, Aristotle is committed to a metaphysic of the future which has the following general features:[1] time has a tree-like structure, branching towards the future. From any point (node) on the structure, there is only one route downwards (representing the necessity of the past); but there are a number of routes branching upwards (representing the openness of the future). At any node, there are no routes to any other node at the same level (representing the necessity of the present).

In saying that time branches towards the future, we need not be committed to saying that *time itself* branches: the expression can rather serve as shorthand for the claim that the *events* which take place in time branch towards the future: there are alternative event-possibilities within the one and only future which we have. Since Aristotle believes that time is the measure of motion (*Phys* 219b1–2), the metaphysically more cautious position I am endorsing could be regarded as more congenial to him. For if time is the measure of motion, it must be the measure of motion which actually takes place, not which may possibly take place. (That would bring back the possibility of empty time, which a slogan like 'time is the measure of motion' is in part meant to rule out.)[2]

If we define a structure as a pair consisting of a nonempty set of points (intuitively: times) and a binary relation, '$<$', on it (intuitively: 'is earlier than') then any structure which satisfies the following conditions will yield such a tree:[3]

[1] In this section I am indebted to White, 'Necessity and Unactualised Possibilities in Aristotle' and Thomason, 'Indeterminist Time and Truth-value Gaps'. Relevant also are Burgess, 'The Unreal Future', *Theoria* 44, 1978, 157–79; Yourgrau, 'On the Logic of Indeterminist Time', *JPhil* 82, 1985, 548–59; King-Farlow, 'Sea Fights Without Tears', *Analysis* 19, 1958–9, 36–42; McCall, 'The Strong Future Tense', *Notre Dame Journal of Formal Logic* 20, 1979, 489–504. I have also benefited from reading Robert Lockie's unpublished paper 'Attributing Actuality'.

[2] Rescher and Urquhart, *Temporal Logic*, p.72.

[3] Burgess, 'The Unreal Future', p.160.

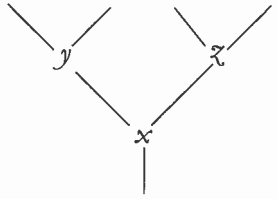
$\forall x \neg [x < x]$	Irreflexivity
$\forall x \exists y\ [x < y] \ \& \ \forall x \exists y\ [y < x]$	Endlessness
$\forall x \forall y \forall z\ [[x < y \ \& \ y < z] \rightarrow x < z]$	Transitivity
$\forall x \forall y \forall z\ [[x < z \ \& \ y < z] \rightarrow [x < y \ v \ y < x]]$	Backwards Linearity
$\forall x \forall y \exists z\ [z < x \ \& \ z < y]$	Connectedness.

The question which concerns us is: how should we fix the semantics for tensed formulae? Here I will not attempt to give a complete account, but simply provide sufficient detail to illustrate the interpretation of Aristotle which I have defended.

First we must make a general distinction between relative and absolute valuations of a formula. A formula can receive a truth-valuation at a node. That valuation may be relativised to one particular route (i.e. one particular sequence of events represented by a continuous line in our structure); or we may specify an absolute valuation of the formula at any given node. That will be a valuation which applies to the formula irrespective of which future branch on the structure the actual course of events follows (there is only one past). We would expect relative valuations to be bivalent, for relative to any particular complete sequence of events (past, present and future) a formula is either true or false (assuming for this purpose that we have no other motive than the contingency of the future to restrict **PB**). Whether absolute valuations are bivalent or not depends on which model of branching time we select. I have argued that on an Aristotelian model absolute valuations will not be (in the strict sense of the word) bivalent. Our semantics must reflect this fact. For example, a formula such as '*Fp*', where '*p*' is contingent, will at any node receive different relative valuations: on some future branches '*Fp*' will be true, on others false. Accordingly, absolute valuation in an Aristotelian model should be trivalent.

The view of future contingency which Kretzmann ascribed to Boethius is captured in the model of time which Prior calls Ockhamist (**O**).[4] On that model, absolute valuation is indeed trivalent. If, for example, contingent '*p*' obtains at *y* but not at *z* (see diagram below), then from the point of view of *x*, '*Fp*' fails to take an absolute truth-value:

[4] *PPF*, pp.122–7. An excellent discussion of this model is Boudot, 'Temps, Nécessité et Prédétermination', *Les Études Philosophiques* 1973, 435–73.



However, although this feature of **O** is satisfactory, **O** also contains the theorem '$p \rightarrow PFp$' (equivalently: '$p \rightarrow PTFp$'). Suppose the actual course of history goes through *y*; then it is true in **O** to say, at *y*, that it was the case that '*p*' would be the case . In other words, although '*Fp*' does not obtain at *x*, '*PFp*' obtains at *y*, given that '*p*' obtains at *y*. The Ockhamist model allows for the *contingent* truth, at *x* (from the point of view of *y*) of '*Fp*'. Hence we have at *y* '*PTFp*'. But we do not have '*PLFp*', because although it was true at *x* that '*p*' would be true at *y*, it was only contingently true. Using Kretzmann's terminology, we can say that *at x* '*Fp*' is undefined,[5] but that *for x* '*Fp*' is (by the time of *y*) true, given that the actual course of history in fact goes through *y*.

We can introduce some machinery in order to capture the way this theorem works. Let α, β, γ etc. range over points on the tree (times). Let a history, *h*, be what I have been calling a route, i.e. a continuous line, running in one direction, on the tree (intuitively, a possible complete history of the world); formally, we may define a history as a maximal linearly ordered subset of points on the structure. Let $\mathbf{H}_\alpha$ be the set of all *h* passing through the point α. Let $\mathbf{V}_\alpha\ (p)$ be the absolute valuation of '*p*' at α. Let $\mathbf{V}^h_\alpha\ (p)$ be the valuation of '*p*' at α with respect to one history, *h*. The relative valuation of '*Fp*' will then be defined:

$$\mathbf{V}^h_\alpha\ (Fp) = \text{T iff } [\exists \beta \in h\ [\alpha < \beta \ \& \ \mathbf{V}_\beta\ (p) = \text{T}]]$$
$$\text{F iff } [\forall \beta \in h\ [\alpha < \beta \rightarrow \mathbf{V}_\beta\ (p) = \text{F}]].$$

This valuation is bivalent. The absolute valuation of '*Fp*', which will be trivalent, can then be defined:

$$\mathbf{V}_\alpha\ (Fp) = \text{T iff } \forall h \in \mathbf{H}_\alpha\ [\exists \beta \in h\ [\alpha < \beta \ \& \ \mathbf{V}^h_\beta\ (p) = \text{T}]]$$
$$\text{F iff } \forall h \in \mathbf{H}_\alpha\ [\forall \beta \in h\ [\alpha < \beta \rightarrow \mathbf{V}^h_\beta\ (p) = \text{F}]].$$
$$\text{undefined otherwise.}$$

[5] I use this term to cover both the 'neither true nor false' of **AR**, and the 'either-true-or-false' of **C**.

The definition of $\mathbf{V}_a(Pp)$ will follow this pattern, but with 'α' and 'β' reversed in the formula '$\alpha < \beta$'. In the particular case of '*PFp*', we have the bivalent valuation:

$$\mathbf{V}_a\,(PFp) = \mathrm{T} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\exists\beta{\in}h\,[\beta < a \;\&\; \mathbf{V}^h_\beta\,(Fp) = \mathrm{T}]]$$
$$\mathrm{F} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\forall\beta{\in}h\,[\beta < a \rightarrow \mathbf{V}^h_\beta\,(Fp) = \mathrm{F}]].$$

Recurring to our earlier example, at x '*Fp*' is undefined, but at y '*p*' is true. It is obvious that the valuations, at y, of '*p*' and '*PFp*' will coincide. In general the point is that, on **O**, '*Fp*' is assessed at x, from the point of view of y, not absolutely but in respect of histories which pass through y. Although the absolute valuation of '*Fp*' at x is undefined, the absolute valuation of '*PFp*' at y is true (given that '*p*' is true at y). Hence we have '$p \rightarrow PFp$' (the reverse implication fails). '*PFp*' is not equivalent to '*PLFp*', because, in general, '*Fp*' is not equivalent to '*LFp*'. For '*Lp*' we set

$$\mathbf{V}_a\,(Lp) = \mathrm{T} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\mathbf{V}^h_a(p) = \mathrm{T}]$$
$$\mathrm{F} \text{ otherwise}$$

and so we have

$$\mathbf{V}_a\,(LFp) = \mathrm{T} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\mathbf{V}^h_a(Fp) = \mathrm{T}]$$
$$\mathrm{F} \text{ otherwise.}$$

Although '*Fp*' will be true if '*LFp*' is true, and *vice versa*, if '*Fp*' is undefined, '*LFp*' will be false.[6] Hence we have

$$Fp \models LFp$$

but

$$\models Fp \rightarrow LFp$$

will be false.

[6] It should be noted that on p.275 of his 'Indeterminist Time and Truth-Value Gaps' Thomason attempts to define a relative rather than an absolute valuation for '*Lp*'. But '*L*' cannot coherently be defined relatively: it is truth on all branches. This is just a slip on Thomason's part: the context clearly shows that he means to define an absolute valuation (and to do so as I have done in the text). Yourgrau's criticism of Thomason ('On the Logic of Indeterminist Time', pp.551–3) is accordingly largely misplaced.

Those familiar with Prior's description of **O** will have noticed that I have filled a gap. Prior makes no allowance for the absolute valuation of the formula '*Fp*': on his approach, we can only meaningfully speak of the truth-value of '*Fp*' relative to a history. Some subsequent work on **O** has made the assumption that **O** permits us to speak of the truth-value of '*Fp*' relative to the *actual* future.[7] There is, it seems to me, no warrant for this in Prior's original characterisation of the model (although we *can* meaningfully speak of the actual future-in-the-past, i.e. what the then-future has turned out to be), but it might be thought in the spirit of the Ockhamist model to make room for such a way of speaking. After all, Ockham himself did not accept the Aristotelian trivalent approach to future contingency. If we follow this lead, we can pick out one particular history, call it h_o, to represent the actual course of events, and then define the absolute valuation of '*Fp*' as:

$$\mathbf{V}_a\,(Fp) = \mathrm{T} \text{ iff } a{\in}h_o \;\&\; \exists\beta{\in}h_o\,[a < \beta \;\&\; \mathbf{V}^{h_o}_\beta\,(p) = \mathrm{T}]$$
$$\mathrm{F} \text{ otherwise.}$$

This valuation is bivalent; my way of evaluating '*Fp*' absolutely was trivalent.[8] My elaboration of **O**, whether or not acceptable on other grounds, at least has the advantage that it conveniently captures Kretzmann's construal of Boethius. The important point – the status of the theorem '$p \rightarrow PFp$' – is unaffected by these considerations.

So much for the Ockhamist model. I have observed that it is unfit to serve as an Aristotelian model, because of its validation of the theorem '$p \rightarrow PFp$'. Prior adumbrates a rival model, which he calls 'Peircean'

[7] See, e.g., Burgess, 'The Unreal Future'. Cf. too Mignucci's 'Truth and Necessity'. Mignucci ascribes to Boethius a (bivalent) conception of the (contingent) actual future.

[8] Talk of the actual future lays itself open to Aristotle's fatalist. Hence I cannot agree with Mignucci that Boethius has such a notion. If we single out h_0, are we not really envisaging a linear future? Yourgrau's criticism of Thomason on this score is misguided ('On the Logic of Indeterminist Time', pp.552–3): Thomason does not only not commit himself to the existence of the actual future; his remarks on pp.270–1 of his article indicate that he precisely recognizes the fatalistic implications of such a move. Yourgrau claims that the conception of branching time itself subverts the intentions of the indeterminist rather than modelling them, but that will only be so if the indeterminist allows one of the future branches to be privileged, and there is no reason why he should do this: there will be a future, but which branch of the tree events will actually follow counts now as (metaphysically) undetermined. Cf. von Wright, 'Determinismus, Wahrheit und Zeitlichkeit', p.173.

(**P**).[9] The outstanding feature of this model is that it draws a distinction between '$\neg Fp$' and '$F\neg p$'. The latter of these formulae is true just in case it is now a non-negotiable fact (unpreventable) that '$F\neg p$'. In general, 'Fp' expresses in **P** what 'LFp' expressed in **O**. The former formula, '$\neg Fp$', is true just in case either '$F\neg p$' is true, or in case each of 'Fp' and '$F\neg p$' fails to obtain. Hence although

$$Fp \vee F\neg p$$

does not hold in **P**, **LEM**, and in particular the instance

$$Fp \vee \neg Fp$$

is a theorem, because in the case of contingent 'p' the right hand disjunct will always obtain. In **P**, '$p \rightarrow PFp$' fails to obtain, because it is equivalent to an Ockhamist '$p \rightarrow PLFp$'.

But although **P** secures **LEM**, it fails, as we have seen, to secure '$Fp \vee F\neg p$'. That is because on this model we have

$$\mathbf{V}_a\,(Fp \vee F\neg p) = \mathrm{T} \text{ iff } \mathbf{V}_a\,(Fp) = \mathrm{T} \text{ or } \mathbf{V}_a\,(F\neg p) = \mathrm{T}$$
$$\mathrm{F} \text{ otherwise}$$

and since on **P** we also have

$$\mathbf{V}_a\,(Fp) = \mathrm{T} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\exists\beta{\in}h\,[a < \beta \,\&\, \mathbf{V}^h_\beta\,(p) = \mathrm{T}]]$$
$$\mathrm{F} \text{ otherwise}$$

where 'Fp' is contingent, each of 'Fp' and '$F\neg p$' will come out false. '$Fp \vee F\neg p$' will therefore come out false. **O**, on the other hand, preserves '$Fp \vee F\neg p$'. That is because on that model we have

$$\mathbf{V}_a\,(Fp \vee F\neg p) = \mathrm{T} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\exists\beta{\in}h\,[a < \beta \,\&\, \mathbf{V}^h_\beta\,(p \vee \neg p) = \mathrm{T}]].$$

Both models preserve '$Fp \vee \neg Fp$', on the other hand: in **O** because '$p \vee \neg p$' will be true on every branch; in **P** because '$\neg Fp$' is true on every branch now (since 'Fp' is false on every branch now) for contingent 'p'.

As far as Aristotle is concerned, **P** is no real advance on **O**. Certainly we want '$p \rightarrow PFp$' to fail, as it does in **P**, but surely we want '$Fp \vee F\neg p$' to succeed. We certainly do not want '$Fp \vee \neg Fp$' to succeed, for contingent 'p', as it does in **P**, on the ground that the right-hand disjunct is

[9] Von Wright's interpretation of the tense-logical operators in his 'Determinismus, Wahrheit und Zeitlichkeit' is similar to **P**'s.

always true. Aristotle's view, as I have argued, is that such a disjunction divides truth and falsity indefinitely, not that the assertion 'There will be a sea battle tomorrow' is always false and its negation always true. **P** cannot be squared with *DI* 19a36–b4. Since the point of the distinction between '$\neg Fp$' and '$F\neg p$' is to preserve unrestricted **PB** (the negation is choice negation), it would seem that the distinction must be regarded as non-Aristotelian. Aristotle does indeed want '$Fp \vee \neg Fp$' to be a theorem, but not for the reason given by a Peircean. That indicates that we should represent Aristotle's adherence to this formula as, in terms of **P**, adherence to '$Fp \vee F\neg p$', and hence that the distinction between '$\neg Fp$' and '$F\neg p$' fails to apply.

It is hardly surprising that neither **O** nor **P** should satisfy an Aristotelian. They were devised by Prior to provide ways of circumventing Diodorus' Master Argument, as Prior reconstructed it.[10] This reconstruction runs on parallel lines to an argument I specified above in my discussion of the fatalist's second argument (18b9ff, #4). That argument, which I rejected as an interpretation of Aristotle, traded essentially on the necessity of the past. If we shift it into the future, we can derive, by a series of parallel steps, 'LFp' from the premiss 'Fp', proceeding again *via* the theorem '$p \rightarrow PFp$' (this time in its substitution-instance '$Fp \rightarrow PFFp$'). To avoid this proof, the Ockhamist rejects the necessitation of all past truths (in particular those concerning the future). The Peircean rejects '$p \rightarrow PFp$', but he does so at the expense of an adherence to unrestricted **PB**. Aristotle rejects **PB** in its unrestricted form, and that, as I shall suggest in #25, would be his answer to Diodorus, whose Master Argument (in *any* reconstruction which renders it a valid argument) must presuppose **PB**.

The semantics of a genuinely Aristotelian model of time, therefore, have to depart from both Ockhamist and Peircean strategies. We adopt from the Ockhamist his way of evaluating '$Fp \vee F\neg p$'; but we reject his acceptance of the theorem '$p \rightarrow PFp$'. We reject the Peircean distinction between '$\neg Fp$' and '$F\neg p$'; but we accept from him his way of evaluating formulae of the form 'PFp'. In contradistinction to the Ockhamist, the Aristotelian follows **P** in setting

$$\mathbf{V}_a\,(PFp) = \mathrm{T} \text{ iff } \forall h{\in}\mathbf{H}_a\,[\exists\beta{\in}h\,[\beta < a \,\&\, \mathbf{V}_\beta\,(Fp) = \mathrm{T}]]$$
$$\mathrm{F} \text{ otherwise.}$$

[10] See *PPF*, p.121.

To recur to our example, this has the consequence that the value of '*PFp*' at *y* is a function, not of the value of '*Fp*' at *x* in respect of histories which pass through *y*, but of its *absolute* value at *x*, which was of course undefined for contingent '*p*'. Hence even if '*p*' is true at *y*, '*PFp*' is false at *y*.

I suggested above (#8) that we can avoid the non-truth-functionality of the propositional connectives if we adopt a suggestion of Prior's and construe Aristotle's commitment to **LEM** in respect of **FCS**s as a commitment to

$$F\,[p \vee \neg p]$$

rather than simply to

$$Fp \vee \neg Fp \text{ (or: } Fp \vee F\neg p).$$

In fact, as I have indicated, we do not need to choose between these options. If we allow '*F*' to distribute over disjunction (and keeping the argued-for commutativity of '*F*' with '¬'), we can treat all three formulae as equivalent (as **O** did), while retaining the usual interdefinitions of the propositional connectives. In that case, given that '¬' and '*v*' are functionally complete, the distributivity of '*F*' over '*v*' and its commutativity with '¬' guarantee that '*F*' distributes over all truth-functional connectives.[11] Of course the formula '$F\,[p \vee \neg p]$' as a whole is not a truth-function of its component propositions, since '*F*' is non-truth-functional, but the suggestion enables us to restrict the non-truth-functionality of the expression to the tense-logical operator.

In fact, there is a coincidence of approach between this proposal and the semantic policy on absolute valuation which I have been following. That is because the method of absolute valuation which I have favoured (of, for example, '$Fp \vee F\neg p$') has been what van Fraassen calls supervaluation, the method according to which a formula any of whose components lacks a truth-value (or has the third truth-value) is assigned that value, if there is a unique such value, which it would be assigned whether its components were true or false.[12] If a formula has a unique bivalent valuation (as, for example, '$Fp \vee \neg Fp$' is true), then that formula receives the *same* valuation under trivalent supervaluation.

[11] Rescher and Urquhart, *Temporal Logic*, p.37ff.

[12] Van Fraassen, 'Singular Terms, Truth-value Gaps and Free Logic'; Haack, *Deviant Logic*, p.86; Vuillemin, *NC*, p.178.

14 *Metaphysics* E.3 on Causal Determinism: a Comparison

One of the texts which I cited (#9) in support of my claim that Aristotle accepts the necessity of the present was *Met* E.3. I also argued (#6) that the causal considerations of this chapter do not overlap with the purely logical considerations of *DI* 9. It is appropriate to discuss the meaning of this chapter in more detail, for it provides a significant and illuminating comparison with *DI* 9.[1] But my interest in the chapter is relatively limited. I shall consider only cursorily whether it provides Aristotle with materials for a successful response to determinism,[2] and not at all how it relates to Aristotle's treatment of causation elsewhere.[3]

The announced purpose of the chapter is to argue that there must be accidental causes in nature, for otherwise everything would happen of necessity (which, by assumption, is not the case): 1027a29–32.[4] The claim that there must be accidental causes in nature is not put by Aristotle in just that way; rather he says that there must be principles and causes which come to be and pass away without going through a *process* of coming to be and passing away (*ὅτι δ' εἰσὶν ἀρχαὶ καὶ αἴτια γενητὰ καὶ φθαρτὰ ἄνευ τοῦ γίγνεσθαι καὶ φθείρεσθαι, φανερόν*, 1027a29–30). Now we know from the previous chapter (E.2) that things which exist non-accidentally go through a process of coming to be and passing away, but

[1] Some important recent contributions to the secondary literature are: Sorabji, *NCB*, ch.1 (with references to further literature); Fine, 'Aristotle on Determinism', *PR* 90, 1981, 561–79; Madigan, '*Metaphysics* E.3: a Modest Proposal', *Phronesis* 29, 1984, 123–36; D. Frede, 'Aristotle on the Limits of Determinism'; White, 'Fatalism and Causal Determinism'; Hintikka, *AMD*, ch.7; Kirwan, commentary on *Metaphysics* Γ, Δ and E; Seel, *DAM*, pp.369–79; Donini, *Ethos*, ch.2; Weidemann, 'APkD', on which I shall rely in my own interpretation of the chapter. But I shall disagree with Weidemann at a number of points. I shall not discuss the parallel passage in *Met* K.8 (which is in any case of doubtful authenticity). But I do not think that chapter contains anything which significantly affects the issue.

[2] Hintikka, *AMD*, ch.2.

[3] See here Sorabji, *NCB*, ch.1.

[4] The threat which Aristotle wishes in *Met* E.3 to avoid is that of universal (efficient) causal determinism, not (as Frede argues in her 'Aristotle on the Limits of Determinism'; cf. *Seeschlacht*, pp.116–121) that of teleological determinism. Cf. Donini, *Ethos*, pp.43–4 n.28.

that accidents (*τὰ κατὰ συμβεβηκός*) do not: 1026b22–4. Hence the quoted sentence is making a claim about accidents. We are then told that if there were no accidental causes in nature, everything would be of necessity: *ἐξ ἀνάγκης πάντ' ἔσται*. The reason given for this claim is that non-accidents must have a non-accidental cause (*εἰ τοῦ γιγνομένου καὶ φθειρομένου μὴ κατὰ συμβεβηκὸς αἴτιόν τι ἀνάγκη εἶναι*, 1027a31–2).[5] So the point is that not all causes can be non-accidental, for otherwise, since non-accidental events themselves must have non-accidental causes, it would follow (according to Aristotle) that everything would happen of necessity. Aristotle is not to be taken to be attempting to remove accidents from the causal order altogether. Rather, he is insisting that even within the category of accidents which are themselves causes,[6] not all of them *have* non-accidental causes.

Now Aristotle remarked in the previous chapter that the cause of what is or comes to be accidentally is itself accidental (*τῶν γὰρ κατὰ συμβεβηκὸς ὄντων ἢ γιγνομένων καὶ τὸ αἴτιόν ἐστι κατὰ συμβεβηκὸς*, 1027a7–8).[7] Note that this claim is not to the effect that all accidents have (accidental) causes; it says rather that causes of accidents (if any) are accidental. That leaves open the possibility that some accidents may have no causes at all. We have then the following constraints on the concept of an accident: (1) something is an accident if and only if it has not gone through a process of coming to be, or, equivalently, something is a non-accident if and only if it has gone through such a process (1026b22–4); (2) whatever goes through a process of coming to be has a non-accidental cause (1027a31–2); (3) an accident has an accidental cause, if any (1027a7–8). These three principles form a consistent triad. Taken together they imply that something is a non-accident if and only if it has a non-accidental cause. The announced purpose of E.3 is to argue that if every cause has a non-accidental cause, and so, by (1)–(3), is a non-accident, then everything will be of necessity. Since (by assumption) not everything happens of necessity, it follows that there are

[5] On the correct interpretation of the phrase '*μὴ κατὰ συμβεβηκὸς αἴτιον*' see Weidemann, 'APkD', p.49.

[6] And are perhaps *non-accidental* causes: this is a point of dispute between Sorabji and Weidemann to which I return below.

[7] '*γιγνομένων*' here might give pause. Have we not just established that accidents do not *come* to be? The position is in fact slightly more complicated: they do not come to be *qua* accidents, but they may come to be *qua* something else (1025a28–30). I return to this important point shortly.

causes which are accidentally caused. Such causes must then themselves be accidents. So determinism is (on Aristotle's view) avoided.

Why does Aristotle argue for the accidental status specifically of *causes* (*ἀρχαὶ καὶ αἴτια*), rather than, generally, of events? His opponent has a picture of a closed system of causes consisting of non-accidents linked by non-accidental causal connections. Aristotle is going to question whether all causal relations are non-accidental (and hence whether their *relata* are non-accidental), but he is not going to question whether every event is a cause; so he simply concedes this point to his opponent, and restricts his discussion to events which are causes. He is in fact best thought of as accepting, for the sake of argument, the assumption that everything is both a cause and is caused (cf. *Phys* 196a11–16), but then meeting his determinist opponent on the issue whether everything is both a *non-accidental* cause and is *non-accidentally* caused.

Now comes the crucial point: Aristotle already has the materials he needs for this conclusion, before he embarks on chapter 3. What he has already told us, in *Met* Δ.30 and E.2, about the relationship between the accidental and necessity immediately yields the conclusion he seeks.

In *Met* Δ.30, the chapter on the accidental in his philosophical dictionary, Aristotle contrasts the accidental with what is of necessity (*ἐξ ἀνάγκης*) and what holds for the most part (*ὡς ἐπὶ τὸ πολύ*). He gives examples: finding treasure when you were digging a hole for a plant; being a white musician. Neither of these combinations holds necessarily or for the most part, and so they fall into the category of the accidental (1025a20–21). In E.2 the contrast drawn is between the accidental on the one hand, and what happens *always* or for the most part on the other (1026b31–3). It is reasonable to assimilate these two ways of drawing the contrast by equating the necessary with what always happens; and indeed Aristotle does so at 1026b27–8 and 1027a8–9. We know that this is an equation which Aristotle frequently draws elsewhere (cf. #7 above), and the presence in the definitions of the phrase '*ὡς ἐπὶ τὸ πολύ*' is a further indication that the relevant dimension of contrast between the accidental and the non-accidental is *statistical*.[8] The accidental is what happens rarely, or, at least, no more often than not. E.2

[8] But I shall suggest shortly that the statistical dimension itself supervenes on a more fundamental ontological category, that of things' *natures*. On the connection which Aristotle draws between the accidental and the statistically rare, see Judson, 'Chance and 'Always or For the Most Part'', #2.

gives further examples: the combination of cold weather during the Dog days, and of white with man (the first of these combinations hardly ever happens, the second no more often that not); the example of a white musician recurs (1027a11–2). It is an immediate consequence of this way of distinguishing the accidental from the necessary, that if there were no accidents in nature everything would happen of necessity. There would not even be a 'for the most part' in nature.[9] That is a conclusion which Aristotle explicitly draws at 1027a12–3. *A fortiori*, since something is a non-accident if and only if it has a non-accidental cause, if there were no accidental causes in nature – if all causes were non-accidental – everything would happen of necessity.

We must pause here to to clarify the notions of accidental and non-accidental causation. Sorabji has pointed out that there are two types of accidental cause: the accidental combination may be located in the cause or in the effect.[10] If a builder heals, he is an accidental cause of health in the first sense: he does not heal *as a builder*, but in virtue of healing powers[11] which are accidentally combined with his role as a

[9] The category of the 'for the most part' is a maverick category with allegiances both to the necessary on the one hand and to the accidental/'as it may chance' (*ὁπότερ' ἔτυχεν*) on the other. Epistemologically, it belongs with the necessary: science studies what mostly happens as well as what always happens (1027a19–26, with Kirwan ad loc.). For what happens for the most part happens by *nature*: *An Pr* 25b14, 32b4–10, *DC* 301a7–9, *Phys* 198b34–6, Rhet 1369a32–b2, *GA* 777a17–21, *PA* 663b28–9, *EE* 1247a31–3. Cf. Judson, 'Chance and 'Always or For the Most Part'', p.82; Frede, 'Sea Battle', p.67; Striker, 'Notwendigkeit mit Lücken', *Neue Hefte für Philosophie* 24–5, 1985, 146–64, p.156ff. Striker argues that the 'for the most part' operator should be understood as a kind of necessity operator restricted to normal cases (cases where nature takes its course without hindrance): the 'for the most part' arises because nature is sometimes obstructed (*Phys* 199a9–11, b18, b26, 255b7ff). But ontologically, the existence of the 'for the most part' is precisely what underwrites the existence of the accidental and the 'as it may chance'; for these latter categories constitute *exceptions* to rules, which would otherwise hold universally (1027a8–11). Alexander calls the '*συμβεβηκός*' '*τὸ τοῦ ὡς ἐπὶ τὸ πολὺ διάλειμμα*' (*In Met* 451.13). Cf. Aquinas: 'Ens ut in pluribus est causa et principium quod aliquid sit per accidens ... Esse per accidens ... est defectus eius quod est in pluribus' (*In Metaphysicam Commentaria* ed. Cathala (Turin, 1926), Liber 6, ##1182–4). Conversely, if there were not accidents, there would not be a 'for the most part' either; everything would happen always and of necessity. The accidental lies 'beyond' the always/necessary and the 'for the most part', but the contingent includes the 'for the most part' (*An Pr* 32b4–22, *DI* 19a20–2), and the possible (strictly taken) includes the always/necessary.

[10] *NCB*, pp.5–6; cf. Weidemann, 'APkD', p.29; Judson, 'Chance and 'Always or For the Most Part''.

[11] Aristotle calls him a doctor in this capacity, but that is rather strong: Kirwan, commentary, p.193.

builder (1026b37–1027a2).[12] In contrast, if a cook produces health, he is an accidental cause of health in the second sense: *as such* a cook produces a pleasant meal, with which a healthy effect is accidentally combined (1027a3–5).[13] The 'as such' locution is not drawn on by Aristotle in E.2 and 3 (although the same point is being made at 1027a3–4: the cook does not heal *κατὰ τὴν ὀψοποιητικήν* – in virtue of his skill in cookery), but it occurs in Δ.30, where Aristotle uses the example of a man who is blown by a storm or taken by pirates to the island of Aegina. The accident here is that it is precisely *Aegina* where he ends up, given that he did not mean to sail there (1025a25–7); that he ends up at a place *other than his intended destination* is not an accident: on the contrary, it is always or at least generally the case that, when your sea-journey from A to B is hijacked by storm or pirates, you do not end up at your intended destination.[14] This seems to be the meaning of the remark (1025a28–30):

> *γέγονε μὲν δὴ ἢ ἔστι τὸ συμβεβηκός, ἀλλ' οὐχ ἧι αὐτὸ ἀλλ' ἧι ἕτερον· ὁ γὰρ χειμὼν αἴτιος τοῦ μὴ ὅπου ἔπλει ἐλθεῖν.*
>
> The accidental event has indeed come to be or obtains, but not *qua* itself but *qua* something else. For the storm is the cause [i.e. the non-accidental cause][15] of his not arriving whither he set sail.

Here Aristotle allows that the accidental event has come to be: there is no conflict with his position elsewhere that accidents do not come to

[12] Cf. *Phys* 195a32–5: Polyclitus does not create a statue *as Polyclitus* but *as a sculptor*.

[13] Cf. *Phys* 2.5. Going to meet someone, or to court, or to the theatre, may take one to a place where, accidentally, one's debtor is collecting contributions, and one recovers one's money. See further Sorabji, *NCB*, p.6 n.6.

[14] Cf. Donini, *Ethos*, p.37; Weidemann, 'APkD', p.41. Sea-journeys undertaken with an intended destination always or generally reach that destination; but sea-journeys interrupted by storm or pirates always or generally end up somewhere else. One is tempted to compare 1027a23–6 and say: honey-water generally cures fever; but honey-water taken at a new moon always or generally fails to cure (so Ross and Kirwan in their commentaries ad loc.). But I think that passage is probably best interpreted as stating that one cannot always capture the exceptions to a given generalisation, not because in doing so one would be in a position to form a new generalisation, but simply because in some cases it is just not possible to do so: 1027a25–6 means that the rule will apply always or for the most part *at new moons too*; so Alexander, *In Met* 452.32–453.2. But no doubt Aristotle is committed by his words to agreeing that if we could bring the apparent exceptions under a rule (as we cannot in the new moon case), then we would have a new rule, and the apparent exceptions would no longer be such. Cf. Aquinas, *In Met* liber 6, #1190.

[15] See below.

be, because, as he immediately makes clear, accidents do not come to be *as such*. The accident of his arriving precisely *at Aegina* has not indeed undergone, as such, a process of coming to be. But this event is (in some way which Aristotle never specifies) accidentally *combined* with arriving at an unintended destination, and *as such* (i.e. as an arriving at an unintended destination) it does undergo a process of coming to be, and so has a non-accidental cause (the storm). The implication of the passage seems to be that causation is a non-extensional relation: causal relations do not obtain between events (or states of affairs) *however characterised*. On that interpretation, there would be one event which, (characterised) as an arrival at Aegina, is an accident and so (1027a7–8) has an accidental cause (the storm); (characterised) as an arrival at an unintended destination, this event is non-accidental and so (1027a31–2) has a non-accidental cause (the storm).[16] But if that is the right way to take Aristotle's point, it must be stressed that the relation between the two aspects (characterisations) of the same event is itself *accidental*.[17] Given now that there are two ways in which A can be an accidental cause of B – A may cause B but not *as A*, or A may cause B but not *as B* – it follows that if A is to be a non-accidental cause of B the following condition must be satisfied: A *as A* causes B *as B*.[18] (By a natural extension of terminology, we may here speak of B as a non-accidental effect.)

With this clarification of the notions of accidental and non-accidental causation in place we can return to the opening of E.3. The claim there is that there must, among events (sc. which are causes) be some that are accidents, for otherwise they would have non-accidental causes and then everything would be of necessity. In terms of our elucidation

[16] I bracket the word 'characterised' to avoid nominalistic connotations. See n.23 below.

[17] Sorabji, *NCB*, p.15; Weidemann, 'APkD', p.42. I do not believe it misrepresents Aristotle to press 1025a28–30 in the way I have done. It may be however that his considered view would be that getting to the wrong destination and getting to Aegina are *different* (but accidentally combined) events or states of affairs (rather than one and the same event characterised in different and accidentally combined ways). In what follows, I shall assume that 1025a28–30 is to be taken as I have done. But nothing of major importance for my purpose turns on this, and my formulations can readily be translated into the alternative terminology which retains the extensionality of the causal relation but cuts events as finely as non-synonymous event-characterisations.

[18] Weidemann, 'APkD', p.29. Weidemann insists on a further condition, which I shall consider (and reject) below, n.30.

of non-accidental causation the idea is this: if all events are non-accidentally caused, then for any event, Y, there would have to be another event, X, such that X as X causes Y as Y. The same reasoning obviously applies to X (there must be a Z which as Z causes X as X), and so on back. So the causal ancestry of Y would – if Y were non-accidental – be unbrokenly non-accidental. Equally, any causal progeny which Y produced would have to be non-accidental (for otherwise there would be a W which was accidentally caused), and so on forward. It follows that unless some events are accidental, the causal order as a whole will be a system of exclusively non-accidental connections between non-accidents. Hence, on the statistical conception of the accidental and the necessary, everything will be of necessity. Using materials drawn exclusively from Δ.30 and E.2, we have easily derived the conclusion which, at the beginning of E.3, Aristotle puts forward as his target, and we have done so without broaching the argument of E.3 itself at all. Of course, it is perfectly natural for a philosopher to repeat himself, or to draw strands together which hitherto have lain separate. In reaching Aristotle's conclusion, that is exactly what we have done. But that is not what Aristotle himself goes on to do in E.3. Instead, as I shall show, he argues for his conclusion on the basis of wholly new considerations.

Before we turn to the body of ch.3, we should clarify the status of the statistical considerations underlying Aristotle's distinction between the accidental and the non-accidental. In both Δ.30 and E.2 a conception of the accidental which at least appears at first sight to be distinct from the statistical is incorporated by Aristotle without special signal into his discussion. On this conception, a connection is accidental if the cause, as specified, does not rationalise the effect, as specified. At *Met* 1025a23–4 the accidental is defined as follows:

> *ὅ τι ἂν ὑπάρχῃ μέν, ἀλλὰ μὴ διότι τοδὶ ἦν ἢ νῦν ἢ ἐνταῦθα, συμβεβηκὸς ἔσται.*
>
> Whatever obtains, but not because it is this or now or here, will be accidental.

At *Met* 1026b37–1027a2 it is said that a builder heals accidentally, because it is not in his nature to heal, but rather in that of a doctor (*καὶ τὸ ὑγιάζειν δὲ τὸν οἰκοδόμον συμβεβηκός, ὅτι οὐ πέφυκε τοῦτο ποιεῖν οἰκοδόμος ἀλλὰ ἰατρός*).[19] To say that a patient is cured by a doctor is to

[19] Cf. Kirwan, commentary, pp.180–2; Sorabji, *NCB*, pp.4–5.

specify a cause which rationalises the effect; but to say that he is cured by a builder is to specify the cause in a way which does not so rationalise the effect. That is because a builder is not a healer in virtue of his nature as a builder (*οὐ πέφυκε*, 1027a1); nor does a cook produce health in virtue of his skill in cookery (*κατὰ τὴν ὀψοποιητικήν*, 1027a4). One might, in a Humean spirit, suggest that the rational connection which Aristotle insists on in non-accidental relations is ultimately statistically-based. That is, what produces what as a matter of its nature (and so which connections can be rationalised) is really a matter of frequency: if builders always or usually healed, would not Aristotle be forced to say that they did so *as such*?

The fact that Aristotle does not signal his point about rationalisation as a distinct way of drawing the accidental/'for the most part'/necessary contrast suggests very strongly that he does not think that it is a distinct way of drawing that contrast. But his position is more likely to be closer to Kant's than to Hume's. Rather than thinking that a thing's nature is constituted (non-essentially) by the kinds of constant (or usual) conjunction it gets itself into, it is more plausible to suppose that Aristotle's view is that the kinds of constant (or usual) conjunction it gets into *flow from* an essential nature (*δύναμις*)[20] in a way which makes available *a priori* rationalising explanation of those conjunctions. That fits better with Aristotle's essentialism.[21] The point that accidental connections are non-rationalising is accordingly mentioned by Aristotle in the same context as the statistical model of the distinction between the accidental, the 'for the most part' and the necessary, because the fact that statistically accidental connections are non-rationalising is an *upshot* of his essentialism: it is the contraposition of the implication from the *a priori* explicability of causal connections resulting from a thing's essential nature to the regularity or usuality of those connections. If a thing explicably produces such-and-such consequences, it will do so regularly (always) or at least for the most part (it has a natural tendency to produce those outcomes, and will do so unless hindered);

[20] *Met* 1027a5–7 with Kirwan ad loc.

[21] *An Pr* 32b4–22 with Smith ad loc.; *An Po* 1.4–6 with Sorabji, *NCB*, chs. 12–13; Lear, *Aristotle: The Desire to Understand* (Cambridge, 1988), ch.2; Judson, 'Chance and 'Always or For the Most Part''. That is also how Boethius interprets Aristotelian regularity. The regularity arises in virtue of *cognationes* which things have (e.g. fire to hot, snow to cold, etc.): *In De Int* 2.236.5ff. So too Ammonius, *In De Int* 151.16–23, 155.4.

accidents are therefore (as such) inexplicable.[22] Hence Aristotle's insistence in E.2 and elsewhere (e.g. *Phys* 197a19–20, *An Pr* 32b18–22) that there can be no science of the accidental. If exceptions to a regularity are themselves brought under a different regularity, they cease to be accidents.[23] Hence too his assertion that the accidental cannot be purposed (1025a25–7). For purposive activity imports explicable connections between intentions and actions, and hence regular or 'for the most part' connections.[24]

We are now in a position to turn to the argument of E.3 itself. What we find is surprising. Instead of reaching the conclusion, as I have done, by simply educing the consequences of the distinction between the accidental and the necessary in the way they have been defined, we find an entirely unprepared-for method of arguing to the conclusion.

Aristotle mounts a *reductio* argument against the hypothesis that every event has a non-accidental cause. For suppose that the hypothesis obtains. Then we can trace back to the present a causal series from an arbitrarily selected future event (1027a32–1027b1). So, for example, we may suppose that a man will die by violence, if he goes out, and that he will go out, if he is thirsty, and that he is thirsty, if he has eaten spicy food (1027b1–5). But in tracing back such a series, we will eventually come, as in this example, to an event in the present or the past (*καὶ*

[22] Only a few, circumscribed (*ὡρισμένον*, *Phys* 196b28) specifications will serve to rationalise the connection between any given cause and effect (and so represent them as non-accidentally connected). The specifications which fail to achieve this (and so represent the effect as accidentally caused by the cause) will be undefined (*ἀόριστον*, *Phys* 196b28) and endless (*ἄπειρα*, *Phys* 196b28, *Met* 1026b7). Cf. *Met* 1025a24–5.

[23] See n.14 above. I have cast Aristotle's essentialism in terms, quite generally, of things (including events and states of affairs) rather than *kinds* of events. That accords fully with my policy on 1025a28–30, which I interpreted as saying that causal relations are non-extensional. Certainly, *a priori* relations of explicability obtain between kinds and not individuals. But there is no implication from non-extensionalism about causation to nominalism about events (or states of affairs). And indeed, as far as Aristotle is concerned, his particular variety of non-extensionalism – incorporating a distinction between accidental and non-accidental causation – not only does not presuppose nominalism, but actually commits him to essentialism about the items which feature as causal *relata*. For which non-accidental relations a thing can enter into will constitute its essence.

[24] Hintikka, *AMD*, ##7, 41 and 43. Cf. *An Po* 95a8–9, *Phys* 198b32–199a8, *PA* 645a24–5, *Rhet* 1369a32–5. A sub-class of accidents – automatic and lucky outcomes – do indeed happen *ἕνεκά του*, but they are precisely not *undertaken* by an agent. They answer to a purpose the agent actually has, or perhaps might have had, but he does not *choose* them: *Phys* 2.5–6 (cf. Charlton, commentary, p.106; Judson, 'Chance and 'Always or For the Most Part'', pp.77–8; Frede, *Seeschlacht*, p.116).

οὕτως ἥξει εἰς ὃ νῦν ὑπάρχει, ἢ εἰς τῶν γεγονότων τι, 1027b3–4, 6–8) which occurs necessarily, so that (given further the necessity of the causal connections), it follows that the future event from which we started will occur of necessity (1027b5–6).[25] But then, since the event was selected arbitrarily, it follows that everything will happen of necessity (1027b8–9), just like the necessity of death for a living creature, the causation of which has such a structure (1027b9–10). But although a creature's death is necessary, the manner of it – whether by disease or violence or what have you – is not yet (*οὔπω*) determined, but only becomes determined when certain conditions are fulfilled (*ἐὰν τοδὶ γένηται*) (1027b10–11). So the conclusion is that such causal series can only be traced back so far, and no further (1027b11–12). The event which end-stops such a chain will be the principle (*ἀρχή*) in virtue of which the final event counts as accidental (*ὁπότερ' ἔτυχεν*);[26] and there will be no further non-accidental cause of the coming to be of the end-stopping event (*αἴτιον τῆς γενέσεως αὐτῆς ἄλλο οὐθέν*) (1027b12–14).[27]

Aristotle may well be using an actual historical example concerning one Nicostratus who, in the version of Alexander, left a besieged city to obtain a drink of water at a well, and was there surprised by the enemy, who killed him.[28] On the most plausible reconstruction, Nicostratus' consumption of spicy food non-accidentally causes thirst, which then non-accidentally causes him to leave the city for a drink at a well. At the well it is accidentally the case that the enemy is already there. This combination is accidental because it is not always or usually the case that enemies lurk around wells when you go to drink there; that in turn reflects the fact that there is no *a priori* connection to be drawn between wells and the presence of enemies. What is accidental is that the enemy is at the well *then* (when Nicostratus goes to the well: cf. '*ποτέ*', *Met* 1025a22). (It is probably not accidental that the enemy is at the well at all: they were probably non-accidentally caused to go there by thirst just as Nicostratus was.) Nicostratus meets his enemies and the meeting non-accidentally brings about his death.[29] Now although the whole

[25] The necessity of the present and past is thus presupposed in the argument: otherwise it would commit a modal fallacy. See below.
[26] See n.43 below on the construction and meaning of this clause.
[27] For the justification of the insertion of 'non-accidental', see below.
[28] *In Met* 454.35–40.
[29] So, rightly, Sorabji, *NCB*, p.6 (*contra* Weidemann, 'APkD', p.46f). I return to this point shortly.

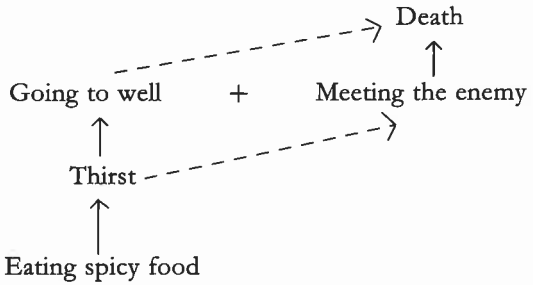
causal sequence contains non-accidental components, it is not an unbroken sequence of non-accidental causation, because at one crucial point it contains an accident. That was the fact that Nicostratus' going to the well coincided with his meeting the enemy.

Recall now that for A non-accidentally to cause B it is requisite that A as A cause B as B.[30] Applying this condition, it is clear that Nicostratus' meeting the enemy non-accidentally causes his death; equally, that his thirst non-accidentally causes his going to the well. But his meeting the enemy *lacks* a non-accidental cause. It has an accidental cause, because *qua* going to the well it has a (non-accidental) cause: his thirst. But *qua* meeting the enemy it has no non-accidental cause. If we step back and view the causal chain as a whole, we can see that the final effect (Nicostatus' death) is accidental, because at one point in the sequence of causes and effects a non-accidental effect (going to the well) is not itself the non-accidental cause of the next stage, but is merely accidentally combined with what is the non-accidental cause of the next stage (meeting the enemy). Since intrusion of the accidental at any point in a causal chain infects the whole sequence (accidents not only have exclusively accidental causes, as we have established; they also have exclusively accidental effects: *Phys* 197a13–14), we must say that Nicostratus' thirst is at best an *accidental* cause of his death.[31] In terms of our two types of accidental causation, we can say that the whole se-

[30] Weidemann insists on the further condition that A have, as A, a cause. What sort of cause is meant? Clearly not an accidental cause: in his discussion of the Nicostratus example Weidemann rejects the view (supported by Sorabji, *NCB*, p.6) that Nicostratus' meeting with the enemy (which is accidentally caused by his thirst) is a non-accidental cause of his death ('APkD', p.46f). But to insist that every non-accidental cause must itself have a *non-accidental* cause is surely to impose too strong a requirement. We must assume that (within the category of efficient causation) the categories accidental and non-accidental are exclusive and exhaustive. But then Aristotle concedes that causal chains may stretch back some distance: it's just that some are end-stopped (1027b11–12). He cannot be talking about chains of *accidental* causes: accidents do not threaten contingency. He must mean non-accidental causes. But then there can be a non-accidental cause which is not itself non-accidentally caused. So Weidemann's extra condition is mistaken.
[31] So there is no conflict (*pace* Weidemann, 'APkD', p.46) between the claim that Nicostratus' death has a non-accidental cause in the meeting and Aristotle's assertion (1027a7–8) that accidents have only accidental causes. It depends how his death is viewed. Viewed as the product of a causal chain starting when he meets the enemy, his death is not an accident, and so has a non-accidental cause. But if the purview is widened to include more of the causal history of his death, that death *is* an accident, and so has an accidental cause in his going to the well (and in any anterior causes: his thirst, eating spicy food, etc.): cf. 1027b10–11.

quence exemplifies *both* types. Nicostratus' thirst non-accidentally causes his going to the well; it is accidental that his going to the well coincides with his meeting the enemy (that *that* event enjoys both characterisations). So his thirst accidentally causes his meeting the enemy: that is accidental causation of the second type (cf. the cook who produces a healthy meal or the creditor who goes to the theatre and meets his debtor). Then the meeting non-accidentally causes Nicostratus' death; since the meeting is accidentally combined with his going to the well, his going to the well accidentally causes his death: that is accidental causation of the first type (cf. the doctoring builder, or the sculpting Polyclitus).

It may be helpful if we summarise the situation diagrammatically.[32] If we use solid arrows to represent non-accidental causation, broken arrows to represent accidental causation, and '+' to represent the accidental combination of the linked aspects or characterisations in one event, we can represent the transaction so:



Alexander's view is that the accident occurs in the connection between eating something spicy and being thirsty, on the grounds that thirst can have other causes (*In Met* 454.40–455.12). So Alexander assimilates the Nicostratus case to the case of the healing builder or sculpting Polyclitus: Nicostratus' thirst is non-accidentally caused by thirst-making food, which in this case happens to be something spicy (but might have been wine: 455.2). This is an interesting suggestion, but it cannot be the correct interpretation. In any causal chain, innumerable accidents will be associated with each stage of the process: Nicostratus' name is one such, and there will be countless others (the names of his

[32] I draw the basic structure of the diagram from Weidemann, 'APkD', p.47; but, as indicated, I differ from him in my understanding of non-accidental causation.

enemies, the weapons they use to kill him, and so on). But these accidents cannot threaten the case for causal determinism as long as they play no significant causal role. Alexander would have seen this if he had reflected on the accident of Nicostratus' name: obviously, his enemies kill him not *as Nicostratus*, but *as their enemy*. But no one is going to suggest that the fact that Nicostratus might have been called by another name deprives the causal sequence leading to his death of deterministic necessity. Accidents can only undermine determinism if they play a significant causal role, and it is clear that they can only play that role if the causal sequence has the structure outlined, that is to say only if at one point in the sequence the non-accidental effect of the previous stage is *not* the non-accidental cause of the next stage, but only the accidental cause (i.e. is accidentally combined with whatever is the non-accidental cause) of the next stage: A as A causes B as B; B is accidentally (combined with) C, which as C causes D as D. The route from A to D goes unavoidably through an accident.[33]

Although Alexander's suggestion must be judged unsatisfactory, the above reconstruction is not the only way of bringing in a causally significant accident. One might find an accidental connection between Nicostratus' thirst and his leaving the city to find a well. Perhaps what is usually the case when one is thirsty is that water-sources are close to hand.[34] One might further object to my reconstruction on the ground that although enemies do not usually lurk around wells as such, they do usually lurk around wells *of besieged cities*. But these elaborations are not to the point. It does not really matter precisely where we locate the accident: the important point is the preservation of the general structure of the causal sequence. Since the proposed alternative would yield that structure too, I have no objection to it. (The accidental connection would now lie between Nicostratus' going somewhere to quench his thirst – non-accidentally caused by his thirst – and that place being a well outside the city.) Perhaps, indeed, Aristotle's example is meant to contain *two* accidental connections, so that its effectiveness as a coun-

[33] Aquinas' example is different, but his treatment of it coincides with the line I favour: 'Verbi gratia, quod iste occidatur a latronibus habet causam per se quia vulneratur; et hoc etiam habet causam per se, quia a latronibus invenitur; sed hoc non habet nisi causam per accidens. Hoc enim quod iste qui negotiatur, ad negotium vadens, inter latrones incidat, est per accidens' (*In Met* liber 6, #1201).

[34] So Donini, *Ethos*, ch.2.

terexample to determinism is overdetermined. If we restrict ourselves to Aristotle's own words, it is surely plausible that there is meant to be some kind of accidental connection between 'going out' and encountering violence, and possibly also between thirst and 'going out'. How we fill out this bare outline is relatively unimportant, and I concede that my proposed reconstruction is not the only possible one (Sorabji, like Aquinas, has Nicostratus encountering bandits). Since, however, the overall structure is what is important, not the details, we can persist with the profered reconstruction in the confidence that we are not thereby falsifying Aristotle's intention in any functional way.

Aristotle appears to say at one point (1027b13–14) that there is *no cause* of whatever it is that end-stops the causal regress,[35] and it looks at first sight as if this remark conflicts with my reconstruction, since I have assigned causes to all stages in the Nicostratus episode: his going to the well has, as such, a non-accidental cause in his thirst, and as a meeting with the enemy (the causally relevant characterisation of the next stage in the chain) it has an accidental cause in his thirst. The meeting, as such, non-accidentally causes the death; as a going to the well, that event accidentally causes the death. Note here that the meeting is not *caused* by his going to the well: his going to the well is the *same event* as his meeting the enemy, but viewed under a different aspect. (Alternatively: they are different events which combine in some way; but that way is certainly not causal.) Now it might be supposed that it is just this accidental combination which has no cause at all, and which end-stops the regress: the event itself has, characterised in one way, one sort of cause; characterised in another way it has another sort of cause; but its having both characterisations has no cause.

It is probably right to suppose that the combination has no cause at all. But, equally, the combination is not a cause either (nor indeed an event). Aristotle, however, is restricting his discussion to events which are causes. His point in 1027b11–14 is that as we trace down the chain of causally connected events, we will come to an event which has no – what? Surely: no *non-accidental* cause. For that is what is needed to refute the opponent. To insist on no cause at all would be more than is required and cannot be fitted into our reconstruction, which assigns

[35] In view of this clear statement of Aristotle's, I do not see how Fine thinks she is entitled to claim that E.3 points 'not to a failure of causation, but to a failure of necessity' ('Aristotle on Determinism', p.568).

causes of some sort to all stages. But Aristotle does not need to insist that there are events which have no cause at all, nor, if our reconstruction captures his intention with the Nicostratus example, would he be entitled to it. Hence we must take '*αἴτιον*' at 1027b13 as short for '*μὴ κατὰ συμβεβηκὸς αἴτιον*' (cf. 1027a32). A parallel for this contraction is provided by *Met* 1025a29 and *Phys* 197a14–15, 198a6 where again 'cause' ('*αἴτιος*') must mean 'non-accidental cause'.[36]

The story is supposed to constitute a counterexample to the claim that every event which is a cause itself has a non-accidental cause. It is this claim which, on Aristotle's view, threatens to import universal necessity. For, as we established above, whatever is caused non-accidentally is itself a non-accident. Hence, by the principles of Δ.5 and E.2, it is necessary. In its own terms, the counterexample is perfectly successful, and entirely reasonable in the light of what we know from Δ.30 and E.2 about the distinction between the accidental and the non-

[36] Sorabji interprets 1027b13–14 as implying that the *meeting* has no cause at all (*NCB*, p.9). But this cannot be right, for it is accidentally combined with something (going to the well) which (on Sorabji's view too) has a non-accidental cause; so that it falls under the type of accidental causation exemplified by the cook who heals. Confusingly, Sorabji seems to want to combine his claim that the meeting has no cause with the claim that it has an accidental cause. I do not think Sorabji can mean 'no non-accidental cause' when he writes 'no cause'. What has no cause (of any sort) is the accidental combination of going to the well and meeting the enemy; the components of the combination each have a cause. (I do not think Sorabji would dispute this: his main contention in ch.1 is that coincidences – accidental combinations – do not, according to Aristotle, have causes.) Precisely the same confusion is present in Weidemann's discussion ('APkD', p.47). Within the space of a few lines, he says both that the meeting has an accidental cause, and that as such it has no cause. But if the meeting has *as such* no cause, what does it have an accidental cause *as*? Certainly not as a going to the well. The cause of the going to the well (thirst) is non-accidental, even on Weidemann's own criterion, because the extra condition (which I rejected above, n.30) is satisfied: that thirst is, as such, caused by eating spicy food, as such (and of course thirst, as such, causes going to the well, as such). So, as a going to the well, the meeting has a non-accidental cause in the thirst; but the combination of going to the well and meeting the enemy is accidental, so *as such* the meeting has an accidental cause in the thirst (and no other cause). No doubt there is a danger of confusion here in terminology. The one thing we cannot say is that X both has an accidental cause and no cause. If we are to find *both* a failure of causation *and* an element of accidental causation in this mêlée, we must either insist on the non-extensionality of the causal relation, or individuate events so finely that the going to the well does not count as the same event as the meeting with the enemy. I prefer the former course. In that case, we reserve for the event under the designation 'meeting the enemy' the role of (a) non-accidentally causing Nicostratus' death, (b) being accidentally caused by Nicostratus' thirst and (c) entering into the accidental combination (which has no cause at all) with his going to the well.

accidental. Strictly speaking, although the scenario contains two accidental causations (the thirst causing the meeting; going to the well causing the death) and one accidental combination (the coincidence of going to the well with meeting the enemy), only one of these is relevant to Aristotle's refutation of the principle that all events have non-accidental causes, namely the thirst causing the meeting. For the meeting has no other cause than the thirst, so it is a counterexample to the opponent's claim.[37] Nicostratus' death, on the other hand, although it is accidentally caused by his going to the well, also has a non-accidental cause in the meeting: so it cannot provide a counterexample (the opponent could concede that there were any number of accidental connections between events, so long as they all had *non*-accidental causes too, and so were non-accidents). The accidental *combination* of going to the well and meeting the enemy is not itself an event; rather, we have here two coincidental characterisations of one event. (Alternatively: we have two events combined in some way; but the combination is not a further event.)

What is the point of the story? Is it just illustrative, or does it introduce any new considerations? The answer is that it does introduce an entirely new consideration. Aristotle's claim in E.3 is that if every cause has a non-accidental cause then it will be possible to trace non-accidental causation to the present or the past. But – and this is the crucial move introduced by E.3 – the present and the past are necessary; that necessity will then be communicated back down the causal chain to all future events. Nicostratus' death by violence will then be necessary. The necessity of the present (or past) is what enables Aristotle's opponent, given his further assumption that all causes themselves have non-

[37] In regarding it as essential to Aristotle's case that he be able to find at least one event which has no non-accidental cause, I find myself at variance with Judson, 'Chance and 'Always or For the Most Part'', p.90f. But I do not see how his account can be squared with *Met* 1027b13–4. Judson would say that the non-accidental cause of the meeting is the conjunction of the non-accidental cause of Nicostratus' going to the well and the non-accidental cause (there presumably is one) of his enemies' going there. But to get a *meeting* out of these occurrences we need to add (at least) that the two parties arrive at the well at the *same time* (cf. *Met* 1025a22); and *that* has no non-accidental cause (Sorabji, *NCB*, p.10). Further, Aristotle's insistence that the accidental is not an object of scientific study shows that he cannot be prepared to admit reduction of the accidental to the non-accidental by widening the view to include conjunctions of causal sequences, for such conjunctions would be feasible objects of scientific study. Cf. Striker, 'Notwendigkeit mit Lücken', p.146.

accidental causes, to detach the necessity of any given caused event.[38] Aristotle concedes that some future events are now necessary: Nicostratus' death, for example, has been necessary at least since his birth (1027b9–10); and he concedes that a point comes, given the hypothesized sequence of events, when Nicostratus' death by violence becomes necessary, and that this may well be before the moment of death itself (1027b10–11): a suitable candidate, in our scenario, would be the moment at which he meets the enemy. What Aristotle resists is the conclusion that his death by violence has always been necessary.[39]

He does so by resisting the communication of necessity down the chain of causes from the past or present to the future. Formally, his opponent argues as follows:[40] suppose Nicostratus is thirsty (p) at t_1 (we can ignore earlier stages in the process), goes to the well and meets the enemy (q) at t_2, and they kill him (r) at t_3. Non-accidental causal

[38] Cf. Aquinas, *In Met*, liber 6 #1198: 'Cum etiam quaelibet conditionalis vera sit necessaria, oportet quod ex quo antecedens est positum, quod consequens ex necessitate ponatur. Sicut haec est vera: Si Socrates currit, movetur. Posito ergo quod currat, necesse erit ipsum moveri, dum currit. Si autem quilibet effectus habet causam per se, ex qua de necessitate sequitur, oportet quod sit illa conditionalis vera, cuius antecedens est causa et consequens effectus. Et licet inter causam, quae nunc est praesens, et effectum, qui erit futurus, quandoque sint plurima media, quorum unumquodque est effectus respectu praecedentium, et causa respectu sequentium; tamen sequitur de primo ad ultimum, quod conditionalis sit vera cuius antecedens est praesens et eius consequens quandoque futurum. Sicut hic, Si comedit salsa, occidetur. Antecedens autem ponitur, ex quo praesens est; ergo de necessitate erit quod occidatur. Et ita omnia alia futura erunt necessaria, quorum causae proximae vel remotae sunt praesentes.' In this passage 'necesse est ipsum moveri, dum currit' must be read as (incorporating the claim) '$Tp \rightarrow Lp$', not '$L\ [p \rightarrow p]$', for the argument to work. That suggests that the necessity which is communicated to the future in Aristotle's argument, as in Aquinas', is relative, rather than absolute, necessity. (Here I concur with Fine, 'Aristotle on Determinism', pp.569–60, against Sorabji, *NCB*, p.22.) For the necessity of the present and past is a relative necessity. That is good enough for Aristotle's opponent, for the necessity is relative *to the facts*. Since we are entitled to assume the facts, we can (so the opponent) *detach* the necessity of future events. Fine claims (ibid.) that Aristotle's denial of necessity to future events is (merely) a denial of absolute necessity, and that he leaves open the possibility that they might be relatively necessary. But this must be wrong. Aristotle denies necessity to future events: he does not restrict his denial to *absolute* necessity. Since future events, if they were necessary, would have to be *relatively* necessary, Aristotle in effect denies relative necessity to them.

[39] The intrusion of the necessity of present and past into the argument incidentally provides us with a further consideration against Alexander's identification of the accidental with the eating of spicy food. For that action lies, *ex hypothesi*, in the present, and so is necessary: hence its provenance is immaterial to the argument, for the determinist's conclusion would then follow anyway: Donini, *Ethos*, p.31.

[40] My presentation follows that of Weidemann closely: 'APkD', p.31ff.

relations introduce necessity (1027a29–32) and so can be represented formally by strict conditionals. Applying the modal axiom '$[L_t p$ & $L_t[p \rightarrow q]] \rightarrow L_t q$' twice to the premisses

$$L_{t_1} p_{t_1}$$

and

$$L_{t_1}[p_{t_1} \rightarrow q_{t_2}] \;\&\; L_{t_1}[q_{t_2} \rightarrow r_{t_3}]$$

we derive the conclusion

$$L_{t_1} r_{t_3}.$$

It is clear from Aristotle's procedure that he accepts the first of these premisses (the necessity of the present), but rejects the second. His way of doing so is, in effect, to object to the way his opponent uses 'q_{t_2}' to represent *both* Nicostratus' going to the well *and* his meeting the enemy. For in so doing the opponent treats causation as an extensional relation (alternatively: he identifies two distinct – and only accidentally combined – events). If we separate the two descriptions of what Nicostratus does at t_2, we might let 's' represent his going to the well and 'u' his meeting the enemy.[41] Aristotle could then accept that

$$L_{t_1}[p_{t_1} \rightarrow s_{t_2}].$$

Thirst always or usually prompts one to go to a place, such as a well, where it can be quenched. Aristotle would, I have suggested, accept too

$$L_{t_2}[u_{t_2} \rightarrow r_{t_3}].$$

Nicostratus' death becomes inevitable at the moment when he meets his enemy. He would also, I think, have no quarrel with

$$L_{t_1}[u_{t_2} \rightarrow r_{t_3}].$$

The connection between meeting the enemy and being killed is non-accidental and so is necessary at all times, t_1 included. But the vital link which his opponent now needs and which Aristotle will not concede is

[41] My policy on individuating events and causal *relata* (i.e. treating the going to the well and the meeting with the enemy as the same event, and abandoning the extensionality of the causal relation) can then be put, in Fregean terms, as: 's' and 'u' have the same *Bedeutung* but different *Sinne*.

$$L_{t_1}[s_{t_2} \rightarrow u_{t_2}].$$

The connection between going to the well and meeting the enemy is accidental and so not necessary at t_1.

Weidemann argues that the connection between going to the well and meeting the enemy does indeed *become* necessary, although not until t_2, so that although Aristotle cannot agree to '$L_{t_1}[s_{t_2} \rightarrow u_{t_2}]$', he can agree to '$L_{t_2}[s_{t_2} \rightarrow u_{t_2}]$'. The argument is: 'Erst zum Zeitpunkt [t_2], ist es notwendig, daß Nikostratos dann, wenn er zu diesem Zeitpunkt die Stadt verläßt, um einen bestimmten Brunnen aufzusuchen, zum Zeitpunkt [t_3] von den Belagerern der Stadt getötet wird, da es erst zum Zeitpunkt [t_2] unvermeidlich ist, daß ihn ein zu diesem Zeitpunkt unternommener Gang zum Brunnen zum Aufenthaltsort der Belagerer führen wird.'[42] We must be careful here. It is not as if the well has been deserted until t_2 at which point the enemy suddenly materialises just in time to catch Nicostratus. They have been there all along. But then it is tempting to object that if there is *ever* a necessary connection between going to the well and meeting the enemy then *all along* it would have been the case that necessarily, *if* someone from the besieged city went to the well, he would meet the enemy; but there is surely no such necessary connection, either at t_2 or at any other time (because goings to wells are not always or usually combined with meetings with enemies). Of course, meeting the enemy becomes necessary at t_2 – with the necessity of the present. Hence, since we have '$L_{t_2} u_{t_2}$', it follows (trivially) that we have '$L_{t_2}[s_{t_2} \rightarrow u_{t_2}]$'. But we have the latter *only* because we have the former, and not because we have an independently constituted *a priori* connection between s_{t_2} and u_{t_2} (which, if it obtained, would obtain at all times). Given the necessity, at t_2, of Nicostratus' meeting the enemy, and given the (*a priori*) necessary connection between meeting the enemy and being killed, Nicostratus' death becomes necessary at t_2. But that is no comfort to Aristotle's opponent, because the regress stops at t_2: although a necessary connection between s_{t_2} and u_{t_2} is indeed constituted at t_2, there is no *a priori* connection between s_{t_2} and u_{t_2}, and so no *a priori* necessity, at t_1 or at any other time, that the going to the well at t_2 will

[42] 'APkD', p.45. (I have altered the temporal specifications to fit my elaboration of the example.) Since Weidemann here concedes that Nicostratus' death becomes *necessary* when he meets the enemy, it is surprising that he refuses to regard the meeting as a non-accidental cause of Nicostratus' death. Necessary and non-accidental causal connections surely coincide.

be combined with meeting the enemy at t_2. But any purported necessary connection, at t_1, between meeting the enemy at t_2 and being killed at t_3 would have to be an *a priori* connection.[43]

Two important points emerge from our discussion of *Met* E.3. Firstly, we have seen the crucial role played by the necessity of the present and past. It might look, purely from the perspective of E.3, as if Aristotle's opponent needs this necessity if he is to detach the necessity of caused events. Otherwise, while *connections* in the *rerum natura* would (assuming universal non-accidental causation) be necessary, we would not be entitled to infer the necessity of any given event: if we tried to do so, we would in effect be trying to apply the invalid axiom '$[p \,\&\, L\,[p \rightarrow q]] \rightarrow Lq$'. Strictly speaking, Aristotle's opponent requires only the necessity of the *past*, not also that of the present.[44] It is therefore of great significance that Aristotle offers his opponent the necessity of both the present and past. It is not this part of the opponent's argument that Aristotle questions.

But it is even more significant that Aristotle introduces the necessity of present and past at all. For we have seen that he already has a complete case, by the beginning of E.3, for the need to find accidents in nature if universal necessity is to be avoided. Given that something is a non-accident if and only if it is non-accidentally caused, and given the further assumption, granted by Aristotle, that whatever causes is itself caused, it follows that if all causation is non-accidental, there will be nothing but non-accidents in nature. The Nicostratus episode is admirably suited to provide a counterexample to this argument, for it can be made to yield a pattern of non-accidental causation, which arises from the presence in the system of an accident (that Nicostratus' going to the well is combined with his meeting the enemy) which itself is

[43] Donini finds a problem with the phrase '*ἡ τοῦ ὁπότερ' ἔτυχεν αὕτη* ⟨sc. *ἀρχή*⟩ (1027b12–13): *Ethos*, pp.37–9. For the event which end-stops the regress (on my reconstruction: meeting the enemy) *necessitates* its effect, so could hardly be described as the *ἀρχὴ τοῦ ὁπότερ' ἔτυχεν*. Donini's own solution is to construe this genitive as subjective rather than objective. But that is unnecessary: the meeting, though it non-accidentally causes Nicostratus' death, itself has no non-accidental cause, and so may justly be said to be the *ἀρχή* of accidentality in the final event.

[44] The standard form of the problem of reconciling divine foreknowledge with human freedom arises from the application of the axiom '$[Lp \,\&\, L\,[p \rightarrow q]] \rightarrow Lq$' to the combination of divine foreknowledge – necessary because now in the past – and the necessary connection between knowledge and truth. See, e.g., Aquinas, *De Veritate*, in *Quaestiones Disputatae* ed. Spiazzi (Turin, 1949), q.2.a.12. Aquinas alludes to the problem in his commentary on *Met* E.3, ##1218–22.

neither caused nor causes. Had Aristotle confined himself to using the story in this illustrative way, E.3 would follow smoothly on Δ.30 and E.2. But instead he chooses to advance a new argument, based on the necessity of the present and past, designed to show that if all causes are non-accidental, then everything is non-accidental, and so necessary. The appearance that Aristotle's opponent *needs* the necessities of the present or the past to detach the necessity of the future event is illusory. Of course if the opponent confines himself to necessary *connections* in nature, such an assumption becomes inevitable if the conclusion is to be detached, on pain of committing a modal fallacy. But the point is that the opponent is *not* confined to necessary connections: for Aristotle has granted him the assumption that something is a non-accident if and only if it has a non-accidental cause, so the (assumed) presence of exclusively non-accidental causes in nature is enough to yield the non-accidental, hence necessary, status of the connected events.

It is true that in *Met* E.3 the target shifts from necessitarianism (in general) to causal determinism (in particular). But the point remains that the materials of Δ.30 and E.2 give Aristotle the resources to combat not only necessitarianism in general, but also causal determinism, without recourse to the necessity of the present or past. Aristotle could simply apply those materials, in the way I did in my reconstruction, to the Nicostratus example: the meeting at the well has no non-accidental cause, and so is an accident; but then it cannot be of necessity (1027a32). We would then expect the Nicostratus example to be merely illustrative. This seems indeed to be the way Alexander takes the relation between E.2 and E.3;[45] but in so doing he misses the point that an alien consideration – the necessity of the present and past – intrudes into E.3.

Secondly, we can make some important comparisons between *DI* 9 and *Met* E.3. Both texts accept the necessity of the present (which, in the case of *DI* 9, also figures in its derivative role as the fatalist's inference from truth to necessity), and both seek to avoid a necessitarianism which threatens to engulf us once this concession has been made. In *Met* E.3 Aristotle seeks to avoid necessitarianism by preserving the '*κατὰ συμβεβηκὸς*' ('accidental'), and in *DI* 9 he seeks to do so by preserving the '*ὁπότερ' ἔτυχεν*' ('as it may chance'). These two notions

[45] *In Met* 454.14–16, 33–4.

are explicitly connected by Aristotle (*Met* 1027a16–17). But in spite of this connection, there is an important difference between the roles they play in the two chapters, and this has its counterpart in the difference between the two sorts of necessitarianism which the chapters are combating. In *DI* 9 the target is (logical) fatalism; in *Met* E.3 it is (causal) determinism. I have argued that the solution offerred in *DI* 9 is not a statistical one, but rather the restriction (or adaptation) of **PB**. Is the solution offerred in *Met* E.3 statistical?

To some extent, yes. In *Met* E.3 the solution is to reject the assumption that all causation is non-accidental, or, equivalently, that all causal connections can be specified *a priori*.[46] I have argued that there is an equation between statistical regularity or 'for the most part' connections and *a priori* causation, and that this equation is to be read in a Kantian rather than a Humean way: it is because things have certain natures that they behave according to certain regular or usual patterns (unless hindered), not *vice versa*. But with that proviso on the direction in which the equation is explanatory, it is true that statistical considerations are paramount in *Met* E.3.[47]

However, in another way the role of statistical considerations in the two chapters is quite similar. In *DI* 9 it is a necessary but not sufficient condition of the contingency of tomorrow's sea battle that sea battles are not in general guaranteed to fall under any relevant regular or 'for

[46] It is just here that Aristotle's account can be attacked as inadequate. Even if there is no *a priori* connection between going to a well and meeting the enemy, the persistent determinist will argue that the combination in the Nicostratus episode was nevertheless inevitable, and in principle predictable by someone in possession of full information concerning the antecedents in all the relevant causal chains (cf. Sorabji, *NCB*, pp.12–13). Aquinas remarks that contingency can arise 'propter concursum duarum causarum, quarum una sub altera non continetur, sicut cum praeter intentionem occurrunt mihi latrones. (Hic enim concursus causatur ex duplici virtute motiva, scilicet mea et latronum.)' (*In Met* liber 6, #1210). This indeed seems to capture Aristotle's idea in the case of the Nicostratus episode, as I have reconstructed it. The determinist could insist that the meeting would not appear coincidental to anyone in possession of a sufficiency of facts. The interpretation of coincidences as the product of crossing causal chains seems to have been characteristic of the Platonic tradition. See, e.g., Boethius, *Consolatio* 5.pr.1 and m.1 with Sharples' commentary ad loc. (pp.214–16).

[47] Judson may be right ('Chance and 'Always or For the Most Part'', #5) that the equation between statistical regularity and natural, rationalisable outcomes should not be so tight as not to admit of exceptions. Perhaps the equation itself is only true 'for the most part'. But that would not seriously affect its fundamental metaphysical status, nor the question of the direction in which it should be read.

the most part' pattern. The contingency of the particular sea battle depends on, but does not – as **S** claimed – consist in, this failure. Now the non-deterministic event of Nicostratus' death resides in the fact that the combination of his going to the well (that particular event) and his meeting the enemy (the same particular event, but viewed under another aspect; alternatively, a different particular event, but combined with the first) was accidental, and *that* fact in turn depends on the fact that there is no *a priori* connection between goings to wells (as a class) and meetings with the enemy (as a class). Can this dependence be strengthened so that the accidental status of the particular is *constituted* by the failure of an *a priori* connection at the the level of the kind? It would appear, from the argument of *Met* E.3, that it can. Indeed, the argument against necessitarianism which Aristotle has available to him on the basis of the materials of Δ.30 and E.2 seems to envisage that the accidental status of a particular is constituted by the failure of a regularity or even a 'for the most part' connection to obtain in respect of the class to which that particular belongs.

Aristotle does not appear to recognise that the failure of such a connection is in fact only a precondition, not a sufficient condition, for the defeat of causal necessitarianism. Or perhaps he does not want to defeat causal necessitarianism so long as it does not take the *a prioristic* form he objects to.[48] The fact that causal considerations are absent

[48] Aristotle would have a response to his determinist opponent if he were prepared to relativise regularity/irregularity to *all* circumstances, i.e. the accidental would be what does not always happen in the same way in the *same* (kind of) circumstances (the doctrine which I earlier called 'contingency of indifference'). The claim would then be that irregularity is not only an objective but also an ultimate feature of reality. That Aristotle thought of irregularity as objective is evidenced by *Met* E.3 itself. (*Met* 1027a19–28 does not constitute counter-evidence: so, rightly, Kirwan, commentary ad loc., against Ross; see Sorabji, *NCB*, pp.19–23 for discussion of further possible counterexamples.) But did he think of irregularity as an ultimate feature of reality? It is true that in many contexts Aristotle's notion of statistical (ir)regularity must be construed as a relative, not absolute, one (i.e. relativised to cases/circumstances, not times; cf. #5 above). What then counts as (ir)regular depends on the way the background conditions are specified. Here, as we have observed, Aristotle seems to regard some specifications as ontologically more significant than others: in general, he concentrates on outcomes which count as regular or irregular relative to conditions which rationalise or fail to rationalise, as a matter of *φύσις* or *προαίρεσις* (*Phys* 2.4–6), those outcomes (hence the connection between non-accidental causation and science). Judson analyses chance (*τὸ αὐτόματον*) in *Phys* 2.4–6 as 'incidental relative to all the natural and deliberative processes taking place in the subject' ('Chance and 'Always of For the Most Part'', p.92): those are just the ones which *make sense* of the (non-accidental) outcome. In order to defeat the persistent causal

from *DI* 9 (and logical considerations absent from *Met* E.3) indicates that we are dealing with two separate arguments against two separate positions. It may indeed be the case that statistical considerations play a constitutive role in Aristotle's solution to the problem of causal determinism; but that provides us with no reason to suppose that Aristotle envisaged a similar role for them in the battle against logical fatalism.

determinist, Aristotle would have to be prepared to go further than this, and relativise his notion of (ir)regularity to *all* background circumstances: regardless of what rationalises what, an outcome would count as accidental (contingent) if and only if outcomes of that type did not always occur in background circumstances of the same type. I do not know whether Aristotle would have wished to go as far as this.

15 Reconstructing the Master Argument Of Diodorus Cronus: Introduction

Since antiquity the so-called Master Argument of the Megarian logician Diodorus Cronus has exerted a fascination over interpreters. In the remainder of this study I try to arrive at a satisfactory reconstruction of it, and consider how it might have related to Aristotle's discussion of fatalism in *DI* 9. The Argument is preserved for us by Epictetus:

> The Master Argument seems to have been developed on the basis of the following sort of premisses. These three premisses form an inconsistent triad: (1) Every past truth is necessary, and (2) The impossible does not follow from the possible, and (3) Something is possible which neither is true nor will be true. Diodorus, aware of this inconsistency, relied on the plausibility of the first two premisses in order to establish the conclusion that nothing is possible which neither is true nor will be true. But some maintain these two premisses: (3) Something is possible, which neither is nor will be true, and (2) The impossible does not follow from the possible, but not (1) Every past truth is necessary. The supporters of Cleanthes seem to have taken this line, and they are mostly followed by Antipater. Others maintain the other two premisses, (3) Something is possible, which neither is nor will be true, and (1) Every past truth is necessary, and assert that the impossible does follow from the possible. It is impossible to maintain all three premisses owing to their mutual inconsistency. (*Diss* 2.19.1–4 = fr.131 Döring = LS 38A)[1]

The three premisses of the argument are:

(1) *πᾶν παρεληλυθὸς ἀληθὲς ἀναγκαῖόν ἐστι*
Every past truth is necessary
(2) *δυνατῶι ἀδύνατον οὐκ ἀκολουθεῖ*
The impossible does not follow from the possible
(3) *δυνατόν ἐστιν ὃ οὔτ' ἔστιν ἀληθὲς οὔτ' ἔσται*
Something is possible which neither is true nor will be true.[2]

[1] Other references to the Master Argument in antiquity are: Plutarch, *De Stoic Rep* 1055d–e = fr.134 Döring = *SVF* 2.202, *Quae Conv* 615a, *De Tuend San* 133b–c = *SVF* 1.389; Lucian, *Vita Auct* 22 = *SVF* 2.287 = LS 37L; Themistius, *Orationes* 2.30b = fr.110 Döring.

[2] The sense of the third premiss (which reads at first glance like a definition of the possible) is fixed by the wording of its negation, as proved by Diodorus – '*μηδὲν εἶναι*

According to Epictetus, the three premisses form an inconsistent triad. Diodorus used the first two premisses to reject the third, and thus arrived at the Principle of Plenitude: all possibilities must at same time be realised.[3] Indeed the point of the Argument was precisely to establish the Principle of Plenitude. We learn this from an important passage of Alexander of Aphrodisias' commentary on *An Pr.* Alexander tells us, speaking initially of Aristotle, that

> *δύναται λέγειν καὶ περὶ τῶν δυνατῶν, τοῦ τε, ὃ Διοδῶρειον λέγεται, ὃ ἢ ἔστιν ἢ ἔσται· τὸ γὰρ ἢ ὂν ἢ ἐσόμενον πάντως δυνατὸν μόνον ἐκεῖνος ἐτίθετο. τὸ γὰρ ἐμὲ ἐν Κορίνθωι γένεσθαι δυνατὸν κατ' αὐτόν, εἰ εἴην ἐν Κορίνθωι, ἢ εἰ πάντως μέλλοιμι ἔσεσθαι· εἰ δὲ μὴ γενοίμην, οὐδὲ δυνατὸν ἦν· καὶ τὸ τὸ παιδίον γενέσθαι γραμματικὸν δυνατόν, εἰ πάντως ἔσοιτο. οὗ εἰς κατασκευὴν καὶ ὁ κυριεύων ἠρώτηται λόγος ὑπὸ τοῦ Διοδώρου.*
>
> [Aristotle] may be talking about the debate concerning possibility, and about the Diodorean definition of the possible as that which either is or will be; for Diodorus claimed that that alone is possible which either is or at all events will be. On his view, for me to be in Corinth was possible if I were (already) in Corinth or if I were at all events going to be there; if I were not to be there, then it was not possible either. And it was possible for a child to become literate if he was at all events going to become so. Diodorus put forward the Master Argument in order to establish this principle. (*In An Pr* 183.34–184.6 = fr.135 Döring = LS 38B)

Adding to the Diodorean conclusion of the Argument, which we may represent as '$\Diamond p \rightarrow [p \vee F p]$', the plausible '$[p \vee F p] \rightarrow \Diamond p$', we arrive at the equivalence '$\Diamond p \equiv [p \vee F p]$'. Assuming L–M duality,[4] as well as F–G duality (cf. #1), that takes us to the definitions of the modalities which Boethius tells us Diodorus espoused:

$$\Diamond p \equiv [p \vee F p]$$
$$\Box p \equiv [p \,\&\, G p]$$
$$\neg \Diamond p \equiv [\neg p \,\&\, \neg F p]$$
$$\neg \Box p \equiv [\neg p \vee \neg G p].^{5}$$

Epictetus records the apparently desperate attempts of others to avoid Diodorus' conclusion: we are told in the above passage that Cleanthes rejected the first premiss, and a little further on Epictetus tells us that Chrysippus rejected the second premiss. These manoeuvres seem desperate because the first two premisses of the Argument look unimpeachable. Nobody in antiquity seems to have questioned that the three premisses are indeed mutually inconsistent. But they do not, just as they stand, so strike modern eyes.[6] Modern interpreters have accordingly sought an extra premiss, or extra premisses, which could have been tacitly understood by Diodorus' contemporaries and which can yield a contradiction when conjoined with the premisses which we have.

In what follows I shall discuss some reconstructions which com-

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δυνατόν, ὃ οὔτ' ἔστιν ἀληθὲς οὔτ' ἔσται' – and by its subsequent repetition in the form *'ἔστι τέ τι δυνατόν, ὃ οὔτ' ἔστιν ἀληθὲς οὔτ ἔσται'*: see further #20 below. But there is an ambiguity in premisses (2) and (3) which will occupy us later. For the moment I translate *'δυνατόν'* as 'possible'; but in due course I shall argue for the translation 'contingent'. Some of the reconstructions which I examine in the sequel formalise premiss (3) as

(i) $\Diamond p \,\&\, \neg [p \vee F p]$

others as

(ii) $M [p \vee F p] \,\&\, \neg [p \vee F p]$.

(For (i), see Prior's reconstruction (#18) and Barreau's 'Diodorean' version (#20).) Strictly speaking, (i) is incorrect, since *'◇p'* means 'it is now possible that p now'. But Diodorus cannot intend in premiss (3) so to construe *'δυνατόν'*: that would render *'οὔτ' ἔσται'* redundant. However, in the case of reconstructions which adopt (i) rather than (ii), (ii) can be substituted for (i) if suitable further adjustments are made.

[3] Cf. Philoponus, *In An Pr* 169.17–21 = fr.136 Döring; Cicero, *De Fato* 13; Plutarch, *De Stoic Rep* 1055d–e = fr.134 Döring.

[4] Does the assumption of L–M duality presuppose **PB**? Michael claims that

$$\neg M \neg p \rightarrow L p$$

requires **PB** ('What is the Master Argument of Diodorus Cronus?', *APQ* 13, 1976, 229–235, p.232 n.10). If we interpret 'L' as 'true in all possible worlds' and 'M' as 'true in at least one possible world', then indeed, from the hypothesis that 'p' is not false in any world, it does not follow, unless we assume **PB**, that it is true in all worlds: it may be true in some worlds and neither true nor false in other worlds (assuming choice negation). But the possible worlds approach is inappropriate in the present context, because we are dealing with temporal discourse. What we require rather is the notion of a possible history of the world. On that approach, 'L' is to be interpreted as truth in all possible histories of the world, 'M' as truth in at least one possible history. Since now, relative to each history, 'p' is determinately either true or false (**PB** applies on each branch of the tree), if 'p' is not false in any such possible history, it follows that it is true in all histories. Truth-value gaps arise when statements are true on some branches and false on others: in such cases statements acquire neither an overall evaluation of truth nor one of falsity. Hence full L–M duality is preserved, without a requirement of **PB**, in the context of modalised temporal statements.

[5] *In De Int* 2.234.22–6 = fr.138 Döring = LS 38C. I shall quote and discuss this passage below, #19.

[6] Cf. Kneale, *DL*, p.119.

mentators have proposed, including my own favoured reconstruction. I shall from time to time mention and assess possible constraints on a successful reconstruction. I mention three such now: the first two of them I accept, the third I reject. One obvious overall constraint which we must accept is that any successful reconstruction should employ as few extra premisses as possible. Further, any extra premisses should have historical plausibility: they should be such that Diodorus could reasonably be taken to have relied on them and, preferably, such that he could have expected them to be uncontroversial. Another constraint which has been proposed is that the Argument 'cannot have been unduly complicated in structure'.[7] The motivation for this proposed constraint is that the Argument, we are told, was a favourite topic of conversation at dinner.[8] As a matter of fact, I do not think that any of the reconstructions I am going to consider are particularly complicated. But in case the reader disagrees, I should add that in any case I do not find the proposed constraint convincing. Philosophers are not usually deterred from broaching complex issues at dinner, especially if they are among other philosophers.[9]

[7] LS vol.2, p.233.
[8] Epictetus, *Diss* 2.19.8; Plutarch, *Quae Conv* 615a, *De Tuend San* 33b–c = *SVF* 1.389.
[9] What counts as complex? Long and Sedley, who favour the proposed constraint, support Prior's reconstruction, but Barreau finds it too complex (at least in the form advanced by Prior himself) to count as a plausible reconstruction: 'Le Maître Argument de Diodore', *Fundamenta Scientiae* (Strasbourg) 46, 1975, 1–51, p.36.

16 Gassendi's Proposal: a First Attempt

The first problem which arises in connection with the Master Argument is its name. 'Master Argument' is a translation of the Greek name '*ὁ κυριεύων λόγος*'; but along with its German and Romance equivalents ('Meisterschluß', 'Argument Dominateur' etc.), it may well be a mistranslation. The Greek phrase literally means 'the Ruling Argument', and all three translations I have mentioned interpret this as indicating that the argument itself rules, or dominates, in the sense that it is irrefutable. Alternatively, it has been suggested that the Argument, which after all in some sense concerns fate, alludes in its title to the invincible power of fate.[1] But the conclusion which Diodorus sought from the Argument is the Principle of Plenitude, which does not immediately strike one as having to do with fate; nor is fate mentioned in any of the premisses. So this suggestion is unconvincing.

A more tantalising proposal was made by Gassendi, who suggested that the *κυριεύων λόγος* was so-called 'non quod aliarum imperans sit, sed quod Dominationis mentio in eius deductione sit' ('not because it rules other arguments, but because its deduction makes mention of ruling').[2] This suggestion fits very well with what we already know of other named arguments of the Hellenistic period: the titles of these arguments generally allude to their subject matter (i.e. the particular example used). Thus the 'Mowing Argument' is about a mower;[3] the 'Heap Argument' (still known as the Sorites Paradox) is about a heap; the 'Liar Argument' is about lying.[4] In addition, some arguments enjoyed yet more sophisticated titles, in which allusion was made not merely to the subject-matter of the argument, but also to the way in which the conclusion is supposedly reached.[5] Thus the 'Lazy Argument' is not merely an argument about doing nothing, but one whose con-

[1] Schuhl, *Le Dominateur et les Possibles* (Paris, 1960), p.10.
[2] *Op. Omnia* B.XVII t. 1: De logicae origine et varietate p.52a, quoted by Schuhl, *Le Dominateur et les Possibles*, p.8.
[3] Ammonius, *In De Int* 131.20–32 = LS 38I.
[4] Both of these at Cicero, *Academica Priora* 92–6 = LS 37H.
[5] LS vol. 1, p.229; Sedley, 'Diodorus Cronus and Hellenistic Philosophy', *Proceedings of the Cambridge Philological Society* 203, 1977, 74–120, n.132.

clusion is that all action is futile.[6] The 'Horned Argument' is about horns, and also places the responder on the horns of a dilemma.[7] Hence, if the *κυριεύων λόγος* conformed to this pattern, it will at least have used the example of a ruling in its typical presentation, and may additionally have carried the implication in its title that it (the Argument) can overcome all opposition. Can we reconstruct the Argument on the basis of an example concerning a ruler?

A possibility in this direction presents itself in the light of Cicero's discussion of Diodorus in his *De Fato*.[8] At 12ff Cicero is engaged in attacking Chrysippus' attempt to combine adherence to astrology and divination with avoidance of necessitarianism. A difficulty arises for Chrysippus because he appears to want to combine universal causal determinism with the openness of the future. For on the one hand Chrysippus believes in divination, which presupposes unrestricted **PB**, and that, on Chrysippus' view, in turn presupposes universal causation (*De Fato* 20–1). In the case of the future, that commits him to the claim that 'futura vera non possunt esse ea quae causas cur futura sint non habent' ('There cannot be truths about the future which do not have causes why they are future [truths]', *De Fato* 26). But, on the other hand, he wishes to allow that something which never happens (e.g. a jewel's being broken) may nevertheless be possible, which requires him to reject Diodorus' conception of possibility (enshrined in the Principle of Plenitude). The difficulty for Chrysippus is this: on his view, if a future statement is bivalent, the corresponding event must have efficient causes (causas ... efficientis quod non habebit, id nec verum nec falsum erit, *De Fato* 20). So if 'This jewel will never be broken' is true, there must be efficient causes, present now in the *rerum natura*, preventing the breakage of the jewel. But then how can Chrysippus insist that it is nevertheless *possible* that the jewel will be broken?[9]

[6] Cicero, *De Fato* 28ff.

[7] See n.29 below.

[8] Cf. White's discussion of what he calls the 'causal-astrological link version' of the Master Argument at *Agency and Integrality*, p.86ff.

[9] One might suspect a muddle here on Cicero's part. Perhaps he has confused Chrysippus' with Philo's conception of possibility. Philo admitted a category of possibility keyed to bare suitability of the subject: a piece of chaff lying on the bottom of the ocean is capable of being burnt even if it never will be burnt (Alexander, *In An Pr* 184.6–10 = fr.135 Döring = LS 38B). (As I have indicated, it is unclear whether this category is to be taken as an anticipation of Scotus' discovery of pure logical possibility or not: cf. #9 n.42 above.) However, Cicero's report is confirmed by Epictetus (on the Master Argument), by Plutarch (*De Stoic Rep* 1055d–e = *SVF* 2.202 = fr.134 Döring), and by Alexander, *De Fato* 176.15–16 (cf. Cicero, *De Fato* 39). In any case, there is a distinction between Chrysippus' use of the example of the jewel, as told by Cicero, and Philo's piece of chaff. Philo seems to be allowing for something to be metaphysically possible even if it is certified now as being causally impossible; Chrysippus can claim that he is not committed to that. The problem for Chrysippus is that even if in the first instance he can rely on the traditional Stoic definition of possibility (the possible is that which admits of being true, there being nothing in external circumstances to prevent its being true: *DL* 7.75 = LS 38D), in order to try and steer a middle path between necessitarianism and Philonian possibilism, the Stoic doctrine of universal causation can be mobilised to force him in the end to choose between the necessity or impossibility of the jewel's being broken (as indeed Plutarch argues, loc. cit.), depending on whether he chooses to retain the possibility that the jewel may be broken, or the fact that it will not be (he cannot have both). See in general Sambursky, *Physics of the Stoics*, pp.75–6; Gould, *The Philosophy of Chrysippus* (Leiden, 1970), ch.5; and cf. Boethius, *In De Int* 2.235.8ff. Note that Chrysippus' deployment of the jewel example need not be read as committing him to a rejection of modality relative to the facts. His point may simply be that the jewel can be broken, even though it is true now that it will not be, in the sense that its nature permits breakage, and there is nothing, as yet, in the external circumstances which *causally* prevents breakage. The *truth* that it will not be broken does not count as an external *causal* factor. (But, as I have indicated, on Chrysippus' own principles that truth presupposes such factors; so his position cannot be maintained.) Nor, *pace* a suggestion of Frede's (*Die Stoische Logik*, p.112), need the Stoic definition of the non-necessary be read as aimed against the Aristotelian position. That definition (with Frede's correction) reads: *δ καὶ ⟨εἰ⟩ ἀληθές ἐστιν καὶ ψεῦδος οἷόν τε εἶναι, τῶν ἐκτὸς μηδὲν ἐναντιουμένων, οἷον τὸ 'περιπατεῖ Δίωνα'* (DL 7.75 = LS 38D). In question is probably '$M\,[p_t \,\&\, M_t \neg p_{t'},\ t' > t]$', rather than '$M\,[p_t \,\&\, M_t \neg p_t]$'.

Cicero does not allude to the Master Argument, but his whole discussion is steeped in terms reminiscent of it. As we shall shortly see, premiss (1) is explicitly present in Cicero's discussion, and premiss (2), on one plausible reading of it, implicitly so. Furthermore, Cicero is familiar with Diodorus' conception of possibility, which the Argument was designed to establish:

> For he [sc. Diodorus] says that that alone can come to be which either is or will be true, and he says that whatever will be happens necessarily, and that whatever will not be cannot happen. (Ille enim id solum fieri posse dicit quod aut sit aut futurum sit verum, et quidquid futurum sit id dicit fieri necesse esse, et quidquid non sit futurum id negat fieri posse.)

Here Cicero initially specifies Diodorus' conception of possibility. Surprisingly, Cicero goes further in this passage and ascribes a general determinism to Diodorus which does not seem, at least in the first instance, to be a consequence of his way of running the Master Argument. This is a point to which I shall return. The passage continues:

> You [sc. Chrysippus] say that things that are not going to be can also come about, as for example that this jewel may be broken, even if that will never be, and that it was not necessary that Cypselus would rule in Corinth, even though that was predicted a thousand years ago by Apollo's oracle.

Here we have our needed example of a ruler. Cicero is imagining that Chrysippus allows that Apollo could have (correctly) predicted a thousand years ago that Cypselus would rule in Corinth, without conceding that his rule is thereby necessary. Cicero tries to refute this position by adducing two principles, both of which Chrysippus ought to accept: the necessity of the past, and the principle that conditionals reporting a connection between an act of divination and the divined event ('If X predicted that E would happen, then E will happen') are, if true, necessary. The crucial passage is the following, which immediately precedes the first passage I quoted above:

> The observations of astrologers may be taken to be of the following kind: 'If anyone was born at the rising of the Dog-star, for example, he will not die at sea.' Beware, Chrysippus, lest you give up your own cause, in which you are in great dispute with the powerful dialectician Diodorus. For if this conditional is true – 'If anyone was born at the rising of the Dog-star, he will not die at sea' – then the following conditional is also true – 'If Fabius was born at the rising of the Dog-star, Fabius will not die at sea' ('Si Fabius oriente Canicula natus est, Fabius in mari non morietur'). Therefore that Fabius was born at the rising of the Dog-star, and that Fabius will die at sea, are inconsistent with one another (pugnant inter se). And since it is certain that Fabius was born at the rising of the Dog-star, there is a further inconsistency between the statements that Fabius exists, and that he will die at sea. Hence the following conjunction consists of incompatible statements: 'Fabius exists and Fabius will die at sea'. This [combination] cannot come about as stated. Hence the statement 'Fabius will die at sea' is the sort of thing which cannot come about. But that is an upshot which you in no way desire, Chrysippus, and this very point is the matter of your great dispute with Diodorus.

There follow the Diodorean definition of possibility and the examples of the jewel and Cypselus, combined with the claim that Chrysippus' approach to possibility does not cohere with his belief in divination of the future. The argument is then summarised by Cicero:

> If the conditional 'If you were born at the rising of the Dog-star, you will not die at sea' is true, and if the antecedent ('You were born at the rising of the Dog-star') is necessary – for true statements about the past are necessary, as Chrysippus supposes in disagreement with his teacher Cleanthes, because they are unchangeable and cannot be converted from truth to falsity (omnia enim vera in praeteritis necessaria sunt, ut Chrysippo placet dissentienti a magistro Cleanthe, quia sunt inmutabilia nec in falsum e vero praeterita possunt convertere) – if therefore the antecedent is necessary, it follows that the consequent is also necessary.

Chrysippus, as Cicero notes, accepts the necessity of the past. That he must also, on Cicero's view, accept the principle that true conditionals are necessary is implicit in Cicero's claim that the antecedent of the relevant conditional (Fabius was born at the rising of the Dog-star) and the negation of its consequent (Fabius will die at sea) are incompatible (*pugnant inter se*). The strength of Cicero's phraseology indicates that he is aware that the conditional must report some sort of necessary connection if it is to be capable of transferring necessity from the antecedent to the consequent. In other words, Cicero is aware that the argument requires the valid modal principle:

$$L\,[p \rightarrow q] \rightarrow [Lp \rightarrow Lq].$$

He is not seeking to rely on the invalid

$$[p \rightarrow q] \rightarrow [Lp \rightarrow Lq].$$[10]

Cicero's argument is then that the necessity of the antecedent (Fabius was born at the rising of the Dog-star) combined with the necessity of the conditional reporting the astrological connection (If Fabius was born at the rising of the Dog-star, he will not die at sea) together yield the necessity of the consequent (Fabius will not die at sea). The necessitarianism which Chrysippus seeks to avoid follows from premisses which he is said to accept.

Chrysippus' response to this argument is to deny that the astrological connection takes the form of a *strict* implication; rather, he claims, it is merely a *material* implication (to cast the distinction in modern terminology): i.e. the negated conjunction of the antecedent and the negation of the consequent (*De Fato* 15ff).[11] Cicero's counter-response to Chrysippus (*De Fato* 15–16) is in effect to refuse the re-description of the relevant conditionals as material implications.[12] The

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[10] Cf. Mignucci, 'Sur la Logique Modale des Stoïciens', in Brunschwig ed., *Les Stoïciens et leur Logique*, Actes du Colloque de Chantilly, 1976 (Paris, 1978), 317–346, p.332.

[11] See here Sedley, 'On Signs', in Barnes et al ed., *Science and Speculation* (Cambridge, 1982), 24–68, and 'The Negated Conjunction in Stoicism', *Elenchos* 5, 1984, 311–16.

[12] See here Sambursky, 'On the Possible and the Probable in Ancient Greece', pp.42–3.

validity of Cicero's argument as an *ad hominem* argument against Chrysippus depends on the supposition that if Chrysippus accepts the *truth* of the relevant conditional then he will *eo ipso* accept its *necessity*. It is clear from Chrysippus' attempt, ridiculed by Cicero, to avoid the conclusion of the argument by recasting the conditional as a negated conjunction, that this assessment of Chrysippus' approach to conditionals is correct. For otherwise, if Chrysippus thought that a locution of the form 'if ... then ...' could be a mere material conditional, he would simply have said so. But in reaching for the negated conjunction expression of the astrological connection, Chrysippus is implicitly *agreeing* with Cicero that if an astrological *conditional* were true, it would be necessary.[13] For Chrysippus, true conditionals are strict implications, so that to avoid Cicero's argument he must actually reformulate the astrological connections as negated conjunctions.[14]

Cicero's treatment of Chrysippus in this passage provides strong evidence for the traditional ascription to him of the theory of conditionals mentioned by Sextus Empiricus under the name '*συνάρτησις*', according to which a conditional is true just if the contradictory of the consequent is incompatible with the antecedent:

> (1) Philo says that a sound conditional is one which does not have a true antecedent and a false consequent, such as, supposing it be day and that I am conversing, 'If it is day, I am conversing'. (2) Diodorus says that a sound conditional is one which was not and is not able to have a true antecedent and a false consequent (*ὃ μήτε ἐνεδέχετο μήτε ἐνδέχεται ἀρχόμενον ἀπὸ ἀληθοῦς λήγειν ἐπὶ ψεῦδος*). According to this criterion the mentioned conditional seems to be false, since when it is day and I am silent it will have a true antecedent and a false consequent. But the following conditional is true: 'If there are not partless elements of things, then there are partless elements of things'. For the antecedent ('There are not partless elements of things') will always be false, and the consequent ('There are partless elements of things') will according to Diodorus always be true. (3)

[13] Cf. M.Frede, 'On the Original Notion of Cause', in Schofield et al ed., *Doubt and Dogmatism* (Oxford, 1980), 217–249, p.248; LS vol.2, p.210.

[14] Although Chrysippus' principal response to Cicero is to deny that astrological connections need be regarded as conditionals, he has another response, briefly mentioned: to deny that the modal principle '$L\,[p \to q] \to [Lp \to Lq]$' is universally valid (hoc Chrysippo non videtur valere in omnibus, *De Fato* 14). This response is further confirmation that Chrysippus does not reject Cicero's claim that *if* astrological connections are conditionals, they are strict implications. For in restricting the validity of the axiom, Chrysippus does not have astrological considerations in mind (see Frede, *Die Stoische Logik*, p.88, and #23 below), otherwise he would not also take refuge in the 'negated conjunction' analysis of astrological conditionals.

> Those who introduce '*συνάρτησις*' say that a conditional is sound whenever the contradictory of the consequent is inconsistent with the antecedent (*ὅταν τὸ ἀντικείμενον τῶι ἐν αὐτῶι λήγοντι μάχηται τῶι ἐν αὐτῶι ἡγουμένῶι*). On their view both the mentioned conditionals will be unsound, but this one true: 'If it is day, it is day'. (4) Those who judge according to '*ἔμφασις*' say that a sound conditional is one whose antecedent potentially [sc. properly] includes its consequent. According to them, the statement 'If it is day, it is day' and every conditional statement in which the consequent repeats the antecedent will no doubt be false: for it is impossible for a thing to be [properly] included in itself. (Sextus *PH* 2.110–13 = fr.141 Döring = LS 35B. Cf. Sextus *AM* 8.115 = fr.142 Döring.)[15]

As we have seen, Cicero's argumentation only makes sense on the supposition that the analysis of conditionals presupposed is accepted by Chrysippus; and that analysis seems to be the same as Sextus' definition of *συνάρτησις*: such a conditional is true just if the antecedent and the negation of the consequent conflict ('pugnant inter se').[16] A true conditional is, on this view, necessary.[17]

As I have observed, the first premiss of the Master Argument (the necessity of the past) is used by Cicero to obtain the necessity of the

[15] Cf. DL 7.73. Barreau makes the point ('Cléanthe et Chrysippe face au Maître Argument de Diodore', in Brunschwig ed., *Les Stoïciens et leur Logique*, 21–40, p.37) that even if the identification of Chrysippus as the author of '*συνάρτησις*' is correct, the method of reasoning Diodorus employs in his treatment of the Master Argument employs exactly that conception of the conditional (and so only derivatively Diodorus' own conception of the conditional).

[16] Frede, *Die Stoische Logik* pp.82–3; Kneale, *DL*, p.129; Gould, *The Philosophy of Chrysippus*, pp.72–82; Mignucci, 'Sur la Logique Modale des Stoïciens', p.332; Sorabji, *NCB*, p.74 n.20.

[17] See Frede, *Die Stoische Logik*, pp.84–93; Sorabji, *NCB*, pp.74–8; Sedley, 'On Signs'; Mates, *Stoic Logic* (Berkeley, 1961), pp.47–51; Gould, *The Philosophy of Chrysippus*, ch.4. Sextus' example of *συνάρτησις* ('If it is day, it is day') suggests a logical connection between antecedent and consequent: the soundness of this conditional is purely formal (Frede, p.84). But Diogenes' example of *συνάρτησις* ('If it is day, it is light') suggests that Chrysippean sound conditionals extended further than just those whose antecedents and negated consequents stand in formal contradiction. It could not, however, compatibly with Chrysippus' other views, have extended so far into the empirical as to embrace causal connections in nature: Frede, p.87. Long and Sedley may be right to suppose (vol.2, p.210) that *συνάρτησις* cannot be *analysed* as strict implication, since the latter leaves room for the paradoxes of strict implication, which Sextus fails to mention, even although he records as an embarrassment for Diodorus' definition that it leaves room for the paradoxes of material implication. However, even if *συνάρτησις* should rather be analysed, as Long and Sedley suggest, as involving a primitive notion of incompatibility, if '*p*' and '*q*' are connected by *συνάρτησις*, '$L\,[p \to q]$' will be a *consequence* of that connection. That will be sufficient for our purposes below.

antecedent of the astrological conditional. Cicero also appeals to the necessity of such conditionals; and we can view this claim as significantly related to Diodorus' own theory of sound conditionals. How is this connection established? First, observe that '*ἀκολουθεῖν*' is used, in contexts where Megarian and Stoic accounts of conditionals are in question, to denote the relation 'is a consequent of' in true conditionals.[18] Secondly, consider Diodorus' definition of the possible: that which is or will be true. If we assume the usual relations of duality between the possible and the necessary, this definition of possibility is equivalent to the following definition of necessity: that which is and will be true. As I have mentioned, we have a report from Boethius confirming that Diodorus did subscribe to this duality. Thirdly, we turn to Diodorus' own account of sound conditionals as specified in the passage of Sextus quoted above. Applying Diodorus' own temporal interpretation of modality to this definition, we have it that a sound conditional is one of which it is, has been and always will be the case that if the antecedent is true the consequent is true or, in other words, of which it is and has always *necessarily* been the case (in Diodorus' sense) that if the antecedent is true the consequent is true.[19] So we can represent Diodorus' conception of a true conditional as

$$HL\,[p \rightarrow q]\ \&\ L\,[p \rightarrow q]$$

[18] Sextus *AM* 8.111–117 = fr.142 Döring; cf. DL 7.71–4 = LS 35A; Mates, *Stoic Logic*, pp.39, 43, 132; Barreau, 'Cléanthe et Chrysippe', pp.23–4; Hintikka, *TN*, p.189. Mates stresses that the consequent is only said to follow from the antecedent in a *true* conditional: see, e.g. DL 7.81. Note too Chrysippus' definition of a paraconditional (since *p*, *q*) at DL 7.74: *παρασυνημμένον δ' ἀληθὲς μέν ἐστι ὃ ἀρχόμενον ἀπ' ἀληθοῦς εἰς ἀκόλουθον λήγει, οἷον 'ἐπεὶ ἡμέρα ἔστιν, ἥλιος ἔστιν ὑπὲρ γῆς'. ψεῦδος δ' ὃ ἢ ἀπὸ ψεύδους ἄρχεται ἢ μὴ εἰς ἀκόλουθον λήγει, οἷον 'ἐπεὶ νὺξ ἔστι, Δίων περιπατεῖ', ἂν ἡμέρας οὔσης λέγηται.* (As the text stands, the example given is awkwardly trying to subserve both types of falsity, and the text should perhaps be emended to something like: ... *οἷον 'ἐπεὶ νὺξ ἔστι, Δίων περιπατεῖ', ⟨ἢ 'ἐπεὶ νὺξ ἔστι, σκότος ἔστιν',⟩* [cf. 7.81] *ἂν ἡμέρας οὔσης λέγηται.*)

[19] Mates, *Stoic Logic*, p.45; Barreau, 'Le Maître Argument de Diodore', pp.18–19; Kneale, *DL*, pp.131–2; Šešić, 'Ein antiker dialektischer Streit', *Živa Antika* 9, 1959, 41–55. Note that the soundness of a Diodorean conditional which, as Mates points out, amounts to the omnitemporal soundness of a Philonian conditional, does *not* require that the antecedent be omnitemporally false or that the consequent be omnitemporally true (*pace* Mignucci, 'L'Argomento Dominatore e la teoria dell'implicazione in Diodoro Crono', *Vichiana* 1966, 3–28, p.26: Mignucci's criticisms of Mates' construal of the Diodorean sound conditional seem to rest on a conception of Diodorean modality which I reject below in #19).

where '*L*' is interpreted temporally, in accordance with Diodorus' definition. The right-hand conjunct is otiose.[20]

I suggested above that Cicero's *ad hominem* argument against Chrysippus exploited Chrysippus' own definition of a true conditional: that definition required a necessary connection, in some sense, between antecedent and consequent. Whatever kind of necessity was in question, it is very likely that it was, and was intended to be, stronger than Diodorean necessity. For Diodorean necessity is weak enough to admit accidental generality, and it looks as if the Chrysippean necessary connection requires the connection between the antecedent and consequent of a true conditional to be in some way non-accidental. That is anyway suggested by the particular example Sextus uses of a Chrysippean conditional ('If it is day, it is day') and by the fact that he treats Chrysippus' analysis of the sound conditional (assuming that it is indeed his) not only separately from Diodorus', but also *after* Diodorus'. For the four analyses which Sextus examines seem to be listed in order of increasing strength; at least the first analysis (Philo's: material implication) is weaker than the second and third (Diodorus' and Chrysippus' respectively), which are in turn weaker than the fourth (the consequent properly contained in the antecedent); which suggests that the second is meant to be weaker than the third. The connection demanded by Diodorus is merely that it should never be the case that the antecedent is true and the consequent false (i.e. that the conditional should always be true in Philo's sense). Sextus' third, Chrysippean, definition (*συνάρτησις*) seeks to rule out *incompatibility* between the antecedent and the negation of the consequent, which seems to go further than Diodorus.

If Cicero's discussion in *De Fato* applies immediately to true conditionals in Chrysippus' sense (as he intended), it can therefore be applied secondarily to Diodorean implications. For if a conditional is true in Chrysippus' sense, it is *a fortiori* true in Diodorus' sense: so such a conditional can be formalised as '$HL\,[p \rightarrow q]\ \&\ L\,[p \rightarrow q]$', where '*L*' can

[20] Kneale, *DL*, p.132. The redundancy only obtains if we apply Diodorus' own interpretations of the modalities: hence the conjecture naturally arises that Diodorus so worded his definition of the sound conditional in order to enlarge his catchment area – to appeal to those who did not yet accept his Master Argument (which aimed to establish his interpretations of the modalitites) as well as those who did: see here Denyer, 'Time and Modality in Diodorus Cronus', *Theoria* 47, 1981, 31–53; Sedley, 'Diodorus Cronus and Hellenistic Philosophy', pp.101–2.

be interpreted in either Chrysippean or Diodorean fashion.[21] Cicero's reasoning exploits, as we have seen, the modal axiom '$L[p \rightarrow q] \rightarrow [Lp \rightarrow Lq]$'. We can find a significant connection between this axiom and premiss (2) of the Master Argument, which states that the impossible does not follow from the possible. Given the plausible interpretation of '*ἀκολουθεῖν*' noted above, what this means is that if 'if p then q' is a sound conditional, then 'p' cannot be possible and 'q' impossible. But on Diodorus' view a sound conditional has the form:

$$HL\,[p \rightarrow q]\ \&\ L\,[p \rightarrow q].$$

Hence the second premiss of the Master Argument can be taken to assert:

$$[HL\,[p \rightarrow q]\ \&\ L\,[p \rightarrow q]] \rightarrow [Mp \rightarrow Mq].$$[22]

Since the left-hand conjunct of the antecedent implies the right-hand conjunct, we can simplify this expression to:

$$HL\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq].$$

Further, we will in practice be able to jettison the initial 'H' of the antecedent. For those who do not share Diodorus' temporal interpretation of 'L' this prefix is redundant anyway. Since Diodorus aimed his argument at those who did not already accept his modal policy, we can take the second premiss to express a principle in terms which would be familiar and acceptable to others. For Diodorus himself, of course, the initial 'H' is not redundant, but we will not be liable to substantial falsification in omitting it, because in the reconstructions we shall consider which interpret premiss (2) in the light of Diodorus' theory of the sound conditional, wherever we have an assumption of the form '$L\,[p \rightarrow q]$' – set up with the object of subjecting it to the familiar modal axiom – we would equally be entitled to write '$HL\,[p \rightarrow q]\ \&\ L\,[p \rightarrow q]$', and then subject this assumption to Diodorus' version of the axiom. That is because the necessary connections in question will hold universally. They will record logical or conceptual connections between the antecedent and the consequent of the conditional.

[21] I observed above (n.17) that '$L\,[p \rightarrow q]$' is at least a consequence of the Chrysippean reading, involving *συνάρτησις*, of 'if p then q'. On the '*συνάρτησις*' conception of 'L', '$HL\,[p \rightarrow q]$' is entailed by '$L\,[p \rightarrow q]$'.

[22] Denyer, 'Time and Modality in Diodorus Cronus'.

That takes us to the familiar modal axiom (equally valid on a Diodorean interpretation of the modalities):

$$L\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq].$$

Given L–M duality, this expression is equivalent to:

$$L\,[p \rightarrow q] \rightarrow [Lp \rightarrow Lq].$$

We can then regard premiss (2) as expressing, *via* Diodorus' theory of a sound conditional, either of these familiar modal principles.[23] It might be thought rather strange to find a basic modal axiom appearing as a premiss in an argument – as if it could be rejected like any other premiss – but that difficulty is perhaps not significant.[24] This way of understanding (2) is by no means mandatory, but it is certainly a possible construal, and it has the advantage of reflecting Chrysippus' understanding of that premiss,[25] as well as being a principle on which Aristotle conspicuously relies in several places.[26]

We now have the requisite materials for a reconstruction of the Master Argument on the basis of the hint furnished by Gassendi. Suppose the example from which the *κυριεύων λόγος* derived its name was an astrological conditional of the following form:

> (AC) If Apollo predicted that Cypselus would not rule in Corinth, Cypselus will not rule in Corinth.

I arrive at this conditional by combining Cicero's mention of Apollo's prediction that Cypselus would rule with the form of his actual example of an astrological conditional: 'If Fabius was born at the rising of the Dog-star, he will not die at sea.' In particular, I adopt from this example the device of making the consequent *negative*.[27] That meshes con-

[23] Premiss (2) is understood in this way by Hintikka and White (#17), Prior (#18), Denyer (#19), Barreau (#20), Vuillemin (#21) and Seel (*DAM*, p.331).

[24] Since perhaps the principle did not seem to the ancients to have the metaphysical neutrality which we associate with it. See here Michael, 'What is the Master Argument of Diodorus Cronus?', pp.234–5. And, after all, Chrysippus *did* reject it. (See next note.) That *reductio ad absurdum* was a specialtiy of the Megarian school is suggested by Frede, *Seeschlacht*, p.95, with reference to DL 2.107.

[25] Alexander, *In An Pr* pp.177–8 = SVF 2.202a; cf. Proclus at *SVF* 2.202b. I deal with Chrysippus' response in #23.

[26] E.g. *An Pr* 34a5ff (on which see von Wright, *Logical Studies*, pp.125–6); *Met* 1047b14–16. See Hintikka, *AMD*, p.23.

[27] This is a crucial feature of Cicero's discussion, which will exercise us again below in #24.

veniently with the third premiss of the Master Argument, which we can for the purposes of this reconstruction take as conjoining the possibility of '$p \vee Fp$' with the truth of its negation. Formalising 'Apollo predicted that Fp' as 'AFp', and thinking of 'p' as standing in for 'Cypselus rules in Corinth', we may formalise (AC) in accordance with Diodorus' theory of the sound conditional as '$L\,[A\neg Fp \rightarrow \neg[p \vee Fp]]$' (dropping the redundant 'H' conjunct, and incorporating Cypselus' present as well as his future failure to rule into the consequent). We can now present our first reconstruction based on Gassendi's hint and Cicero's text:

(1)	$A\neg Fp$	Extra hypothesis
(2)	$L\,[A\neg Fp \rightarrow \neg[p \vee Fp]]$	(AC)
(3)	$L\,[A\neg Fp \rightarrow \neg[p \vee Fp]] \rightarrow [LA\neg Fp \rightarrow L\neg[p \vee Fp]]$	Premiss (2), $p/A\neg Fp$, $q/\neg[p \vee Fp]$
(4)	$M\,[p \vee Fp] \,\&\, \neg[p \vee Fp]$	Premiss (3)
(5)	$LA\neg Fp$	1, Premiss (1)
(6)	$L\neg[p \vee Fp]$	2,3,5, Modus Ponens × 2
(7)	$M\,[p \vee Fp] \,\&\, L\neg[p \vee Fp]$	4,6, &-Introduction
(8)	$p \vee Fp$	4,7, Reductio
(9)	$M\,[p \vee Fp] \rightarrow [p \vee Fp]$	4,8, Conditional Proof.

The argument can be strengthened if we assume that Apollo predicts *all* future happenings. That would allow us to derive line (1) from line (4). We could, in fact, formalise (AC) as:

$$L\,[A\neg Fp \equiv \neg[p \vee Fp]].$$

Simultaneously we would drop line (1) from the above proof. The only extra premiss (other than the three recorded premisses) would then be the strengthened astrological (bi)conditional (AC).[28]

What should we say about this reconstruction? One difficulty is this: not only is the negative formulation of (AC) convenient; it is actually required by the argument. For given that the sentence 'Cypselus is ruling in Corinth' will be *false* after Cypselus' death,

$$L\,[AFp \rightarrow [p \vee Fp]]$$

will be false on Diodorus' interpretation of 'L': for

[28] The proof thus arrived at would be quite similar to Denyer's reconstruction, which I consider below (# 19); but Denyer does not make use of astrological considerations.

$$AFp \rightarrow [p \vee Fp]$$

will become false after Cypselus' death. Cicero's use of a negated sentence turns out to be, from our point of view, embarrassingly convenient. But that surely spoils the prospects for this reconstruction. For Diodorus hopes to deploy the Master Argument as a route to his conception of possibility, which is certainly not limited to the impossibility of sentences of the form '$\neg[p \vee Fp]$'. The failure of this reconstruction to cope with *positive* future sentences is a serious drawback.

The second difficulty is the requirement of an extra premiss: (AC). The absence of an allusion to this premiss in Epictetus' report need perhaps not be regarded as fatal. Epictetus tells us that he himself does not know how to respond to the Master Argument: perhaps he does not know because he does not have access to the full version of it. Or perhaps he is simply careless in his reportage, whether because of logical ineptitude, or because he regards the Argument as a sophism not meriting full consideration.

Thirdly, and most importantly, there is the following objection: the fact that this reconstruction works on an example concerning a ruler may indeed allow us to account satisfactorily for the Argument's name, but it is clear that the particular example used in our proof was an entirely inessential feature of it. The essential move was to allow the Argument to run on reliable *predictions*, whether of rulers, earthquakes, or anything at all. The assumption that Apollo (or anyone) can predict the future is what does the work in my reconstruction (other than the three recorded premisses). Hence Epictetus' alleged omission would not simply be a failure to report the particular example Diodorus favoured, but would represent a failure to transmit a vital part of the *logic* of the proof. That makes the reconstruction much harder to swallow. It means that any advantage which might be supposed to accrue to this reconstruction in virtue of its use of an example concerning a ruler is illusory. If this reconstruction can adduce ruling as an example, it is surely open to *any* reconstruction to use the same ploy. We simply say that the sentence-placeholder in our reconstruction is to be thought of as standing in for a sentence about a ruler.

That suggests the following reflection. Perhaps Diodorus did originally run his proof on an example concerning a ruler. Perhaps too we have an echo of that example in Cicero's discussion in *De Fato*. It was because Diodorus used that particular example (and also, perhaps, be-

cause of the overpowering strength of the Argument itself) that the title '*ὁ κυριεύων λόγος*' was acquired, in accordance with one standard Hellenistic way of naming arguments. But the particular example which Diodorus employed was in point of fact quite adventitious. Hence, naturally enough, that example dropped out of discussions of the Argument, though the punning name stuck. By the time Epictetus comes to report the Argument at least three centuries later, he has only its essential logical structure to relate.

That the Argument could have been named after an example which was in fact quite inessential to it should not cause surprise: there are several known cases of the same phenomenon. One such is the Horned Argument which I mentioned above. To the question 'Have you lost your horns?' neither a 'yes' nor a 'no' answer seems satisfactory. This is the form in which Diodorus himself propounded the argument. But an argument of this general form need not allude to horns: another version of the same argument which we find in the Hellenistic period is 'Have you stopped beating your father?'[29]

If I am right that the particular example Diodorus used in running his Argument was inessential to it, it would appear that the reconstruction I have examined in this section loses plausibility. For that reconstruction depends on a substantial thesis about prediction which we would therefore expect to find reported; its scope is also limited, implausibly, to negative future sentences. Of course we cannot guarantee that Epictetus has reported all the premisses of the Master Argument. But, as I have indicated, it must be an *a priori* constraint on our endeavour to recreate the original form of the Argument that the fewer the number of extra premisses required the better, and that, if possible, we should adduce no extra premisses. Of course, the presumption against extra premisses should not be invoked without regard to the content of any such premisses. An extra premiss which Diodorus could plausibly have adopted, or presupposed in his intended audience, is less

[29] DL 2.135 = fr.84 Döring. The Horned Argument: DL 7.187 = fr.65 Döring, DL 2.111 = fr.109 Döring; cf. Sextus *PH* 2.241. The Sorites paradox = the Bald Argument = the Silent One (*ἡσυχάζων*); cf. Diodorus' motion paradox at Sextus *AM* 10.112–117 = fr.129 Döring. The Veiled Argument (*ὁ ἐγκεκαλυμμένος λόγος*) = Electra: Lucian *Vita Auct* 22 = *SVF* 2.287 = LS 37L; cf. Sextus *AM* 7.408–10. Diogenes reports that Zeno of Citium was shown seven forms of the Mower Argument and paid twice the asking price to obtain them (DL 7.25). See in general Sedley, 'Diodorus Cronus and Hellenistic Philosophy', pp.89–96.

objectionable than one which he would not obviously have subscribed to, or which would have been anyway controversial. The reconstruction we have considered falls foul of this constraint too. (AC) is certainly not uncontroversial, nor do we have any evidence that Diodorus believed in divination or astrology. In any case, reliance on something like (AC) would have severely restricted the scope of the Master Argument, as would the requirement that the Argument be run on negative sentences. Diodorus sought to extract a general conclusion from his device: the temporal interpretation of the modal operators. We surely cannot believe that he would have attempted to achieve this general conclusion on the basis of a dubious appeal to astrology, and with an argument which is in any case only adequate for negative sentences.

17 The Reconstructions of Zeller and Hintikka

One of the earliest attempts to reconstruct the Master Argument – perhaps indeed the earliest – was Zeller's. Zeller read '*ἀκολουθεῖν*' in premiss (2) temporally: the impossible does not follow the possible in time. I shall call this Zeller's Principle. He then reasoned: if it is possible for '*p*' to obtain at *t*, but it does not obtain, its obtaining at *t* will subsequently be impossible, given the necessity of the past (premiss (1)); but then what was possible has subsequently become impossible, contrary to premiss (2). So if it is possible for '*p*' to obtain at *t*, it must do so.[1] This reconstruction was subsequently embellished by Schuhl, but not in a way which compromised the temporal interpretation of '*ἀκολουθεῖν*'.[2] Schuhl argued that if we suppose '*p*' to be possible, but that '$\neg p$' is realised, then the realisation of '$\neg p$' has had the effect of rendering something which was *ex hypothesi* possible impossible. But that itself is impossible (premiss (2)). So '*p*' must all along have been impossible, for no genuine possibility can be *rendered* impossible. This reconstruction is still, in essence, Zeller's, since the sense in which a possibility cannot be made impossible is that it cannot be *subsequently* rendered impossible. Zeller's view is that Diodorus equivocated on the sense of '*ἀκολουθεῖν*': premiss (2) gained plausibility from a 'logical' reading of the word, but the Argument applied it in a temporal way.[3]

The temporal interpretation of '*ἀκολουθεῖν*' is, as many commentators have observed, unconvincing. Not only is the word, as we have

[1] *Die Philosophie der Griechen* (Leipzig, 1875), Bd.2.1, pp.230–1; 'Über den *κυριεύων* des Megarikers Diodorus', *Sitzungsberichte der Preussischen Akademie der Wissenschaften* (Berlin, 1882), 151–9; cf. Hartmann, 'Der megarische und der aristotelische Möglichkeitsbegriff'. Zeller's interpretation is followed by Magris, 'Aristotele e i Megarici', pp.126–7; Maier, 'Die Echtheit der ar. Hermeneutik', p.29; O. Becker, 'Über den *κυριεύων λόγος* des Diodoros Kronos', *Rheinisches Museum* 99, 1956, 289–304; von Wright, 'The Master Argument of Diodorus', in Saarinen et al ed., *Essays in Honour of Jaakko Hintikka* (Dordrecht, 1979), 297–307; Rescher (see #19 n.11 below).

[2] Schuhl, *Le Dominateur et les Possibles*, pp.74–5.

[3] The solutions of Zeller and Schuhl are drawn on by Stahl ('Une Formalisation du Dominateur', *Revue Philosophique* 88, 1963, 239–43); his reconstruction is usefully criticized by Barreau, 'Le Maître Argument de Diodore', pp.29–30.

seen, a standard term in Stoic discussions of propositional logic (in which Diodorus was involved) for the relation 'is a consequent of' in a true conditional; it is unlikely that Diodorus would have relied on a premiss which, in Zeller's and Schuhl's application, is so patently false: after Socrates has failed to sit at *t*, it is no longer possible for him to sit at *t*, but that does not mean that it was not possible before *t* for him to sit at *t*. Further, Diodorus' own definitions of the modalities, which, as we know, the Master Argument was designed to secure, clearly allow that a temporally indefinite sentence which is possible at one time (=is or will be true) may subsequently become impossible (=is and will be false).[4] Zeller is well aware that his reconstruction ascribes to Diodorus a blatant fallacy. But rather than ascribe such a tactic to Diodorus, and to suppose that his opponents failed to notice the equivocation on '*ἀκολουθεῖν*', it is more plausible to suppose that Diodorus did not argue in that way at all.[5]

Zeller's reading has found echoes in more recent attempts to reconstruct the Argument. Hintikka's reconstruction is a case in point.[6] This reconstruction works by exploiting a truth-value link. Informally, it runs as follows. 'Suppose that there will be no sea battle tomorrow, Tuesday. Then on Wednesday it will be necessary (because past) that there was no sea battle on Tuesday, and impossible that there was one. But in that case a person who says on Monday that it is then possible for there to be a sea battle is wrong. For from this supposedly possible thing (the Tuesday sea battle) there would follow the thing that we have agreed to be impossible on Wednesday, namely that there should have been a sea battle on the preceding day.'[7]

This reconstruction looks like a version of Zeller's, and Sorabji accordingly criticizes it for relying on 'the illegitimate premiss, that what is

[4] Kneale, *DL*, p.118; Boudot, 'L'Argument Dominateur et le Temps Cyclique', *Les Études Philosophiques* 1983, 271–98, p.273; 'Temps, Nécessité et Prédétermination', p.445; McKirahan, 'DPM', p.250 n.32; Mignucci, 'L'Argomento Dominatore', p.13. Cf. #19 below.

[5] In his 'L'Argomento dominatore', Mignucci interprets '*ἀκολουθεῖν*' in premiss (2) as 'is compatible with': premiss (2) then simply asserts that the impossible is incompatible with the possible. This proposal surely makes premiss (2) too uninteresting to be part of an argument (even if the reading were linguistically possible, which must at least be doubtful; but see Hintikka, *TN*, ch.3); but there are further objections to Mignucci's reconstruction. See #19 n.17 below.

[6] *TN*, ch.9. Cf. Barreau, 'Cléanthe et Chrysippe', p.34.

[7] Sorabji, *NCB*, p.108.

impossible *on Wednesday* does not follow from what is possible *on Monday*.' Sorabji's criticism was in fact anticipated by Sutula, who suggested that the argument depends on an unwarranted slide from 'It will be impossible (at $t + 2$) for it to have been the case (at $t + 1$) that p' (which is all the argument entitles us to) to 'It is impossible that it will be the case (at $t + 2$) that it was the case (at $t + 1$) that p' (which is what we would require to generate a contradiction with the assumption that tomorrow's sea battle is now possible).[8] It should be noted that Hintikka does *not* follow Zeller in treating '*ἀκολουθεῖν*' temporally. Instead, he treats it 'logically' in the way suggested by the Stoic and Megarian discussions. Premiss (2) he interprets as stating that the possible can be assumed to be actual without impossibility resulting. In a slightly modified form, I shall adopt this interpretation of premiss (2) in the reconstruction which I shall put forward in #22. But in spite of Hintikka's correct treatment of premiss (2), his reconstruction is justifiably located within the tradition of Zeller, since it does in effect rely on the principle that the impossible cannot follow from the possible *in time*. Even though Hintikka recognizes, against Zeller, that this principle is not the content of premiss (2), the overall thrust of Zeller's reconstruction remains clearly present in Hintikka's version, and Hintikka himself takes his version to vindicate Zeller.[9]

White has tried to defend Hintikka by arguing that his version need not be couched in the temporal terms which render it liable to Sorabji's objection. Instead, it can be cast in tenseless terms.[10] In that case, it would run somewhat as follows (I recast, using the square bracket function mentioned in #1):[11]

(1) It [is] possible on d_1 that e will occur on d_2 — Premiss (3)
(2) It [is] true on d_1 that e will not occur on d_2 — Premiss (3)
(3) Hence it [is] true on d_3 that e did not occur on d_2 — 2, Truth-value link
(4) Hence it [is] impossible on d_3 that e occurred on d_2 — 3, Premiss (1)

[8] Sutula, 'Diodorus and the Master Argument', *Southern Journal of Philosophy* 14, 1976, 323–42, p.334.
[9] *TN*, pp.193–4.
[10] *Agency and Integrality*, pp.83–4.
[11] '[is]' can be read as 'is, was and will be'.

(5) Necessarily, if it [is] true on d_1 that e will occur on d_2 then it [is] true on d_3 that e occurred on d_2 — Truth-value link
(6) Hence, it [is] impossible on d_1 that e will occur on d_2 — 4, 5, Premiss (2).

(1) and (6) conflict: (1) is rejected. (6) is reached from (4) and (5) *via* the modal principle '$L\ [p \rightarrow q] \rightarrow [Mp \rightarrow Mp]$', which is the form premiss (2) takes on this reconstruction. Has White avoided, on Hintikka's behalf, the objection to Zeller? One's suspicions are initially aroused by the peculiarity of the locution 'It [is] possible/true on d_n that p', which seems, antinomically, to have a foot in both tensed and tenseless camps. As far as I can see, the locution can only be understood as entitling us to replace the tenseless verbs by suitably tensed counterparts: '[is]' in lines (1), (2) and (6) becomes 'is' and in lines (3) and (4) it becomes 'will be'. Line (5) must be rewritten as

(5)′ Necessarily, if it is true on d_1 that e will occur on d_2 then it will be true on d_3 that e occurred on d_2.

But now we can see that Zeller's Principle continues to support the argument. For to arrive at

(6)′ Hence it is impossible on d_1 that e will occur on d_2

we need to apply the modal principle (premiss (2)) to line (5)′, which takes us to the intermediate step

(5)″ If it is impossible that it will be true on d_3 that e occurred on d_2 then it is impossible on d_1 that e will occur on d_2.

We now need the antecedent of (5)″ in order to be able to detach its consequent (=(6)′) What we already have is

(4)′ It will be impossible on d_3 that e occurred on d_2.

But to suppose that (4)′ entitles us to the antecedent of (5)″, i.e. to

(4)″ It is impossible that it will be true on d_3 that e occurred on d_2

is to suppose, with Zeller, that the impossible cannot follow the possible in time. This principle thus remains tacitly present in the proposed new version of Hintikka's reconstruction.

However, it is no longer clear that the presence of Zeller's Principle in this reconstruction is objectionable, at least to an Aristotelian. An

Aristotelian must reject the conclusion of the Master Argument. But what part of the current reconstruction would he take exception to? White's answer to this question is: 'The Peripatetic philosopher would have no reason to hold that it follows from the fact that it turns out to be true (false) the day after tomorrow that event *e* occurred the preceding day that it is *now* true (respectively, false) that event *e* will occur tomorrow.'[12] We have to ask here *when* it is envisaged that the relevant proposition turns out to be true. If White means to accommodate the spurious distinction we examined in #7 (if 'turns out to be true' means '*will* turn out to be true, but is not already true'), his claim is not correct: if it *will* be true that *Pp*, then it is *now* true that *FPp*. But I take it that White's point is that Aristotelians would reject, in general, '$F2P1p \rightarrow F1p$' (and '$F1p \rightarrow F2P1p$'): the antecedents and consequents will in each case be neither true nor false for contingent '*p*'. That point is correct; but the reconstruction under consideration circumvents it by involving the *T*-operator, which renders formulae to which it is prefixed bivalent. For Aristotelians would have no objection to

(7) $TF1p \rightarrow TF2P1p$.

Application of the modal axiom to (7) then yields

(8) $L\,[TF1p \rightarrow TF2P1p] \rightarrow [\neg MTF2P1p \rightarrow \neg MF1p]$.

In order to detach the consequent of the right-hand implication of (8), we need its antecedent, i.e.

(9) $\neg MTF2P1p$.

What we already have is

(10) $TF2\neg MP1p$.

To suppose, as the reconstruction in effect does, that (10) amounts to (9), is exactly to import Zeller's Principle. It is to suppose that if it is true now that '*p*' will be impossible, then it is impossible now that '*p*' will be true. But there can be no Aristotelian objection to the application of Zeller's Principle in the present context, because that application follows from the conception of modality as relative to the facts. On that conception (10) does indeed amount to (9). For an Aristotelian, if it is

[12] *Agency and Integrality*, p.85.

true on Monday that 'A sea battle took place place yesterday' will be impossible on Wednesday, it follows that 'A sea battle will take place tomorrow' *is impossible* on Monday. The assumption in this context of unrestricted **PB**, imported by the involvement of the *T*-operator, renders the application of Zeller's Principle immune to the objection which attached to it in Zeller's own reconstruction. An Aristotelian objection to the Master Argument on this reconstruction would alight not on Zeller's Principle, but on the assumption of **PB** itself. (If one sought to obviate the problem by detruding the *T*-operator from the reconstruction, White's statement of the Peripatetic objection, on the second construal I gave it above, would then bite.)

Hintikka's reconstruction therefore faces a dilemma. On the one hand it could, like Zeller's, make no assumptions about **PB**. The impossibility which would be assumed, under the argument's *reductio* strategy, to follow a possibility in time, would not necessarily be given as an impossibility in advance: it need not be true *on Monday* that it will be impossible on Wednesday that a sea battle did not take place on Tuesday. This option has the disadvantage that it retains Zeller's Principle in an implausible form: for surely what is impossible can (if it is not even true in advance that it will be impossible) follow the possible in time. On the other hand, the reconstruction could help itself to unrestricted **PB** (perhaps, though not necessarily, by explicit involvement of the *T*-operator), in which case the application of Zeller's Principle is rendered innocuous, given modality relative to the facts, but the reconstruction can simply be rejected out of hand by an Aristotelian.

How should Hintikka's reconstruction respond to the dilemma? It might be said on behalf of the first option that if the Master Argument works then Zeller's Principle is a *consequence* of the conclusion (the Principle of Plenitude), at least as far as temporally definite expressions are concerned.[13] But, as I have observed, the Principle is false for temporally indefinite sentences, to which, as I shall argue in #19, the conclusion of the Argument is intended to apply.[14] Can Hintikka then comfortably adopt the second option? I shall argue in #25 that he can.

[13] Cf. Michael, 'What is the Master Argument of Diodorus Cronus?', p.235.

[14] In brief, the point will be that if the Diodorean definitions of the modalitites are run on temporally definite sentences, modal collapse ensues. The objection that Zeller's reconstruction makes the Argument circular (Frede, *Seeschlacht*, pp.97–8) is incorrect.

18 Prior's Reconstruction

Hintikka's reconstruction relied on exploiting a truth-value link. The other important reconstruction to adopt this general approach is Prior's.[1] But whereas Hintikka exploited the link between what is the case and what will have been the case ($p \rightarrow FPp$), Prior's reconstruction adopts a tactic which is the mirror-image of this: the truth-value link he appeals to is that between what is the case and what has been going to be the case ($p \rightarrow PFp$).

The first premiss of the Master Argument asserts that every past truth is necessary. What we normally mean when we talk about the necessity of the past is simply that there is nothing that anyone can *now* do about the way things were. But, it might be objected, this expression is too wide. If there *were* facts about how things *would* be after now, then maybe one *can* do something about some of those facts. This is a point we owe to Ockham, who insisted that the fact that a sentence is grammatically past-tensed does not yet mean that it is *about* the past.[2] If we simply formalised premiss (1) as

$$Pnp \rightarrow LPnp, \qquad n > 0$$

we would thereby allow for the substitution-instance

$$PnFmp \rightarrow LPnFmp.$$

If it were true yesterday ($n = 1$) that I would swim in two days' time ($m = 2$), then it would turn out to be necessary that I swim tomorrow: the future would be fixed.

But perhaps the Master Argument traded on just such an ambiguity

[1] The truth-value link version of the Master Argument is also endorsed by Zagzebski, *The Dilemma of Freedom and Foreknowledge*, p.14. My characterisation of Prior's reconstruction as exploiting a truth-value link is due to White, *Agency and Integrality*, p.79ff. Barreau's reconstruction in 'Cléanthe et Chrysippe' is very similar to Prior's.

[2] *Tractatus*, p.6. Also *Ordinatio* 1.d.38.q.1.P (Boehner, *Tractatus*, p.101); *Super 1 librum Perihermeneias*, in Gambatese and Brown eds., *G. de Ockham: Opera Philosophica* (New York, 1978), vol.2 (Boehner, *Tractatus*, p.111); *Summa Logicae*, in Boehner, Gál and Brown eds., *G. de Ockham: Summa Logicae* (New York, 1974) III.3.c.31 (Boehner, *Tractatus*, p.116).

in premiss (1) between initially past-tensed statements (which need not be about the past and are therefore not in general necessary) and statements about the past (which are in general necessary but need not be initially past-tensed). After all, premiss (1) does not say that all past *events* are necessary, but that all past *truths* are necessary: perhaps this formulation was preferred just because it permits the slide from the second of these senses to the first.[3] If so, the argument will have cheated, gaining plausibility for premiss (1) as understood in the second of the above senses, but actually employing it in the first sense. The argument will then have run something like this: 'Take someone who, *ex hypothesi*, is not, and never will be, ruling. From the false (*i*) 'x is ruling or will rule' follows the false (*ii*) 'it has been the case that x would rule'. But (*iii*) 'It has been false that x would rule', being true about the past, is by premiss (1) necessary. Therefore (*ii*), which conflicts with (*iii*), is impossible. Therefore, by premiss (2), (*i*), from which (*ii*) follows, is also impossible. By generalization from this example, Diodorus can eliminate premiss (3), and establish his definition of the possible.'[4] This is Prior's reconstruction.[5]

Prior formalises the three premisses as follows:

Premiss (1): $Pp \rightarrow \neg M \neg Pp$

Premiss (2): $L\,[p \rightarrow q] \rightarrow [\neg Mq \rightarrow \neg Mp]$

Premiss (3): $Mp\ \&\ [\neg p\ \&\ \neg Fp]$.[6]

Prior interprets 'L' in accordance with Diodorus' own understanding of necessity, as reported to us by Boethius ('is and will be true').[7] (But if we assume that the proof may run on metric as well as non-metric for-

[3] It is clear from the formulations of premisses (1) and (3), as from the reports of Alexander (*In An Pr* pp.183–4 = fr.135 Döring) and Boethius (*In De Int* 2.234–5 = fr.138 Döring), that the modalities are attached to linguistic items (whether sentences or statements will be a matter for consideration) rather than states of affairs. See here Barreau, 'Cléanthe et Chrysippe', pp.22–3; Kneale, *DL*, p.118; *contra* Frede, *Seeschlacht*, pp.101–3.

[4] LS vol. 1, p.234, slightly adapted. Cf. Sutula, 'Diodorus and the Master Argument', p.325; Sedley, 'Diodorus Cronus and Hellenistic Philosophy', p.97.

[5] 'Diodoran Modalities', *PQ* 5, 1955, 205–13; 'Diodorus and Modal Logic', *PQ* 8, 1958, 226–30; *PPF*, pp.32–58, 113–136. Cf. Kneale, *DL*, pp.119–21; von Kutschera, F: 'Zwei modallogische Argumente für den Determinismus: Aristoteles und Diodor'; Weidemann, 'DSM', pp.37–53; Sutula, 'Diodorus and the Master Argument', pp.324–329.

[6] Cf. #15 n.2 above.

[7] 'Diodoran Modalities', p.210.

mulae, Diodorus' temporal interpretation becomes unattractive, since '$Pnp \rightarrow LPnp$' is false for temporal 'L'. This raises a serious problem regarding the right reading of premiss (1), which will be of concern to us in what follows; I defer discussion of it until #19.) Prior's formalisation of premiss (2) is the familiar modal principle which we have already encountered: I have acknowledged that this is a possible, although by no means mandatory, construal of Diodorus' second premiss. Prior now adduces two further premisses:

Premiss (4): $L\,[p \rightarrow HFp]$

Premiss (5): $[\neg p\ \&\ \neg Fp] \rightarrow PG\neg p$.

'Hp' is defined as '$\neg P\neg p$' and 'Gp' as '$\neg F\neg p$'. (Hence the Peircean sense of 'Fp' is *not* in question.) The proof then proceeds as follows:

(1)	$Pp \rightarrow \neg M\neg Pp$	Premiss (1)
(2)	$L\,[p \rightarrow q] \rightarrow [\neg Mq \rightarrow \neg Mp]$	Premiss (2)
(3)	$\neg p\ \&\ \neg Fp$	Premiss (3)
(4)	$L\,[p \rightarrow \neg P\neg Fp]$	Premiss (4)
(5)	$[\neg p\ \&\ \neg Fp] \rightarrow P\neg Fp$	Premiss (5)
(6)	$P\neg Fp$	3, 5, Modus Ponens
(7)	$\neg M\neg P\neg Fp$	1, 6, Modus Ponens, $p/\neg Fp$
(8)	$\neg Mp$	2, 4, 7, Modus Ponens × 2, $q/\neg P\neg Fp$
(9)	$[\neg p\ \&\ \neg Fp] \rightarrow \neg Mp$	3, 8, Conditional Proof.

What is the justification for the extra premisses? Becker has argued that they can be found in ancient sources, and hence that Diodorus could have been warranted in assuming them in his audience.[8] The extra premiss (4) is witnessed at Cicero *De Fato* 27:

> Potest ... quicquam factum esse quod non verum fuerit futurum esse?
>
> Can anything be the case of which it was not true that it would be the case?

Cicero impliedly answers this question in the negative, and goes on to affirm a symmetry between past and future:

[8] O. Becker: 'Zur Rekonstruktion des 'Kurieuon Logos' des Diodoros Kronos', in Derbolav and Nicolin eds., *Erkenntnis und Verantwortung* (Düsseldorf, 1960), 25–63.

> Nam ut praeterita ea vera dicimus, quorum superiore tempore vera fuerit instantia, sic futura, quorum consequenti tempore vera erit instantia, ea vera dicemus.
>
> Just as we call those past statements true whose corresponding state of affairs obtained [lit. was true] in the past, so we shall call those future statements true whose corresponding state of affairs will obtain hereafter.[9]

The second extra premiss Becker finds in the fatalist's argument in *DI* 9. In fact, he argues, both of Prior's extra premisses are to be found at 18b9ff. 18b9–11 expresses premiss (4):

> *ἔτι εἰ ἔστι λευκὸν νῦν, ἀληθὲς ἦν εἰπεῖν πρότερον ὅτι ἔσται λευκόν, ὥστε ἀεὶ ἀληθὲς ἦν εἰπεῖν ὁτιοῦν τῶν γενομένων ὅτι ἔσται.*
>
> Further, if something is white now, it was true to say previously that it would be white, so that it was always true to say of anything coming to be [sc. in the future] that it would be.

Premiss (5) is expressed by 18b11–13. In this passage Becker proposes to excise the phrase which I place in parenthesis:

> *εἰ δ' ἀεὶ ἀληθὲς ἦν εἰπεῖν ὅτι [ἔστιν ἢ] ἔσται, οὐχ οἷόν τε τοῦτο μὴ εἶναι οὐδὲ μὴ ἔσεσθαι.*
>
> If it was always true to say that it [is or] will be, it cannot not be or be going to be.

If we read this passage as expressing

$L\,[HFp \rightarrow [p \vee Fp]]$

we have premiss (5) by contraposition.

The passages which Becker adduces from Cicero to instance Prior's extra premiss (4) can indeed discharge that role. Perhaps they show that Diodorus could have relied on a sympathetic audience if he meant to presuppose this extra premiss. As we have seen, the fatalist's argument in *DI* 9 presupposes **PB**: we might wonder whether the same presupposition is lurking behind the extra premisses. Premiss (4) is reminiscent of (it implies) the theorem which I noted as being distinctive of

[9] Becker also adduces support for this premiss from [Alexander of Aphrodisias], *Quaestio* 1.4: 11.9–11, 13–14, 17–18, 21–2, 25–7; p.12.9–12, 14–15, 20–5. I make clear in Appendix 3 why I do not accept this interpretation of these lines: Becker reads the conditionals as being of the form '$L\,[p \rightarrow p]$' – specifically '$L\,[p \rightarrow PFp]$' – rather than '$Tp \rightarrow Lp$'.

the Ockhamist model **O**, but which I detruded from the Aristotelian model, namely

$$p \rightarrow PFp.$$

The theorem does not import unrestricted **PB** into **O**, because **O** does not permit the (invalid) '$Fp \rightarrow PFp$' to count as a substitution-instance. Similarly, the actual employment of its equivalent, premiss (4), in Prior's reconstruction does not as such import unrestricted **PB**, because what is employed in the proof is (to put it in metric terms)

$$p \rightarrow PnFmp,\ n \geq m$$

which is validated in an Ockhamist (though not an Aristotelian) model, and not

$$Fmp \rightarrow PnF(m + n)p$$

which is validated in neither an Ockhamist nor an Aristotelian model (assuming Kleene's table for trivalent implication). In assuming premiss (4), Prior's proof does not yet import unrestricted **PB**.[10] Nevertheless, the fact that Aristotle does expressly reject '$p \rightarrow PFp$' does raise a

[10] In his 'Diodoran Modalities', Prior argues that premiss (4) does not presuppose unrestricted **PB**, because 'even on the three-valued hypothesis it must be admitted that when anything is the case it has not been the case that it will not be the case' (p.212). This, however, is surely incorrect. Assuming the usual truth-table for three-valued negation (choice negation), the friend of trivalence is *not* obliged to accept '$p \rightarrow \neg P \neg Fp$'. If he is an Ockhamist he will do so; if he is an Aristotelian he will not.

Prior's premiss (4) is subjected to criticism by Barreau in his 'Le Maître Argument de Diodore' on the ground that it imports necessitarianism (in Diodorus' sense). But his criticism is invalidated by his misconsrual of that premiss as (in effect) '$p \rightarrow HGp$'. The mistake is pointed out by Picolet in her response to Barreau, 'A Propos d'une Reconstruction Récente du Maître Argument de Diodore Cronos', *Fundamenta Scientiae* (Strasbourg) 72, 1977, 1–12. But Barreau in his 'Reponses aux Remarques de L'Article de Mme Picolet', *Fundamenta Scientiae* (Strasbourg) 72, 1977, 13–27, and his 'Conception Diodorienne et Conception Stoïcienne du Maître Argument', *Fundamenta Scientiae* (Strasbourg) 88, 1978, 13–53, continues to suppose that '$p \rightarrow HFp$' imports necessitarianism. In Diodorus' sense of 'necessary', it obviously does no such thing. And although on Aristotle's view it does import necessity (in Aristotle's sense of 'necessity'), and hence is to be rejected, it would be wrong to suppose that one *has* to reject it if one wishes to reject necessitarianism in respect of the future, as its presence in **O** shows. Its rejection is an optional extra for the possibilist (albeit an attractive one, if he wishes to avoid anti-realism about time: #12). So its presence in Prior's reconstruction is harmless. (These remarks should allay a worry expressed by Weidemann, 'DSM', p.26 n.24.)

problem for Prior's reconstruction. For it limits the potential impact of Diodorus' Argument.[11]

As regards Prior's second extra premiss, the question whether *DI* 18b11–13 can be adduced in its support requires consideration. Becker's excision of '*ἔστιν ἢ*' is open to the charge that it is *ad hoc*.[12] However, one might seek to defend Becker without resorting to excision. Perhaps 18b11–13 could be read as containing two separate claims: the first of these is obtained by ignoring '*ἢ ἔσται*' and '*οὐδὲ μὴ ἔσεσθαι*':

> *εἰ δ' ἀεὶ ἀληθὲς ἦν εἰπεῖν ὅτι ἔστιν, οὐχ οἷόν τε τοῦτο μὴ εἶναι.*
>
> If it was always true to say that it is, it cannot not be.

That is the claim

$$Hp \rightarrow Lp.$$

The second reading is obtained by ignoring '*ἔστιν ἢ*':

> *εἰ δ' ἀεὶ ἀληθὲς ἦν εἰπεῖν ὅτι ἔσται, οὐχ οἷόν τε τοῦτο μὴ εἶναι οὐδὲ μὴ ἔσεσθαι.*
>
> If it was always true to say that it would be, it cannot not be or be going to be.

That is the claim

$$HFp \rightarrow L\,[p \vee Fp].$$

Becker, indeed, interprets the passage as lodging not this claim, but the weaker

$$L\,[HFp \rightarrow [p \vee Fp]]$$

which can now be contraposed to yield Prior's second extra premiss. If that interpretation is correct, we could construe 18b11–13 as a consisting of a conflation of two separate claims, one of which supplies us with the needed premiss.

But this is not the only available interpretation of the passage. At least two further possibilities suggest themselves. One is that Aristotle inserted '*ἔστιν ἢ*' by confusion between temporally definite expressions and temporally indefinite sentences. Although I have argued that Aris-

[11] Weidemann, 'DSM', pp.40–1; Vuillemin, 'L'Argument Dominateur', p.233.
[12] Weidemann, 'DSM', p.40.

totle's essential polemic against the fatalist in *DI* 9 concerns temporally definite expressions and not the temporally indefinite sentences favoured by **S**, there can be no justification on that basis for extruding or ignoring the '*ἔστιν ἢ*' here since, as we have seen, there are other places in *DI* 9 where Aristotle does confusedly make an irrelevant point about temporally indefinite sentences. Secondly, one might understand the 'or' of '*ἢ ἔσται*' to be an 'or rather'. In that case Aristotle would be shifting tenses for the purpose of clarification, and not to make a different point. The sense would be: 'If it was always true to say that it is white – or [rather] that it would be white – then it is not possible for it not to be white; nor [was it possible] for it not to be going to be white.' The point of the 'or rather' clause is to indicate that '*ἔστιν*' refers to *our* present, and not to the present of the hypothesized past predictor. Since we can make good sense of the text without excising '*ἔστιν ἢ*', we should not excise. It is still possible to interpret the text in accordance with Becker's proposal. Nevertheless, the interpretation of the text in accordance with Becker's proposal seems artificial when set against the two rather more attractive suggestions I have outlined.

A further charge which has been levelled against Becker's line is that he has misplaced the modal operator in his formalisation of 18b11–13.[13] The correct formalisation of this passage is, as we have seen,

$$HFp \rightarrow L\,[p \vee Fp].$$[14]

Were Becker right in his formalisation, the fatalist would commit the fallacy of operator shift, and we have seen that there is no justification for this charge against him.[15] However, Becker's formalisation of 18b11–13 is *entailed* by the correct formalisation. Instead of ascribing to the fatalist the weaker thesis required by the Priorean proof (in which the necessity operator governs the whole conditional), thereby saddling him with an undeserved fallacy, Becker could and should have allowed

[13] Weidemann, 'DSM', p.40.

[14] Strictly, what 18b11–13 says is

$$HTFp \rightarrow L\,[p \vee Fp].$$

At this point the fatalist is moving from truth to necessity.

[15] In fact, Becker is confused between his chosen formalisation and the correct one: he slides unwittingly from a correct interpretation of the text to his own incorrect version (Weidemann, 'DSM', p.40).

the fatalist the stronger thesis (in which the necessity operator governs only the consequent of the conditional), and then simply noted the entailment relation between the stronger and the weaker thesis.

It seems, therefore, that Becker's attempt to locate Prior's extra premisses in ancient sources – though not unproblematic – can be defended. Indeed the sources are highly relevant to the Master Argument: they document views some of which could well be supposed to find favour in Diodorus' intended audience. Prior's reconstruction, although it uses as many as two extra premisses, cannot then be faulted on the ground of anachronism. That consideration, however, only contributes support of a negative sort. The reliance on extra premisses still constitutes a *prima facie* disadvantage of Prior's reconstruction.

I have observed that the application of premiss (4) in the reconstruction does not presuppose unrestricted **PB**. But premiss (5) does presuppose it. Attention was drawn to this fact by Prior himself,[16] and it has been reiterated by others in criticism of the reconstruction.[17] At first sight, this appears to be a grave drawback. Assuming that the Master Argument postdated Aristotle's discussion of fatalism in *DI* 9,[18] we would be committed, on Prior's reconstruction, to ascribing to Diodorus an assumption which it was Aristotle's precise purpose in *DI* 9 to controvert. On this approach, Diodorus would be begging an important question against Aristotle, which Aristotle had already brought into the open.

Another apparent difficulty with Prior's reconstruction is the equivocation on premiss (1) which it seems to import. Premiss (1), on Prior's view, would gain its plausibility from seeming to deal with the genuine past (which is unalterable), but would then be applied in the proof to past-tensed sentences which actually concern the future. The difficulty here is that the equivocation seems so obvious that it is hard to imagine anyone seeking to expose the Argument in any other way than

[16] *Time and Modality*, p.87–8, 'Diodoran Modalities', pp.212–3. Prior says that in trivalent logic premiss (5) may have a neuter antecedent and a false consequent; but if the antecedent is neuter, the consequent (assuming discrete time) is surely neuter, not false. So we require Kleene's table for trivalent implication to ensure that the validity of the premiss presupposes **PB**. (But I have already indicated that Kleene's table is anyway to be preferred.)

[17] Sorabji, *NCB*, p.107.

[18] See #25 below.

by simply pointing out the sleight of hand. It is hard to believe that so celebrated an argument rested on so patent an equivocation.[19]

On one attractive view, these two worries about Prior come to the same. As I suggested in #8, in agreement with Dummett and Taylor, it is plausible to regard the motivating force behind the thought that the past is necessary as the thought that the past, unlike the future, is stocked with *truths*. But if **PB** is unrestricted, the future is just as much stocked with truths as the past. Hence the necessity of the past, combined with unrestricted **PB**, leads, on this approach, to the contamination of all truths with necessity, *via* the possibility of expressing all statements, including ones genuinely about the future, in a form with an initial past-tense operator. There would, on this approach, be nothing illicit in the way premiss (1) is applied in Prior's proof. Conversely, if the application of premiss (1) is warranted, then, given also the necessity of the past, **PB** cannot justifiably be restricted. So the objection that Prior's reconstruction presupposes **PB**, and the objection that it imports an equivocation into premiss (1), are (at least on the above view of the *content* of the claim that the past is necessary) the same objection. Is the objection serious? I am going to postpone tackling this issue until I have completed my own reconstruction of the Master Argument, because it will convenient to address this question with my own version in the background. I shall, to anticipate, indicate that I do not regard this objection to Prior as carrying weight.

But the objections to Prior are not therewith exhausted. As I have remarked, a *prima facie* objection is that his reconstruction requires two extra premisses.[20] Of course, if these premisses imported no more than some trivial symbolic manipulations consequential on the substantial presupposition of unrestricted **PB**, there might be little to object to (if, as I shall argue, the objection that Prior's reconstruction presupposes **PB** itself has little force). But although such a line seems to apply to premiss (4), premiss (5) goes further than premiss (4) not only in its

[19] So Vuillemin, 'Éternel Retour et Temps Cyclique: Quelle Solution Cléanthe a-t-il donnée de l'Argument Dominateur?', *Archives de Philosophie* 45, 1982, 375–409, at p.398; 'L'Argument Dominateur', pp.235–6; Boudot, 'L'Argument Dominateur et le Temps Cyclique', p.280; Hintikka, *TN*, pp.179–80 n.3.

[20] Note that premiss (5) in Prior's reconstruction is without question an *extra* premiss. It is not possible to read premiss (3), contrary to what Barreau at one point suggests ('Conception Diodorienne et Conception Stoïcienne', p.35), as incorporating premiss (5), i.e. as containing an inference from the fact that 'p' is and will be false to the past truth that at a point in the future '$p \vee Fp$' would be false.

presupposition of **PB**, but also in a further important respect. For the truth of

$$[\neg p \,\&\, \neg Fp] \rightarrow P\neg Fp$$

requires a particular topology of time, namely that it be discrete.[21] Again, this difficulty was originally conceded by Prior himself,[22] and has been reiterated since.[23] The objection runs: given that $[\neg p \,\&\, \neg Fp]$, the implication that $P\neg Fp$ is only justified if there is a unique previous moment. If there is no such moment, then the possibility arises that 'Fp' may be true at any previous moment arbitrarily close to the present moment. Now Diodorus probably did believe that time is discrete: this we may deduce from the way he argued that whereas 'This has moved' can be true, 'This is moving' cannot be true.[24] Aristotle, of course, rejected the thesis that time is discrete.[25] Hence if Diodorus relied on that thesis in his Master Argument he cannot have hoped to convince the Aristotelians in his audience; nor indeed orthodox Stoics such as Chrysippus.[26] But Chrysippus responded to the Master Argument by challenging *not* any assumption of discrete time, but one of its recorded premisses. Surely if the Argument had relied on an assumption of discrete time he would have challenged that. Hence it is unlikely that the Argument rested on such an assumption.[27]

In spite of Prior's own doubts about his second extra premiss, and the echoes of those doubts in the subsequent literature, Rescher and Urquhart have suggested that the axiom '$[p \,\&\, Gp] \rightarrow PGp$' or, equiva-

[21] Assuming the irreflexivity of the 'is earlier than' temporal relation: Trzesicki, 'Is Discreteness of Time Necessary for [the] Diodorean Master Argument?', *Bulletin of the Section of Logic* 16, 1987, 125–135, pp.128–9. Cf. #23, where I reject cyclic time as a factor in the Master Argument and its contemporary responses.

[22] 'Tense logic and the Continuity of Time', *Studia Logica* 13, 1962, 133–49, p.138; *PPF*, p.49. Prior's attention had been drawn to the point by Becker ('Zur Rekonstruktion des 'Kurieuon Logos'', #2).

[23] Boudot, 'Temps, Nécessité et Prédétermination', pp.447–8; Vuillemin, 'L'Argument Dominateur', p.233–4, *NC*, p.24; Weidemann, 'DSM', p.41; Sutula, 'Diodorus and the Master Argument', p.329.

[24] See Note on Diodorus' Atomism at the end of the present section.

[25] *Phys* 6.1–3.

[26] Stobaeus, *Eclogae* 1.142.2–6 = *SVF* 2.482 = LS 50A, 1.106.5–23 = *SVF* 2.509 = LS 51B; Sextus *AM* 10.142 = LS 50F(5); cf. Plutarch, *Comm Not* 1081c = *SVF* 2.519 = LS 50C.

[27] Cf. Picolet, 'A Propos d'une Reconstruction Récente du Maître Argument de Diodore Cronos', pp.4–5; White, 'The Necessity of the Past and Modal-Tense Logic Incompleteness', *Notre Dame Journal of Formal Logic* 25, 1984, 59–71, p.63.

lently, '$[\neg p \ \& \ \neg Fp] \rightarrow P \neg Fp$', does not, in point of fact, presuppose the discreteness of time.[28] For, they argue, on an Aristotelian conception of change, although there can be a last instant of change – the instant at which change is completed – there is no first instant of change. Rescher and Urquhart conclude from this that there need be no first instant at which '$\neg p \ \& \ \neg Fp$' obtains, and hence that the above axiom can hold in continuous time.[29] But their contention involves a misapplication of Aristotle. Consider our case: we envisage a change from 'p' to '$\neg p$'. '$\neg p$' is now the case and will hereafter be the case. Suppose that t_1 is the last instant of 'p' and t_2 the first instant of '$\neg p$'. Now it would be contradictory to suppose that $t_1 = t_2$. But nor can we suppose that t_1 and t_2 are adjacent to one another: in continuous time there are no adjacent instants. Nor can they be separated by a stretch of time: for then we should have neither 'p' nor '$\neg p$' in that stretch. We must accordingly drop the assumption either that there is a last instant of 'p' (t_1), or that there is a first instant of '$\neg p$' (t_2), or both. Of these two options, it is clear that Aristotle selects the former.[30] He argues that if a thing changes from one state into another, there is a first instant at which the thing is in the new state. In our scenario, there is no last instant at which 'p' obtains, but there is a first instant at which '$\neg p$' ob-

[28] *Temporal Logic*, pp.168–9.

[29] For our purposes it is not necessary to distinguish between continuity and density: I use 'continuity' to cover both.

[30] Unfortunately, Aristotle's treatment of change in *Physics* 6 focuses on the case of continuous motion and changes between contraries, and fails to apply to the case change from one state to its contradictory state. He argues that anything which is in a state of having changed must previously have been in a process of change, because there must be a stretch of time between the last instant of the previous state and the first instant of the new state (in which the changing thing is moving between states): 237a17–b9. But this cannot be true of changes between contradictories (*contra* 235b16–30, 237a35–b2). Since he does clearly embrace the view that there is a first instant of rest (the new state), Aristotle would be forced to abandon his assumption that there must, in general, be a last instant of the previous state: Bostock, 'Aristotle on Continuity in *Physics* 6', in Judson ed., *Aristotle's Physics* (Oxford, 1991), 179–212, pp.196–200. (Bostock conjectures on the basis of 240a19–29 that Aristotle might have been willing to claim that any change between contradictories can be redescribed so that the end-points are contraries. If that is so, his position could apply to all changes – assuming that all changes, under some description, take time – though not indeed to all changes however described, so not to our hypothesized change from 'p' to '$\neg p$', so described.) This is indeed the policy he adopts in *Phys* 8 263b9–264a6, a discussion which supersedes the earlier discussion of book 6, much as the new solution to Zeno's dichotomy paradox in 8.8 supersedes the solution of 6.2. See here Owen, 'Tithenai ta phainomena', in his *Logic, Science and Dialectic* (London, 1986), 239–51, at p.249.

tains. So Aristotle's principle that there is no first instant of change does not show what Rescher and Urquhart take it to show. For there is, for Aristotle, a first instant of rest after change. So '$[p \ \& \ Gp] \rightarrow PGp$' is not generally valid in continuous time.[31]

This is a convenient place at which to mention Øhrstrøm's ingenious reconstruction of the Master Argument.[32] Let us take as instantiations of premiss (3)

(P1) It is possible for Dion to be here
(P2) Dion is not and never will be here.

Let '*I*' refer to the instant immediately before the present instant, i.e. to a particular, dated instant (not to whichever instant is before whichever instant is the present instant). In other words, '*I*' is a proper name, not an abbreviated definite description. (The importance of this point will emerge below.) Then

(P3) *I* has been present

[31] See esp. *Phys* 235b30–236a13; cf.263b9–26. Elsewhere Aristotle endorses the principle that there is no *shortest first period* of either motion or rest: *Phys* 236a7–35 (cf. Sorabji, *TCC*, p.415 n.17), 236b32–237b22, 238b31–239a22. That does not entail that there cannot be a first *instant* of motion or rest, but in some moods Aristotle seems to be equally hostile to this possibility, for the reason (among others) that it does not, on his view, make sense to speak of motion or rest at an instant: *Phys* 239a4–6, 10–14 (cf. Bostock, 'Aristotle on Continuity in *Physics* 6', pp.192–196). Aristotle no doubt ought to endorse the principle that there can be no first instant of *motion*: for if, as Aristotle would no doubt want, all changes in velocity are continuous, the instantaneous velocity of a body at the instant when it changes from motion to rest or *vice versa* is zero: Sorabji, 'Aristotle on the Instant of Change', *PAS* Supplementary vol.50, 1976, 69–89, p.72. But Aristotle cannot afford to endorse the principle that there is no first instant of *rest* without contradicting his clear position in *Phys* 236a7–13. His motive at *Phys* 238b31–239a22 for denying that there can be a first instant of rest is, as observed, that it does not make sense to speak of motion or rest at an instant. But Aristotle could surely avoid the incipient contradiction by insisting on his view that a point can be said to be in motion *κατὰ συμβεβηκός*, by virtue of being a point on a magnitude which is, properly speaking, in motion (240b8–12). Similarly, the first instant of a period of rest counts (in a secondary sense) as an instant precisely *of rest* by virtue of the fact that the whole period is (in a primary sense) one of rest. These undeniable complications in Aristotle's position cannot help out the axiom '$[p \ \& \ Gp] \rightarrow PGp$'. If there is rest at an instant, then Aristotle's best view is that there can be a first instant of rest; if on the other hand there cannot be a first instant of rest, for the reason that there cannot be rest at an instant at all, then the axiom cannot be interpreted on instants, but as interpreted on periods it is (on anyone's view) invalid.

[32] 'The Master Argument of Diodorus Cronus', *International Logic Review* 11, 1980, 60–5.

is true now and hereafter. Hence we have, by premiss (1):

(P4) It is necessary that *I* has been present

and so

(P5) It is impossible that *I* has not been present.

But the following implication is sound for Diodorus:

(P6) If Dion is here, then *I* has not been present.

That is because (a) the antecedent of (P6) is false now and hereafter (by (P2)), and (b) if the antecedent was true at any time in the past, the consequent was at that time also true. Hence (P6) is true at all times; hence it is sound for Diodorus. But now, Øhrstrøm argues, the antecedent of (P6) is possible (by (P1)), whereas the consequent is impossible (by (P5)). But that contradicts premiss (2), which on this reconstruction is taken to express Diodorus' theory of the sound conditional. Hence we must reject one of the premisses: the axe falls on (P1).

In the reconstruction, '*I*' has to be taken as a proper name, for if it were taken as a definite description (P6) would not be guaranteed to be true for Diodorus (there could be an instant in the past, *t*, at which Dion was here, and of course the instant preceding *t* would have been present). But

(P7) *I* has not been present

has been possible – it has even been true – but is now impossible. If the argument were run at a moment before the present moment (i.e. at a moment before or simultaneous with *I*), it would fail, because (P3) would be false. That means that the success of the above argument depends on its being run *after I*. But the argument cannot be run too long after *I*. For if it is, we can suppose (compatibly with our assumptions) that Dion is here up until (but not including) the new present moment (the new moment when we run the argument). But then at any moment between *I* and the new present moment (P6) is false. The upshot is that the argument can only safely be run at the moment next after *I*. But that not only somewhat restricts the scope of the argument; it also requires that time be discrete.

Øhrstrøm is aware of this latter restriction on the scope of the argument, but he thinks the restriction can be removed if, instead of the discreteness of time, we assume that no sentence has a first instant of truth/falsity. For in that case there is no first instant at which 'Dion is here' is false. But there will be a last instant at which 'Dion is here' is true. '*I*' can then be taken to be any instant between this last instant and the present moment, and the argument goes through. Øhrstrøm suggests that the substitute principle can be found in Aristotle;[33] but we have seen that although Aristotle is not entirely consistent on this matter, his best position is that while there no first instant of change there is a first instant of rest. The substitute principle is in any case implausible. So it does not seem to present a tolerable way in which Diodorus could have avoided the discreteness of time, if he envisaged his argument to work along the line suggested by Øhrstrøm.

In thinking about Prior's reconstruction it is important to remember that '$p\neg Fp$' says that it was the case at some time in the past that '$\neg Fp$' obtained *then*, not that '$\neg Fp$' would obtain *now*, i.e. it was the case that '$\neg p$' would (from then on) be the case, not: it was the case that '$\neg p$' will (from now on) be the case. If we wrote premiss (5) as

(5)′ $[\neg p \ \& \ \neg Fp] \rightarrow PN\neg Fp$

where '*N*' represents Kamp's 'Now' operator (#1, n. 21), we should certainly avoid a commitment to discrete time; but in order to complete the proof, we should now need to write premiss (4) as

(4)′ $L\,[p \rightarrow \neg PN\neg Fp]$

which is false. (It does not follow from the fact that '*p*' is true now that it will be true hereafter.) So the price of avoiding, in this way, the commitment of Prior's premiss (5) to the discreteness of time would be the falsity of the new premiss (4)′. Conversely, if we insist on the Priorean version of premiss (4), premiss (5) has to take the form which commits us to the discreteness of time.[34]

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[33] *Phys* 236a12–14.

[34] See here McKirahan, 'DPM', pp.234–8 (McKirahan casts the point in Standard notation, but it can be just as readily grasped in Priorean notation with '*N*'). As I have indicated (#1 n.21), McKirahan seems to be wrong in his claim that there is an equivocation in Prior's reconstruction. Prior surely understands '$p\neg Fp$' as I have defined it (not as '$PN\neg Fp$'). There is then no ambiguity in Prior's premisses (4) and (5); and Prior cannot avoid the commitment of premiss (5) to discrete time.

One might suppose – so McKirahan – that *any* version of Prior's reconstruction which avoids that commitment is committed to adopting the false premiss (4)′. But in fact it is possible to put together a version of Prior's reconstruction which not only avoids his premiss (5), but which retains an acceptable version of his premiss (4): I explore this option in #20 below. McKirahan's own solution to the difficulty is to suggest that Diodorus may in fact have accepted (4)′, on the grounds that any present-tensed sentence can be replaced by a past-tensed one. McKirahan cites here Diodorus' arguments on motion, and his notorious claims that 'Helen had three husbands' can be true while 'Helen has three husbands' is always false, and that if a ball is thrown onto a roof 'The ball has touched the roof' becomes true, but at no point is 'The ball is touching the roof' true.[35] If these passages do indeed show that Diodorus favoured the general elimination of present-tensed formulations and their replacement by past-tensed ones, then no doubt they can also provide evidence for his acceptance of (4)′ (*via* acceptance of '$p \rightarrow Pp$'), and hence for his acceptance of a version of Prior's reconstruction in which (4)′ and (5)′ are deployed, i.e. (in outline):

(1) $[\neg p \,\&\, \neg Fp] \rightarrow PN\neg Fp$ Premiss (5)′
(2) $PN\neg Fp \rightarrow \neg M\neg PN\neg Fp$ Premiss (1)
(3) $L\,[p \rightarrow \neg PN\neg Fp]$ Premiss (4)′
(4) $L\,[p \rightarrow \neg PN\neg Fp] \rightarrow [\neg M\neg PN\neg Fp \rightarrow \neg Mp]$ Premiss (2)
(5) $[\neg p \,\&\, \neg Fp] \rightarrow \neg Mp$ 1,2,3,4, Premiss (3).

Appeal to the principle '$p \rightarrow Pp$' in effect allows us to subject the assumption '$\neg p \,\&\, \neg Fp$' of premiss (3) to immediate necessitation (given the necessity of the past, premiss (1)), and derive a contradiction with the assumption 'Mp' of premiss (3). But it also entails that there can be no first instant of either rest or motion. I have suggested that, in spite of some unclarity, Aristotle is best interpreted as accepting the possibility of a first instant of rest. Hence the drawback of this proposal is, once again, that we are required to import too much of Diodorus' own controversial metaphysical views. We have avoided one such item (discrete time) only to find ourselves relying on another (the axiom '$p \rightarrow Pp$'). But it is surely preferable to reconstruct the Master Argument without adducing such extras, if we can: otherwise we deprive the Argument of the general impact which it plainly had, and reduce it to a school conundrum. The reconstructions which I shall favour will indeed rely on a principle which permits us to subject present or future truths to necessitation, whether directly or indirectly. But everything turns on how this move is legitimised: I do not think it is attractive to do so either by assuming a particular topology of time, or by importing the crude and implausible claim '$p \rightarrow Pp$'.

[35] Sextus, *AM* 10.97–102 = fr.123 Döring.

A further remark about the meaning of premisses (4) and (5) is in order here. I noted above that Prior in his reconstructions presupposes the equivalences

$$Hp \equiv \neg P\neg p$$

and

$$Gp \equiv \neg F\neg p.$$

The Peircean model abandons the right-to-left implication of this latter formula. In that case

(4) $L\,[p \rightarrow \neg P\neg Fp]$

is not equivalent to

(4)″ $L\,[p \rightarrow \neg PG\neg p]$

and

(5) $[\neg p \,\&\, \neg Fp] \rightarrow P\neg Fp$

is not equivalent to

(5)″ $[\neg p \,\&\, G\neg p] \rightarrow PG\neg p.$

Valid arguments along Priorean lines can be constructed using either (4) and (5), or (4)″ and (5)″, together with the remaining premisses. If we translate (4)″ and (5)″ from Peircean into Ockhamist terms, they equate to

(4)‴ $L\,[p \rightarrow \neg PL\neg Fp]$

and

(5)‴ $[\neg p \,\&\, L\neg Fp] \rightarrow PL\neg Fp.$

Premiss (4)‴ is now even more harmless than premiss (4): it is true not

only in an Aristotelian, but also in an Ockhamist, model of time. Premiss (5)‴ continues to require the discreteness of time.[36]

White argues that the issue of discreteness of time is an irrelevancy introduced by Prior's syntactic approach to the Master Argument.[37] He offers a semantic derivation of Diodorus' conclusion from premisses which do not entail the discreteness of time. White's reconstruction does not look much like Prior's: in particular, nothing corresponding to Prior's exploitation of a truth-value link survives in the semantic version. We can certainly agree that it is possible to reconstruct the Master Argument without presupposing the discreteness of time:[38] my own proposed reconstruction in #22 below, for example, makes no such presupposition, and in #20 I shall indeed present a version of Prior's reconstruction, due to Barreau, which drops Prior's premiss (5). But White's own proposal seems to me unsuccessful.

White seeks to derive the conclusion of the Master Argument, '$Mp \rightarrow [p \vee Fp]$', from the premisses '$Mp \rightarrow [Pp \vee p \vee Fp]$' and '$Pp \rightarrow LPp$'. The derivation works as follows. The first of these premisses is taken to define the following first-order condition on a frame

(W1) $\forall t \forall t' \; [Rtt' \rightarrow [t < t' \vee t = t' \vee t' < t]]$

where 'R' is the accessibility relation for the modal operators. The second premiss White takes to define the following condition:

(W2) $\forall t \forall t' \; [Rtt' \rightarrow \forall t'' \; [t'' < t \rightarrow t'' < t']]$.

Given the irreflexivity of '$<$', there is then no difficulty in demonstrating that these conditions entail

[36] Cf. Weidemann, 'DSM', pp.44–8, who purports to circumvent this point by reinterpreting 'Fp' and 'Pp' so that they include the present moment as limiting cases, in which case '$\neg Fp \rightarrow P\neg Fp$' is trivially true, and presupposes no particular topology of time. But the cost of this manoeuvre is that premiss (1) must now be taken to state – what it plainly does not – that past *and present* truths are necessary.

[37] 'The Necessity of the Past and Modal-Tense Logic Incompleteness'.

[38] *Pace* Trzesicki, 'Is Discreteness of Time Necessary for [the] Diodorean Master Argument?', who argues that every syntactic proof of the conclusion of the Master Argument must have a premiss which presupposes the backwards-discreteness of time (pp.130–2). But his proof relies on interpreting the modal operators in such a way as to import that presupposition: 'L' is interpreted as 'PG', and 'M' as 'HF'. The conclusion then takes the form:

$[\neg p \; \& \; \neg Fp] \rightarrow \neg HFp$

which obviously presupposes the backwards-discreteness of time.

(W3) $\forall t \forall t' \; [Rtt' \rightarrow [t = t' \vee t < t']]$

which is just the first-order condition defined by the conclusion of the Master Argument, i.e. $Mp \rightarrow [p \vee Fp]$. The problem with this derivation comes over (W2), which White takes to be the first-order condition defined by '$Pp \rightarrow LPp$'. This is a mistake.[39] In fact, (W2) is the condition defined by '$Pp \rightarrow \neg M p$'. This formula yields

$PPp \rightarrow \neg MPp \; (p/Pp)$

and, given '$PPp \rightarrow Pp$', we can derive from '$Pp \rightarrow LPp$'

$PPp \rightarrow LPp$.

The reconstruction therefore in effect abandons $L - M$ duality. But then the first premiss ($Mp \rightarrow [Pp \vee p \vee Fp]$) loses its plausibility, for if 'L' is the contradictory, not the dual, of 'M', that premiss would have the untoward consequence that what never happens is necessary. So I do not think White has offered a genuine candidate for a reconstruction of the Master Argument. However, the implicit abandonment of the duality of the modal operators is not without interest. For although the duality of 'L' and 'M' is just a matter of definition, I shall argue below (#22) that the duality of '*ἀναγκαῖον*' in premiss (1) of the Master Argument and '*δυνατόν*' in premisses (2) and (3) is very much in question; I shall in fact abandon it in my own reconstruction.

Note on Diodorus' Atomism

Diodorus' atomism in respect of motion is evidenced by Sextus, *AM* 10.85–6 (=fr.123 Döring), and 142–3 (=fr.125 Döring).[40] These texts suggest that Diodorus derived his argument for atomic motion from his acknowledged atomism in respect of space and matter.[41] But, as Aristotle argued in *Physics* 6.1, atomism in respect of space and mo-

[39] Cf. Trzesicki, 'Is Discreteness of Time Necessary for [the] Diodorean Master Argument?', p.134.

[40] See Denyer, 'The Atomism of Diodorus Cronus', *Prudentia* 13, 1981, 33–46, p.35; Barreau, 'Le Maître Argument de Diodore', p.35; Sedley, 'Diodorus Cronus and Hellenistic Philosophy', pp.84–9; Sorabji, *TCC*, pp.17–21.

[41] Frr.116–120 Döring; these passages do not explicitly ascribe to Diodorus belief in the discreteness of *time* (*pace* Vuillemin, 'L'Argument Dominateur', p.233).

tion implies atomism in respect of time. So it is quite plausible that Diodorus embraced this implication of his position.[42] Denyer and Sorabji argue convincingly that the content of *AM* 10.119–20, although not explicitly linked by Sextus to Diodorus, in fact derives from him: that passage can be read as both an argument against motion on the basis of the discreteness of time, and an argument for the discreteness of time itself. Note that although Diodorus seems to have intended to rely on the discreteness of time and space in his refutation of motion, the refutation as such in fact does not depend on it. The argument is: a thing can neither move in the space (time) where it is is, nor in the space (time) where it is not; so it cannot move. It can, however, *have moved*.[43] The argument is reminiscent of Zeno's paradox of the arrow, which seems to involve infinitesimal instants rather than discrete time-atoms: if the arrow is not moving (and so is at rest) at any instant during the period of its supposed flight, then it is not moving (and so is at rest) during that period. (The argument can be extended to the case of space by considering any point on the arrow.) The parallel with Zeno is not exact: after all, Zeno meant to reject motion *toto caelo*; Diodorus means to reject motion in the present, but not states of having moved.[44] But it is sufficiently close to indicate that Diodorus' argument does not depend for its effect on any particular topology of time.[45]

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[42] For a contrary view, McKirahan, 'DPM', p.244; but his argument depends on seeing a contrast between the positions ascribed by Sextus to the Epicureans and to Diodorus at *AM* 10.142–3 which I do not think is there.

[43] As well as the passages referred to, see Sextus, *PH* 3.71 (=fr.124 Döring), *AM* 1.309–12 (=fr.128 Döring), *AM* 10.105–107 (applying the principle to time).

[44] Cf. Sorabji, *TCC*, pp.347–8.

[45] Cf. Sorabji, *TCC*, p.18. Bostock suggests ('Aristotle on Continuity in *Physics* 6', p.207) that Aristotle read Zeno's arrow paradox as depending on time-atomism, but that would sort ill with Zeno's other paradoxes. Bostock's reason for this move is that Aristotle seems to reject the paradox not only on the ground that one cannot properly speak of motion or rest at an instant, but also on the ground that time is not made up of instants. Since this latter ground is unconvincing – Zeno's inference would fail even if time were made up of instants, as we now believe it is, or at least could be – Bostock supposes that Aristotle means to be attacking a position according to which an 'instant' is taken to be a very short period. But the second ground given by Aristotle is sufficiently motivated by the possibility, which Aristotle probably discerned, of generating a new paradox on the basis of his first response to Zeno. For if the arrow cannot properly be said to be in motion or at rest at any instant (cf.239b2), a strengthened Zeno could argue that the arrow can then not be said to be in motion or at rest throughout the entire period. Aristotle needs (or rather: thinks he needs) his second response to counter this possible development of the original paradox.

19 The Consistency and Plausibility Constraints

An interesting variant of Prior's reconstruction is Denyer's. Examination of this version raises a number of important general points. So far, I have not given detailed consideration to the interpretation of the modal operators as they figure in the reconstruction, although I mentioned that Prior wished to read '*L*' in his formalisation of premiss (1) in accordance with Diodorus' own favoured construal of necessity. According to the Boethian account, which I shall quote shortly, Diodorus' interpretation of 'necessarily *p*' was 'It is and will always be true that *p*'. This interpretation of necessity is arrived at simply by combining *L*–*M* duality with conclusion of the Master Argument (Possibly *p* = It is or will be true that *p*).

Denyer has argued that an important constraint on any reconstruction of the Argument is that it must be possible to run the Argument on the conception of necessity which that Argument yields.[1] I shall call this constraint the Consistency Constraint (**CC**). Arguably, we must equally seek to avoid interpreting the premisses in such a way that they *only* look plausible when the modalities are given a Diodorean interpretation. This is because, as Purtill has pointed out,[2] the Argument would then have the form of a *petitio principii*, and we know from the report of Alexander which I quoted in #15 that the purpose of the Master Argument was precisely to *establish* the Diodorean interpretation of the modal operators. I shall speak of this constraint as the Plausibility Constraint (**PC**). These constraints have considerable intuitive appeal. Can they be met?

Reflection on the Diodorean sense of 'necessary' might suggest that we ought to formalise premiss (1) as

$$Pp \rightarrow Lp.$$[3]

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[1] 'Time and Modality in Diodorus Cronus'; cf. Celluprica, 'L'argomento dominatore di Diodoro Crono e il concetto di possibile di Crisippo', in Giannantoni ed., *Scuole socratiche minori e filosofia ellenistica* (Bologna, 1977), 55–73.

[2] 'The Master Argument', *Apeiron* 7, 1973, 31–6.

[3] Cf. Michael, 'What is the Master Argument of Diodorus Cronus?'

But this is patently false if '*L*' is interpreted in a Diodorean fashion. From the fact that Socrates was sitting, it does not follow that he is sitting and will for ever after be sitting. (Since the formula is also false if '*L*' is interpreted in a non-Diodorean way – 'unpreventably' – it has no plausibility whatever as a formalisation of premiss (1).)[4] Equally, we cannot have

$$Pnp \rightarrow LPnp.$$

For from the fact that Socrates was sitting ten minutes ago, it does not follow that it will at every subsequent moment be the case that he was sitting ten minutes before that moment.[5] Of course, if we extrude the metric from this formula, we arrive at the true

$$Pp \rightarrow LPp.$$

But, as Boudot points out,[6] it is unlikely that Diodorus so restricted himself, since ancient discussions of fatalism move easily between metric and non-metric formulations. (Aristotle's discussion in *DI* 9 is a case in point.)

There is a further problem with '$Pp \rightarrow LPp$'. No restriction is made on substitution into the position occupied by '*p*'; indeed, the application of this premiss in Prior's reconstruction turns on the possibility of unrestricted substitution. But

$$PFp \rightarrow LPFp$$

is false when '*L*' is interpreted in a Diodorean way. This point escaped notice when we examined Prior's reconstruction, because premiss (1) figured rather in the form

$$P\neg Fp \rightarrow LP\neg Fp \text{ (equivalently: } PG\neg p \rightarrow LPG\neg p)$$

which is true. '$Pp \rightarrow LPp$' only admits of a Diodorean interpretation of '*L*' if we ban metric formulae and restrict substitution of formulae involving an *F*-operator to those which are equivalent to *G*-formulae (i.e.

[4] Rescher formalises premiss (1) as:

$$\forall t \forall t' \, [[T_t p \,\&\, t < t'] \rightarrow L_{t'} p]$$

which looks as if it is liable to the same objection. But in Rescher's case I take it that '*p*' is meant to be standing in for a temporally *definite* expression. See n.11 below.

[5] Kneale, *DL*, pp.119–20.

[6] 'L'Argument Dominateur', p.278f.

fomulae with an *initial* '*G*'). In Prior's reconstruction we can buy the conformity of premiss (1) to **CC** only at the price of a double failure of that premiss to conform to **PC**.[7]

Denyer's own reconstruction uses a version of '$Pp \rightarrow LPp$'. But he implicitly recognizes the problems I have identified as attaching to it by adopting as his formalisation of premiss (1) the substitution-instance

$$PGp \rightarrow LPGp.$$

Since the argument actually requires premiss (1) in something like this form (given the '$G\neg p$' of premiss (3)), and not in the more general form captured by '$Pp \rightarrow LPp$', this move makes sense. Denyer notes that premiss (1), so formalised, and indeed the whole argument, conforms to **CC**. Denyer's own presentation of his proof is long, but I think it can be reduced to this:

(1)	$\neg p \,\&\, \neg Fp$	Premiss (3)
(2)	$L\,[[\neg p \,\&\, \neg Fp] \equiv PG\neg p]$	Extra Hypothesis
(3)	$PG\neg p$	1,2, Modus Ponens
(4)	$LPG\neg p$	3, Premiss (1), Modus Ponens
(5)	$L\,[\neg p \,\&\, \neg Fp]$	2,4, Premiss (2)

This is an elegant proof. It assumes **PB** in its extra hypothesis at line (2) and in its formalisation of premiss (1). But, as I shall argue in #25, this reliance is not as such an objection to a reconstruction. The fact that the proof conforms to **CC** is an attractive feature of it. The second premiss is formalised, once again, as

$$L\,[p \rightarrow q] \rightarrow [Lp \rightarrow Lq].$$

As we have seen, this is a plausible reading of premiss (2) in the light of Diodorus' own theory of the sound conditional.[8]

But the most important objections to Prior remain. Denyer requires an extra premiss, and that premiss presupposes the discreteness of time.

[7] McKirahan's version of Prior's reconstruction ('DPM', p.228ff) endorses the strategy of restricting the application of premiss (1) to non-metric formulae, in order to conform to **CC**.

[8] In Denyer's own presentation, he makes use of the longer

$$[HL\,[p \rightarrow q] \,\&\, L\,[p \rightarrow q]] \rightarrow [Mp \rightarrow Mq].$$

But I have indicated (#16) that we are entitled to work with the familiar modal axiom in place of this cumbersome formula.

Further, the scope of premiss (1) is severely restricted if we adopt **CC** (i.e. if we interpret '*L*' and '*M*' in a Diodorean way): we are unable to find any relevant sense in which metric past-tensed formulae are necessary, and the transfer of necessity from past to future will be restricted to *G*-formulae. But if the first premiss is to have pre-proof appeal, it must surely answer to our intuition that the past is necessary in the sense that there is nothing anyone can do, at any given time, to alter the past in respect of that time. This intuition finds necessity in all past-tensed statements (=past-tensed sentences as assessed at times), metric and non-metric alike. Equally, if the necessity of the past transfers to the future, surely it should transfer to all of the future (the future of *F*-formulae as well as the future of *G*-formulae). The problem we seem to have run up against in Prior's and Denyer's reconstructions is that they cannot both meet **CC** and achieve the required generality in their formalisation of premiss (1) to meet **PC**. The price of respecting **CC** is the abandonment of **PC**.[9]

Denyer takes premiss (1), and the rest of the Argument, to deal in temporally indefinite sentences. Perhaps if we try a different tack, and instead run premiss (1) on temporally *definite* expressions, we will be able to achieve conformity to both **CC** and **PC**. If the items to which necessity attaches are either statements, or sentences of the form 'Socrates died in 399 B.C.', rather than of the form 'Socrates died (*n* years ago),' then no difficulty arises in meeting both **CC** and **PC**, at least as far as our understanding of premiss (1) goes.[10] The necessity, at all subsequent times, that Socrates died in 399 B.C. has intuitive plausibility: we understand it as the *unalterability*, after 399 B.C., of the death of Socrates in 399 B.C. Equally, the necessity in question admits of a Diodorean interpretation: it is and always will be true that Socrates died in 399 B.C. Hence to interpret premiss (1) in this way meshes satisfyingly with both our constraints.

If premiss (1) is understood as concerning temporally definite expressions, what of the rest of the argument? Rescher and Urquhart reconstruct the entire Master Argument in terms of temporally definite

[9] Cf. Sutula, 'Diodorus and the Master Argument', (on Prior), p.324.

[10] Cf. Mates, *Stoic Logic*, p.39, who notes that premiss (1) is most naturally construed as applying necessity to what he calls propositions (=temporally definite sentences) rather than propositional functions (=temporally indefinite sentences). But of course Diodorus' official definition of necessity has it applying to propositional functions: this antinomy will be a matter of concern to us in the sequel.

sentences.[11] So too White.[12] White is influenced in this endeavour by a desire to understand Cicero's claim that Diodorus was a determinist. Cicero, as we have seen, first of all reports Diodorus' views on possibility correctly (at least, in agreement with our other information), but then proceeds to ascribe a determinism to Diodorus which appears to go beyond our other sources on Diodorus, and beyond anything the Master Argument seems to yield.[13] Now the point is that Cicero's ascription of determinism to Diodorus becomes comprehensible if we run the Master Argument on temporally definite expressions. For example, if the sentence 'There will be a sea battle on November 24th 2097' is possible, then it is or will be true. But if it will be true, then it is true that it will be true: hence the sentence is simply true (#7). But if the sentence is simply true, then it both is and will be true. Diodorean possibility, interpreted over temporally definite expressions, coincides with actuality and Diodorean necessity.

There are several ways we can jump on this one. Perhaps the Master Argument was originally intended to run on temporally indefinite sentences and then was later applied (by whom first, we do not know) to temporally definite expressions, thus yielding determinism; or perhaps it was intended to run on temporally definite expressions from the start. Or perhaps the truth is more complicated than either of these options.

White argues for the thesis that the Argument ran on temporally definite sentences from the start. He has two supporting considerations.

[11] *Temporal Logic*, p.189ff. Cf. Rescher, 'A version of the Master Argument of Diodorus', *JPhil* 63, 1966, 438–445. This version is usefully criticised by Sutula ('Diodorus and the Master Argument', p.338ff), who finds a difficulty in Rescher's assumption of Zeller's Principle (in premiss (2)), that the impossible does not follow the possible in time (cf. the criticism of Boudot, 'Temps, Nécessité et Prédétermination', p.445; McKirahan, 'DPM', p.250 n.32). But cf. my remarks in #17 above. Sutula further shows that Rescher's own attempt to avoid the conclusion of the argument, involving a restriction of **PB**, does not work. (The same result had already been reached by Guerry, 'Rescher's Master Argument', *JPhil* 64, 1967, 310–2.) Weidemann's statement that Michael's reconstruction ('What is the Master Argument of Diodorus Cronus?') runs on temporally definite sentences ('DSM', p.32) seems to me to be incorrect. Double indexing does not in itself introduce such sentences; it depends on how the indexing is employed. Cf. my reconstruction in #22 below.

[12] *Agency and Integrality*, p.76ff.

[13] *De Fato* 13, 17 = fr. 132A Döring. Cf. Jerome, *Dialogus contra Pelagianos* 1.702, *PL* 23 525A = fr.132B Döring; Cicero, *Ad Fam* 9.4 = fr.133 Döring; Boethius, *In De Int* 2.235.4–8 = fr.138 Döring. See Blanché, 'Sur L'Interpretation du *κυριεύων λόγος*', *Revue Philosophique de la France et de l'Étranger* 155, 1965, 133–49; Barreau, 'Le Maître Argument de Diodore'.

Firstly, as mentioned, he seeks to explain Cicero's categorisation of Diodorus as a determinist. But as I have just observed, we do not have to suppose that the Master Argument was *designed* to run on such sentences in order to account for Cicero's ascription; it is quite sufficient to imagine that the Argument, intended in the first instance to apply to temporally indefinite sentences, was subsequently applied to temporally definite expressions. Secondly, White argues that Boethius' report of Diodorus' modal interpretations indicates that the modalities were conceived as applying to temporally definite sentences. I have already referred to this passage several times. It reads as follows:

> Diodorus possibile esse determinat, quod aut est aut erit; inpossibile, quod cum falsum sit non erit verum; necessarium, quod cum verum sit non erit falsum; non necessarium, quod aut iam est aut erit falsum.
>
> Diodorus defines the possible as what is or will be [true];[14] the impossible as that which, when (since?) it is false, will not be true; the necessary as that which, when (since?) it is true, will not be false; the non-necessary as what is already false or will be false.[15]

White proposes that we understand 'cum' here as meaning 'since', rather than 'when' or 'whenever'.[16] It is indeed definitive of a temporally definite sentence that, supposing it is true at a time, *since* it is true at that time it will not subsequently become false. On the linguistic point, either rendering of 'cum' is feasible. But White's interpretation makes no logical sense either of Boethius' definition of possibility or of the conclusion of the Master Argument. It is inept to say of a temporally *definite* sentence that it is possible if and only if it either is or will be ⟨true⟩. As I have observed, if a temporally definite expression is true, it

[14] This insertion is justified by the form of premiss (3), the negation of which constitutes the definition of possibility, and by Cicero, *De Fato* 13, 17. Cf. McKirahan, 'DPM', p.225; Kneale, *DL*, p.118.

[15] *In De Int* 2.234.22–6 = ft.138 Döring = LS 38C. The translations of Mates (*Stoic Logic*, p.37), Kneale (*DL*, p.117) and Mignucci ('L'Argomento Dominatore', p.5) render the 'cum' clause by a participial construction ('... that which, being true (false), will not be false (true) ...') which conceals the ambiguity we are concerned with. I am indebted to David Langslow for discussion of this point.

[16] McKirahan ('DPM', p.248 n.8) also claims that 'cum' must mean 'since'. But he accepts that the sense needed for the interdefinitions of the modalities is the temporal rather than the causal one, and suggests that Boethius may have been faced with a Greek account which defined 'necessary' as something like '*ὅ, ἀληθὲς ὄν, οὐκ ἔσται ψευδές*', in which he misunderstood the participial construction as bearing a causal sense.

follows that it will be true; equally, if it will be true, then it is true now that it will be true, hence it is simply true. The disjunctive formulation is misleading in its suggestion that there are two ways in which a temporally definite sentence can be possible, when in fact there is only one.

What is more, if Diodorus conceived of his modalities as attaching to temporally definite expressions, there would be a general modal collapse: possibility would coincide with necessity, and both with simple truth. An Aristotelian escape from this collapse would not be available to Diodorus. Aristotle, as we have seen, identifies truth with relative necessity. But the sub-domain of possibility which coincides with contingency is identified with potentiality for opposites. In the context of a suitable restriction on **PB**, if '*Fp*' is merely contingent, it lacks a truth-value; hence there is no route from its possibility to necessity. But Diodorus, in ascribing a truth-value (at the present or some unspecified future time) to all sentences which are possible, could not avoid collapsing possibility into necessity if he conceived of those sentences as temporally definite. And then it simply makes no sense to *distinguish* the various modal notions in the way Boethius has him do. Why make a point of the distinctness (and indeed the *duality*) of possibility and necessity, if the notions collapse into one another?[17]

[17] McKirahan ('DPM', pp.250–1 n.38) seems to regard modal collapse in the case of temporally definite sentences as harmless. But it is very far from being so: not only does it render redundant the Diodorean distinctions between the modalities; it also leads, on a non-Diodorean interpretation of the modalities, to necessitarianism. This point was discerned by Kneale (*DL*, p.121) and will be explored below, #24; McKirahan's objection to Kneale on this score is not well taken.

Some kind of modal collapse seems also to be countenanced by Mignucci in his 'L'Argomento Dominatore', if I understand him correctly. But it is not entirely clear what kind. While most of Mignucci's remarks, and his official reconstruction (p.15), envisage a *total* modal collapse along similar lines to White's (this is recognized by Mignucci: pp.17 and 27), other remarks hint at a strange form of *partial* modal collapse. According to this line, Diodorus understands 'necessity' in premiss (1) and in the Boethian definitions simply as 'self-consistency' ('mera incontraddittorietà di ciascuna cosa con se stessa', p.11). (Mignucci seems to interpret *DI* 19a23f in the same way, i.e. as '$L\,[p_t \rightarrow p_t]$'.) Boethius' 'cum' is understood as bearing a conditional sense ('se è stato il caso che *p*, allora è sempre vero che sia stato il caso che *p*', p.11 n.25). In that case possibility entails truth, which entails necessity; but although the first of these entailments is reversible, the second is not. We therefore have the peculiar situation that possibility entails, but is not entailed by, necessity; possibility destroys contingency but necessity does not. Mignucci's motive in so construing the Diodorean modalities is to accommodate Cicero's characterisation of Diodorus as a determinist. But the method does not achieve the objective: for no reader of *De Fato* could possibly suppose that Cicero intended the necessity of an event to be com-

This consideration is, in my view, decisive against White's interpretation. But a final point, which is worth mentioning, is that White's line is not compatible with Alexander's report of Diodorean possibility. It is quite clear from this report that possibility attaches to temporally *indefinite* sentences, such as 'I am in Corinth', rather than to temporally definite expressions such as 'I am in Corinth on date *d*'. I think we are entitled to conclude that the Master Argument cannot, *as a whole*, have been intended to run on temporally definite expressions, at least not in the first instance.

Does that mean we can conclude that the first premiss must be run on temporally indefinite sentences in line with the overall strategy of the Argument? Certainly consistency, if it is to be had, is preferable to inconsistency. That means that it would be preferable, if possible, to avoid so construing premiss (1) that it applies to temporally definite expressions and employs a non-Diodorean sense of 'necessary'. But perhaps we cannot free the Master Argument from inconsistency on this point. The options confronting us seem to be these:

(1) The Argument ran on non-metric temporally indefinite sentences, and conformed to **CC**, but breached **PC** (because of the restriction of premiss (1) to non-metric formulae, and the restriction on substitution of future-tensed formulae to *G*-formulae).
(2) The Argument ran on both metric and non-metric formulae, so allowing premiss (1) to conform to **PC**. But now the Argument cannot conform to **CC**, because premiss (1) must be taken to concern temporally definite expressions, whereas the conclusion of the Argument concerns temporally indefinite sentences. (So premiss (1) fails to conform to **CC** in the sense that, as it figures in the Argument, '*L*' is not given a Diodorean interpretation.)
(3) The Argument ran on both metric and non-metric formulae, and ran on temporally definite expressions throughout. It would thus have conformed to **PC**, but breached **CC**, because it is clear that the conclusion of the Argument (the Diodorean modalities) must be interpreted on temporally indefinite sentences.

patible with its contingency. Mignucci further suggests (p.17) that total modal collapse need not render ridiculous a Diodorean effort to distinguish the modalities, since – although logically equivalent – there would be a psychological difference between what *will be* true (the possible) and what *has been* true (the necessary), founded at least on an epistemic asymmetry between the future and the past. But the distinctions which Boethius' Diodorus seeks to make out are meant to be *logical* distinctions (that is surely beyond question); so I do not think Mignucci's suggestion can work.

My argument against White rules out (3). That leaves (1) and (2), neither of which is entirely satisfactory. Prior favoured (1), and that is also the direction taken by Denyer's version of Prior. The reconstructions proposed by Zeller, Hintikka, Vuillemin, and my own proposed reconstruction, favour (2). Ideally, what we would want is:

(4) The Argument ran on temporally indefinite sentences of both metric and non-metric kinds, and conformed to both **CC** and **PC**.

But (4) makes an impossible demand: we cannot insist that all truths of the form '*Pnp*' or '*PFp*' should be necessary in the sense which meets **CC**. If we allow linguistic items of the form '*Pnp*' or '*PFp*' to count as necessary in Diodorus' sense, we naturally envisage those items as being statements or temporally definite sentences.[18] Equally, if we set aside the temporal and extensional interpretation of 'necessarily' sought by Diodorus, we are thrown back on the sense which we have usually been employing, namely 'unpreventably'; and 'necessarily' in *that* sense can again only intelligibly be applied to items with a truth-value as such, i.e. temporally definite expressions. (Temporally indefinite sentences do not have a truth-value *as such*, only *at a time*.) All the elements of (4) are features which, I think we must concede, would ideally find inclusion in a completely satisfactory interpretation of the Master Argument. But they cannot all be included, for they are jointly inconsistent. Diodorus' Argument must contain at least one unsatisfactory element. The question is: which is it?

In advance of arriving at a reconstruction which is pleasing from other points of view, it is hard to answer this question. Reconstructing the Master Argument is like solving a set of simultaneous equations: it is a matter of finding a group of parameters which work together. I shall accordingly not seek to adjudicate between the options at this stage, but continue with my examination of reconstructions.

[18] Unless, in the case of '*PFp*', we countenance everlasting recurrence or cyclic time. Cf. #23 below.

20 Barreau's 'Stoic' and 'Diodorean' Reconstructions

In #18 we saw that the main objection to Prior's reconstruction lay in its assumption of the discreteness of time. Can this premiss be avoided, while still retaining the overall shape of Prior's reconstruction? Barreau has suggested a simplification of Prior which avoids the assumption of the discreteness of time (while retaining a version of premiss (4)). Since the Stoics rejected that discreteness, but did not object to the Master Argument on that ground, he suggests that they might have understood the Argument in this way.[1] Barreau presents his version in a symbolism which employs time-indexed tense-operators. I shall discuss his version shortly, but I shall first present his proposal in a more familiar symbolism which I think conveys its essence more clearly, namely Priorean notation with metric tense-operators. The proof then runs as follows (I retain throughout '*Fp*' as shorthand for '$\exists n\,[Fnp]$'):

(1)	$Pnp \rightarrow \neg M \neg Pnp$	Premiss (1)
(2)	$L[p \rightarrow q] \rightarrow [\neg Mq \rightarrow \neg Mp]$	Premiss (2)
(3)	$\neg [p \vee Fp]$ & $M\,[p \vee Fp]$	Premiss (3)
(4)	$L[p \rightarrow PnFnp]$	Premiss (4)
(5)	$PnFn \neg [p \vee Fp]$	3,4, Modus Ponens, $p/\neg [p \vee Fp]$
(6)	$\neg M \neg PnFn \neg [p \vee Fp]$	1,5, Modus Ponens, $p/Fn \neg [p \vee Fp]$
(7)	$\neg MPnFn[p \vee Fp]$	6, Commutativity of Pn/Fn and $\neg$
(8)	$\neg M\,[p \vee Fp]$	2,4,7, Modus Ponens × 2, $p/[p \vee Fp]$, $q/PnFn[p \vee Fp]$
(9)	$p \vee Fp$	3,8, Reductio
(10)	$M\,[p \vee Fp] \rightarrow [p \vee Fp]$	3,9, Conditional Proof.

How have we managed to avoid appealing to Prior's premiss (5)? The trick lies in the use of a metric. Prior had to find a moment in the past at which '$\neg Fp$' was *always* going to be true, in order to move from the truth now of '$\neg p$ & $\neg Fp$' to its necessity (*via* premiss (1)). The only candidate for that moment is the immediately preceding moment, which requires that time be discrete. But the introduction of a metric

[1] 'Conception Diodorienne et Conception Stoïcienne du Maître Argument', pp.29–33.

circumvents that problem. Instead, we can select *any* moment in the past: applying the extra premiss (4), if that moment is *n* units of time ago, it was *then* the case (given premiss (3)) that '$\neg p$ & $\neg Fp$' would be the case in *n* of units time. The possibility that '*p*' might be true at any of the intervening moments (in continuous time) up to but not including the present moment is now irrelevant: the metric enables us to bypass those moments. Formally, the difference is that a simple '*F*' at line (6) would not commute with '$\neg$' in continuous time, whereas '*Fn*' does so commute: hence if we omitted the metric, we could not move from line (6) to line (7) without introducing the assumption of discrete time.

Barreau's own variant of this reconstruction differs in the following way: instead of employing the (undated) metric formulae, he introduces a date, t_0, which refers to the present moment. Premiss (4) then takes the form

$$L\,[p \rightarrow PF_{t_0}\,p].$$

If *p*, then it was the case at some (any) time in the past that it would be the case now (i.e. at t_0) that *p*. Equivalently, we might express premiss (4) as:

$$L\,[p_t \rightarrow PFp_t].$$

The proof then takes the following form (I alter some of the details of Barreau's presentation):

(1)	$Pp_t \rightarrow \neg M \neg Pp_t$	Premiss (1)[2]
(2)	$L\,[p_t \rightarrow q_t] \rightarrow [\neg Mq_t \rightarrow \neg Mp_t]$	Premiss (2)
(3)	$M\,[\exists t \geq t_0\,[p_t]]$ & $\neg \exists t \geq t_0\,[p_t]$	Premiss (3)
(4)	$L\,[p_t \rightarrow PFp_t]$	Premiss (4)
(5)	$PF\,[\neg \exists t \geq t_0\,[p_t]]$	3,4, Modus Ponens, $p_t/\neg \exists t \geq t_0\,[p_t]$
(6)	$\neg M \neg PF\,[\neg \exists t \geq t_0\,[p_t]]$	1,5, Modus Ponens, $p_t/F \neg \exists t \geq t_0\,[p_t]$
(7)	$\neg MPF\,[\exists t \geq t_0\,[p_t]]$	6, Commutativity of P/F and $\neg$

[2] The formalisation of this premiss is similar to McKirahan's ('DPM', p.230):

$\exists t\,[t < t_0$ & $T_t\,(p)] \rightarrow \neg M_{t_0} \neg \exists t\,[t < t_0$ & $T_t\,(p)]$.

But for my purposes it is not necessary to index the modal operators or introduce the alethic operators.

(8) $\neg M\,[\exists t \geq t_0\,[p_t]]$ — 2,4,7, Modus Ponens × 2, $p_t/\exists t \geq t_0\,[p_t]$, $q_t/PF\,[\exists t \geq t_0\,[p_t]]$

(9) $\exists t \geq t_0\,[p_t]$ — 3,8, Reductio

(10) $M\,[\exists t \geq t_0\,[p_t]] \rightarrow \exists t \geq t_0\,[p_t]$ — 3,9, Conditional Proof.

It is clear that this proof preserves the crucial feature of the metric version, which enabled us to avoid assuming the discreteness of time, namely the commutativity of 'F' and '$\neg$' applied at line (7). If one mentally substitutes '$\neg\,[p \vee Fp]$' and '$[p \vee Fp]$' for the expressions in brackets in lines (6) and (7) respectively, one will see that line (7) does not then follow from line (6): it was precisely to bridge this gap that Prior required his premiss (5). But the introduction of a date (t_0) also enables us to bridge the gap, without appealing to discrete time: for although '$\neg$' does not commute with a bare 'F', it does commute with 'F_{t_0}'. (What I have written as $F\,[\exists t \geq t_0\,[p_t]]$ is equivalent to $F_{t_0}\,[p \vee Fp]$.)

What are we to make of these two variants of Prior's reconstruction? The variant of Barreau's proposal which I presented first had to cast premiss (1) as

$$Pnp \rightarrow LPnp.$$

We have seen that this is false if 'L' is read in a Diodorean way, but acceptable if it is read in a non-Diodorean way as 'now-unpreventable'. In that case – i.e. preferring **PC** to **CC** – the metric reconstruction can serve as a genuinely Priorean reconstruction which circumvents Prior's own reliance on discrete time. Similarly, in the case of Barreau's own variant we should read 'L' in premiss (1) in a non-Diodorean way, since otherwise modal collapse ensues: there is no material distinction between 'It is or will be true that p_t' and 'It is and will be true that p_t': 'It is true that p_t' implies 'It will be true that p_t' and *vice versa*. This collapse would be most obvious and objectionable in the case of premiss (3), which, if we are employing the symbolism of Standard notation, is formalised as, in part,

$$M\,[\exists t \geq t_0\,[p_t]].$$

Under a Diodorean interpretation of the modal operators, this expression is equivalent not only to

$$\exists t \geq t_0\,[p_t]$$

but also to

$$L\,[\exists t \geq t_0\,[p_t]].$$[3]

The first of these equivalences is not objectionable, because Diodorus accepts it (it is indeed the conclusion of the Argument), but the second equivalence is highly objectionable to Diodorus, because it collapses the modalities which, according to Boethius' report, he studiously sought to distinguish. Although the reconstruction proposed by Barreau does not run on temporally definite sentences (merely running a reconstruction in Standard notation does not yet have that consequence), still the objection I raised in #19 to running the Argument on temporally definite sentences – namely that modal collapse ensues – does apply to reconstructions which formalise premiss (1) as Barreau does, *if* those reconstructions seek to conform to **CC**, i.e. seek to read the operators in a Diodorean way. Hence if we interpret premiss (1) in this way, we cannot, on pain on introducing modal collapse, allow the argument as a whole to conform to **CC**.

With this important proviso in place (which of course runs counter to Prior's own adherence to **CC**), we can say that the proposed new version of Prior is entirely successful in circumventing Prior's premiss (5). Both variants yield a distinctively Priorean reconstruction of the Master Argument which now depends exclusively on the three recorded premisses and (a version of) Prior's extra premiss (4).

I mentioned in my discussion of Prior that his premiss (4) did not as such import the assumption of unrestricted **PB** into the reconstruction, but that his premiss (5) did. Now that we have dispensed with premiss (5), have we dispensed with the assumption of **PB**? No. In fact the assumption of unrestricted **PB** now attaches to the way in which the new version of premiss (4) is applied. For line (5) of each proof in effect applies it in the substitution-instance

$$L\,[\neg\,[p \vee Fp] \rightarrow PF\,[\neg\,[p \vee Fp]]]$$

or

$$L\,[\neg \exists t \geq t_0\,[p_t] \rightarrow PF\,[\neg \exists t \geq t_0\,[p_t]]]$$

[3] A similar collapse occurs in the case of the metric version, if the modalities are interpreted in a Diodorean way, for under that interpretation we have:

$$M\,\exists nFnp \equiv \exists nFnp \equiv L\,\exists nFnp.$$

and this axiom is not valid in Ockhamist or Aristotelian models of time. The assumption of unrestricted **PB**, which attached to Prior's own version of his reconstruction, remains present, then, in our improved version of his reconstruction (under either variant). I shall return to the issue of the legitimacy of this assumption in #25.

Barreau's reconstruction of what he calls the 'Diodorean' version of the Master Argument[4] reads premiss (3) as a *definition* of the possible:

$$Mp \equiv \neg[p \vee Fp].$$

Barreau includes Prior's premiss (5)[5] and formalises premiss (2) as

$$[Mp \rightarrow \neg Mp] \rightarrow \neg Mp.$$

This is not an implausible reading of premiss (2). By a series of obvious steps Barreau deduces a contradiction of the form 'Mp & $\neg Mp$'. The negation of premiss (3), taken as a definition, is

$$\neg[Mp \equiv \neg[p \vee Fp]]$$

from which it might look as if we could derive the Diodorean definition of possibility:

$$Mp \equiv [p \vee Fp].$$

These two expressions look at first glance as if they are equivalent (after all, '$p \equiv \neg q$' is equivalent to '$\neg[p \equiv q]$'), but are they? We must here recall that the sentence-letter 'p' in our formalisations is implicitly being quantified over. A fully explicit proof will prefix suitable quantifiers for the sentence-letters. Barreau is aware of this point, and accordingly formalises premiss (3) as

$$\exists p\,[Mp \equiv \neg[p \vee Fp]].$$

The negation of this premiss yields

$$\forall p\,[Mp \equiv [p \vee Fp]]$$

which is certainly the desired conclusion. But has Barreau formalised premiss (3) correctly, given his view that Diodorus read premiss (3) as a definition of the possible? Surely not. If premiss (3) is genuinely a definition, it must be *universally* quantified, i.e.:

[4] 'Conception Diodorienne et Conception Stoïcienne du Maître Argument', pp.34–9.
[5] Cf. 'Cléanthe et Chrysippe', p.34.

$$\forall p\,[Mp \equiv \neg[p \vee Fp]].$$

But then there is no way to arrive at Diodorus' definition of the possible by negating this formula.[6] All we arrive at is

$$\exists p\,[Mp \equiv [p \vee Fp]]$$

which falls short of the universality required of a definition.[7] As I have already indicated (#15), Diodorus cannot have intended premiss (3) as what on a superficial reading its wording might suggest, namely a definition of the possible, but rather as stating that

$$\exists p\,[Mp \;\&\; \neg[p \vee Fp]].$$

That is exactly how we are told the Stoics understood premiss (3).[8] Barreau suggests that the Stoic understanding of premiss (3) might have been different from Diodorus' own.[9] But, apart from the inherent unlikelihood that Diodorus could have set up such an implausible definition, the above argument shows that Diodorus cannot have understood that premiss as a definition anyway, since the conclusion he sought (*μηδὲν εἶναι δυνατόν, ὃ οὔτ' ἔστιν ἀληθὲς οὔτ' ἔσται*) would not then follow. The Stoic understanding of premiss (3) must have coincided with Diodorus' own.[10]

[6] Nor by negating the formula '$\forall p\,[Mp \rightarrow \neg[p \vee Fp]]$' (as Frede construes premiss (3): *Seeschlacht*, p.99).
[7] This was clearly pointed out to Barreau by Picolet in her preceding contribution to their symposium: 'Nouvelles Remarques à propos de Diodore', *Fundamenta Scientiae* (Strasbourg) 88, 1978, 7–11, p.10. But in his reply he ignored it. Cf. 'Cléanthe et Chrysippe', p.27.
[8] Picolet, 'A propos d'une Reconstruction Récente du Maître Argument de Diodore Cronos', pp.6–7.
[9] 'Reponses aux Remarques de L'Article de Mme Picolet', 'Conception Diodorienne et Conception Stoïcienne du Maître Argument.'
[10] Cf. McKirahan, 'DPM', p.224; Vuillemin, 'L'Argument Dominateur', pp.248–50; Weidemann, 'DSM', p.30 nn.34 and 35. In fact, of course,

(i) $\exists p\,[Mp \;\&\; \neg[p \vee Fp]]$

implies

(ii) $\exists p\,[Mp \equiv \neg[p \vee Fp]]$.

Barreau's Diodorean reconstruction depended on this fact. Although officially Barreau treats premiss (3) as a definition, in formalising it as (ii), with a view to arriving, by *reductio*, at the negation of (i), he in effect treats premiss (3) as asserting (i), the so-called 'Stoic' understanding of it.

21 Vuillemin's Reconstruction

Vuillemin takes seriously the Ockham-inspired objection to Prior I mooted above.[1] He finds it implausible that the Master Argument should have equivocated on the sense of premiss (1) as between the necessity of the genuine past and the necessity of statements which are merely past-tensed. On his approach, premiss (1) states that sentences which are *genuinely* about the past are, if true at a time, necessary at that time. In other words, contingencies (two-sided possibilities) must have reference to the present or future:

$$[M_t p_{t'} \,\&\, M_t \neg p_{t'}] \rightarrow t' \geq t.^2$$

This approach to premiss (1) seems to me fundamentally correct: I adopt it in my own reconstruction, and I postpone further discussion of it until #22. If we assume 'p_t', for some t earlier than t', we may derive from the above formula

$$p_t \rightarrow \forall t' > t\, [L_{t'} p_t].^3$$

This conditional obtains on the assumption that 'p_t' is *true* (i.e. on the assumption of **PB**): in a trivalent logic it would fail to obtain. We can

[1] I shall be concerned with the interpretation put forward in *NC*, chs 1 and 2; 'Die Aporie des Meisterschlusses von Diodorus Kronos und ihre Lösungen', *Allgemeine Zeitschrift für Philosophie* 10, 1985, 1–19. Both of these pieces build on his earlier 'L'Argument Dominateur'. Vuillemin has since adapted this interpretation in certain respects in 'Zur Rekonstruktion des Meisterschlusses: Antwort an Helmut Angstl', *Allgemeine Zeitschrift für Philosophie* 11, 1986, 83–7. Except where otherwise signalled, I shall take the 1984/5 account as the basis of my exposition.

[2] Vuillemin's own formalisation of premiss (1) is

$$[M_t p_{t'} \,\&\, M_t \neg p_{t'} \,\&\, t' < t] \rightarrow \neg [t' < t]$$

(*NC*, p.50; 'Die Aporie des Meisterschlusses', p.3) which can be simplified to the formalisation I have given (cf. Angstl, 'Bemerkungen zu Jules Vuillemin, Die Aporie des Meisterschlusses von Diodoros Kronos und ihre Lösungen', *Allgemeine Zeitschrift für Philosophie* 11, 1986, 79–82, p.80). In his earlier article ('L'Argument Dominateur', p.252) Vuillemin formalised premiss (1) as

$$M_t p_{t'} \rightarrow t \leq t'$$

which can only be accepted if L–M duality is relinquished.

[3] Vuillemin, 'Die Aporie des Meisterschlusses', p.4 n.2.

ensure the general validity of this formula if we operate a restriction on substitution into the sentence-letter places, so as to rule out substitution of formulae which are future in content (cf. #8). The objection that this ban is too heavy-handed does not have force in this context, because we are specifically trying to capture the necessity of the past, not relative necessity (which allows for the necessity of certain sectors of the future).

The important question we have to ask about this last formula is how it should be read. What does the modal operator 'L_t' mean? If we construed it in a Diodorean way we would collapse the modalities, for, as I have stressed, there is no material distinction between 'It is or will be true that p_t' and 'It is and will be true that p_t': 'It is true that p_t' implies 'It will be true that p_t' and *vice versa*. Hence we should interpret the indexed operator as 'unpreventable at t': Vuillemin's approach to premiss (1) entails preferring **PC** to **CC**.

Vuillemin takes premiss (2) to be enunciating the modal principle:

$$L\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq].$$

To the two reported premisses Vuillemin adds two further premisses. One of these is the necessity of the present, formalised as

$$\forall t\,[p_t \rightarrow L_t p_t].$$

(We require the same restriction on substitution which we imposed on the formal expression of the necessity of the past.) Vuillemin's second extra premiss is what he calls the Principle of Synchronic Contraction. This is the principle that if a sentence is possible there must be a time, identical with or later than the present, such that it is possible at that time for that sentence to be true at that time. Possibilities cannot be, as one might put it, 'staggered', or 'temporally stepped'.[4] This principle is formalised as

$$\forall t \forall t'\, [M_t p_{t'} \rightarrow \exists t''\, [t \leq t'' \leq t' \,\&\, M_{t''} p_{t''}]].$$

Now this principle is almost certainly false as it stands. Suppose, in an example due to Wiggins,[5] that it is possible at 4.10 for me to catch the 4.45 train. I am ten minutes' walk from the station, let us say. So at

[4] Latter terminology in Wiggins, 'Temporal Necessity, Time and Ability'.

[5] 'Temporal Necessity', pp.197–8. Cf. also McCall, 'Time and the Physical Modalities', p.435; Angstl, 'Bemerkungen zu Jules Vuillemin', p.81.

4.10 it is still possible for me to depart on the train at 4.45. But Vuillemin's principle now asserts that, given this possibility, there must be an instant on the closed interval between 4.10 and 4.45 such that it is possible at that instant to depart on the train at that instant. In this example the instant in question has to be 4.45, since that is the instant at which the train departs. But is Vuillemin's principle true? It would seem not. If I spend the next hour in a café instead of going to the station, there is no instant such that it is possible for me at that instant to depart on the train at that instant; but it nevertheless remains the case that it *was possible* for me *at 4.10* to leave on the train *at 4.45*. Possibility can be temporally stepped.[6]

Having established these four premisses, there is no doubt that the conclusion, the Principle of Plenitude, does follow from them. The third premiss, which the Argument seeks to reject, may be formalised as follows: for some sentence '*p*':

$$\exists t \exists t' \geq t\, [M_t p_{t'}] \;\&\; \forall t''\, [t \leq t'' \rightarrow \neg p_{t''}].^{7}$$

There is no need to specify the proof at this point, because we can observe immediately that not all the above premisses are required to yield the conclusion. Barnes,[8] Wiggins[9] and Angstl[10] have indeed suggested that the desired conclusion follows immediately from the *extra* premisses supplied by Vuillemin, without the need of either of the first two premisses which, as we know from Epictetus, were used by Diodorus. The demonstration of this can be given informally as follows:[11] suppose that '*p*' is possible but is not true now and is not going to be true hereafter. Given that '*p*' is possible, the Principle of Synchronic Contraction tells us that

[6] In his reply to Wiggins (in Brittan ed., *Causality, Method and Modality* (Dordrecht, 1991), 211–21), Vuillemin invokes Aristotle's principle that *real* possibility (which is obviously what is in question) presupposes the absence of external hindrances (*Met* 1048a17–21). But the counterexample is not affected by that principle: there need be nothing *external* confining me to the café between 4.10 and 4.45. The counterexample shows that Vuillemin is wrong to suppose that denial of the Principle of Synchronic Contraction amounts to a permanent deferral of the realisation of the possibility ('Die Aporie des Meisterschlusses', p.13).

[7] 'Zur Rekonstuktion des Meisterschlusses', p.83 n.2. Vuillemin's earlier formalisation of premiss (3) omitted the initial restriction on the range of t'. But without the restriction, Vuillemin's five premisses are consistent.

[8] In his review of Vuillemin's book: *Classical Review* 36, 1986, 77–9.

[9] 'Temporal Necessity', p.191f.

[10] 'Bemerkungen zu Jules Vuillemin', pp.81–2.

[11] A slightly more technical version at Wiggins, 'Temporal Necessity', p.192.

there must be an instant identical with or later than the present moment, call it t_0, such that it is possible at t_0 that '*p*' obtain at t_0. But we are given that '*p*' is false at every instant identical with or later than the present moment, including t_0. If '*p*' is false at t_0, then by the necessity of the present, '*p*' is impossible at t_0. Hence '*p*' is both possible and impossible at t_0: contradiction. But t_0 was selected arbitrarily: it follows that if '*p*' is false now and hereafter, '*p*' is impossible.

The premisses recorded by Epictetus are all we actually know of the constitution of the Master Argument. Any reconstruction which does not use them, and uses other premisses instead, must be judged unsatisfactory. But the accusation that Vuillemin makes use of *neither* of the first two recorded premisses is not quite fair: his reconstruction does after all employ a *reductio* strategy, which can be regarded as an application of premiss (2). Still, premiss (1) remains redundant. It is important to be clear that the Principle of Synchronic Contraction is an *extra* premiss. At one point, Vuillemin suggests that premiss (2) can be read as enunciating this principle, in the form

$$\forall t \forall t'\, [M_t p_{t'} \rightarrow \neg \forall t''\, [[t \leq t'' \leq t' \vee t' \leq t'' \leq t] \rightarrow \neg M_{t''} p_{t''}]].^{12}$$

But this comes nowhere near to expressing the utterly general claim that the impossible does not follow from the possible. The new version of the Principle of Synchronic Contraction does, however, have the advantage that it enables us to re-integrate premiss (1) into the reconstruction: that premiss is now needed to rule out the possibility – permitted by the Principle of Synchronic Contraction in the new (but not the old) version – that the instant t_0 such that $M_{t_0} p_{t_0}$ might lie in the past. It is crucial to note here that if premiss (1) is to play this role, '*δυνατόν*' in premiss (3) must be read as 'contingent' rather than 'possible', for what premiss (1) rules out is that there should be *contingencies* with respect to the past: there is no objection to *possibilities* lying in the past. This reading of premiss (3) is indeed the one I shall favour, but my reconstruction will differ from Vuillemin's in jettisoning his Principle of Synchronic Contraction, and compensating for this by employing the broad principle of modality relative to the facts rather than the narrow principle of the necessity of the present.

Wiggins tries, on Vuillemin's behalf, to circumvent the problem

[12] 'Zur Rekonstruction des Meisterschlusses', p.86.

posed by Vuillemin's use of two extra premisses by *deriving* one of the extra premisses – the necessity of the present – from the first two recorded premisses. Given certain further assumptions about the continuity of time and action, the trick can be turned: 'Consider everything I am doing now at this instant. And consider also something I am not actually doing that the possibilist might say that I *can* now do now. Read the newspaper, say. I am not reading a newspaper. If it be possible for me now to read a newspaper now, then by [premiss (2)] whatever is implied by my now reading a newspaper is possible now. But then it is possible now for me to have done something different from what I did moments ago. But it is not possible for me now to have done something different then. By [premiss (1)], what happened then is necessary now. Therefore, generalising from this case, I cannot now do anything different from what I am doing now.'[13] Wiggins notes that the claim that I cannot read a newspaper at this instant, given that I have not had one in my hand up to this instant, can only be justified as an application of premiss (2) if the continuity of time and action is adduced as an auxiliary premiss.[14] Wiggins proposes that this premiss be regarded, case by case, as a matter of the semantics of the particular action-verb under consideration.

There are three objections to this account. Firstly, from what we know of Diodorus' views on motion, he would not have been entitled to – nor would have wished – the continuity of time and action in any purported derivation of the necessity of the present from (1) and (2). As I have mentioned, Diodorus' proof of the impossibility of motion probably relies on atomism with respect to both time and space.[15] Our objection to Prior's reconstruction (in Prior's own version) was that it presupposed (in accordance with Diodorus' own views, no doubt, but against those of Aristotle and the Stoics) the discreteness of time; we do not now want to rebound to the opposite extreme of setting up a reconstruction which presupposes (against Diodorus himself) the continuity of time. If time is discrete, then there are action-minima. Now no doubt there are some actions which one could not now perform, if one has not prepared the ground for them, and given the impossibility of altering the past. But this position is not generalisable to cover *all* actions; or, at least, such a generalisation would be a substantial empirical thesis, which Diodorus could not simply rely on without argument in the lemma which is being ascribed to him.

Secondly, the manoeuvre does not escape the original objection. If Diodorus wanted the necessity of the present, why did he not help himself to it? As we have seen, it was not a particularly controversial doctrine in the ancient world (and did not become so until Scotus' challenge to it). If Diodorus intended, as is commonly supposed, to deploy his Master Argument as a counterblast to Aristotle's refutation of fatalism in *DI* 9 (see further #25), the obvious thing to do would have been simply to take over one of Aristotle's premisses, rather than derive it, in what can only be described as an artificial manner, from further premisses. The proposed reconstruction is, then, at worst (Vuillemin) irrelevant and at best (Wiggins) unduly enthymematic. A final objection would be that any version of Vuillemin's reconstruction is going to require his (false) Principle of Synchronic Contraction. There is enough here, therefore, to warrant serious reservations about the proposed reconstruction. But Vuillemin's view that the necessity of the present has a role to play in the Master Argument seems to me to be in principle correct; the question is how it should emerge.

[13] Wiggins, 'Temporal Necessity', p.193.
[14] 'Temporal Necessity', p.194.
[15] #18, Note on Diodorus' Atomism. Indeed Wiggins' own polemic against Diodorus accuses him of chopping up time into instants and ignoring intervals, and so creating 'a world shifting as if stroboscopically from a state of being frozen stiff in one way to a state of being frozen stiff in another way' ('Temporal Necessity', p.194). This description does indeed accurately capture Diodorus' views on time and motion; it is no caricature. How then could Diodorus have subscribed to the *continuity* of time in the Master Argument?

22 The Proposed Reconstruction

We have seen that if premiss (1) is taken to treat of temporally indefinite sentences, and the modality accordingly given a Diodorean interpretation, it does not conform to **PC**, because it must be restricted to non-metric such sentences, and because of the restriction on subsitution of future-tensed formulae to *G*-formulae, although it can, under those restrictions, conform to **CC**. On the other hand, if premiss (1) is taken to concern temporally definite expressions, while it naturally conforms to **PC**, it cannot form part of an Argument which conforms to **CC**, because of the modal collapse which ensues if the modalities are both interpreted in a Diodorean way and applied to temporally definite expressions. I suggested that we should not try to settle the correct interpretation of premiss (1) in isolation from the rest of the Argument. The interpretation of premiss (1) which fits into the reconstruction which is judged best from an overall point of view should be allowed to count as the right one.

In the reconstruction which I shall propose in this section, I am going to agree with Vuillemin that we should (in effect) prefer **PC** to **CC**. That means that we throw some inconsistency onto the proof itself, while keeping the premisses comprehensible and pre-theoretically attractive. So premiss (1) will say that the past is necessary, not in the temporal, Diodorean sense of 'necessary', but in the sense that there is nothing anyone can do about the way the past was. The past is not the domain of contingency: contingencies must have reference to the present or future. This is the thought that Aristotle expressed in the words '*οὐδεμία γάρ δύναμις τοῦ γεγονέναι ἐστίν, ἀλλὰ τοῦ εἶναι ἢ ἔσεσθαι*' ('No potentiality is of the past, but only of the present or future', *DC* 283b13–4. Cf. *Rhet* 1418a3–5; *NE* 1139b7–9). Of course in one obvious sense the past is within the domain of the *possible*, because it happened.[1] But it is not within the domain of the *continaent*, and it is notorious that ancient thinkers had difficulty drawing the distinction

[1] Cf. Seel, 'Diodore domine-t-il-Aristote?', pp.301–5.

between the possible and the contingent. As I have indicated (#7), one need look no further than Aristotle's discussion of modality at *DI* 12–13 to see how tricky he found this issue. On the one hand he wants to say that necessity implies possibility; on the other hand he wants 'possible to be' and 'possible not to be' to imply one another. The result is predictably muddled. The suggestion being here put forward is that '*ἀναγκαῖον*' in premiss (1) of the Master Argument is functioning not so much in its role as the dual of possibility, but rather as the negation of contingency. Given that all past truths are necessary, it follows that all past falsehoods are impossible, and in general that all past truths or falsehoods are non-contingent. It is this more general point that the Argument, on the reconstruction to be proposed, requires.

If we symbolise 'It is contingent that p' as 'Qp' then we can define 'Qp' in terms of possibility properly so-called (the dual of necessity) as

$$Qp =_{df} Mp \,\&\, M\neg p$$

or equivalently as

$$Qp =_{df} \neg[Lp \vee L\neg p].$$

In the notation of Standard, premiss (1) could then be formalised as

$$\forall t \forall t' [Q_t p_{t'} \rightarrow t' \geq t].$$

If we wished to incorporate the necessity of the present, we would write:

$$\forall t \forall t' [Q_t p_{t'} \rightarrow t' > t].$$

But premiss (1) does not mention the present.[2] I shall agree that modality relative to the facts (rather than narrowly the necessity of the present) is needed to help the proof through to its conclusion; but it must be found elsewhere.

Of course, in claiming that necessity in premiss (1) is functioning as a stand-in for non-contingency, I am not denying that it remains the dual of possibility. I am just stressing that when we talk of the necessity

[2] *Pace* Maier, 'Die Echtheit', p.29. Still less does it license the necessity of the future (*pace* Seel, 'Diodore domine-t-il-Aristote?', p.307). At least, it does not as such license these further necessities: the *application* given to premiss (1), on the other hand, by, for example, Prior's reconstruction, licenses the spread of necessity to all domains to which **PB** applies: see #24 below.

of the past, the important constrasting notion to this species of necessity is not its dual, possibility (which also applies to the past), but the contradictory of necessity-or-impossibility, contingency (which does not apply to the past). That is indeed what the conformity of premiss (1) to **PC** should lead us to expect. For **PC** invites us to read '*ἀναγκαῖον*' in premiss (1) as 'inevitable' (or 'unpreventable'). But the natural contrasting notion to 'inevitable' ('unpreventable') is not its *dual*, which has indeed no single word to express it, but the *contradictory* 'avoidable' ('preventable'). ('Avoidable/preventable' entails 'avoidable/preventable that ... not ...' and *vice versa*.) So far, there is nothing surprising: I am just spelling out the orthodox understanding of the necessity of the past, and hence the way premiss (1) must be understood, if it is to conform to **PC**. The crucial move comes now. Suppose we construe the rest of the argument in such a way that it runs on the necessity-contingency antithesis rather than the necessity-possibility duality. Suppose we read '*δυνατόν*' in premisses (2) and (3) as 'contingent' rather than 'possible': what then?

I noted above that it is not mandatory to construe premiss (2) as enunciating the modal principle '$L[p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$' or its equivalent '$L[p \rightarrow q] \rightarrow [Lp \rightarrow Lq]$'. Instead, one may find in premiss (2) an expression of a version of the principle mentioned and relied on by Aristotle in several places – the principle that any genuine possibility can be assumed to be actual without incoherence. As Aristotle puts it at *Met* 1047a24–6:

> *ἔστι δὲ δυνατὸν τοῦτο ὧι ἐὰν ὑπάρξηι ἡ ἐνέργεια οὗ λέγεται ἔχειν τὴν δύναμιν, οὐθὲν ἔσται ἀδύνατον.*
>
> The possible is that of which it is the case that, if its supposed potential is posited as a reality, nothing impossible will result.

We might call this principle 'The possible realisation of the possible': it is an important principle in Aristotle's writings. Especially relevant to us is *Met* 1047b3. With Zeller's emendation (which must count as virtually certain, given 1047a24ff),[3] this passage comes linguistically very close to Epictetus' report of premiss 2:

[3] Ross' '*ἢ*' at 1047b3 is not satisfactory: 1047a24ff gives a definition of the possible, not a consequence of some other definition. The reading '*ἢι*' gives the same sense as Zeller's proposal.

> *εἰ δέ ἐστι τὸ εἰρημένον τὸ δυνατὸν ⟨ὧι ἀδύνατον μ⟩ὴ ἀκολουθεῖ ...*
>
> If, as we have said, the possible is that from which the impossible does not follow ...

The meaning of the Aristotelian phrase, fixed by '*τὸ εἰρημένον*', is that of 1047a24ff: the possible realisation of the possible. That makes it highly plausible that Diodorus' premiss carries a similar meaning.[4]

But I do not think it carried exactly the same meaning. As I have argued, premiss (1) is concerned not merely with the necessity of past truths, but with the non-contingency of the past in general. That would have special point if we understood premisses (2) and (3) to be dealing with contingency rather than possibility proper. And indeed in one place where Aristotle so defines the possible, he restricts the scope of the definition to the contingent:

> *λέγω δ' ἐνδέχεσθαι καὶ τὸ ἐνδέχομενον, οὗ μὴ ὄντος ἀναγκαίου, τεθέντος δ' ὑπάρχειν, οὐδὲν ἔσται διὰ τοῦτ' ἀδύνατον.*
>
> By contingency and the contingent, I mean that which, not being necessary, and if assumed to be actual, results in nothing impossible. (*An Pr* 32a18–20)

We might call this principle 'the possible realisation of the contingent'.[5] Possibility proper consists of the contingent and the necessary. Since the necessary is already *en acte*, the definition of the possible as that which may, without incoherence, be assumed to be actual only has point in the case of the contingent. It is especially relevant to us that Aristotle explicitly excludes the necessary from the contingent as he is defining that notion, because that means that the past – as a proper part of the necessary – is also being excluded from the domain of the possible in this sense (i.e. the contingent). I have suggested that the role of

[4] Cf. also *Met* 1047b9–11, 18–20; *Phys* 256b10–12; *An Pr* 32a18; *DC* 283b6ff, with Hintikka, *TN* p.183ff, *AMD* pp.23–4. Note that when Aristotle discusses the modal principle '$[Lp \rightarrow Lq] \rightarrow [Mp \rightarrow Mq]$' at *An Pr* 34a5ff (and at *Met* 1047b14ff, on which see below) he *grounds* this principle in the thesis of the possible realisation of the possible, which therefore emerges as the more fundamental doctrine. This is especially clear in Alexander's commentary on this passage (177). The line is: suppose A necessarily implies B, and that A is possible and B impossible. If A is possible it can be assumed to be actual when it is possible. Then B must be actual at the same time, but B cannot be actual at that or any other time, since B is impossible: contradiction. (A similar link is drawn between the modal principle and the definition of possibility at *DC* 281b20–5.)

[5] Cf. Hintikka, *TN*, pp.183–4.

premiss (1) is to make just such an exclusion. Hence *An Pr* 32a18–20 can serve as an excellent Aristotelian expression of premisses (1) and (2) of the Master Argument combined.

What could be more natural than that Diodorus should have understood '*δυνατόν*' in premiss (2) as 'contingent' rather than 'possible'? But a difficulty seems to arise. Should we understand '*ἀδύνατον*' in premiss (2) as 'impossible' or 'non-contingent' (=either necessary or impossible)? Given the ambiguity in '*δυνατόν*', we might expect '*ἀδύνατον*' to be ambiguous too. Aristotle's table of modalities at *DI* 12–13 seems to incorporate just such an ambiguity in '*ἀδύνατον*' at two crucial points: 22a16–17 and 22b15–16. In both passages, '*οὐκ ἀναγκαῖον*' is said to follow from '*οὐκ ἀδύνατον*'. Hintikka argues that we should construe 'not necessary' in these contexts as 'neither necessary nor impossible', and he supports his claim from other contexts (especially *An Pr* 1.13).[6] In that case 'not impossible', i.e. 'not necessary that not', will be equivalent to 'neither impossible nor necessary', which will in turn entail 'not necessary'. Seel counters that it suffices to construe '*ἀδύνατον*' as 'non-contingent'.[7] Seel's suggestion does not, in context, constitute an alternative to Hintikka's interpretation: either way of disambiguating the phrases will preserve the inference, and both ways come to the same.[8] However, even if it is historically possible to understand '*ἀδύνατον*' as occasionally bearing the sense 'non-contingent', that sense will not be relevant to the strategy of the Master Argument. What will be operative in the Argument will be '*ἀδύνατον*' in the sense of 'impossible': the Argument will work by employing a *reductio* strategy, deducing a contradiction from the premisses and thus rejecting one of the premisses.

Admittedly, the contingent cannot be *identified* with that which, assumed to be actual, results in no impossibility: the necessary also satisfies this criterion, so that the definition 'that which, assumed to be actual, results in no impossibility' can only be correctly attached to possibility proper.[9] But there is a one-way implication from contingency

[6] *TN*, p.34. At *Met* 1019b28–30 Aristotle defines the possible as the non-necessary. But this seems to be a mistake, rather than a candidate for Hintikka's line. It is immediately corrected: see Seel, *DAM*, pp.187–8.

[7] *DAM*, p.163.

[8] See Note on *An Pr* 1.3 at the end of this section.

[9] Van Rijen, *Aspects of Aristotle's Logic of Modalities*, pp.22–3. Unless we say that the necessary, being already actual, cannot be *assumed* to be actual. But the point to follow in the text saves me from relying on this rather uncertain escape route. In his commentary on Aristotle's definition of contingency at *An Pr* 32a18–21 (*In An Pr* 156.15–157.10), Alexander observes that the contingent, which is posited as being the case, is, as such, *not yet* (*μηδέπω*) the case (156.15–19). The contingent in the proper sense (*κυρίως*) is that which is not actual (*δ μὴ ἔστι*), but which when assumed to be actual leads to no impossibility (19–20). This observation naturally prompts Alexander to consider why Aristotle defined the contingent as that which, not being *necessary*, can be assumed to be actual...; rather than as that which, not being *actual*, can be assumed to be actual ... (20–2). Alexander solves the problem in two alternative ways: firstly, the fact that the contingent has to be posited as actual shows that it is not already *as such* actual (22–26). But secondly, Alexander points out that the actual is included in the necessary, so that in excluding the necessary Aristotle has thereby excluded the actual (26–9). Alexander quotes Theophrastus in support of the claim that the actual is, as long as it is actual, necessary (156.28–157.2); it is clear from the context, as I have noted (#11), that the quotation from Theophrastus has to be disambiguated as introducing the necessity of the present rather than conditional necessity. Alexander concludes by remarking that since both the necessary and the actual can be assumed to be actual without impossibility (since they are already actual), it is the distinctive mark (*ἴδιον*) of the contingent to be such that, without *already* being actual (and hence not necessary either) it can be assumed to be actual without impossibility (157.2–10). (This 'distinctive mark' distinguishes the contingent from the necessary, the actual and the impossible: see Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', n.112.)

[10] Aristotle calls the parallel principle concerning possibility a 'definition' of 'possible' at *An Pr* 33a25: Hintikka, *TN*, p.184.

to the definition of possibility: if '*p*' is contingent, it can be assumed to be actual without impossibility resulting. Since the reverse implication does not obtain, if premiss (2) were asserting an *equivalence* between the *δυνατόν* and that which, assumed to be actual, results in no impossibility, we should indeed be unable to construe '*δυνατόν*' as 'contingent' (given that '*ἀδύνατον*' in its normal usage does not include the necessary in its semantic range). But the second premiss surely asserts no such equivalence, but rather a simple *implication* from '*δυνατόν*' to 'that which, assumed to be actual, results in no impossibility.' There is therefore no difficulty here for our interpretation of '*δυνατόν*'. We can take premiss (2) to be asserting the possible realisation of the contingent.

How are we to formalise 'the possible realisation of the contingent'? The principle is simply a meaning-rule for the word 'contingent'.[10] What it means to say that something is contingent is just that it can be supposed to be actual without incoherence. Premiss (2), so understood, cannot simply be formalised (in accordance with Diodorus' theory of the sound conditional) as:

$L\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$.[11]

For if we use the Aristotelian definition of the possible or contingent to elucidate Diodorus, it is not enough that the sheer possibility of '*p*' should involve no incoherence. Rather, it is the assumption of the actuality of '*p*', in the context of the facts, which must involve no incoherence. The significance of this extra move is that the modality in question is understood as *relativised* to the facts, in the way we have explored. Hence, while 'Mp_t' (i.e. $\exists t'\ [M_{t'}\, p_t]$), in the context of '$\neg p_t$', might be thought to involve no incoherence, as a sheer *logical* possibility, the assumption of the actualisation of 'p_t' does lead to contradiction, given the facts (which are not waived for the purposes of the assumption). So the apparent possibility was not a *real* possibility after all. The Aristotelian formulation, with its stress on positing the purported possibility as a *fact* for purposes of evaluation (*ἐὰν ὑπάρξηι ἡ ἐνέργεια...*, *τεθέντος δ'ὑπάρχειν*), invites us to read relativity to the facts into the meanings of the modal operators.[12]

It is significant that in one of the passages where the possible realisation of the possible is applied by Aristotle – *Met* Θ.3 – it can be demonstrated that the necessity of the present is presupposed (cf. #9). The principle is applied, assuming that Zeller's emendation of 1047b3 is correct (cf. 1047b10–11), to a specific example in *Met* Θ.4, in order to combat the extreme anti-Megarian assimilation of the impossible to the merely false: against the view that all things are possible (including the commensurability of the diagonal with the side of a square), Aristotle insists on the distinctness of the false and the impossible (1047b12–3), and on the integrity of the impossible as a non-reducible category (1047b3–6). In the second half of the chapter (1047b14ff), Aristotle argues for the modal principle

$L\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$

[11] *Pace* Seel, *DAM*, pp.331–2 (to be read with Weidemann, 'Die Aristotelische Modaltheorie', pp.115–6); Hintikka, *TN*, p.187.

[12] My understanding of the way in which the Aristotelian definition of possibility goes beyond the modal principle coincides with Seel's at *DAM*, pp.334–6. But Seel, in spite of his informal recognition of this point, does not appear to withdraw his earlier assertion (p.332) that the Aristotelian definition of possibility (and hence Diodorus' premiss (2)) is adequately captured by '$L\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$'. (Seel omits the initial '*L*' from his expression of this principle, but that is presumably just a slip: cf. Weidemann, 'Die Aristotelische Modaltheorie', p.116 n.42.)

on the basis of the definition of possibility (1047b18–19), which therefore emerges as the more fundamental principle. Since in *Met* Θ.3 the context of his statement of that principle was infected with the necessity of the present, that suggests that in our treatment of premiss (2) we should incorporate the necessity of the present, or, better, modality relative to the facts.[13]

Any formalisation of modality relative to the facts as an axiom along the lines of

$p_t \rightarrow \neg M \neg p_t$ (i.e. $\forall t\,[p_t \rightarrow \neg \exists t'\ [M_{t'} \neg p_t]$)

must presuppose **PB**; for if the antecedent is allowed to fail to take a truth-value, the conditional as a whole fails to be true (cf. #8; I shall recur to this point in #25). So since Aristotle accepted modality relative to the facts, and accepted also truth-value gaps, he would have rejected any such formalisation. That need not yet impress Diodorus – indeed I shall argue in due course that his Master Argument must, on any reconstruction, presuppose **PB** – but it will make for clarity if we continue to leave the question of **PB** open, and accordingly do not seek to formalise the principle of 'the possible realisation of the contingent'. Instead of formalising premiss (2), we may understand it metalogically as a meaning-rule, yielding a rule of inference, for the operator 'contingently', with modality relative to the facts built into the way the rule is applied. That means that while Vuillemin was right to seek aid from this quarter, he mislocated his insight. Instead of figuring as an extra, crucial premiss – inexplicably unreported by Epictetus – the relativity of modality to the facts is correctly positioned in the Master Argument as a self-evident meaning-rule for the modal operators.[14] No wonder then

[13] Cf. too *DC* 281b2–25, where the definition of contingency is probably alluded to in the phrase '*συμβαίνει δ'ἀδύνατον ἐξ ἀδυνάτου*' (281b15), and where, as I have demonstated (#9), the context presupposes modality relative to the facts. Cf. Waterlow, *PP*, ch.2. Note that my argument has been that contexts in which Aristotle promulgates the principle of the possible realisation of the possible *presuppose* modality relative to the facts; it is not correct to *identify* these two principles, as Vuillemin does in 'Zur Rekonstruktion des Meisterschlusses', pp.84–5.

[14] Vuillemin seems to be aware of the special status of the relativity of modality to the facts, for he states that it is 'kein logisches Prinzip, auch kein modallogisches Prinzip ... Es gehört zu jenen Prinzipien, welche die Beziehung der Logik zur Wirklichkeit regeln' ('Die Aporie des Meisterschlusses', p.12). The mistake is merely to formalise it as an extra premiss. In Vuillemin's 1984/5 position, the formalisation takes not the broad form I have specified, but the narrow form.

that it receives no mention from Epictetus. No more would you expect a report of the 'Have you stopped beating your father?' fallacy to contain an explicit meaning-rule for the predicate '... is a father'.

We are now in a position to give our version of the Master Argument. Informally, the proof goes like this: we are given (premiss (3)) that there is some 'p' which is contingent, but which neither is nor will be true. (In accordance with the moral of #16, we may suppose that Diodorus' actual example concerned a ruler.) If it is contingent, then it can be assumed to be actualised in the context of the facts without yielding an incoherence (premiss (2)). But it cannot be assumed to be actualised in the past, because there is no contingency with respect to the past (premiss (1)). So assume it to be actualised in either the present or the future. But now in each of those cases we derive a contradiction with the given fact that 'p' neither is nor will be true (premiss (3)). Given that 'p' neither is nor will be true, it follows according to the notion of modality we are working with that 'p' and 'Fp' are both impossible. So incoherence has resulted (premiss (2)). Hence, rejecting part of premiss (3), if 'p' is contingent, it either is or will be true. So if 'p' is possible (either contingent or necessary), it either is or will be true. This reconstruction uses no extra premisses. The conception of modality as relative to the facts, which Diodorus would have taken for granted in his audience, is implicit in premiss (2).

Formally, we can reconstruct the Argument as follows. Recall that we have formalised premiss (1) as

$$\forall t \forall t' \, [\mathcal{Q}_t p_{t'} \rightarrow t' \geq t].$$

We set t_0 = the present moment. Premiss (3) we may then formalise as

$$\exists t \, [\mathcal{Q}_{t_0} p_t] \; \& \; \forall t \geq t_0 \, [\neg p_t].$$[15]

$$\forall t \, [p_t \rightarrow \neg M_t \neg p_t]$$

i.e. the necessity of the present (so that the argument then requires the Principle of Synchronic Contraction to be completed). Boudot's suggested formalisation ('L'Argument Dominateur', p.287) of premiss (2), which he understands as the possible realisation of the possible, is:

$$M_t p \rightarrow \exists t' \, [t \leq t' \; \& \; M_{t'} p].$$

But this is just an elaboration of the tautology that if 'p' is possible at a time, then it is possible at a time (at least at the same time).

[15] I noted above (#20) that a fully explicit formalisation must incorporate quantification over the sentences for which our sentence-letters are holding place. But for simplicity's sake I omit this refinement in my presentation.

The proof then follows easily:[16]

(1)	$\forall t \forall t' \, [\mathcal{Q}_t p_{t'} \rightarrow t' \geq t]$	Premiss (1)
(2)	$\exists t \, [\mathcal{Q}_{t_0} p_t]$	Premiss (3)
(3)	$\forall t \geq t_0 \, [\neg p_t]$	Premiss (3)
(4)	$p_{t_1}, t_1 \geq t_0$	1, 2, Premisses (1), (2)
(5)	$\neg p_{t_1}, t_1 \geq t_0$	3, ∀-Instantiation
(6)	$p_{t_1} \; \& \; \neg p_{t_1}, t_1 \geq t_0$	4, 5, &-Introduction
(7)	$\neg \exists t \, [\mathcal{Q}_{t_0} p_t]$	2, 6, Reductio, Premiss (2)
(8)	$\forall t \geq t_0 \, [\neg p_t] \rightarrow \neg \exists t \, [\mathcal{Q}_{t_0} p_t]$	3, 7, Conditional Proof.

Given the definition of '$\mathcal{Q}$' we can move to:

(9) $\forall t \geq t_0 \, [\neg p_t] \rightarrow \forall t \, [\neg M_{t_0} p_t \vee \neg M_{t_0} \neg p_t]$ 8, def. '$\mathcal{Q}$'.

If '$\neg p$' obtains at all future times, then it is now either necessary or impossible that 'p' should obtain at those times. Since it cannot be necessary in respect of any time after the present moment (since it is false at all such times), we can discard the right-hand disjunct in the consequent of (9) as long as we bring the remaining left-hand disjunct of (9) within the scope of the restriction of times to present and future times. That yields:

(10) $\forall t \geq t_0 \, [\neg p_t] \rightarrow \forall t \geq t_0 \, [\neg M_{t_0} p_t]$.

Finally, contraposing, we obtain the Principle of Plenitude:

(11) $\exists t \geq t_0 \, [M_{t_0} p_t] \rightarrow \exists t \geq t_0 \, [p_t]$.

If there is *any* time in the future which is such that it is now possible for 'p' to be then realised, then 'p' will be realised at *some* time in the future.

Premiss (2) figured in the proof as a *rule* permitting us to make the assumption (line (4)) of 'p_{t_1}' on the back of '$\exists t \, [\mathcal{Q}_{t_0} p_t]$' and, in consequence of the derivation of a contradiction from this assumption,

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[16] This proof bears some resemblance to Hintikka's reconstruction (*TN*, ch.9; cf. *AMD*, pp.32–3) when simplified to remove the detour through the past in the future. Hintikka mentions such a simplification (*TN*, pp.193–4), but he does not ascribe it to Diodorus. The removal of the detour - whose sole purpose is to achieve the necessity of the posited event (*via* the necessity of the past) – requires that it be compensated for by introducing the necessity of the present, or modality relative to the facts, which leaves it mysterious what the necessity of the past is doing in the Argument. I aim to have cleared up that mystery.

allowing us then to reject the original existential component of premiss (3). Premiss (1) figured in disallowing, in effect, the assumption of the actuality of a contingent '*p*' in the past.[17] Premiss (3) contains the combination – to be rejected by Diodorus – of the contingency (*δυνατόν*) of '*p*' with its present and future falsity.[18] Line (11) gives us the conclusion sought by Diodorus. Note that there is no requirement that the time indices attaching to the modality and the sentence-letter be the same: that requirement was Vuillemin's Principle of Synchronic Contraction; but I have not included it in my reconstruction. Possibility can be 'temporally stepped'.

This reconstruction uses no extra premisses, nor relies on a controversial metaphysic, such as a particular topology of time, or the (false) Principle of Synchronic Contraction. It makes crucial use of the notion of modality relative to the facts: that was shown by the fact that in assuming the actuality of our contingent sentence '*p*', we did not waive the fact that $\neg p$; we allowed the assumption that *p* to come into

[17] Hintikka (*TN*, ch.9) supposes that it is not sufficient for the *reductio* strategy of the Argument that it should end up with a contradiction of the form: p & $\neg p$ (i.e. the assumed '*p*' (from '*Mp*') conflicting with the *fact* that $\neg p$). Rather, he claims, what we need is: p & $\neg Mp$ (the assumed '*p*' must conflict with a *necessity*: $\neg Mp$, i.e. $L\neg p$). But given that we are working with modality relative to the facts, a falsity is *eo ipso* impossible. So 'p & $\neg p$' is immediately convertible into 'p & $\neg Mp$'.

[18] Vuillemin seeks to *derive* the expression of contingency from premiss (3), rather than find it stated explicitly there ('Die Aporie des Meisterschlusses', pp.6–7). For, given the second limb of premiss (3), i.e.

$\forall t \geq t_0\ [\neg p_t]$

we may derive

$\forall t \geq t_0\ [M_{t_0}\ \neg p_t]$

which can then combine with the first limb of premiss (3), as formalised by Vuillemin, i.e.

$\exists t \geq t_0\ [M_{t_0} p_t]$

to yield

$\exists t \geq t_0\ [M_{t_0} p_t\ \&\ M_{t_0} \neg p_t]$ (i.e. $\exists t \geq t_0\ [\mathcal{Q}_{t_0} p_t]$).

But the application of this formula, with its restriction on the range of *t*, renders premiss (1) redundant. What we require rather, if premiss (1) is to do any work, is the unrestricted

$\exists t\ [\mathcal{Q}_{t_0} p_t]$.

(Vuillemin erroneously omits the restriction on the range of *t* from his derivation, and so purports to reach the 'right' conclusion; if the restriction is properly observed, the 'right' conclusion cannot be reached.)

conflict with the given fact that $\neg p$, rather than *replacing* the fact that $\neg p$ by a new fact that *p*. But modality relative to the facts, though it strikes *us* as controversial, cannot count as such in the pre-Scotist context of the Master Argument. The reconstruction derives a contradiction from the three premisses taken together: any two premisses are consistent. Premisses (2) and (3) are consistent if contingencies may be realised in the past; premisses (1) and (3) are consistent if modality relative to the facts is relinquished; premisses (1) and (2) are consistent if the Principle of Plenitude is embraced.

The reconstruction conforms to **PC**, in the sense that the premisses are given a natural interpretation and that there is some epistemic distance to traverse between the premisses and the conclusion. It can be an intellectual discovery that, if the contingent is that which can be assumed to be actual without incoherence, and given the plausible understanding of modality as relative to the facts, then there can be no such thing as an unactualised possibility.

What of **CC**? Clearly, the reconstruction does not *as such* conform to this constraint. It cannot be run on the temporal and extensional interpretations of the modal operators (without inducing modal collapse). Instead, it understands '*ἀναγκαῖον*' in premiss (1) non-extensionally as 'inevitable' or 'unpreventable', and '*δυνατόν*' in premisses (2) and (3) not as the dual of of this notion, but as the negation of 'necessary or impossible', i.e. as the contingent, interpreted in an Aristotelian, not a Diodorean, way. Since contingency is defined in terms of possibility proper, there is no difficulty in converting the immediate conclusion of the Argument into the form which Diodorus sought. Given now the final conclusion of the Argument that all future possibilities must at some time be realised, we arrive at the Boethian definitions of the modalities by defining necessity in the usual way as the dual of possibility in *this* sense, and by running the operators, so defined, on temporally indefinite sentences. Line (11), where '*M*' must bear a non-Diodorean sense, is thus immediately convertible into '$Mp \rightarrow [p\ v\ Fp]$'. So the Master Argument, on my reconstruction, does *yield* the Diodorean modalities, just as Alexander tells us it was meant to. But it does not *employ* those modalities; it does not conform to **CC**. Hence the Master Argument might be said to equivocate on the senses of '*ἀναγκαῖον*' ('inevitable' in premiss (1); 'is and will be true' in the conclusion) and '*δυνατόν*' ('contingent' in premisses (2) and (3), in the sense of Aristotle's definition; 'possible' in the conclusion, in Diodorus' sense), just

as (in the case of '*δυνατόν*') Aristotle does. The only difference is that Aristotle's equivocation lies on the surface, open to all viewers; Diodorus' equivocation resides deep down in the workings of his Argument, of which only the surface features survive.

The Master Argument on my reconstruction is quite closely mimicked by an argument of Aristotle's which we have already examined in connection with the necessity of the present: *DC* 283b6ff.[19] In this passage Aristotle argues that something generated cannot be eternal. For if it is generated, it has the capacity not to be (since at one time it was not); but it cannot exercise this capacity at any time when it exists (the necessity of the present) and it will always exist. Nor can it exercise it in the past (the necessity of the past). Hence (by *reductio*) it cannot be both generated and eternal. It might be thought that there is the following difference between this argument and my reconstruction of the Master Argument, namely that this argument depends (narrowly) on the necessity of the present rather than (broadly) on modality relative to the facts. That would mean that it would require completion with something like Vuillemin's Principle of Synchronic Contraction to succeed; for if Aristotle were to admit here temporally stepped possibility, as he does in other contexts,[20] the argument would fail. On the other hand, the Master Argument, as I have taken it, by working with the broader notion of modality relative to the facts, is not dependent on the assumption that modality cannot be temporally stepped.

It is true that argument of *DC* 283b6ff, so construed as depending on the necessity of the present narrowly taken, would indeed require the Principle of Synchronic Contraction, in order to yield the conclusion that an eternal object does not, at any moment, have the potential

[19] Cf. Vuillemin, 'L'Argument Dominateur', p.237ff, *NC*, ch.2. There is an ambiguity in Vuillemin's argument in the earlier article: it is unclear whether he wishes to take what he calls 'conditional necessity' narrowly (the necessity of the present) or broadly (modality relative to the facts). The former course would not be sufficient to yield Aristotle's conclusion. What is further required is the adoption *either* of the Principle of Synchronic Contraction (the option Vuillemin subsequently selects), *or* of the generalised inference from truth to necessity (my preferred option).

If premiss (1) were taken, as Seel takes it ('Diodore domine-t-il-Aristote?'), to assert the irrevocability of facts in general (regardless of time of realisation), then it could be applied directly to premiss (3) to yield a contradiction, without the need of 'conditional necessity' in either sense (*pace* Seel, p.310). But that policy, though convenient, surely depends on an impossible reading of premiss (1): it would make '*παρεληλυθός*' redundant.

[20] E.g. the passages in *Met* Θ.3 and *DI* 13 which I examined above in #9.

not to exist not only at *that* moment, but at *any* moment. Such a dependence might be taken to be signalled by Aristotle's expression of the necessity of the present at 283b9: *πλὴν οὐ τοῦ τότε μὴ εἶναι ὅτε ἔστιν* ('[It would have the capacity not to be] except not the capacity not to be at the time when it is'). But I have argued that the necessity of the present cannot reasonably be accepted without accepting also the generalised inference from truth to necessity: so something which does not have the capacity not to be at the time when it is equally does not have the capacity not to be going to be at the time when it is going to be (so that the quoted principle just entails '*πλὴν οὐ τοῦ τότε μὴ ἔσεσθαι ὅτε ἔσται*'). There is no basis on which to draw a distinction between these two cases, and no warrant for supposing that Aristotle did so. That means that we do not need to appeal to the Principle of Synchronic Contraction in our understanding of the argument of *DC* 283b6ff, which can be taken to follow closely the outline of my favoured reconstruction of the Master Argument.[21]

Note on An Pr 1.3

At *An Pr* 1.3 the following definition of *τὸ ἐνδεχόμενον* is offered: *πολλαχῶς λέγεται τὸ ἐνδέχεσθαι (καὶ γὰρ τὸ ἀναγκαῖον καὶ τὸ μὴ ἀναγκαῖον καὶ τὸ δυνατὸν ἐνδέχεσθαι λέγομεν)* (25a37–39). Hintikka, following Ross, understands the division of *τὸ ἐνδεχόμενον* to be a bipartite rather than a tripartite division: '*τὸ μὴ ἀναγκαῖον*' is elliptical for '*τὸ μήτε ἀναγκαῖον μήτε ἀδύνατον*', and the first two limbs of the tricolon, taken together, constitute a definition of possibility proper; '*τὸ δυνατόν*' then represents the contingent. The two parts of possibility proper – the necessary and the contingent – are then correlated with the discussion of 25b4–14, an example being given of each. The contingent is then dealt with at 25b14ff. This interpretation is subjected to detailed criticism by Seel (*DAM*, pp.174–188), who defends the tripartite reading of 25a38–9. The main point of criticism is that on Hintikka's interpretation the contingent figures twice, once as a subdivision of possi-

[21] Note that the Aristotelian commitments to modality relative to the facts and the availability of temporally stepped two-sided possibility ($M_t p_{t'}$ & $M_t \neg p_{t'}$, $t' > t$) are not in tension. On the contrary, taken together they precisely force the recognition of truth-value gaps, which I have argued is Aristotle's position.

bility proper, and again on its own account. Since Aristotle allows certain relations of convertibility in the first case which he rejects in the second case, the chapter as a whole would be incoherent on the subject of the contingent. In view of this, Seel interprets '*τὸ ἐνδέχεσθαι*' (25a38) as, in effect, a conflation of '*τὸ ἐνδέχεσθαι*' and '*τὸ ἐνδέχεσθαι μή*': the definition which follows then conflates two definitions corresponding to these definienda (respectively: *ἀναγκαῖον, μὴ ἀναγκαῖον μή, δυνατὸν εἶναι καὶ μή*; and *ἀναγκαῖον μή, μὴ ἀναγκαῖον, δυνατὸν εἶναι καὶ μή*). In the following discussion (25b4ff), the *ἀναγκαῖον* (*μή*) and the *μὴ ἀναγκαῖον* (*μή*) are correlated with the man/horse and the white/cloak examples respectively, and 25b14ff then deals with contingency. So the example of the cloak which is not always white then functions as a case of possibility proper, rather than specifically of the contingent. But, apart from the inherent difficulty of reading 25a38–9 in such a tortuous way, it seems unlikely, in the case of the category '*τὸ ἐνδέχεσθαι*', that Aristotle would include *τὸ ἀναγκαῖον* as a separate, self-standing variety of *τὸ ἐνδεχόμενον* if the next variety (the 'not necessarily not') includes it (so too, *mutatis mutandis*, for the category of '*τὸ ἐνδέχεσθαι μή*'). The problem of the cloak/white example remains on Seel's interpretation too. It is hardly satisfactory to say that 'es Aristoteles auf die Frage, ob es sich bei dem zweiten Sachverhalt [the white cloak] um einen kontingenten Sachverhalt handelt oder nicht, gar nicht ankommt' (p.183). The fact is that the example chosen *is* of a contingency, so that an inchoate inconcinnity between 25b4–14 and 25b14ff seems unavoidable. Neither Hintikka's nor Seel's interpretation seems satisfactory. We cannot in any case avoid an inconcinnity between 25b4–14 and 25b14ff, because the examples chosen of the possible in 25b4ff exhaust the field: one is of a necessity, the other of a contingency. In view of that, the right approach to 25a38–9 will be to match up the tricolon with the whole field of the possible, but without overlap of its parts: we should then take it as a bipartite division in which the first limb refers to the necessary, and the second and third limbs taken together refer to the contingent. The third limb has the effect of restricting the domain introduced by the second limb to the contingent ('the not necessary which is *also* – *καί* – possible'): the '*καί*'s of 25a38 denote union; that of 25a39 denotes intersection. (We should then delete the second '*μή*' in 25b5 from Ross' text.)

23 The Responses of Cleanthes and Chrysippus

Any reconstruction of the Master Argument must try to make sense of the responses offered to it by its earliest critics, the Stoics Cleanthes (who wrote a work on it)[1] and Chrysippus (who devoted the first book of his treatise 'On things Possible' to it).[2] But, since we are not told how they interpreted the Argument, we cannot assume that they understood it as Diodorus intended it, and so we cannot assume that if they understood the premisses in a particular sense, those premisses bore that sense for Diodorus.

Cleanthes, we are told by Epictetus, rejected premiss (1), the necessity of the past. We might initially be inclined to question the report – surely the necessity of the past is unassailable? – but it is confirmed by Cicero.[3] It is not easy to see what Cleanthes can have had in mind. As far as premiss (1) goes, the main reconstructions we have examined fall into two broad groups. There are those which, following Prior, try to transfer necessity from the past to the future. In that case Diodorus will have traded on an ambiguity in premiss (1) between 'True statements about the past are necessary' and 'True past-tensed statements are necessary': the audience is lured into accepting premiss (1) because they read it in the first sense; but the Argument actually employs it in the second sense. Alternatively, one may construe premiss (1) as involving no such ambiguity, but as relating simply to the (genuine) past. In that case it states that the past is fixed. My reconstruction, and those of Hintikka and Vuillemin, follow this policy.

If Cleanthes understood the Argument to work in a Priorean way, the most likely explanation for his rejection of premiss (1) will be that he objected to the transfer of necessity from past to future. In that case he will have argued as Ockham later did that only statements which are genuinely about the past, and not past-tensed statements in general, are necessary (statements which are genuinely about the past may not even be past-tensed). Now if, as I have suggested, the *basis* for ascribing

[1] Epictetus, *Diss* 2.19.9.
[2] Ibid.
[3] *De Fato* 14.

necessity to the past is the fact that the past is stocked with *truths*, the transfer of necessity from past to future envisaged by reconstructions in the tradition of Prior would seem to involve no more than a simple putting together of premiss (1) – understood in either way – with **PB**. Hence any objection to premiss (1) would in effect be an objection to the Argument's reliance on **PB**. Cleanthes, on this line, will then have been aligning himself with what would have been the Aristotelian response to the Argument, which I explore below (#25). But we cannot assume that Cleanthes subscribed to this line of reasoning. He may, like Ockham himself, have wished to combine the necessity of the (genuine) past with unrestricted **PB** and the openness of the future. That is indeed, given his Stoic affiliations, the most likely interpretation of his position.

Suppose Cleanthes understood the Argument to work in the way envisaged in my reconstruction. On what grounds could one object to the way premiss (1) figures in that reconstruction? One suggestion would be that Cleanthes rejected the fixity of the past *tout court*. As a causal determinist, he may have thought that no distinction can be made between the future and the past in point of openness or fixity, for if strict causal determinism obtains the past is as dependent on the future as *vice versa*. If I were to act differently from the way I do act, not only would the future be different from the way it will be, but also the past would have to have been different from the way it was. If I can bring about the future, I can also bring about the past. The Stoics, notoriously, tried to combine freedom with causal determinism; perhaps Cleanthes saw that a casualty of this combination is the necessity of the past.

A somewhat different interpretation of Cleanthes' position would be the following. In my version of the Master Argument, premiss (1) operated to rule out the assumption of the actuality of a contingency in the past. The sense of the premiss was 'There is no contingency with respect to the past'. The application of premiss (1) accordingly depended on the way premiss (2) was read, and in particular on the construal of '*δυνατόν*' in that premiss (and in premiss (3)) as 'contingent'. But of course '*δυνατόν*' can also mean 'possible', and I conceded that the sense of '*ἀδύνατον*' operative in the Argument is 'impossible', not 'non-contingent'. So it would hardly be surprising if subsequent critics of the Argument construed '*δυνατόν*' in premisses (2) and (3) as 'possible'. But in that case one might well challenge the application of premiss (1) in

the Argument, for although past truths are not *contingent*, they certainly are *possible*, because they happened. Admittedly, on this interpretation of Cleanthes' response, he will have been objecting not to premiss (1) as such, but to the way it is applied in the Argument (namely, to rule out the assumption of a contingency/possibility in the past). But it is not clear to me that this consideration constitutes a serious difficulty for the proposal; after all, the same has to be said of the most plausible interpretation of Cleanthes' response to a Priorean version of the Master Argument.

We have seen, then, that interpretations of Cleanthes' rejection of premiss (1) can be devised both on the assumption that he understood the Argument in accordance with Prior's reconstruction, and on the assumption that he understood it in accordance with mine. Unfortunately I do not think we can go any further. None of the ways of interpreting Cleanthes' objection which I have sketched seems to me historically implausible. But even if that point fails to carry conviction, and it is held more likely that Cleanthes had (say) the Priorean version of the Master Argument in mind and accordingly objected to it along Ockhamist lines, nothing can be concluded as to the Diodorean version of the Argument, because, as I stressed at the outset, we do not know how Diodorus understood his Argument, and so whether his Stoic critics construed him correctly or not.

One suggestion which has been made by a few writers, but which I think we can rule out, is that Cleanthes rejected premiss (1) on the basis of the Stoic doctrine that events repeat themselves in a process of everlasting recurrence (or that time is cyclic.)[4] For why should that lead

[4] Vuillemin, 'Éternel Retour et Temps Cyclique'. There is a tentative proposal along the same lines in White, 'Facets of Megarian Fatalism: Aristotelian Criticisms and the Stoic Doctrine of Eternal Recurrence', p.202ff. There does not appear to have been complete unanimity among the Stoics on the relation between events and their counterparts in other cycles. For strict numerical identity: Alexander, *In An Pr* 180.33–6 = *SVF* 2.624 = LS 52F(1); Nemesius, *De Natura Hominis* 309.5–311.2 = *SVF* 2.625 = LS 52C; Tatian, *Oratio ad Graecos* 3 = *SVF* 1.109; Origen, *Contra Celsum* 4.12 = *SVF* 2.628. For qualitative but not numerical identity: Origen, *Contra Celsum* 4.68 = *SVF* 2.626 = LS 52G(1). For numerical or qualitative identity but admitting trivial discernibilities: Alexander, *In An Pr* 181.25–31 = *SVF* 2.624 = LS 52F(2)–(3); Origen, *Contra Celsum* 5.20 = *SVF* 2.626 = LS 52G(2). Strictly speaking, numerical identity would render time itself cyclic, and hence destroy the doctrine of recurrence: there would be just one cycle. But recurrence with qualitative but not numerical identity seems to conflict with the Stoic adherence to the identity of indiscernibles: see here Barnes, 'La Doctrine du Retour Éternel,' in

him to reject premiss (1) rather than *accept* the conclusion of the Master Argument? If events do so repeat themselves (or time is cyclic), why not say that the future is fixed (since the past is), rather than that the past is open (since the future is)? That reflection actually suggests the possibility of reconstructing the Master Argument on the basis of everlasting recurrence/cyclic time. Such a reconstruction has, indeed, been proposed.[5] But, since the doctrine of everlasting recurrence/cyclic time can be used with equal effect to run the Argument forwards (i.e. to the rejection of premiss (3)) or in reverse (i.e. to the rejection of premiss (1) or premiss (2)), I suggest that it drops out of the picture as irrelevant. It seems unlikely that anyone could have tried to draw on the notion of everlasting recurrence/cyclic time, either to support or controvert the Argument, without noticing that the consideration cuts both ways.

As regards Diodorus, there is no direct evidence of his views on eternal recurrence, although an epigram of Callimachus directed at Diodorus may be relevant here:

> *αὐτὸς ὁ Μῶμος*
> *ἔγραφεν ἐν τοίχοις 'ὁ Κρόνος ἐστὶ σοφός'.*
> *ἠνίδε κοὶ κόρακες τεγέων ἔπι 'κοῖα συνῆπται'*
> *κρώζουσιν καὶ 'κῶς αὖθι γενησόμεθα'.*
>
> Momus himself wrote on the walls 'Cronus is wise', and lo! even the daws on the rooftops croak 'Which conditionals are sound?' and 'How shall we become hereafter?' (fr.393 Pfeiffer)[6]

The reference of '*κοῖα συνῆπται*' is clear enough. Sextus interprets the phrase '*κῶς αὖθι γενησόμεθα*' as relating to and drawing on Diodorus' views on motion: just as a thing can neither move in the place or time where it is, nor in the place or time where it is not, so a living thing cannot die in a moment in which it is living, nor in a moment in which it is not living. Hence it cannot die, and so it is immortal. But this interpretation is unsatisfactory for two reasons. Firstly, Diodorus' argument against the possibility of motion leaves open the possibility, which

Brunschwig ed., *Les Stoïciens et leur logique* (Paris, 1978), 3–20. For my purpose, any of these versions of the Stoic position suffices for the point in the text. For the evidence on Cleanthes, see Barnes, p.4 with n.9. The relevant texts include Stobaeus, *Eclogae* 1.20.1 = *SVF* 1.107, 1.17.3 = *SVF* 1.497.

[5] Boudot, 'L'Argument Dominateur'.

[6] Lines 1–2 = DL 2.111 = fr.96 Döring; lines 3–4 = Sextus, *AM* 1.309 = fr.128 Döring.

Diodorus indeed expressly affirms, of *having moved*. Hence if Diodorus applied his argument against motion in the present context, he can only have contended against the possibility of *dying* (i.e. the process), not of *having died* (the state). But then all that follows is that death is an instantaneous matter; the conclusion that we are immortal does not, as Sextus supposes, follow. Secondly, Sextus' interpretation misses the force of '*αὖθι*' and makes little sense of '*γενησόμεθα*'. A more plausible interpretation of the phrase is that Diodorus had some part in the debate about eternal recurrence, and in particular concerning what form ('*κῶς*') that recurrence took.[7] That interpretation yields a satisfying parallelism between the two questions posed by the jackdaws: the second question means 'What shall we be like when we come to be the next time around?'. However, even if Diodorus did believe in some form of eternal recurrence, the basic point remains unaffected. Furthermore, there must be a presumption (which I have already exploited against Prior's original reconstruction) against importing too much of Diodorus' own metaphysical baggage into an argument which he would have intended to have general appeal.[8]

In the case of Chrysippus, we have rather more evidence on his rejection of premiss (2). In his commentary on *An Pr* 34a5ff, where the modal axiom '$L\,[p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$' is mentioned by Aristotle, Alexander records Chrysippus' attempts to argue against this principle. The wording follows that of premiss (2) as reported by Epictetus: Chrysippus is said to claim that nothing prevents the impossible from following from the possible (*μηδὲν κωλύειν καὶ δυνατῶι ἀδύνατον ἕπεσθαι*). The report is confirmed by Cicero.[9] Chrysippus supported his

[7] I am indebted to István Bodnár for suggesting this line of interpretation to me.

[8] M.Frede suggests (*Die Stoische Logik*, p.117) that Cleanthes may have rejected the necessity of the past because he thought that it did not follow from the Stoic definition of necessity, the relevant part of which runs: 'that which, being true, does not admit of being (=cannot become) false' (DL 7.75 = LS 38D). But, in the context of modality relative to the facts, the necessity of the past does follow from that definition, as Cicero seems to have been aware at *De Fato* 14: see #24. Frede makes the further suggestion (ibid.) that Cleanthes may have been one of those Stoics, referred to by Alexander (*De Fato* 177.8ff), who identified the necessary with the always true. That would indeed have provided him with a basis for the rejection of Diodorus' premiss (1), although it would have required him to understand premiss (1) to be treating of temporally indefinite sentences which, as I have argued, on the most plausible reconstructions it does not do.

[9] *De Fato* 14: 'Si igitur quod primum in conexo est necessarium est, fit etiam quod consequitur necessarium. Quamquam hoc Chrysippo non videtur valere in omni-

claim by producing a counterexample to the modal axiom. His example is

(D) If Dion is dead, this man is dead (*εἰ τέθνηκε Δίων, τέθνηκεν οὗτος*)[10]

it being assumed that Dion is the referent of 'this man'. Chrysippus argues that the conditional as a whole is true, but that the antecedent is possible while the consequent is impossible. The antecedent is possible because Dion can die, and if he does then the antecedent will be true. The consequent, on the other hand, is impossible, for it is false while Dion is alive, and after his death the statement 'this man is dead' is destroyed, and so has no truth-value at all. For in the absence of a referent, 'this man' has no sense, so that any purported statement in which it occurs in non-oblique contexts fails to express a sense. On the other hand, Chrysippus evidently does not think that 'Dion' loses its sense after Dion's death, perhaps because he was a descriptivist about proper names.[11]

One naturally raises the question why Chrysippus thinks that (D) is a sound conditional. Recall that for Chrysippus, on the most plausible reconstruction of his view, true conditionals are strict implications, so that what is in question is whether (D) is necessary. Surely, for Chrysippus' counterexample to work, it has to be; but is it? On one view, it is not. For a necessary *ἀξίωμα*, on the Stoic view, is by implication one which is and always will be true.[12] But (D) will not always be true: after Dion's death the consequent is 'destroyed', so fails to take a truth-value, so that (D) as a whole fails to take a truth-value after Dion's death.[13] If

bus.' Recall that, given *L*–*M* duality, '$L\ [p \rightarrow q] \rightarrow [Lp \rightarrow Lq]$' is equivalent to '$L\ [p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$'; cf. Frede, *Die Stoische Logik*, pp.87–8.

[10] Alexander, *In An Pr* 177.25–178.1 = *SVF* 2.202a = LS 38F. Cf. Philoponus, *In An Pr* 166.3ff, also in *SVF* 2.202a.

[11] Mignucci, 'Sur la Logique Modale des Stoïciens', pp.322–3, with reference to *SVF* 3 Diog.22 and 25. Cf. Sextus, *AM* 8.97 with Frede, *Die Stoische Logik*, pp.61–2; Mates, *Stoic Logic*, p.23.

[12] Mignucci, 'Sur la Logique Modale des Stoïciens', p.320, with reference to Cicero, *De Fato* 14 and Alexander, *De Fato* 177.20–1. Cf. n.8 above. If a necessary *ἀξίωμα* is and always will be true, and necessity and possibility are duals, how can Chrysippus refuse the Diodorean identification of the possible with (or at least an implication from the possible to) what is or will be true? Perhaps by some such tactic as was sketched in #7 n.22.

[13] Alexander raises this criticism (among others): *In An Pr* 178.8ff (= fr.994 Hülser); cf. Philoponus, *In An Pr* 166.9ff (= fr.995 Hülser); Proclus, *In Parmenidem* 1.62ff Steel (= fr.997 Hülser).

we wish to rescue Chrysippus' logical credentials, we must construe his argument differently.

Mignucci argues,[14] following a suggestion of Prior's,[15] that Chrysippus attacked not

$$L\ [p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$$

which he accepted, but rather

$$\neg M \neg [p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$$

and that he was enabled to distinguish the two axioms in this way because he rejected '$\neg M \neg p \rightarrow Lp$'. Take the case of 'This man is dead', said of Dion. This statement presumably does not exist before Dion's birth,[16] is false throughout his life, and is destroyed at the moment of his death. The statement is therefore impossible (it is never true); but its negation is not necessary, because its negation ('This man is not dead') is equally non-existent before Dion's birth and destroyed at the moment of his death, and so is not always true. (The argument presupposes choice negation rather than exclusion negation.) Applying this to the case of (D), we have it that while the negation of (D) is impossible – there is never a time at which the antecedent is true and the negation of the consequent is true – (D) is not necessary, because it is not always true. After Dion's death the consequent, and so (D) as a whole, fails to take a truth-value. Hence we have

$$\neg M \neg [\text{If Dion is dead, this man is dead}]$$

but not

$$L\ [\text{If Dion is dead, this man is dead}]$$

and since the antecedent of (D) is possible, while the consequent impossible, Chrysippus is able to reject

$$\neg M \neg [p \rightarrow q] \rightarrow [Mp \rightarrow Mq].$$

The proposal is certainly ingenious, but there is, as Mignucci himself points out, a significant problem with it. This problem is most con-

[14] 'Sur la Logique Modale des Stoïciens'.

[15] *PPF*, pp.151–2. The line is also defended by Vuillemin, *NC*, ch.5; cf. 'Die Aporie des Meisterschlusses', p.11.

[16] Kneale, *DL*, p.154.

veniently dealt with in the context of my treatment of Cicero's discussion of Chrysippus on divination in the next section: I postpone discussion of it until then.

There is a rather simpler option available to us than construing Chrysippus' definition of a sound conditional as '$\neg M \neg [p \rightarrow q]$' rather than '$L\ [p \rightarrow q]$' (and then rejecting the full duality of 'M' and 'L').[17] A necessary condition of the truth of this latter conditional is that '$p \rightarrow q$' should be always true. Surely Chrysippus thought, not that '$p \rightarrow q$' is always true if and only if it is always the case that the antecedent is false or the consequent true (so rendering the modalised conditional false if, as in the case of (D), there is a time when the antecedent is true and the consequent does not exist), but, following Diodorus, that '$p \rightarrow q$' is always true if and only if it is never the case that the antecedent is true and the consequent *false*. In that case

L [If Dion is dead, this man is dead]

comes out true. Chrysippus' definition of a sound conditional is, as we have seen (#16), plausibly to be identified with Sextus' definition of *συνάρτησις*, according to which a conditional is sound if and only if the antecedent is incompatible with the negation of the consequent, that is to say, if and only if the antecedent and the negation of the consequent cannot both be true. But that is precisely the case with the above conditional. I think we should prefer this option, and accordingly construe Chrysippus as retaining the full duality of 'M' and 'L'.[18]

[17] This option is sketched by Kneale, *DL*, p.154.

[18] Mignucci argues ('Sur la Logique Modale des Stoïciens', p.334) that Chrysippus' response to Cicero at *De Fato* 15f, which consists in recasting predictions in conditional form as negated conjunctions, is to be read as follows. The negated conjunctions, Mignucci claims (so too Vuillemin, *NC*, pp.132–3, 139), should be formalised as

$\neg M\ [p\ \&\ \neg q]$

which is equivalent to

$\neg M \neg [p \rightarrow q]$.

As we have seen, Chrysippus, on Mignucci's analysis, rejects

$\neg M \neg [p \rightarrow q] \rightarrow [Lp \rightarrow Lq]$.

Hence, that will entitle him to combine a 'negated conjunction' analysis of divination with a rejection of Cicero's 'conditional' analysis of it. The problem with this line is that Cicero's text at *De Fato* 15f provides no warrant for treating the negated conjunctions which Chrysippus is said to prefer as '$\neg M\ [p\ \&\ \neg q]$' rather than simply as '$\neg [p\ \&\ \neg q]$'. Mignucci suggests that the claim that 'p' and '$\neg q$' 'pugnant inter se' (*De Fato* 12) warrants the stronger formulation, but that claim is applied *not* to the negated conjunction formulation, which Chrysippus prefers, but to the conditional formulation, which he rejects (Chrysippus certainly concedes that the antecedent and negated consequent of a sound conditional are incompatible – 'pugnant inter se'). Hence we should take Chrysippus as seeking to avoid Cicero's argument by replacing '$L\ [p \rightarrow q]$' – regarded as equivalent to '$\neg M \neg [p \rightarrow q]$' – with '$\neg [p\ \&\ \neg q]$', i.e., '$p \rightarrow q$'. If '$p \rightarrow q$' is substituted for '$L\ [p \rightarrow q]$' into the axiom '$L\ [p \rightarrow q] \rightarrow [Lp \rightarrow Lq]$', the resulting axiom is invalid.

In that case, we construe Chrysippus as having rejected

$L\ [p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$.[19]

The fact that Chrysippus understood premiss (2) in this way does not mean that Diodorus must have understood it in the same way. But we have seen that most of the reconstructions we have considered regard premiss (2) as expressing some form of the above axiom. In the case of my reconstruction, although I treated premiss (2) metalogically as a rule of inference for the operator 'contingently', I indicated that premiss (2), so understood, was regarded by Aristotle as the basis of the above axiom. Hence, if Chrysippus understood the Master Argument to function along the lines of my reconstruction, his rejection of the modal axiom could justifiably have been thought sufficient for the rejection of premiss (2).[20]

[19] For some interesting speculation on *why* Chrysippus rejected this axiom, at least in the special case of sentences involving demonstrative expressions, see Kneale, *DL*, p.127. Since Chrysippus did not reject this axiom *toto caelo* (cf. Cicero, *De Fato* 14 with #16 n.14 above and this section n.9), it is natural to ask why he thought the rejection of the axiom in the 'Dion' case had a bearing on the Master Argument. Perhaps, as Vuillemin suggests (*NC*, p.138), he regimented premiss (3) into a suitably deictic form: 'If there is a possibility which neither is nor will be realised, then *this* possibility neither is nor will be realised.'

[20] The conclusion of the Master Argument was also rejected by Diodorus' pupil Philo, who allowed possibility to be constituted by 'mere suitability', regardless of external hindrances to the realisation of the possibility (cf. #9 n.42). Sedley may be right in supposing that Philo objected to premiss (2) on the basis of his own conception of the sound conditional as a material implication ('Diodorus Cronus and Hellenistic Philosophy', n.130). In that case, Philo would have read premiss (2) as having to take the invalid form '$[p \rightarrow q] \rightarrow [Mp \rightarrow Mq]$'. On the other hand, it is not impossible that the Master Argument is itself a response to Philo's conception of possibility, rather than *vice versa*: see here Giannantoni, 'Il *κυριεύων λόγος* di Diodoro Crono', *Elenchos* 2, 1981, 239–72.

24 Diodorus and Cicero

I have argued that it is a mistake to regard the Master Argument as a whole as concerned with temporally definite expressions, although I have conceded that premiss (1) must be so understood. I have suggested that the Argument was intended to apply in the first instance to temporally indefinite sentences; it was subsequently applied – though probably not by Diodorus himself – to temporally definite expressions. When it is so applied, it becomes a ticket to determinism;[1] that is one reason why Cicero, among others, characterises Diodorus as a determinist.[2] But the Master Argument yields conclusions which one might loosely call necessitarian even when applied to sentences which are not temporally definite, as long as those sentences concern individuals. If Fabius may die at sea, the conclusion of the Master Argument tells us that he is dying or will die at sea, and hence, since he can only die once, that he must (in Diodorus' sense) die at sea. (This is not quite a fully deterministic conclusion, since it leaves open *when* Fabius will die at sea.) Application of Diodorean modalities leads here, as also in the case of temporally definite expressions, to modal collapse.[3]

Cicero ascribes to Diodorus the necessitarian principle that 'whatever is going to be is necessarily going to come about' ('quidquid futurum sit, id ... fieri necesse esse', *De Fato* 13). The ascription is warranted. Diodorus is indeed committed to the principle that whatever happens (happened, will happen) is necessary, and whatever does not (did not, will not) happen is impossible. In my reconstruction, and in Hintikka's (on the assumption that it selects the second option of the

[1] Hintikka *TN*, ch.9, *AMD*, p.33; Christian, 'Zur Interpretation der diodoreischen Modalgesetze und der diod. Implikation', *Anzeiger der östereichischen Akademie der Wissenschaften* (Vienna) 101, 1964, 235–43; White, 'Facets of Megarian Fatalism'; Sedley, 'Diodorus Cronus and Hellenistic Philosophy', p.99; McKirahan, 'DPM', p.246; Sorabji, *NCB*, p.120.

[2] *De Fato* 12–14, 17; *Ad Fam* 9.4 = fr. 133 Döring; Jerome, *Dialogus contra Pelagianos* 1.702, *PL* 23 525A = fr.132B Döring; Boethius, *In De Int* 2.234–5 = fr. 138 Döring.

[3] This conclusion is resisted by Frede, *Seeschlacht*, pp. 103–4, but her report of Diodorean necessity is not accurate ('... wovon es wahr ist und niemals falsch sein wird, zu sagen, daß es *ist*': the last five words are not in Boethius).

dilemma which which faces it, i.e. that it assumes unrestricted **PB**),[4] that is a consequence of the presence of modality relative to the facts. In the case of Prior's reconstruction, the necessitarian principle is yielded by the wide application accorded to premiss (1); for if past truths are necessary, but that necessity can be transferred to present and future truths, those truths too will be necessary. Of course, if Prior's reconstruction is read as conforming to **CC** rather than **PC**, that necessity will be construable as Diodorean necessity, and on that reading Cicero's charge of necessitarianism (in a non-Diodorean sense) will be unwarranted. But the best version of Prior's reconstruction (Barreau's) must be read as conforming to **PC** rather than **CC** (in the metric variant, because premiss (1) will be false under a Diodorean interpretation of '*L*'; in the mixed tensed and dated variant, because the Diodorean interpretation of the modalities induces their collapse). In that case the transfer of necessity from past to future effected by premiss (1), under the wide application of it exploited by the Argument in Prior's version, will yield the necessitarianism which Cicero seeks to pin on Diodorus.[5]

The general point is that if one has the necessity, in a non-Diodorean sense, of *either* the past *or* the present *or* the future, one can generate the necessities, in the same sense, of both of the other two domains, so long as there are no restrictions on substitution of formulae. That proviso, on the plausible view advanced in different ways by Dummett and Taylor, and against Ockham, is in turn tantamount (merely) to insisting upon unrestricted **PB**. For the *basis* of the necessity of (say) the past is the truth of statements about the past; once that has been conceded, nothing can stop necessity spreading, in the context of unrestricted **PB**, to truths about the present and future. The possibility of that spread is manifested formally in Prior's reconstruction by his permissive approach to the inter-substitution of tense-logical equivalents; in my reconstruction, and in Hintikka's, the spread has been effected *ab initio*, in the implicit assumption of modality relative to the facts.

Hence, on Hintikka's and my reconstructions, and on the best way of taking Prior's reconstruction, a general necessitarianism is indeed a consequence of the Master Argument. That necessitarianism sits un-

[4] Cf. #17. I treat this qualification as understood in subsequent references to Hintikka's version.

[5] Cf. Weidemann, 'Zeit und Wahrheit bei Diodor', in Döring and Ebert eds., *Dialektiker und Stoiker* (Stuttgart, 1993), 319–329.

easily beside (even if it does not directly conflict with) the conclusion which Diodorus explicitly sought from the Argument – the definitions of the Diodorean modalities – for it applies to temporally definite expressions, whereas the Diodorean modalities apply to temporally indefinite sentences. Furthermore, the application of those definitions to temporally definite expressions has as its consequence modal collapse, as does the necessitarianism, in the context of unrestricted **PB**, which premiss (1) ushers in.[6] There is, therefore, some tension between the divergent commitments of the Master Argument, on the one hand to necessitarianism and modal collapse, and on the other to the Diodorean definitions of the modalities.

The presence of this antinomy in Diodorus' proof, on Prior's reconstruction (Barreau's version), Hintikka's, and mine, might well prompt the following objections to all three reconstructions. If Diodorus thought the Master Argument entitled him immediately to the necessity of all true statements about the future (indeed of all true statements), with the consequent collapse (in the context of unrestricted **PB**) of the (real) modalities, why should he then seek to use the Master Argument precisely to distinguish the modalities? And why should he satisfy himself with the relatively weak conclusion that the possible is what is or will be the case, when he might draw the much stronger conclusion that the possible, the necessary and the true coincide? The

[6] Cf. Kneale, *DL*, p.121. Kneale interprets the Master Argument in accordance with Prior's reconstruction, but she differs from Prior in reading '*ἀναγκαῖον*' in premiss (1) in a non-Diodorean way (i.e. as conforming to **PC** rather than **CC**). She then concludes from Diodorus' necessitarianism that 'there can therefore be no change of truth-values', which conflicts with the fact that 'Diodorus' definitions of the modal notions are based on the assumption that truth-values change' (cf. Barreau, 'Cléanthe et Chrysippe', p.33). But the Diodorean definitions of the modalities are based on the assumption that truth-values of temporally *indefinite* sentences change; his necessitarianism does not *directly* conflict with that assumption. The necessitarian is committed to the inference from the truth of temporally *definite* expressions to necessity (in the sense of unpreventability). On anyone's view truth-values of temporally definite expressions cannot *change* (in the context of unrestricted **PB**); that still leaves open the question whether there is anything anyone can do to *determine* them. Kneale's analysis of the Master Argument confuses two separate issues: whether premiss (1) contains an ambiguity between initially past-tensed statements and statements about the past, and whether premiss (1) conforms to **PC** or **CC**. A reconstruction may, like Prior's (in Prior's own version and in Denyer's) treat premiss (1) as exploiting the ambiguity without being thereby committed to reading premiss (1) as conforming to **PC**. But it is the construal of premiss (1) in accordance with **PC** which (in, for example, Barreau's version of Prior) introduces a commitment to necessitarianism into the Argument.

only answer to these objections which seems remotely plausible is that Diodorus did not see the global necessitarianism implicit in his Argument. At least, that is the answer we must give if we prefer **PC** to **CC**. For to prefer **PC** is immediately to read 'necessary' in premiss (1) in a non-Diodorean fashion; in addition, on my reconstruction, and Hintikka's, modality relative to the facts imports non-Diodorean modalities. If the above answer is right, Diodorus will not only not have noticed the necessitarianism implicit in his Argument when he constructed it, but will most likely not have employed the Argument, once devised, to deliver necessitarian conclusions. In that case, the necessitarianism which Cicero, with perfect entitlement, imputes to Diodorus,[7] will not constitute evidence for Diodorus' own understanding of his Master Argument, but will point rather to discussions of the Argument subsequent to its original promulgation (but no doubt anterior to Cicero's discussion).[8]

Cicero's discussion of Diodorean determinism at *De Fato* 12–13 gives rise to a difficulty which is worth pausing over. We have already examined the dialectical structure of Cicero's discussion (#16).[9] Cicero sets up the conditional

(F) If Fabius was born at the rising of the Dog-star, he will not die at sea.

Cicero tries, we recall, to show that Chrysippus is committed to the necessity of the antecedent, and to the necessity of the conditional as a whole, and hence to the necessity of the consequent. Chrysippus is represented as being in dispute on this matter with Diodorus. Hence Diodorus, we may suppose, has no trouble with the argument (indeed may be the author of it). Obviously there is no difficulty in supposing that Diodorus accepts the necessity of the antecedent of (F): that is just the necessity of the past, which Diodorus commits himself to in premiss (1) of the Master Argument. But in what sense does *Cicero* think

[7] And indeed *connects* with the Diodorean definition of the possible: *De Fato* 17. Cf. McKirahan 'DPM', p.245.

[8] Cf. Sedley, 'Diodorus Cronus and Hellenistic Philosophy', p.99, p.116 n.140; *pace* Frede, *Seeschlacht*, pp.99–107, who fails to distinguish satisfactorily between the necessitarianism implicit in the Argument (keyed to temporally definite expressions) and the temporal conception of the modalities (keyed to temporally indefinite sentences) which the Argument sought to yield, and accordingly ascribes both to Diodorus' intentions in framing the Argument.

[9] The following reconstruction of the argument at *De Fato* 12f follows White's 'Facets of Megarian Fatalism' closely. But I diverge from him in my analysis of the upshot.

Diodorus accepts the necessity of the past? Although Cicero is aware of Diodorus' definition of the possible, he shows no explicit sign of knowledge of the Diodorean definition of necessity as the dual of possibility (in this sense) as reported by Boethius. He reports the necessity of the past as a principle which both Diodorus and Chrysippus accept. In what sense, then, does Chrysippus adhere to the necessity of the past? The crucial words are these:

> Omnia enim vera in praeteritis necessaria sunt, ut Chrysippo placet dissentienti a magistro Cleanthe, quia sunt inmutabilia nec in falsum e vero praeterita possunt convertere.
>
> For all past truths are necessary, as Chrysippus thinks (in disagreement with his teacher Cleanthes), because they are unchangeable, and cannot, as past truths, change from truth to falsity. (*De Fato* 14)

The sense of 'necessary' in question is probably Chrysippus': at any rate, Cicero means to be reporting Chrysippus' view, and his wording is suggestive of at least *part* of the standard Stoic definition of necessity ('that which, being true, is not capable of being false, or which is capable of being false, but is prevented from being false by external circumstances'). But the Stoic definition of necessity *entails* Diodorus' official definition when it is applied to temporally indefinite sentences. So it looks as if, as far as the necessity of the antecedent of (F) goes, the dialectic presupposes Chrysippus' sense of 'necessary', which entails Diodorus' (official) sense. In that way Cicero can hope to generate disagreement between Chrysippus and Diodorus on the basis of premisses which they both accept. If that analysis is correct, what is striking is that Cicero, in spite of his failure to advert explicitly to Diodorus' official definition of 'necessary', implicitly shows awareness of it.

Let us now consider the necessity of the conditional (F) itself. Again, if Cicero is to generate a debate between Chrysippus and Diodorus it is requisite that both parties subscribe to the necessity of (F). In what sense would each accept the necessity of (F)? Presumably, again, each would accept it in his own sense of 'necessary'. I have suggested that Chrysippus' definition of a sound conditional is plausibly to be identified with Sextus' third definition, *συνάρτησις*, which entails Diodorus' definition. Hence the dialectical position we observed in the case of the antecedent of (F) is reproduced in the case of (F) itself: both parties can regard (F) as sound – that is, necessary – and each party is entitled to interpret this soundness according to his own favoured definition. Since Chrysippus' definition entails Diodorus' definition, it is sufficient for the achievement of agreement on this premiss of the argument – the necessity of (F) itself – that (F) be sound according to Chrysippus' definition. Cicero can then hope to embarrass Chrysippus with his refusal to accept the necessity of the consequent of (F), in contrast to Diodorus' acceptance of it. Chrysippus, of course, rejects the claim, implicit in Cicero's strategy, that predictions should be regimented as conditionals like (F); rather, he proposes to understand them as negated conjunctions (*material* implications).

The issue I wish to address here is this: why is the consequent of (F) negative? It is striking that if we interpret the necessities of the conditional and of its antecedent as Diodorean necessities, then, as White observes, Cicero's argument only works for Diodorus with a negative sentence such as 'Fabius will not die at sea' as the consequent of the conditional, *not* with a positive sentence such as 'Fabius will die at sea.'[10] For after Fabius' death the sentence 'Fabius will die at sea' ceases to be true, and so becomes false,[11] so that it cannot, in Diodorus' sense, be necessary. Hence, not in Chrysippus' sense either. Is Cicero aware of this purported restriction on the scope of his argument? A cursory glance would suggest that he is, because he initially gives as the conclusion of the argument (acceptable to Diodorus, but which Chrysippus wishes to resist): Whatever is falsely said about the future cannot come to pass (Omne ergo quod falsum dicitur in futuro id fieri non potest, *De Fato* 12). The negative form of this conclusion might suggest that Cicero realises that it cannot be extended to conditionals with positive consequents. But on further inspection we see that this initial modesty evaporates, because Cicero's *general* conclusion is that according to Diodorus whatever will be, must come to be (quidquid futurum sit, id fieri necesse esse). And he gives another example of divination: Apollo's prediction that Cypselus would rule in Corinth. That yields a conditional which Cicero would surely regard as equally well suited to be deployed in his concocted dispute between Diodorus and Chrysippus:

(C) If Apollo predicted that Cypselus would rule in Corinth, then Cypselus will rule in Corinth.

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[10] *Agency and Integrality*, p.203.

[11] The argument presupposes that Diodorus would not have admitted truth-value gaps. The question of Diodorus' attitude to **PB** is not an entirely straightforward one (see #25); but at least in the case of sentences of the form under discussion, I think we can be fairly certain that Diodorus would have regarded them as bivalent.

Consequently, whatever reason (if any) he had for choosing a negative consequent in his original argumentation against Chrysippus, Cicero does not regard his argument as *restricted* to conditionals with negative consequents. But if he meant his argument to work for Diodorus (and, hence, potentially too for Chrysippus) when run in terms of Diodorus' special temporal and extensional sense of 'necessary', surely he should have restricted his conclusion to conditionals with negative consequents.

White tries to rectify the situation for Cicero by appealing to everlasting recurrence (or cyclic time). If we assume that history will repeat itself endlessly (with numerical and not merely qualitative identity between 'counterparts' in 'different' cycles), then we can restore necessity, in Diodorus' sense, to positive sentences such as 'Fabius will die at sea'. The argument advanced by Cicero would then work for both positive and negative consequents.

I have already rejected everlasting recurrence/cyclic time as a surreptitious factor in the Master Argument, so that it would be disappointing if it were needed here to prop up Cicero's understanding of Diodorus. But it is not needed. We observed that Diodorus could not (assuming linear time) accept the necessity, in his sense, of 'Fabius will die at sea'; but we omitted to observe that the *conditional* 'If Fabius was born at the rising of the Dog-star, he will die at sea' would not be true, or necessary (in Diodorus's sense), either. A conditional is necessary in Diodorus' sense if the corresponding material implication is always true. But after Fabius' death the above implication ceases to be true. So the positive consequent does not present Diodorus with a counter-example. For although he would reject the necessity of this consequent, he would also reject the necessity of the conditional. Hence he would not be required to give up the modal principle on the basis of which Cicero reasons. The choice of a negative consequent is still apt, since it yields a conditional which Diodorus *can* accept as necessary, and hence, given the necessity of the antecedent, a conclusion which he (but not Chrysippus) can accept as necessary. But Cicero's tactic need not be regarded as *underhand*. It is not that conditionals with positive consequents provide a counterexample to Diodorus too (and so undermine his purported attempt to corner Chrysippus), and that Cicero conveniently obscures this fact by serving up a negative consequent; rather, they simply do not provide a useful way of engaging Diodorus and Chrysippus in debate, because they do not provide premisses which the

parties can accept as true, and so necessary. In particular, Diodorus cannot accept the necessity (in his special sense) of 'If Fabius was born at the rising of the Dog-star, he will die at sea'. And so, given that the Chrysippean necessity of a conditional entails its Diodorean necessity, if Diodorus cannot accept the necessity of (F), Chrysippus cannot do so either.

Is now the fact that Cicero's *particular* example requires a negative consequent for the argument between Diodorus and Chrysippus to get going an adventitious feature of it? It would seem not. A moment's reflection shows that if we tried to construct examples of suitable conditionals with positive consequents which were necessary in Diodorus' sense we would have to adduce consequents which were *independently* necessary, because their subject-matter would have to be eternally recurring events and processes. For example, the conditional 'If the sun has ever risen, it will rise tomorrow' constitutes material for the argument to run on, since both the antecedent and the conditional as a whole are necessary (in Diodorus' sense). So if we apply the modal principle, the consequent is rendered necessary too; but this is hardly to the point in the debate between Diodorus and Chrysippus, because (waiving the fact that the conditional does not relate to divination) the consequent of this conditional is acknowledged on all sides to be necessary *anyway*. We will not achieve, by this tactic, an inference which will satisfy Diodorus but embarrass Chrysippus. Obviously, an argument for determinism needs to deliver purported necessities whose necessary status is under challenge from the opposition. Fabius' dying at sea is good material here, because it seems to involve Fabius' own choice (whether or not to sail, etc.); the sun's rising tomorrow is not. It is surely clear that *any* conditional with a positive consequent is going to replicate this feature of the example: if the conditional is itself necessary, the consequent will be necessary *anyway*, since no contingent event is eternally recurring (unless, that is, we appeal to the doctrine of everlasting recurrence or cyclic time). Conditionals with positive consequents whose subject matter is contingent, on the other hand, will be useless for Cicero's purpose, because Diodorus will not accept the necessity (in his sense) of such conditionals (and hence Chrysippus will not do so either). So there will be no prospect of a conflict between Diodorus and Chrysippus on the basis of such conditionals.

This is a convenient point at which to say something more about Chrysippus' treatment of sound conditionals, and redeem the promise

I made in #23. Cicero makes a mistake in supposing that (C) would be as good a conditional as (F) for getting a debate going between Diodorus and Chrysippus on the necessity of the consequents of such conditionals. In fact, as I have just shown, both Diodorus and Chrysippus would reject the soundness of (C). That Chrysippus would reject its soundness follows from the fact that Diodorus would reject it (given that Chrysippus' definition of a sound conditional entails Diodorus' definition), *and* the fact that Chrysippus would not be entitled to regard the consequent of (C) as liable to destruction after Cypselus' death, given his (we may presume) descriptivist approach to the semantics of proper names. But now consider

(C)′ If Apollo predicted that Cypselus would rule in Corinth, then this man will rule in Corinth

uttered while demonstrating Cypselus. If Mignucci were right that Chrysippus construed sound conditionals as '$\neg M \neg [p \rightarrow q]$', where '$\neg M \neg p$' is not taken to imply 'Lp', Chrysippus would have to regard (C)′ as true even if Apollo predicted that Cypselus would rule in Corinth and Cypselus never rules in Corinth – an embarrassing upshot indeed.[12]

This arises for the following reason. Suppose we allow 'p' to stand in for the antecedent of (C)′, and 'q' for the consequent. We have:

$$\neg M \neg [p \rightarrow q] \equiv \neg M [p \,\&\, \neg q].$$

Since 'p' is true and past, it is necessary, so '$\neg M \neg [p \rightarrow q]$' requires the truth of '$\neg M \neg q$'.[13] But this says that it is impossible that 'This man will rule in Corinth' is false. Since that sentence means 'There will be a time at which this man rules in Corinth', the impossibility of the falsehood of this sentence is equivalent to the impossibility that 'This man

[12] This difficulty is raised by Mignucci himself ('Sur la Logique Modale des Stoïciens'); he seems to suppose, however (p.340), that the problem confronts (C) and not merely (C)′, on the ground that 'Cypselus' is a 'logically proper name'. But that conflicts with his treatment of the Dion case, and his suggestion in that context that Chrysippus was a descriptivist about names.

[13] On Mignucci's interpretation of Chrysippus, although

$$\neg M \neg [p \rightarrow q] \rightarrow [Lp \rightarrow Lq]$$

is not valid,

$$\neg M \neg [p \rightarrow q] \rightarrow [Lp \rightarrow \neg M \neg q]$$

is valid.

rules in Corinth' should be *always* false. But now, given that the consequent is destroyed afer Cypselus' death, '$\neg M [p \,\&\, \neg q]$' will be verified even if Cypselus never rules in Corinth. For if 'q' is destroyed, then it is impossible that it should be always false. (Mignucci's proposal requires us to operate with choice negation.) Hence Chrysippus would have to regard (C)′ as true even if Cypselus never rules in Corinth. (C), on the other hand, would be verified if and only if Cypselus rules at some time in Corinth. To compound the embarrassment, Chrysippus would have to make a sharp distinction between conditionals with positive consequents and ones with negative consequents, for

(C)″ If Apollo predicted that Cypselus would not rule in Corinth, then this man will not rule in Corinth

(said while demonstrating Cypselus) is verified if and only if Cypselus does indeed not rule in Corinth. Since the antecedent is necessary, (C)″ is true, on the approach we are considering, if and only if it is impossible that the consequent be always false. The consequent is implicitly universally quantified: it is equivalent to 'This man will never rule in Corinth'. The impossibility that this sentence should be false is tantamount to the impossibility that Cypselus should rule in Corinth.[14]

The embarrassments can be avoided if we reject the proposed interpretation of Chrysippean conditionals. Instead of construing these as having the form '$\neg M \neg [p \rightarrow q]$', in combination with a rejection of L–M duality, we should construe them as having the form '$L [p \rightarrow q]$', with the full duality of 'L' and 'M' in place. A conditional is sound, on Chrysippus' view, if and only if the antecedent is incompatible with the negation of the consequent, i.e. if and only if the antecedent and the negation of the consequent cannot both be true. On that approach Chrysippus can adopt a unified and satisfying stance towards all three conditionals (C), (C)′ and (C)″. In each case the conditional is verified, assuming the truth of divination and of the antecedent, if and only if the consequent is verified.

But is the consequent of each of these conditionals (on the given assumptions) verified? In particular, what are we to say of (C) after Cypselus' reign? There are two options. We could say that the conditional continues to be verified, because Cypselus ruled in Corinth (that

[14] Cf. Mignucci, 'Sur la Logique Modale des Stoïciens', pp.340–1.

is a necessary condition of the verification of (C)), and treat the linguistic items forming the subject-matter of the conditionals as, in modern terms, propositions or Fregean thoughts. (C), uttered before Cypselus' rule, will then express the same proposition as

(C)‴ If Apollo predicted that Cypselus would rule in Corinth, then Cypselus did rule in Corinth

uttered after his rule, and since (C)‴ is verified, (C) is verified too. This approach attaches truth to propositions rather than sentences. Alternatively, if we insist on attaching truth to sentences, we must say that 'Cypselus will rule in Corinth' ceases to be true – and so (given that it is not destroyed, and given also unrestricted **PB**, subscribed to by Chrysippus) becomes false (i.e. its negation becomes true) – after Cypselus has ceased ruling. In that case (C) is not verified according to the Chrysippean account of a sound conditional. But (C)′ is verified, because its consequent, and the negation of that consequent, are both destroyed after Cyselus' death, so that there is never a time when the antecedent and the negation of the consequent are both true. (We have to assume here that Cypselus' life/reign has no last instant.) Further, the conditional we used in #16, namely

(AC) If Apollo predicted that Cypselus would not rule in Corinth, then Cypselus will not rule in Corinth

and its congener (C)″ are also verified, because the consequents are in each case negative.

Since we have Alexander's report of a Stoic construal of 'necessary' as 'always true', applied to temporally indefinite sentences,[15] and since it was in general the policy of ancient logicians, including the Stoics, to evaluate sentences rather than propositions for truth, we should prefer the second of these two options.[16] That is the policy which I have been

[15] *De Fato* 177.8ff. I have commented on this passage in detail in my article 'Alexander's Sea Battle: a Discussion of Alexander of Aphrodisias *De Fato* 10'.

[16] The Stoics believed that truth-bearers can change their truth-values (the so-called *μεταπίπτοντες*): Frede, *Die Stoische Logik*, pp.44–48. Hence they cannot have identified those truth-bearers with temporally definite expressions. Strictly speaking, the Stoics located truth not in the sentence itself, but in its meaning (Sextus, *AM* 8.11–12). But the meaning of a sentence cannot be identified with any temporally definite expression (it is the Kaplanian character of a sentence rather than the Fregean sense), so it will not falsify matters if, for present purposes, we proceed on the basis that the Stoic truth-bearers were (in terms of my categorisation) temporally indefinite sentences. Note that since the Stoics regarded some sentences containing demonstrative expressions as destroyed on the demise of the referent, the referents of expressions must be taken account of in sentence-individuation: Frede, pp.48–9; Vuillemin, *NC*, p.135. 'This man is dead', with the reference fixed to Dion, is a different sentence (though the same qualitative pattern of ink-marks) from 'This man is dead', with the reference fixed to Socrates (cf. #1 n.8). Otherwise the sentence would not be destroyed on the demise of any particular referent, but would be continuously available for use regardless of the comings and goings of particular men. That is, of course, how *we* individuate sentences, but it is not how the Stoics did so.

following. In that case we must confirm our earlier judgment that Cicero has erred in (implicitly) including (C) in his discussion, and that his stress on (F), with its negative consequent, is by no means adventitious.[17] Chrysippus, like Diodorus, must regard (C) as an unsound conditional, even if Cypselus rules in Corinth. (AC), on the other hand, escapes the difficulty attaching to (C), and can count as a sound conditional on both logicians' criteria.

We have seen that Cicero implicitly draws on Diodorus' official definition of 'necessary', because he draws on Chrysippus', which entails it; and we have seen that he also draws on Diodorus' conception of a sound conditional because, again, his framework presupposes Chrysippus' conception, which entails Diodorus' conception. In this latter case Cicero fails to notice a restriction on the scope of his argument. He concentrates on an astrological conditional with a negative consequent (perhaps drawing on a tradition which was more clear-sighted than he) without registering the fact that his argument will *only* run on such conditionals. As far as the Master Argument is concerned, Cicero's discussion indicates that he was at least implicitly aware of Diodorus' official definition of necessity, even if he only explicitly mentions the official definition of possibility. But the only conception of necessity which Cicero explicitly ascribes to Diodorus is the non-Diodorean one (unpreventability). That conception of necessity can be derived, as we have observed, from the presence in the Master Argument of (on Hintikka's or my reconstruction) the assumption that modality is relative to

[17] *Pace* Theiler, in whose judgment ('Tacitus und die antike Schicksalslehre', in his *Forschungen zum Neuplatonismus* (Berlin/ New York, 1966), 46–103, p.53) Cicero 'hätte jede andere so formulierte Weissagung aufgreifen können' (with 'so formuliert' understood sufficiently generously to embrace Plutarch's '*ὧι ἐν θαλάσσηι πεπρωμένον ἐστὶν ἀποθανεῖν, πῶς ἄμ' οἷόν τε τοῦτον ἐπιδεκτικὸν εἶναι τοῦ ἐν γῆι ἀποθανεῖν;*' *De Stoic Rep* 1055e–f).

the facts, or (on Prior's reconstruction in Barreau's version) the necessity of the past in the context of unrestricted **PB**. The antinomy in the Master Argument between the Diodorean and the necessitarian conceptions of necessity is preserved, and hence evidenced, in Cicero's discussion of Diodorus in *De Fato*.

25 Diodorus and Aristotle

I turn finally to the relationship of the Master Argument with *DI* 9. Sorabji has suggested that it is, for reasons of intellectual economy, attractive to rule out the possibility that neither Aristotle's argument against the fatalist nor the Master Argument was a response to the other.[1] At the very least, it has heuristic value to make the assumption that one is a response to the other, and try to discover which way round makes better historical and logical sense. Now it has been made very likely by Sedley,[2] on the basis of historical considerations, that Diodorus was a younger contemporary of Aristotle's than had previously been supposed, and hence that if we respect Sorabji's constraint, we should conclude that the Master Argument was probably a response to Aristotle.

Purely logical considerations certainly make it unlikely that *DI* 9 was intended as a response to Diodorus. For one thing, it would be difficult to construe Aristotle's fatalist as arguing along Diodorean lines.[3] The fatalist argues that if it is true (at a time) that *Fp*, then it is necessary (at that time) that *Fp*. Interpreting 'necessary' in a Diodorean way yields an argument to the effect that if it is true (at a time) that *Fp*, then it is (at that time) and will *always* (thereafter) be the case that *Fp*. But this principle is obviously false, given that '*p*' is temporally indefinite (and given that we are not treating time as cyclic or events as eternally recurrent). Of course if the argument is run on temporally definite expressions, or if time is cyclic, or events eternally recurrent, it regains plausibility. In the former case it reads: if 'p_{t_1}' will be true, where t_1 is later than now, then it is and will always be the case that p_{t_1}. But I have argued that however Diodorus' Master Argument was subsequently applied, it was not in the first instance intended to apply to temporally definite expressions. In any case, the fatalist's argument, run on temporally definite expressions under a Diodorean interpretation of the modalities, is of no threat to contingency. Aristotle's argument is directed against a

[1] *NCB*, p.106.
[2] 'Diodorus Cronus and Hellenistic Philosophy'.
[3] See here White, 'Facets of Megarian Fatalism', pp. 195–202.

position which makes use of a non-Diodorean conception of necessity (inevitability at a time), and which concerns temporally definite expressions. Although I have allowed that the Master Argument contains both these elements, the conclusion of the argument is meant to yield Diodorean modality and be run on temporally indefinite sentences. So it seems unlikely that Aristotle intended *DI* 9 as a direct counter to the Master Argument.[4]

But if the Master Argument is a response to Aristotle, rather than *vice versa*, what sort of response is it? We have seen that both premisses (1) and (2) can be extracted from Aristotle's own writings. But he cannot accept the Diodorean conclusion, for that states that all possibilities are at some time realised, which cannot cohere with the possibility, but not necessity, that there will be a sea battle tomorrow. For if a sea battle tomorrow and no sea battle tomorrow are both possible (as on Aristotle's view they are), one of these possibilities must remain unrealised. It has been suggested that the purpose of the Master Argument was to subvert Aristotelian possibilism from the inside, using premisses which Aristotle could not have reciled from.[5] But I have argued that it is unlikely that Diodorus himself intended his Argument to run on temporally definite expressions, or that he noticed its implicit commitment to necessitarianism. So it is most likely that neither the Master Argument nor *DI* 9 was directly conceived in opposition to the other, and hence that Sorabji's proposed constraint should be rejected. Still, it is interesting to speculate how the conclusion of the Master Argument could be resisted by Aristotle, since he rejects the Principle of Plenitude, even as applied to temporally indefinite sentences (except in a restricted domain: #7).

Given that Aristotle would have accepted the first two premisses of

[4] Interpreters who have argued that *DI* 9 is a response to the Master Argument include Maier ('Die Echtheit der ar. Hermeneutik', p.29ff); Schuhl, *Le Dominateur et les Possibles*, p.31ff; von Fritz (in his review of Schuhl, *Gnomon* 34, 1962, 138–52, p.147); Magris ('Aristotele e i Megarici', pp.127–8); Vuillemin, *NC*, ch.6. Frede gives the view a sympathetic hearing, *Seeschlacht*, pp.107–8. These critics fail properly to distinguish the conclusion of the Master Argument (the Diodorean definitions of the modalities) from the necessitarianism which Cicero ascribes to Diodorus.

[5] Magris, 'Aristotele e i Megarici', p.126ff; Frede, *Seeschlacht*, p.93; further references at Weidemann, 'DSM', p.48 n.73). This approach to the Master Argument gives us a further argument against Zeller's reconstruction, for Aristotle would not have accepted premiss (2) read in a temporal way: Frede, *Seeschlacht*, p.96. Maier ('Die Echtheit', pp.30–4) takes *Met* 1047b8–9 to be an expression of Aristotelian possibilism. But see #7 n.72 above.

the Argument, how could he have avoided the conclusion? Here we must make a distinction between two ways in which premiss (3) can be read. Aristotle could in fact have presented Diodorus with a dilemma. Either Diodorus wants the '$\neg p$ & $\neg Fp$' conjunct in premiss (3) to be (assumed to be) *true*, in which case since, for Aristotle, **PB** does not apply to **FCS**s, Diodorus must relinquish the other conjunct, the contingency of 'p'; or, if he wishes to retain the contingency of 'p', he must at least not assume the truth (falsity) of '$\neg p$ & $\neg Fp$'.[6] If Diodorus selects the first horn, Aristotle simply agrees with him in rejecting premiss (3) on the basis of premisses (1) and (2). But Aristotle's agreement with Diodorus on this point would not constitute an embarrassment to him, because it is not part of Aristotle's position that the contingency of 'p' can consist with the truth of '$\neg p$ & $\neg Fp$'. Quite the contrary. Far from damaging him, the rejection of premiss (3), so construed, simply articulates an authentic Aristotelian position.[7]

[6] Cf. Seel, 'Diodore domine-t-il-Aristote?' pp.308–11. Seel's statement of the dilemma is vitiated by involvement of a distinction between different temporal possibilities of realisation of a possibility: at any time (past, present or future)/at any future time/at a precise instant of the future. But this distinction is irrelevant here. The dilemma is not between

(1) The possibility of 'p' combined with the truth now of '$\neg p$ & $\neg Fp$'

and

(2) The possibility of 'p_{t_1}' (t_1 > now) combined with the truth, at t_1, of '$\neg p$'

(so Seel, p.311), but, quite generally, between

(3) The contingency of 'p' (or 'p_{t_1}') combined with the truth now of '$\neg p$ & $\neg Fp$' (or 'p_{t_1}')

and

(4) The contingency of 'p' combined with the *lack* of truth (falsity) now of '$\neg p$ & $\neg Fp$' (or 'p_{t_1}'). 'p' may turn out, at a later time (such as t_1) to be true (false); but that is irrelevant.

[7] See here Seel, 'Diodore domine-t-il Aristote?', p.308: 'Nous ne connaissons aucun endroit, où Aristote assigne la possibilité d'avoir lieu à un instant précis de l'avenir à des événements, dont on sait auparavant qu'ils n'auront pas lieu à cet instant.' Seel makes the suggestion (pp.312–3) that Diodorus might nevertheless have sought to correct Aristotle's mistake at *DI* 19a12–14, where Aristotle does indeed seem to permit the truth of '$\neg p$ & $\neg Fp$' to consist with the possibility of the future realisation of 'p' (cf. #7). The suggestion is certainly intriguing, and not implausible as far as it goes. I cannot accept Seel's further suggestion (ibid.) that *Met* 1047b3–6 represents Aristotle's response to Diodorus, in effect agreeing with Diodorus' critique of his earlier position in *DI* 9; firstly because the chronology which the suggestion relies on presupposes a dating of Diodorus' activities which Sedley has cast doubt on, and secondly because the interpretation of *Met* 1047b3–6 is implausible (#7 Further Remarks).

The Master Argument in Diodorus' hands goes further than merely rejecting premiss (3) on the basis of premisses (1) and (2): it also seeks to derive the Principle of Plenitude. But if the truth of '$\neg p$ & $\neg Fp$' is part of the *content* of premiss (3), the Argument to that Principle cannot, in the eyes of an Aristotelian, be completed. Aristotle can indeed accept

$$T[\neg p \,\&\, \neg Fp] \rightarrow \neg Mp$$

with its contrapositive

$$Mp \rightarrow [\neg T \neg p \vee \neg T \neg Fp]$$

but not

$$[\neg Tp \,\&\, \neg TFp] \rightarrow \neg Mp$$

with its contrapositive

$$Mp \rightarrow [Tp \vee TFp].$$

'$T\neg p$' is not, in general, equivalent to '$\neg Tp$': in particular, '$T\neg Fp$' is not equivalent to '$\neg TFp$'. The former of each pair entails the latter, but not *vice versa*. Expressed in these terms, '$Mp \rightarrow [Tp \vee TFp]$' is the Principle of Plenitude, but the most that Aristotle would be willing to accept – and the most the Argument will yield if Diodorus explicitly assumes the truth of '$[\neg p \,\&\, \neg Fp]$' in premiss (3) – is the harmless '$Mp \rightarrow [\neg T \neg p \vee \neg T \neg Fp]$'.

Suppose, then, that Diodorus opts for the second horn of the dilemma. Here too the Argument cannot be completed. For if 'p' is genuinely contingent, it follows, for Aristotle, that 'Fp' and '$\neg Fp$' are both neither true nor false, so that

$$[\neg p \,\&\, \neg Fp] \rightarrow \neg Mp$$

and its contrapositive

$$Mp \rightarrow [p \vee Fp]$$

are both non-tautologous, since in the case of the former implication the antecedent, and in the case of the latter implication the consequent, is neuter, so that the former implication takes a neuter value when its consequent is false, and the latter implication when its antecedent is true. Hence, if Diodorus selects the second horn of the dilemma, Aristotle can avoid Diodorus' proof by objecting to the move *via* the rule of

Conditional Proof from line (7) in my reconstruction to line (8). That is, if we let 'Δ' stand for premisses (1) and (2), Aristotle would object to the move from

$$\Delta, \forall t \geq t_0\, [\neg p_t] \vdash \neg \exists t [Q_{t_0} p_t]$$

to

$$\Delta \vdash \forall t \geq t_0\, [\neg p_t] \rightarrow \neg \exists t [Q_{t_0} p_t]$$

or, in Priorean notation, from

$$\Delta, \neg p \,\&\, \neg Fp \vdash \neg Qp$$

to

$$\Delta \vdash [\neg p \,\&\, \neg Fp] \rightarrow \neg Qp.$$

Hence we cannot get to

$$\Delta \vdash [\neg p \,\&\, \neg Fp] \rightarrow \neg Mp$$

and thence to the Principle of Plenitude

$$\Delta \vdash Mp \rightarrow [p \vee Fp].$$

As we have seen (#8), the rule of Conditional Proof cannot be accorded unrestricted validity in trivalent logic. From the assumption of '$\neg p$ & $\neg Fp$' it does of course follow for Aristotle that $\neg Mp$. That is because the assumption of '$\neg p$ & $\neg Fp$' is the assumption that '$\neg p$ & $\neg Fp$' is *true*. And *that* assumption leads directly (on Aristotle's view, in agreement with the fatalist) to the necessity of the assumed truth. So, on either horn of the dilemma, the proof can, as far as Aristotle is concerned, go to its penultimate stage; but it cannot, in the context of a trivalent logic, deliver the *coup de grâce* and arrive at the Principle of Plenitude.[8]

We are now in a position to see that an objection which is sometimes brought against Prior is not compelling. This is the objection that his reconstruction presupposes **PB** in the teeth of *DI* 9.[9] The plain fact is, however, that *any* reconstruction which renders the Master Argument a valid argument to the conclusion which Diodorus wanted (the Prin-

[8] Cf. Vuillemin, *NC*, p.171.
[9] See, e.g., Sorabji, *NCB*, p.107.

ciple of Plenitude) must presuppose unrestricted **PB**. Prior does so in his extra premiss (5), or, in Barreau's version, in the application of the new version of premiss (4). Hintikka's reconstruction does so in its assumption of

$$Fnp \rightarrow F(n + m)Pmp$$

and of

$$F(n + m)\neg MPmp \rightarrow \neg MF(n + m)Pmp$$

(or by explicit involvement of the *T*-operator, as in White's version: #17). My reconstruction presupposes **PB** in applying the rule of Conditional Proof at its penultimate stage. That any viable reconstruction of the Master Argument must presuppose **PB** is clear *a priori*. For either, on the first horn of the above dilemma, a reconstruction must build the truth of '$\neg p$ & $\neg Fp$' into the explicit content of premiss (3), thereby closing off the possibility that '$\neg Fp$' might be neither true nor false (even so, as we have seen, the Argument cannot be completed); or, on the second horn, no assumptions are made about the truth-value of '$\neg p$ & $\neg Fp$', in which case the reconstruction will be obliged to make the same final move as mine under the rule of Conditional Proof, and so will have to presuppose **PB** at least at that point, if not before. Since **PB** is vital to the argument, why is reference to it suppressed in Epictetus' report? The most plausible answer is that since the Master Argument has come down to us through Stoic hands, and since the Stoics subscribed to **PB**, they simply did not bother to include **PB** among the Argument's explicit premisses, if indeed they noticed its presence. Their challenges landed elsewhere.[10]

In #18 I raised the objection that Prior's proof equivocates on premiss (1), gaining plausibility for that premiss as an expression of the unalterability of the genuine past, but actually employing it more loosely, allowing past-tensed statements to concern the future. For his

[10] Sedley, 'Diodorus Cronus and Hellenistic Philosophy', p.98. Sedley suggests that **PB** was an explicit premiss in the Mower Argument, which is treated by Lucian as a companion-piece to the Master Argument (*Vita Auct* 22 = *SVF* 2.287 = LS 37L). But, strictly speaking, only **LEM** is explicit in this argument; **PB**, which is indeed presupposed to the argument, remains implicit. (Equivalently: the Mower Argument assumes that the 'or' in 'Either you will mow or not' is truth-functional.) See Appendix 2.

proof allowed a crucial substitution of '*Fp*' for '*p*' into this premiss, so that although the premiss was paraded in the innocent-looking form

$$Pp \rightarrow \neg M\neg Pp$$

it was subsequently employed in the very far from innocent form

$$P\neg Fp \rightarrow \neg M\neg P\neg Fp.$$

In a trivalent logic, this formula is neuter for contingent '*p*', since its antecedent is neuter and its consequent false. I argued, against Ockham, that the equivocation on premiss (1) is of a piece with the assumption of unrestricted **PB** in the sense that no one who allowed either could (given a certain plausible view of what the necessity of the past amounts to) reasonably object to the other. Conversely an objection to one would (given the same proviso) amount *eo ipso* to an objection to the other. In the light of our subsequent discussion we now have another angle on this equivalence between the way Prior's reconstruction applies premiss (1) and his assumption of unrestricted **PB**. For no one who proposes, as I have done, a reconstruction of the Master Argument which appeals to the concept of modality relative to the facts could object to the way Prior's reconstruction employs premiss (1). What Prior requires is the premiss in unrestricted form, so as to permit the substitution-instance

$$PFp \rightarrow LPFp.$$

But, given that *any* reconstruction must presuppose **PB**, this premiss could not be objected to by anyone who takes on board relative necessity. For the premiss simply records one instance of that necessity. So, at least as far as his employment of premiss (1) goes, Prior's reconstruction is on the same footing as mine (and Hintikka's).

Still, it is a significant fact that Prior's reconstruction, evading the Ockham-inspired objection, in effect prays in aid relative necessity. That surprising result obviates a potential line of objection to my reconstruction. It now looks as if *any* plausible reconstruction will have to draw not only on **PB**, but also on relative necessity, either directly (my reconstruction) or indirectly (in Prior's reconstruction, in the justification of the transfer of necessity from the past to the future; in Hintikka's reconstruction, in the justification of '$F(n + m)\neg MPmp \rightarrow \neg MF(n + m)Pmp$'). Aristotle, as I have argued, accepts relative neces-

sity, so that his central objection to the reconstructions offered by Prior and Hintikka, and to my own reconstruction, remains their reliance on **PB**.

As between Prior's reconstruction (in Barreau's version), Hintikka's reconstruction, and my own, there now seems little to choose. It is true that Prior still requires his extra premiss (4), but although that premiss is not metaphysically inert I do not think we can seriously object to it as historically implausible. (Furthermore, we have ancient testimony to the prevalence of the principle captured in that premiss.) My reconstruction makes no explicit use of any extra *premisses*, but it could be said to employ an extra *principle* in the way premiss (2) is applied (namely, modality relative to the facts): again, that principle has excellent historical credentials. Hintikka's reconstruction draws on this principle, as well as on a truth-value link (in the form '$Fnp \rightarrow F(n + m)Pmp$') which assumes no more than the endlessness of the future and **PB**. All three reconstructions conform to **PC** and breach **CC**. It seems to me then that these reconstructions are, as one might put it, metaphysically equivalent. The important insight here is that Prior's deployment of premiss (1) in effect incorporates modality relative to the facts, which is a key principle deployed in my reconstruction and in Hintikka's. The underlying equivalence of these superficially different approaches may perhaps permit a certain confidence that what they have in common – the fatalist's inference from truth to necessity – is indeed the fundamental mechanism of the Master Argument. That inference was accepted by Aristotle, but perhaps, as I speculated in #23, in Cleanthes' response we have an early rejection of the general validity of this inference, possibly combined with acceptance of it in the special case of the past, a position later defended by Cicero[11] and by Ockham.

The impression is sometimes conveyed by writers in this field that a successful reconstruction of the Master Argument would render it both valid and non-question-begging as against Aristotle. But the trick cannot be brought off. The refutation of fatalism in *DI* 9 in effect imported, as Ockham recognised, a third truth value. That fact might inspire the thought that Aristotle must be responding to Diodorus rather than *vice versa*: Diodorus publishes a proof which, rather subtly, presupposes unrestricted **PB**; Aristotle rebuts fatalism by restricting

[11] Cf. Barreau, 'Cléanthe et Chrysippe', p.38.

PB, thereby circumventing Diodorus' argument. But this suggestion is implausible. We have seen that *DI* 9 cannot be construed as an attack on Diodorean modality. It could still nevertheless perhaps be construed as an attack on the assumption of **PB** in the Master Argument itself. But that too strains credulity. *DI* 9 is directed against the fatalist, not the Principle of Plenitude. To take Aristotle's restriction of **PB** in a polemic against the fatalist as additionally constituting a side-swipe at Diodorus has no textual warrant. The suggestion is in another way too sophisticated, because it carries the tacit presupposition that, had Aristotle's argument antedated the Master Argument, Diodorus would not have presented his argument in a form which presupposed the now discredited **PB**.[12] But the history of philosophy, though in part about proofs, does not itself have the form of a proof: inconsistency and oversight abound. So it is better to say this: in order to solve a problem about future contingency which arises in the context of relative necessity, Aristotle proposed a fundamental alteration in the the logic of our language. Diodorus (and who can blame him?) had not adjusted to this extra-ordinary stroke; or perhaps, like the Stoics, he considered it but rejected it.[13]

I suggested above (#9) that the Megarian thesis which Aristotle attacks in *Met* Θ.3 was that if, at any time, it is possible that p_t, then 'p' obtains at t and ever after. If we are confident that the likely chronology is that the Master Argument postdated the bulk of Arisototle's philosophical activity, perhaps it would not be implausible to see the Argument as representing a retreat to a weaker position than that defended by the earlier Megarians. Instead of indentifying the possible with what is *and* will be true, Diodorus now merely identifies it with what is *or* will be true.[14] However this may be, Diodorus' attempt to prove that all

[12] This presupposition is exemplified by Frede, *Seeschlacht*, p.108.

[13] That Diodorus did not notice the reliance of the Master Argument on **PB**, rather than that he did and perhaps even defended it, is rendered plausible by the fact that he invented the Horned Argument, which precisely serves to call **PB** in question (although in a context which has nothing to do with the metaphysics of the future). See here Sedley, 'Diodorus Cronus and Hellenistic Philosophy', p.102. And note that the Liar was invented by Diodorus' teacher Eubulides (DL 2.108 = fr.64 Döring).

[14] So Ross, Commentary on *Met* Θ.3, vol.2 p.244. Hence, on balance, I favour the chronology: *Met* Θ.3–4 – *DI* 9 – Master Argument. Sainati supports: *DI* 9 – Master Argument – *Met* Θ.3–4 (*Storia dell' organon aristotelico*, pp.240–246); but his argument involves a misinterpretation of the beginning of *Met* Θ.4 as accepting the conclusion of the Master Argument (cf. #7 Further Remarks).

possibilities will in time be realised still presumes that no one will question the Principle of Bivalence. Aristotle meanwhile has dared to do just that.

Appendix 1: Some Arabic and Medieval Interpretations of *DI* 9

Al-Farabi: Commentary and Short Treatise on De Interpretatione[1]

In both the *Commentary* and the *Treatise*, al-Farabi uses the language of *distribution* of truth-values within an antiphasis, claiming that truth and falsity are not definitely distributed within a **FCA**;[2] but he rejects the interpretation of Aristotle according to which the members are neither true nor false, i.e. truth and falsity are not distributed at all: for he identifies the failure of distribution of truth-values within a **FCA** with both members taking the value true, or both taking the value false (85, Zimmermann, p.79); and of course he rejects both of these options. Al-Farabi's adherence to **C** emerges more clearly in the *Treatise*, for example in the following passage:

> Often enough, it is known that this particular contradictory [of an antiphasis concerning necessary matters or the present or past] is the true one and that particular one is the false one. But in many cases it is not known whether this particular one is the true one rather than the other, though if it is just because *we* do not know ⟨which is⟩ the true one, it is still true intrinsically, however little we may know it, and if *we* do not know the false one it is still false intrinsically, however little *we* may know it ⟨for what it is⟩.
>
> By contrast, future matters of possibility – like 'Zayd will go to the market tomorrow' and 'Zayd will not go to the market tomorrow' – are contradictories which, though they do distribute truth and falsity between themselves, do so intrinsically indefinitely. For it is not possible that truth should definitely attach to this particular one of them and falsity to this particular other one in such a way as to make it impossible for the true one to be false and for the false one to be true. But rather, they are deprived of definiteness intrinsically just as much as to our minds. (79, Zimmermann, pp. 244–5)

The contrast drawn between **FCA**s and antiphases concerning necessary, present or past matters requires that it be not metaphysically de-

[1] Zimmermann, *Al-Farabi's Commentary and Short Treatise on Aristotle's De Interpretatione.*
[2] So, rightly, Zimmermann, *Al-Farabi's Commentary and Short Treatise*, pp.lxvii–lxviii.

terminate which member of a **FCA** is true and which false: for that determinateness is precisely what is asserted of antiphases concerning necessary, present or past matters. In view of this, al-Farabi's use of the word 'impossible' in the second paragraph is unfortunate. For the claim that the truth-values are not distributed in a **FCA** in such a way that they *cannot* be distributed contrariwise is a weaker claim than al-Farabi is entitled to make, and putting the point in that way is likely to give encouragement to supporters of **R** (according to which 'definitely' means 'necessarily' and 'indefinitely' means 'non-necessarily'). What he should say is that the truth-values are not so distributed in a **FCA** in such a way that they *are not* distributed contrariwise. However, that this is his position is secured by the contrast drawn between the two types of antiphasis. It is confirmed by a subsequent passage:

> [S]uch contradictories on matters of possibility as we are ignorant of and as are of indefinite truth to our minds never become known or definite to our minds in the sense that *this particular one is true rather than the other*, as long as the matters do not change and actually come to be, thereby ceasing to be possibilities. (80, Zimmermann, p. 245)

Al-Farabi goes on to make the claim, which we also found in Boethius, that the truth and falsity of contradictories about possibilities are 'unknown by nature'.[3] This phrase, as I suggested in my comments on Boethius, must mean 'metaphysically indeterminate'. In the *Commentary*, we have the following gloss on 'unknown by nature':

> It is therefore in the nature of possibilities to be unknown, precisely because they are possibilities. Their very nature prevents them from being known to us. It is not because of an incapacity in our nature to grasp them that we are ignorant of them but because of their incomplete existence. (97, Zimmermann, p. 92)

'Incomplete existence' captures exactly the ontological corrolate of the claim that **FCS**s are either-true-or-false without being either true, or alternatively false. Al-Farabi does indeed offer a realist solution to the problem of future contingency (he rejects the fatalist's inference from antecedent truth to necessity) but he does so *in propria voce* and not as an interpretation of Aristotle (*Commentary*, 99–100, Zimmermann, pp. 94–6).

[3] For al-Farabi's relation in general to the commentators, see Zimmermann, *Al-Farabi's Commentary and Short Treatise*, p.lxxxivff.

Averroes: Middle Commentary on De Interpretatione[4]

Averroes adopts the language of dividing. His exposition recalls that of al-Farabi:

> With matters existing in the present or the past, they must necessarily be divided into truth and falsehood in that one of the two is in itself true and the other false, regardless of whether we know the true one from the false one or not. Thus, it is clear in itself that one of the two sentences about whether Zayd exists now or not is necessarily true and the other false, regardless of whether we have reached the point of distinguishing between what is true and what is false or not, for its existence is definite in itself. It is the same with past things and with necessary matters whose existence has no time stipulation. Matters existing in the future – namely, possible things – do not divide truth and falsehood in a completely definite manner. (28–29, Butterworth, p. 142.)

It is clear from this passage that Averroes regards definite truth as distributed truth. There is a distinct inference from (distributed) truth to necessity, which is worked into the argument at one point (the necessity of the present). But that the inference is indeed just that – that we should not *identify* definite truth with necessity – is clear from Averroes' wording. He goes on to argue that a **FCA** does indeed divide truth and falsity, since otherwise both members would be true, or both false (29), either of which options is absurd (33).

Averroes' Jewish commentator, Levi ben Gershon (Gersonides) follows him closely, arguing that **FCS**s do divide the true from the false (since otherwise both members of a **FCA** would be true or both false), but not *perfecte*.[5] That we have to do with metaphysical indeterminateness emerges from the following passage. Levi has run through the fatalist's argument and concluded that according to it antecedent truth would (absurdly) both cause and be caused by the relevant future contingent events, and that everything would happen of necessity:

> Si ita res se haberet [i.e. in accordance with the fatalist's conclusion], tunc non posset una harum duarum orationum reduci ad actum, nisi quae est vera, quoniam, si posset id fieri [i.e. if *either* of the members could be reduced to actuality], tunc ipsa veritas in altera illorum oppositorum non

[4] Butterworth, *Averroes' Middle Commentaries on Aristotle's Categories and De Interpretatione* (Princeton, 1983).

[5] *Supercommentary on Averroes on Aristotle's De Interpretatione* (Venice, 1552). Kretzmann has translated the relevant portion (Translation Clearing House, Oklahoma, 1980).

> posset habere perfectum esse in se: quod est contra id, quod suppositum fuit [sc. by the fatalist]. Et si non habuerit perfectum esse de se [sc. as is in fact the case], tunc una et eadem res posset indifferenter esse et non esse, et non erit res ita vera vel falsa antequam sit, quemadmodum est dum est ...

Although truth and falsity are divided in a **FCA** they are not completely constituted. That seems to accord with **C**.

Peter Abelard: Introductiones Dialecticae, Editio Super Aristotelem De Interpretatione[6] *and Logica Ingredientibus Part 3*

Abelard commented on *DI* twice. In neither place is his interpretation of ch.9 entirely clear, but the sense can be eked out from his remarks on future contingency in the *Dialectica*.[7] He seems to have followed **R** rather than **AR** or **C**. In the shorter *Editio*, we find the following commentary on *DI* 19a36–19b2:

> 'Necesse est quidem alteram partem contradictionis veram esse vel falsam' sub disiunctione 'non tamen hoc aut illud' determinate, 'sed utrumlibet,' id est indeterminate, et aequivolat in utrumlibet, 'et magis quidem veram alteram, non tamen iam vera⟨m⟩ vel falsam' determinate. 'Quare.' Quandoquidem propositiones singulares et contradictoriae agentes de praesenti habent determinatam veritatem vel falsitatem et etiam sub disiunctione, propositiones vero de futuro contingenti habent veritatem et falsitatem sub disiunctione tantum. (112.38–113.3)

The phrase 'sub disiunctione' might at first blush be taken to introduce non-truth-functionality into the discourse about **FCS**s: otherwise it might seem to be otiose. A **FCS** is either true or false. What could be meant by insisting in addition that it is so 'under disjunction', if not that it is only either-true-or-false? Elsewhere Abelard is clear about the inference from determinate truth to necessity. At 99.36–42 he even appears to equate 'determinate' with 'necessary' in one of its senses; but that a direct equation of senses – as opposed to a mutual entailment – is not Abelard's intention may be deduced from the fact that elsewhere he glosses 'determinate' with 'knowable by us in its own right' ('ex se nobis

[6] In M. dal Pra ed., *Pietro Abelardo: Scritti di Logica* (Florence, 1969), pp.99.12–113.15. This portion is translated by Kretzmann (Translation Clearing House, Oklahoma, 1981).

[7] *Petrus Abelardus Dialectica* ed. de Rijk (Assen, 1956).

cognoscibilis').[8] Given a mutual entailment between determinate truth and necessity, the above distinction between present and future statements is reworked by Abelard with this entailment incorporated into the dialectic:

> Res de praesenti habent determinatam necessitatem et sub disiunctione, res vero de futuro contingenti habent necessitatem tantum sub disiunctione. (113.12–15)

Here what is said is that future contingent actualities are necessary *sub disiunctione*, which must mean that a **FCD** as a whole is necessary, not that the disjuncts are either-necessary-or-impossible. Hence the phrase 'sub disiunctione' does not here introduce non-truth-functionality.[9] That suggests that it may not be meant to do so either in the first quoted passage. In that case, the sense will presumably be that truth and falsity attach to the members of a **FCA** truth-functionally: either this one, or alternatively that one, is true (false). 'True or false under disjunction only' will mean that we cannot go further and attach *determinate* truth/falsity (in Abelard's sense) to the members.

This interpretation receives some confirmation from an examination of Abelard's glosses on *DI* 9 in part 3 of his *Logica Ingredientibus*. Admittedly some of his formulations are ambiguous:

> Alteram partem contradictionis horum subiectorum, quae sunt utrumlibet, necesse est esse veram et rursus alteram necesse est esse falsam. (3.444.20–2)

But Abelard again speaks of *necessity* (not merely truth) attaching to a future contingency 'sub disiunctione' (3.442.12–13 and *passim*). Finally, the position is disambiguated by Abelard's own explicit differentiation of his stance from that of Boethius:

> Notandum vero, quod Boethius ponens in Commento pro necessario 'definite' non videtur nostrae expositioni assentire, nisi forte iam intelligat per 'definite' quod nos per 'necessario', id est 'inevitabiliter' subintelligendum esse supra confirmavimus ex verbis ipsius auctoris. (3.466.30–4)

[8] *Logica Ingredientibus* 3.422.26–40; *Dialectica* 211.5–7, 212.2–7, 14–5.

[9] Note that Abelard uses the more perspicuous phrase 'in disiunctione' at *Logica Ingredientibus* 3.443.4–8: 'Licet necessitas propositioni in disiunctione simul possit applicari hoc modo: esse futurum vel non esse futurum hoc totum necesse est, non tamen disiunctim, id est singillatim, in disiunctione potest singulis applicari, ac si dicamus: vel necesse est esse futurum vel necesse est non esse futurum.'

That Boethius indeed does not intend 'definite' in the sense of 'necessario' was argued in #12. Hence it is likely that Abelard's interpretation is meant to conform to **R** rather than **C**. On his view, the fatalist's inference works only when applied to determinate truth in his sense (i.e. knowable truth). The inference is not trivial, because 'determinate' in this sense does not *mean* 'necessary' (cf. *Logica Ingredientibus* 3.437.35–438.17). That releases simple truth from the threat of the fatalist's inference. As Abelard puts it in the *Dialectica*:

> Sicut autem eventus contingentis futuri indeterminatus est, ita et propositiones quae illos eventus enuntiant indeterminate verae vel falsae dicuntur. Quae enim verae, indeterminatae verae sunt, et quae falsae, indeterminatae falsae sunt secundum indeterminatos ... eventus quos pronuntiant. (211.28–32)

Here indeterminate truth (falsity) figures as a species of truth (falsity): there is no prospect of taking Abelard to respect **C**'s constraint (#12) that a statement is indeterminately true if and only if it is indeterminately false. In a further passage, he blocks any inference from simple truth to determinate truth:

> Si enim ita ⟨est⟩ ut propositio dicit, vera est; si autem non, falsa, sive haec nobis cognita sint sive non. Si enim par sit numerus astrorum, etsi nos nesciamus, non minus propositio vera est quae illud dicit. Similiter etiam in futuro; si enim futurum sit ut propositio dicit, etsi ignoratum nobis sit, vera est propositio; sin autem futurum non sit, falsa est. (213.10–15)

Hence **FCS**s can be simply true, without being necessary, if things will be as they say they will be (213.21–8). The position which Abelard adopts in the *Dialectica* seems, then, to be the same as his interpretation of Aristotle in the commentaries.[10]

Bonaventura: In Sententias[11] *and In Hexaemeron*[12]

In both of these works Bonaventura simply says of Aristotle that he denies that **FCS**s can be true. Hence we may enrol him under **AR/C**.

[10] A number of difficulties remain, in particular Abelard's interpretations of 18b9ff and 18b33ff, but it is unclear whether these difficulties go to my ascription of **R** to Abelard, or to **R** itself as an interpretation of Aristotle.
[11] Mainz, 1515; Boehner, *Tractatus*, p.76.
[12] In *Opera Omnia* (Florence, 1891), vol.5; Boehner, *Tractatus*, p.76.

Albert the Great: Liber 1 Perihermeneias[13]

In his remarks on *DI* 9 in *Tractatus* 5 c.4–7 of this treatise (pp. 418–23), Albert subscribes to **C**. He rejects **AR** on the basis of 18b17–25, but he affirms that necessity follows from the truth of a prediction ('Si ergo erit, tunc de necessitate erit. Si vero non erit, de necessitate non erit'). Hence the language of 'determinate truth', which he employs, is to be construed along the lines of **C** rather than **R**.

Thomas Aquinas: In Peri Hermeneias

Aquinas follows, if more cryptically, the wording of Abelard:

> [D]icit [Aristoteles] quod harum enunciationum, quae sunt de contingentibus, necesse est quod sub disiunctione altera pars contradictionis sit vera vel falsa; non tamen haec vel illa determinate; sed se habet ad utrumlibet. (Lectio XV.4)

But, unlike Abelard, Aquinas seems to follow **C** rather than **R**. For he supposes that Aristotle accepts the fatalist's argument from truth to necessity (XIII.7); that the inference is indeed from *simple* truth and not merely from *determinate* truth emerges from XIII.8, where Aquinas argues for an entailment from simple truth, *via* determinate truth, to necessity:

> Si necesse est quod omnis affirmatio vel negatio in singularibus et futuris sit vera vel falsa, necesse est quod omnis affirmans vel negans determinate dicat verum vel falsum. Ex hoc sequitur quod omne necesse sit esse vel non esse.

Hence there appears to be little scope for an interpretation of Aquinas according to which he follows **R** in allowing the simple truth of a **FCS** to cohere with its contingency.[14] But Aquinas equally rejects the 'neither disjunct true' option (XIII.12). Hence his position conforms to **C**: in the quoted passage the 'sub disiunctione' locution is consequently not applied truth-functionally, as it was by Abelard, but non-truth-functionally.[15]

[13] *Opera omnia* ed. Borgnet (Paris, 1890), vol.1.
[14] *Pace* Boehner, *Tractatus*, p.77.
[15] *Pace* Martin, *The Philosophy of Thomas Aquinas* (London, 1988), p.17, who interprets

John Duns Scotus: Ordinatio 1.d.38 and Lectura 1.d.39

In both of these works Scotus adopts the the language of **C**: 'Secundum Philosophum non est veritas determinata in futuris contingentibus'. But we do not have sufficient evidence to be confident that he locates 'determinate' truth on the side of truth, epistemically, rather than on the side of necessity. He seems to adopt something like the Neoplatonic solution to the problem of divine foreknowledge, but whether he understands God's determinate foreknowledge of indeterminate states of affairs as necessary foreknowledge of the contingent, or as foreknowledge of the metaphysically indeterminate, is unclear.

Pseudo-Scotus: Opus Secundum in Duos Libros Perihermeneias, Quaestiones 7 and 8[16]

On Question 7 ('An propositio de futuro sit determinate vera vel falsa?') the author writes:

> Ad oppositum est Aristoteles, dicens, quod in his quae sunt ad utrumlibet, non magis est oratio vera quam falsa ... (2)

In Question 8 the author draws a distinction between two ways in which a **FCS** may be taken (3). According to the first way, it asserts that the future event is already present in its causes. The author says that taken in this way it is false (4, 6); he takes himself to be following Boethius on this point. According to the second way, a **FCS** is taken simply to assert that things will be a certain way (that the corresponding present-tensed statement will be true). If taken in this second way, the author claims first that the **FCS** is indeterminately true or false, but he then goes on to claim that it is neither true nor false. The relevant passage reads as follows:

Aquinas' remarks in XV.3 on the failure of *necessity* to distribute over disjunctions as representing Aquinas' view of Aristotle's solution. But at that point Aquinas is commenting on *DI* 19a27–32. Since Aristotle's point here is indeed that necessity only applies to a **FCD**, and not to **FCS**s taken *divisim*, Aquinas' elaboration of this point is unsurprising. Richard of Middletown follows Aquinas in reconstruing divine foreknowledge as knowledge in an eternal present, but he nevertheless interprets Aristotle in accordance with **R**: *Super Quattuor Libros Sententiarum* (Brescia, 1591) 1.d.38.q.5.

[16] In *Opera Omnia* ed. L.Wadding (Lyons, 1639), vol.1.

> Si autem propositio de futuro non significat, nisi quodcumque futurum pro quo significat, quod si fuerit praesens, quia tunc erit verum dicere, quoniam illud est, quod nunc enuntiatur futurum [i.e. if the **FCS** is taken in the second way], propositio de futuro est indeterminate vera, vel falsa ... Ideo dicit Aristoteles, quod in illis, quae sunt ad utrumlibet, non magis est affirmatio vera quam negatio. Unde non convenit dividentem dicere definitive quod hoc erit, nec definitive quod hoc non erit; definitive autem dicit hoc fore, quando enuntiat sic esse nunc, ut aliquid habebit esse in futuro. Concluditur igitur ex praedictis, quod propositio singularis de futuro contingenti sumpta hoc secundo modo, sicut et Aristoteles accipit, nec simpliciter est vera, nec falsa, nec est determinate vera nec determinate falsa.

The author seems to use 'determinate' and 'definitive' in line with **C**, that is, not as *meaning* 'necessarily', but as allowing an immediate inference to 'necessarily'. But in spite of this, the author does not seem to favour **C**'s 'either-true-or-false' option. The author here takes a severely anti-realist line on the application of **PB** to **FCS**s taken in the second way: it does not apply.[17]

William of Ockham: Super I Librum Perihermeneias

The following passage shows Ockham adopting a position consonant with **C**. I follow Boehner's text:[18]

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[17] Pseudo-Scotus is followed by Antonius Andreas (*Super Artem Veterem*). Antonius interprets Aristotle as combining acceptance of **LEM** with rejection of determinate truth/falsity for **FCS**s. In the main part of his commentary he uses the familiar '*sub disiunctione*' locution:

> De quolibet affirmatio vel negatio vera, de nullo autem simul, quia licet non de omnibus altera pars sit determinata vera aut falsa, tamen sub disiunctione de quolibet est vera ⟨haec⟩ vel falsa [vel illa]. [For these alternative readings, cf. the 1517 Bonn edition.]

> The locution is not satisfactorily disambiguated in the main part of the commentary, but in a discussion appended by Antonius, and which imitates Pseudo-Scotus, it becomes clear that Antonius, like Pseudo-Scotus, interprets Aristotle in accordance with **AR**: at the end of the discussion he states that **FCS**s – taken in the second sense, i.e. as bare assertions about what will be – are neither true nor false (see Boehner, *Tractatus*, p.81), and, although the text at the crucial place is corrupt (Boehner, pp.81–2), it is clear from a comparison with the corresponding passage in Pseudo-Scotus that Antonius means to ascribe his view to Aristotle.

[18] Boehner, *Tractatus*, Appendix 2. There are no significant differences at this point between Boehner's text and the more recent edition of Gambatese and Brown.

> [ad 19a32–9] Hic ostendit quod neutra pars contradictionis in illis de futuro est determinate vera et hoc sic: orationes similiter sunt verae sicut res se habent, quae denotantur per orationes; sed res quae denotatur[19] per futurum contingens, ex quo est ad utrumlibet, non est magis determinata, quod erit quam quod non erit, igitur propositio haec denotans non est magis vera quam falsa. Addit tamen Philosophus, quod quamvis necesse sit alteram partem esse veram et alteram falsam, hoc est, quamvis disiunctiva sit vera, tamen neutra pars est determinate vera nec determinate falsa.

But Ockham immediately goes on to write, in Boehner's text:

> Est ergo tota intentio Philosophi, quod in futuris contingentibus neutra pars est [determinate: E] vera neque falsa, sicut res ipsa nec est determinata ad fore nec ad non fore. [ad 19a39–b4] Infert duo corrolaria: primum est, quod non est semper necessarium, quod altera pars contradictionis sit vera, et altera falsa *... [I]n talibus contingentibus futuris neutra pars est vera vel falsa [determinate: E], sicut res non magis determinatur ad fore quam ad non fore. (Boehner, pp. 110–1)

This second passage seems not to cohere with the previous one in three places. In two of them, the early printed edition of 1496 (which Boehner calls 'E') supplies the needed epithet, but in one place (where I have inserted * above) Boehner records no variant. Given the rather uncertain state of the text, it may be right to insert 'determinate' in the places where it is omitted but the sense seems to demand it.

However, the above passage is by no means unique in its failure to employ the Boethian terminology consistently. There are a number of other passages in his commentary on *DI* 9 where Ockham oscillates between 'neither true nor false' and 'neither true nor false determinately'. In some of these passages Ockham clearly means 'neither true nor false' and not 'either-true-or-false but neither determinately'.[20] That suggests the following possibility. Perhaps Ockham does not pay close attention to whether or not he inserts the epithet, because he (rightly) does not regard **C** as genuinely (logically) distinct from **AR**. In that case, Boehner's text, or something like it, could be in order as it stands: Ockham would indeed not consistently use the language of 'determinate verum/falsum' in his commentary, since he would regard formulations incorporating 'determinate' as equivalent to ones lacking it.

[19] *denotantur* Gambatese and Brown.

[20] One such case is the passage referred to in the next note.

This possibility acquires some plausibility from the fact that Ockham was one of the first commentators to recognise unambiguously that Aristotle's position commits him to a trivalent logic.[21] Ockham, on this construal, would have realised that there is no point in insisting on **C**'s formulation as opposed to **AR**'s rather more perspicuous one. Moreover, in the discussions of Aristotle's view in Ockham's *Ordinatio*[22] and *Summa Logicae*,[23] **C**'s qualification makes no appearance: Aristotle is simply represented as asserting that **FCS**s are neither true nor false, while seeking to preserve unrestricted **LEM**. Finally, Ockham does not make use of the concept of *indeterminate* truth.

The possibility that Ockham simply conflated **C** and **AR** is well exemplified by the text quoted above, assuming it is good. Ockham first says (1) that neither disjunct of a **FCD** is determinately true; he then expands this with the claim that (2) 'alteram partem esse veram et alteram falsam'. This is immediately glossed by (3) 'hoc est: ... disiunctiva [est] vera'. Finally, he asserts (4) that it is not always necessary that one disjunct be true and the other false. Ockham seems to be making precisely the claim that **C**'s assertion that **FCS**s are 'either-true-or-false' is equivalent to the combination of **LEM** and restricted **PB**: (1) and (2) together constitute **C**, (3) and (4) **AR**.[24] It seems most likely, then, that Ockham recognised the logical equivalence of **C** and **AR**, and subscribed to a suitable fusion of the two positions.[25] This interpretation

[21] At the end of his commentary on *DI* 9 Ockham discusses the truth-values of various implications involving antecedents or consequents which are neither true nor false (Boehner, *Tractatus*, p.112). Cf. Michalski, *Le Problème de la volonté à Oxford et à Paris au XIV^e siècle* (Leopoldi, 1937), p.299; more cautiously, Kneale, *DL*, p.238.

[22] d.38q.1 M = Boehner, *Tractatus*, Appendix 1, p.98; Etzkorn and Kelley, p.584.

[23] P.III (3), c.32 = Boehner, *Tractatus*, Appendix 3, pp.114–7; Boehner, Gál and Brown, pp.710–14.

[24] The anti-realist line also emerges very clearly from the end of his commentary on *DI* 9, where Ockham argues that the universal statement 'Omne futurum contingens erit' is true but that none of the singular statements 'Hoc futurum contingens erit' is true. That is because the universal statement is equivalent to a conjunction of disjunctive statements each of the form 'Hoc futurum contingens erit vel non erit'. Each of these disjunctions is true (each is an instance of **LEM**), but the disjuncts are all neither true nor false. Ockham adds that this phenomenon is 'speciale in propositionibus non habentibus veritatem vel falsitatem determinatam' (Boehner, p.113). Cf. *Summa Logicae* p.III (3), c.32 (=Boehner, p.115). Cf. Gregory of Rimini, *Lectura Super Primum et Secundum Sententiarum*, 1.d.38.q.1, pp.253–4.

[25] The interpretation of Ockham as following the tradition of the commentators is embraced by Adams, *William Ockham* (Indiana, 1987), pp.1137–9. Adams argues that although Ockham subscribed to the mutual entailment of determinate truth and necessity, he does not suppose this to make available a gap between simple truth and

receives further confirmation from Ockham's statement of Aristotle's view in his *Tractatus de Praedestinatione* at O (Boehner, p.13):

> Sed in illis [**FCS**s] non est veritas determinata, quia secundum eum nulla ratio potest assignari, quare magis una pars sit vera quam alia, et ita vel utraque pars erit vera vel neutra; sed non est possibile, quod utraque pars sit vera, ergo neutra.

Peter Aureoli: In I Sententiarum d.38.a.3[26]

Ockham's fusion of **C** and **AR** had already been anticipated by Peter Aureoli. In his commentary on the Sentences, he alternates between both kinds of formulation. One notable difference between his treatment and Ockham's is that he is prepared to make use of the concept 'indeterminately true'. The following passage contains an excellent statement of **AR**:

> Sententia Philosophi est penitus conclusio demonstrata ita quod nulla propositio singularis formari potest de futuro contingenti de qua concedi possit quod sit vera et eius opposita falsa vel econverso. Sed quaelibet est neque vera neque falsa. Unde quamvis verum sit, quod Sortes erit vel non erit, formando propositionem disiunctivam, tamen categorice dicendo: Sortes erit, propositio neque vera neque falsa, similiter nec opposita: Sortes non erit.

But Aureoli is prepared to use the terminology of **C**, as a later passage from the same article shows:

> Haec propositio [est] vera: Sortes erit vel non erit; et ista falsa; Sortes nec erit nec non erit; et ista vera: Aliquod istorum indeterminate eveniet, quod scilicet Sortes erit vel non erit; et illa falsa, scilicet quod neutrum determinate eveniet. Haec tamen: Sortes erit, neque vera neque falsa; similiter nec illa: Sortes non erit.

This passage contains a perfect fusion of **AR** and **C**: *one* of the disjuncts of a **FCD** is true, but indeterminately so; *each* disjunct (taken separately) is neither true nor false, but **LEM** obtains unrestrictedly. Given the equivalence of the two positions, Aureoli is entitled to say all of that. It

determinate truth, so as to permit **FCS**s to be true without being determinately true, as envisaged by **R**.

[26] Boehner, *Tractatus*, Appendix 4.

is worth noting, however, that Aureoli's commitment to **C** does not extend to acceptance of the claim that Aristotle does not restrict **PB**: on the contrary, Aureoli states explicitly that Aristotle does restrict **PB** in respect of **FCS**s.

Walter Burley: Middle and Final Commentaries on De Interpretatione[27]

Boehner states, with regard to the Final Commentary, that Burley did not believe that Aristotle admitted the three-value thesis,[28] but the claim seems to be mistaken about both Middle and Final Commentaries. In fact in both commentaries Burley appears to adopt **AR**. In the following passage from the Middle Commentary he considers the truth-values of present- or past-tensed statements which are equivalent to **FCS**s:

> Intelligendum est quod nec in illis de praesenti nec in illis de praeterito oportet semper quod alterum contradictorium sit verum et reliquum falsum, quia neutrum illorum est verum vel falsum 'A est homo nasciturus', 'A non est homo nasciturus', posito quod indeterminatum sit utrum A erit vel non erit. Similiter, neutrum illorum est verum 'A fuit homo futurus', 'A non fuit homo futurus' et hoc quia veritas utriusque dependet a futuro contingenti. (p. 90)

Burley continues to talk of **FCS**s failing to be *determinately* true or false, but in his exposition of Aristotle this appears to mean that they are not true or false at all:

> Ex his omnibus concludit Philosophus quod in illis de futuro non est necesse alteram partem contradictionis esse veram et alteram falsam, et ponit rationem ad hoc, quoniam omnes sunt verae quaemadmodum et res. Sicut enim res se habent ad esse et non esse sic orationes ad veritatem et falsitatem. Sed in rebus est sic quod quaedam res se habent indifferenter ad esse vel ad non esse in futuro ita quod non magis determinentur ad non esse quam ad esse nec e contra. Igitur sic erit in propositionibus de futuro quod nec erunt determinate verae nec determinate falsae, et sic non opor-

[27] The Middle Commentary is to be found in Brown, 'Walter Burley's Middle Commentary on Aristotle's *Perihermeneias*', *Fransiscan Studies* 33, 1973, 42–134 (translated by Andrews, Translation Clearing House, Oklahoma, 1984). The Final Commentary (1337) is in his *Super Artem Veterem* (Venice, 1497), ff.66^{rb}–69^{rb} (there is a translation by Kretzmann for the Translation Clearing House, Oklahoma, 1981).

[28] *Tractatus*, p.83.

tet in illis de futuro quod affirmatio et negatio sit vera vel falsa. (Middle Commentary, pp. 95–6)

But although Burley appears not to subscribe to the 'either-true-or-false' interpretation, he accepts that Aristotle did regard a **FCD** as true:

Etsi enim ista 'A erit' nec sit determinate vera nec determinate falsa, tamen ista 'A erit vel non erit' est determinate vera. (Middle Commentary, p. 92)

That brings his interpretation fully into line with **AR**.

Burley appears not to work with the distributive sense of *determinate/indeterminate*. This is reflected in the fact that he does not employ the notion of 'indeterminately true/false' at all. Rather, 'determinately' seems to function simply as a way of reinforcing 'true (false)'. As such it helps render the fatalist's inference from simple truth to necessity particularly compelling; but here Burley recalls Aquinas in his insistence that the reference to determinate truth is just an intermediate step in the argument: necessity does indeed follow from simple truth, and not merely from determinate truth (so there is no scope for a realist construal of Burley). Here is a passage from the Final Commentary (on 18b9ff) where this point is made:

Sit una [propositio] vera pro nunc, sequitur quod illa de futuro est determinate vera. Quod non potest pro tunc non esse et ita de quocumque futuro non potest evitari quin esset futurum et sic omne futurum necessario erit accipiendo necessarium pro determinato tempore.

As the example which Burley goes on to give makes clear, the point here is that if '*p*' is true, then '*Fp*' *was* determinately true, hence necessary.

In the Final Commentary, Burley's adherence to **AR** emerges well from the following passage (on 19a32–9), where we find both the claim that neither of the disjuncts of a **FCD** is true, and the claim that the **FCD** itself is true:

[A future contingent thing is disposed equally to be or not to be.] Ergo propositio de futuro in materia contingenti equaliter se habet ad veritatem et falsitatem, aut ergo erit utraque pars contradictionis determinate vera in talibus de futuro contingenti, aut neutra pars erit vera, sed non utraque pars erit vera in talibus determinate; ergo neutra etc. Et sic est in omnibus que non sunt semper vera in talibus de futuro, scilicet neutra pars contradictionis per se accepta est determinate vera in illis de futuro, sed cum disiunctione ad suum contradictorium est determinate vera. Hoc est disiunctiva facta ex partibus contradictoriis est determinate vera ...

I have argued that **AR** is inadequate as an interpretation of Aristotle because it cannot account satisfactorily for Aristotle's assertion that the disjuncts of a **FCD** are (in a way) true or false; so we would expect Burley's interpretation to run into trouble, and indeed it does. On 18b17–25 Burley in the Final Commentary follows the Boethian line that 'neither disjunct (of a **FCD**) true' is the same as 'both disjuncts false' (see his third note: 68va). But a consistent supporter of **AR** has to say, implausibly, that the first formulation is an inept gesture towards the second (rather than its equivalent), and is discarded in favour of the second. Burley is honest (or unoriginal) enough not to take this line; his commentaries therefore faithfully represent **AR**, including its difficulties.[29]

Adam Wodeham (Goddam): Super Quattuor Libros Sententiarum[30]

Adam interprets Aristotle in accordance with **R**. He does not, however, use 'determinately' to mean 'necessarily', instead, it simply reinforces 'true/false':

Una pars [of a **FCA**] plus est vera quam alia, quia in re futurum determinate erit, et tunc affirmativa est vera, vel determinate non erit, et tunc negativa[31] est vera.

Adam tackles the difficulty of '*οὐχ ὁμοίως*' at 18a33–4 and offers what I called (#3) **R**'s orthodox response:

Ad Philosophum dicendum, quod ipse intelligit, quod in singularibus de futuro non est determinata veritas eo modo, quo in illis de praeterito vel de praesenti. Nam omne quod fuit, sic est determinatum ad fuisse, quod non potest per aliquam potentiam non fuisse, et omne quod est, necesse est quando est ... Non sic autem in illis de futuro, ubi simul stat, quod propositio aliqua de facto est vera et potest esse falsa, quae tamen potest esse vera et semper fuisse vera; et tanta est indeterminatio, quod non stat cum evidenti notitia creata de talibus, quid eveniret et quid non.

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[29] Why does Boehner misinterpret Burley? Perhaps because when he has concluded his Final Commentary proper, Burley goes on to discuss the problem on its own terms, and appears to favour something like the realist approach to future contingency.

[30] Paris, 1512; Boehner, *Tractatus*, p.83.

[31] The 1512 edition prints 'necessitativa': Boehner's emendation is clearly correct.

Robert Holcot: Super Sententias Liber 2[32]

In Quaestio II Robert provides a nice statement of Aristotle's position which presupposes the equivalence of **AR** and **C**:

> Ostendit [Aristoteles] quod in propositionibus contradictoriis de futuro in materia contingenti neutra pars est determinate vera. Hoc autem arguit per duas rationes, quarum una ducit ad impossibile, secunda est ostentiva. Primo modo sic: si haec sit vera 'A erit', ergo dicens hanc dicit verum. Sed si dicens hanc dicit verum necesse est sic fore sicut ipse dicit; et si necesse est sic fore sicut ipse dicit non potest aliter evenire quam ipse dicit: igitur A de necessitate eveniret. Hoc autem relinquit Aristoteles pro impossibili tam ibi [i.e. *DI* 9] quam VI *Meta* [i.e. *Met* E]. Secundo arguit ad idem sic: sicut res se habent ad fore et non fore, sic se habent contradictiones de eis formate ad veritatem et falsitatem. Sed res quae significantur future sunt omnino ad utrumlibet, nec plus determinantur ad fore quam ad non fore. Igitur contradictiones de eis formate non plus determinantur ad veritatem quam ad falsitatem, nec econtrario. Ideo tenet ipse quod in talibus contradictionibus neutra pars est vera, et neutra pars falsa. Igitur secundum eum si aliqua propositio de futuro sit vera, de necessitate sic erit sicut denotatur per eam. Ergo si haec fuisset vera ab eterno 'Deus producet mundum', ab eterno verum fuisset dicere 'Deus de necessitate producet mundum'. Consequens falsum, quia libere produxit mundum.

Robert goes on to propose a reconciliation between an Aristotelian approach to future contingency and the doctrine of divine foreknowledge along Boethian lines: strictly speaking, divine foreknowldge is knowledge in an eternal present. This is not Robert's own position on future contingency, however: he rejects Aristotelianism, favouring an Ockhamist (i.e. realist) approach to the future.[33]

Gregory of Rimini: In 1 Sententiarum d.38.q.1[34]

C received what is perhaps its clearest and most elegant expression in Gregory of Rimini's commentary on the *Sentences*. Gregory uses the usual terminology, but more than other medieval exponents he reverts

[32] Lyons, 1518 (Frankfurt, 1967).
[33] In a passage in his *Quodlibeta*, quoted by Boehner (*Tractatus*, p.85), Robert seems to interpret Aristotle realistically, 'determinate' there meaning 'necessary'.
[34] Paris, 1482; Boehner includes most of d.38.q.1 in his edition of Ockham's *Tractatus*, Appendix 5. It has also recently been edited by Trapp and Marcolino, whose text I follow.

to Boethius' own technique of helping out the sense by providing alternative locutions. He notes the difference between '*θάτερον μόριον τῆς ἀντιφάσεως*'/'altera pars contradictionis' (19a37) on the one hand, and '*τόδε ἢ τόδε*'/'hoc vel illud' (19a38) and '*τὴν μὲν . . . τὴν δὲ*'/'haec . . . illa' (19b2) on the other, the difference between these expressions being just what enables Aristotle to capture the sense in which truth and falsity are present in the **FCA**, and the sense in which they are not. The passage in which Gregory makes all this clear can stand as the definitive statement of the correct interpretation of Aristotle's intention in *DI* 9:

> Sed advertendum quod, quamquam Philosophus dicat quod non cuiuslibet contradictionis haec est vera, illa vero falsa, tamen cum hoc vult quod cuiuslibet contradictionis altera est vera et altera falsa. Nec umquam invenitur ibi dicere, quod non cuiuslibet contradictionis altera est vera et altera falsa, sed semper cum signo singulari, scilicet pronomine demonstrativo, numquam autem particulari quale est 'alter' vel 'altera'. Quinimmo cum tali signo dicit expresse oppositum etiam in contradictionibus singularibus de futuro ad utrumlibet. Unde de talibus loquens circa finem ait: 'Horum enim necesse est quidem alteram partem contradictionis esse veram vel falsam, non tamen hoc vel illud, sed utrumlibet,' id est non tamen hanc designatam vel illam, sed unam vel alteram indistincte. Ex quo manifeste patet quod demonstratis quibusdam duobus contradictoriis singularibus de futuro, haec particularis secundum Philosophum est vera. 'Altera harum duarum est vera,' et tamen nulla eius singularis est vera, ita quod non contingit vere dicere, 'Haec est vera,' sive haec sive illa demonstretur. Et similiter haec particularis est vera, 'Altera istarum est falsa,' et tamen non habet aliquam singularem veram, quoniam non contingit vere dici 'Haec est falsa,' sive demonstretur affirmativa sive negativa.[35]

Gregory himself finds the position absurd:

> Item, sequitur ex hac opinione Philosophi, quod aliqua disiunctiva erit vera, cuius nulla pars erit vera, quod etiam videtur inconveniens logicum.[36]

But Gregory is not tempted – as, to his regret, others are – to allow the absurdity of the position to dissuade him from imputing it to Aristotle: 'Sequela inconvenientium non eum [sc. Aristotelem] illud non sensisse sed non debuisse sensisse convincit.'[37]

[35] Trapp et al., pp.242–3; Boehner, *Tractatus*, pp.128–9.
[36] Trapp et al., p.251; Boehner (who reads 'logico'), *Tractatus*, p.136.
[37] Trapp et al., p.243; Boehner, *Tractatus*, p.129.

Peter of Ailly: Quaestiones Super Libros Sententiarum 1.q.11.A[38]

Peter follows Ockham and Gregory. He ascribes two conclusions to Aristotle:

> Prima est quod non omnis propositio singularis de futuro cathegorica de inesse et de simplici subiecto et praedicato et copula est vera vel falsa, ita quod non cuiuslibet contradictionis de futuro haec pars determinate vel illa est vera et similiter nec ista determinate vel illa est falsa. Secunda est quod licet neutra talium determinate est vera, tamen propositio singularis negativa de praedicato copulato ex praedicatis illarum ambarum non est vera. Verbi gratia: quamvis nec ista sit vera 'Antichristus erit' nec ista 'Antichristus non erit', ista tamen non est vera 'Antichristus nec erit nec non erit.' Unde secundum Ockam in Logica (Tractatu de Hypotheticis) Aristoteles concessisset aliquam disiunctivam esse veram et necessariam cuius tamen nullam partem concessisset esse veram. Exemplum de ista: 'Antichristus erit vel Antichristus non erit.' Et quod ista fuerit intentio Aristotelis declarat Ockam circa librum Periarmeneias, et post eum Gregorius in Lectura sua Sententiarum.

The fusion of **AR** and **C** is clearly to be seen here, with a leaning towards **AR**. Peter then joins Gregory in expressing amazement that anyone could have so misunderstood Aristotle as to interpret him in the realist way, with 'determinately' taken to mean 'necessarily':

> Aliqui autem volentes Aristotelem excusare dicunt quod non est verisimile ipsum sic errasse, cum hoc sit manifestum inconveniens, sed voluit dicere non quod talis propositio non sit vera aut falsa, sed quod non est determinate vera aut determinate falsa, intelligendo per propositionem determinate veram vel determinate falsam necessario veram vel necessario falsam.

Who are these misinterpreters of Aristotle? One possible candidate is Buridan.

John Buridan: Quaestiones Longe Super Librum Perihermeneias

In this treatise, Buridan rejects the inference from truth to necessity in respect of statements about the future, accepting it in respect of statements about the past and, in a degenerate and improper sense, statements about the present (see esp. 49.6–24). He seems consistently

[38] Strasbourg, 1490 (Frankfurt, 1968).

to use 'determinately' as a variant of 'necessarily', and appears also to ascribe his position to Aristotle:

> Oppositum videtur de intentione Aristotelis ponentis quantum ad hoc differentiam inter illas de presenti vel preterito et istas de futuro. Et arguitur ratione quia hoc voco determinate verum quod inpossibile est de cetero[39] non esse vel non fuisse verum, et determinate falsum quod inpossibile est de cetero non esse vel fuisse falsum. Et sic non est de isto 'ego legam cras' vel 'ego non legam cras.' Modo de affirmativa adhuc possibile est et erit possibile usque cras quod ipsa non est nec fuit vera, quia possibile est quod ego non legam cras. Igitur ipsa non est determinate vera. Et similiter si est falsa, tamen non est determinate falsa, quia adhuc est possibile et erit possibile usque cras quod ipsa non est nec fuit falsa, quia possibile est quod ego legam cras. Igitur nec est determinate vera nec falsa. Et similiter de negativa. (46.29–47.5)

That this passage is to be interpreted in accordance with **R** rather than **AR** is confirmed by a later passage:

> Concedo secundum casum positum quod ista [= the proposition 'Ego legam cras'] heri fuit vera sed numquam determinata. Sed per actum meum legendi determinatum est quod ipsa fuit vera et quod postea inpossibile est ipsam non fuisse veram. Ideo illa nova [sc. propositio] est determinate vera que dicit quod ipsa fuit vera. (49.25–30)

Finally, Buridan's ascription of **R** to Aristotle emerges from 55.17–35, especially the final words:

> ... Licet Antichristus erit, tamen adhuc possibile est quod ista est falsa 'Antichristus fuit vel erit.' Et hoc intendebat Aristotiles cum dixit 'in singularibus vero et futuris non similiter' (55.33–5)

Thomas Bradwardine: De Futuris Contingentibus[40]

Another candidate for Gregory's and Peter of Ailly's attack could be Thomas Bradwardine, who offers an epistemic reading of Aristotle (recalling Abelard). His discussion is also noteworthy for its employment of the *sensus compositus/sensus divisus* contrast to distinguish between a disjunction and its disjuncts:

[39] *de cetero* = henceforth.

[40] Genest, 'Le *De Futuris Contingentibus* de Thomas Bradwardine', *Recherches Augustiniennes* 14, 1979, 249–336; translated by Kretzmann (Translation Clearing House, Oklahoma, 1981).

Tercia opinio est quod hec est vera: 'Aliquod futurum ad utrumlibet est futurum vel non futurum' ut accipitur in sensu composito, sed hec: 'Aliquid est futurum' similiter hec: 'Aliquid non est futurum' nec est vera, nec falsa, quia nulla talis in sensu diviso de futuro est vera vel falsa. Et hoc patet per Philosophum, qui dicit quod de futuris contingentibus non est veritas determinata. Et per consequens nulla talis in sensu diviso est vera vel falsa, quia omne verum est verum quod est, et omne tale est determinate verum, etc. Sed respondetur primo racioni huic, et post arguetur contra opinionem istam: quia Philosophus non vult per hoc plus habere nisi quod nulla talis est nobis nota esse vera loquendo naturaliter, eo quod potest esse et non esse et contingens est. Sed non vult dicere quod hec non est vera: 'Aliquid est futurum' nec 'Aliquid non est futurum', tum quia secundum Philosophum de quolibet quod est, erit vel fuit dicitur affirmacio vel negacio et de nullo eorum ambo; igitur, cum plura erunt que non sunt, sequitur propositum quod hec est vera: 'Aliquid est futurum.'

Albert of Saxony: Quaestio de Futuris Contingentibus[41]

Albert clearly adopts a realist interpretation of Aristotle. In his view Aristotle combines acceptance of **LEM** with rejection of the determinate truth/falsity of **FCS**s, where 'determinate' means 'impossibile ... aliter se habere'. But although 'Socrates disputabit in die veneris' is 'indeterminate vera vel falsa' because 'forte disputabit et forte non', neverthless 'sic est vera quod non falsa, vel sic falsa quod non vera.'

Richard of Lavenham: Treatise on Future Contingents[42]

In this short treatise, Richard aligns himself with Ockham:

Tertia opinio, quae fuit opinio Aristotelis, obviat fidei christianae pro tanto quia illa opinio habet ponere quod Deus non plus determinate scit quod

[41] *Expositio Aurea et admodum utilis super artem veterem edita per venerabilem inceptorem Guillielmum de Ockham cum quaestionibus Alberti parvi de Saxonia* (Bologna, 1496); now in Muñoz García ed., *Alberti de Saxonia: Quaestiones in Artem Veterem* (Maracaibo, 1988), pp.616–626. The passage I quote from is numbered 1055 by García (p.620). It is also excerpted by Boehner, *Tractatus*, p.87. There is a translation by Kretzmann for the Translation Clearing House, Oklahoma (1981).

[42] This treatise has been edited from the MSS. in the British Library (Sloane 3899, 67^{v}–68^{r}) and at Venice (B. Marc. Z 300, 78^{va}–79^{rb}) by P.Øhrstrøm, 'Richard Lavenham on Future Contingents', *Université de Copenhague: Cahiers de L'Institut du Moyen-Age Grec et Latin* 44, 1983, 180–186.

Antichristus erit quam quod Antichristus non erit, nec plus determinate scit quod dies iudicii erit quam quod dies iudicii non erit, nec plus determinate scit quod resurrectio mortuorum erit quam quod resurrectio mortuorum non erit. Et ratio est quia de nullis futuris contingentibus ad utramlibet est veritas determinata; sed istae propositiones 'dies iudicii erit' et 'resurrectio mortuorum erit' sunt propositiones contingentes de futuro ad utramlibet, ergo non sunt ad veritatem determinatae, et per consequens non magis sunt determinatae ad verum quam ad falsum nec e contrario. Patet consequentia, et maior est opinio Aristotelis in libro Periermeniarum. Et illa opinio habet ponere quod nulla propositio contingens de futuro est vera, nec aliqua talis est falsa, et haec fuit intentio Aristotelis, ut dicit Hokkam super librum Periermeniarum. (20–34)

Peter de Rivo: Quaestio Quodlibetica Disputata[43]

Peter simply states that Aristotle denied that **FCS**s are bivalent:

[O]pinio Epicuri fuit quod opponuntur [sc. propositiones] mediate sic quod esset dare aliquas propositiones veras, et aliquas falsas, et aliquas neutras nec veras nec falsas, et tales dixit esse omnes propositiones de futuro contingenti. Tullius adhaesit opinioni Chrysippi [i.e. unrestricted **PB**]. Sed Aristoteles, primo Periermeneias, magis videtur imitatus Epicurum. (71)

C is also followed by a number of Renaissance commentators.

Julius Pacius[44] glosses 'altera sit vera, altera falsa' at 19a39ff with 'definite, ita ut dici possit, utra sit vera, utra falsa.'

Sylvester Maurus[45] clearly states that the fatalist's inference follows from *simple* anterior truth (77^{a} on 18a35ff), which at one point he calls 'obiectiva veritas' (78^{b} on 18b33ff), and he follows the Boethian line of equating 'not true' with 'false' (77^{b}). Hence it seems best to interpret his expression of Aristotle's solution (on 19a23ff) in accordance with **C**:

Necesse est, ut ex propositionibus de futuris contingentibus altera indeterminate sit vera, altera falsa, sed non est necesse ut altera determinate sit vera, altera falsa. (79^{a})

The interpretation is confirmed by the fact that Sylvester feels the need to claim that the doctrine is not against the faith if it is taken to state

[43] Baudry, *La Querelle des Futurs Contingents* (Paris, 1950), pp.70–8; translated by Kretzmann (Translation Clearing House, Oklahoma, 1981).

[44] *Aristotelis Organum* (Paris, 1619).

[45] *Aristotelis Opera Quae Extant Omnia* (Rome, 1668), vol. 1, pp.76–80.

that **FCS**s are not determinately true/false 'naturaliter in rebus creatis', but that if it is taken to state that **FCS**s do not have determinate truth/falsity 'etiam in scientia divina', then it is against the faith. Were Sylvester an adherent of **R**, this addition would be incomprehensible: that **FCS**s are not necessary is *according* to the faith; and God's foreknowledge does not render them necessary.

Augustino Nifo agrees that in the case of a **FCD** 'non est altera pars contradictionis determinate vera'.[46] Nifo's commentary is interesting in a number of respects, one of which is his interpretation of 18b17ff, which he takes to be directed against the Megarians (the opponents of *Met* Θ.3): because they reject the notion of a potentiality which is to be realised in the future, they are in effect committed to saying of a future contingency that it neither will be nor not be (a necessary condition of not going (not) to be is having the potential, now, not to be going (not) to be). Nifo is in no doubt that the fatalist's inference follows from simple truth, and his interpretation of 19a33ff makes it clear that he adheres to **C**:

> Harum enim rerum [i.e. contingents] ... alteram contradictionis partem veram aut falsam esse necesse est; non tamen hanc vel illam disiunctive, sed utraque contigerit disiunctim. Sed dices cum neutra sit necessario vera, estne altera magis apta fieri vera quam altera? Respondet: fit etiam ut magis quidem vera sit altera, ut in contingentibus plerumque, ut Socratem fore canum in senio, quam non fore. Non tamen vera iam determinate et necessario aut falsa determinate. Sic igitur patet in contradictione de futuris necessario alteram partem fore veram disiunctim, neutram autem disiunctive aut determinate.

'Disiunctive' here fixes the meaning of the whole in favour of **C**.

What our survey has shown us is that while a non-negligible proportion of the examined commentators follows **R**, the majority construes Aristotle in accordance with either **AR** or **C**, or a fusion of the two.[47]

[46] *Aristotelis Perihermeneias* (Venice, 1537).

[47] Another Renaissance commentator who follows **C** is Molina: see my 'Molina on Divine Foreknowledge and the Principle of Bivalence'. John Major, however, in opposition to Gregory, appears to follow **R**: *In Primum Magistri Sententiarum Disputationes* (1530), d.38.q.1.

Appendix 2: Alexander on Foreknowledge and Contingency: *De Fato* 30–1

The problem of reconciling divine foreknowledge with future contingency, which was brought into the centre of philosophical debate by Boethius in the last book of his *Consolatio Philosophiae*, received one of its earliest treatments in chs. 30–1 of Alexander of Aphrodisias' *De Fato*.[1] In a previous publication,[2] I argued that Alexander seeks in ch.10 of *De Fato*, following Aristotle, to restrict **PB** in some way with respect to **FCS**s. Here I wish to consider how Alexander's treatment of the foreknowledge problem in chs.30–1 affects our understanding of his approach to the semantics of **FCS**s.

Two interpretations of these two chapters are *prima facie* available. Alexander clearly acknowledges that the gods have foreknowledge of contingencies in some sense (201.28–30). The question is: in what sense? On one view, Alexander does not rule out divine foreknowledge of contingent events; he simply insists that the gods foreknow such events *as contingent*, and that foreknowledge as such does not upset the contingent status of those events. On another view, Alexander's insistence that divine foreknowedge does not upset the contingency of the foreknown events relates to future *possibilities*, not actualities. On this view, the gods cannot foreknow what *will* contingently happen, only what *may* happen.

My interpretation of ch.10 would face a serious problem of consistency if the first interpretation were correct: Alexander could hardly wish to deny that **FCS**s can be true, if he were prepared to admit that they can be known. I shall argue below that the first interpretation is not correct. If I am right, the question arises whether, as D.Frede has claimed,[3] Alexander rejects the possibility that the gods might know future contingent actualities on the ground that it is already impossible that a **FCS** should be *true* (and hence, *a fortiori*, it cannot be known to be

[1] *Supplementum Aristotelicum* 2.2, 164–212; Sharples, *Alexander of Aphrodisias on Fate* (London, 1983).

[2] 'Alexander's Sea Battle: a Discussion of Alexander of Aphrodisias *De Fato* 10'.

[3] 'Could Paris (Son of Priam) Have Chosen Otherwise?'

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true), or whether his reason for rejecting foreknowledge of **FCS**s is not that **FCS**s are not either true or false, but that, even if **FCS**s do have truth-values, no foreknowledge of those truth-values is possible because such foreknowledge would destroy the contingency of the relevant events. On this latter interpretation, as far as chs 30–1 go, Alexander might, like many others, have no difficulty with the *truth* of **FCS**s (he might reject fatalism), but find foreknowledge of such **FCS**s incoherent. Consistency with my interpretation of ch.10, on the other hand, would require that the sheer truth (let alone foreknowledge) of **FCS**s would already, for Alexander, import their necessity. I shall argue that this interpretation achieves some, if not absolutely conclusive, support from ch.30 itself.

Our two chapters attempt to refute the Stoic argument for determinism from divine foreknowledge.[4] Alexander's response is twofold: in the first place, the gods do not have foreknowledge of contingent actualities; in the second place, their admitted foreknowledge of contingent possibilities is not such as to upset the contingent status of those possibilities.

At 200.12–15 Alexander rejects the conjunction of the claim that the gods foreknow future contingent actualities[5] and the claim that the consequence of this first supposition is that everything happens of necessity. It is just so far not clear whether Alexander means in fact to reject both conjuncts *divisim*, or just their conjunction, leaving open the possibility that one conjunct (in particular the first) holds. He goes on to concede that if the nature of things permits foreknowledge, no one is better placed than the gods to have it, but insists that if such foreknowledge is impossible, then not even the gods can know something impossible (200.15–19).

In the next part of the text (200.19–201.3), it is important to realise that Alexander is discussing foreknowledge of future contingent *actualities* (i.e. that something will or will not happen), not *possibilities*. That is the force of the phrases '*τὸ ἐσόμενον*' and '*τὰ μέλλοντα*' around which the discussion revolves. Hence if his argument is construed as an argument against foreknowledge of such actualities, the gods are still free to foreknow contingent possibilities. The question is whether Alexander's

[4] *SVF* 2.939, 942, 943; cf. Sharples, commentary, p.164; Huber, *VgV*, p.9 with n.14.
[5] *τὰ ἐσόμενα* (200.12–13), *τὰ μέλλοντα* (200.17): there is no distinction between these terms in this chapter.

position is that the gods can foreknow *τὰ ἐσόμενα* without destroying the contingency of those events, or whether the fact that foreknowledge of *τὰ ἐσόμενα* is incompatible with their contingency implies for Alexander that no such foreknowledge is available. Either position would enable Alexander to attack his opponents.

At 200.19–23 Alexander's opponents are presumed to agree that not even the gods can do something that is genuinely impossible. Similarly impossible, Alexander continues, is foreknowledge of the contingent *ὡς ἐσόμενον πάντως ἢ ὡς μὴ ἐσόμενον οὕτως* (as at all events going to be, or as at all events not going to be: 200.24–5) For *if* foreknowledge removes contingency, it follows that if contingency is to be preserved, such foreknowledge must be deemed impossible (200.25–7). The opponents are supposed to accept this implication, since they precisely argue from foreknowledge to necessity (200.28–31). Hence, contraposing, if on their account too necessity follows from foreknowledge, then if there is no necessity in the things that come to be, the gods cannot have foreknowledge of the future (200.31–201.1).[6] Alexander concludes this section with the observation that his opponents too are forced to ascribe to the gods the 'same incapacity' (201.1–3).

What is the force of '*πάντως*' (and '*οὕτως*')[7] in 200.25? Perhaps it is equivalent to '*ἐξ ἀνάγκης*': in that case, the impossibility in the face of which the gods are helpless would be the impossibility of foreknowing future contingent actualities *as necessary*. That reading would point to an interpretation of Alexander according to which the gods can foreknow *ἐσόμενα*, as long as it is insisted that they foreknow them *as such*. But perhaps '*πάντως*' simply reinforces '*ἐσόμενον*', without modalising it. That would mean that the gods cannot foreknow that such-and-such *will be* the case (or not). In that case, Alexander would be rejecting foreknowledge of contingent *ἐσόμενα tout court*. Which reading of '*πάντως*' is correct? In Ammonius' report of the Mower Argument, the word '*πάντως*' occurs in a very similar context, and there too its sense is problematic:

> If you will mow, it is not the case that you will perhaps mow and perhaps not mow, but you will at all events mow (*εἰ θεριεῖς ... οὐχὶ τάχα μὲν θεριεῖς*

[6] With the general structure of this argument, cf. Cicero, *De Divinatione* 2.18; Boethius, *In De Int* 2.225.10–15.
[7] *οὕτως* = *πάντως*: Sharples, commentary, p.166.

> *τάχα δὲ οὐ θεριεῖς, ἀλλὰ πάντως θεριεῖς*); and if you will not mow, likewise you will not perhaps mow and perhaps not mow, but you will at all events (*πάντως*) not mow. But you will of necessity either mow or not mow: so the 'perhaps' has been removed, since there is neither any room for it in the disjunction of your mowing with your not mowing – one of these occurring of necessity – nor in what follows upon either supposition. But the 'perhaps' was just what imported contingency: so the contingency has disappeared. (Ammonius, *In De Int* 131.25–32)

The possibility of your mowing or not mowing is said to be excluded by the fact that you will at all events ('*πάντως*') mow, but it is not clear whether '*πάντως*' records the fact of your mowing (or not), or the necessity of your mowing (or not) which, on the fatalist's view (accepted and exploited by the argument) follows from that fact. The words '*εἰ θεριεῖς ... οὐχὶ τάχα μὲν θεριεῖς τάχα δὲ οὐ θεριεῖς*' certainly record the fatalist's inference from the truth of a statement about the future to its necessity, but the question is whether the adjunct '*ἀλλὰ πάντως θεριεῖς*' records the conclusion (the necessity of your mowing) or aims to restate the premiss (the fact that you will mow) in a sufficiently forceful way to make the inference to necessity mandatory. If we feel confident of the clarity of the articulation of the argument, we will surely – given the '*ἀλλὰ*' – wish to suppose that '*ἀλλὰ πάντως θεριεῖς*' is restating the conclusion of the argument in other words, rather than the premiss. But since the gap between premiss and conclusion is so small, this is not a confidence we are really entitled to. The argument purports to work by refusing to find a logical gap between truth (premiss) and necessity (conclusion). Since we have no anterior semantic grip on the vague adverb '*πάντως*', we cannot tell which side of the truth/necessity divide it reinforces. And because the argument operates by refusing to acknowledge any such divide, perhaps we cannot even meaningfully raise the question of the exact content of '*πάντως*' in this context. The comparison with the Mower Argument yields no clear guidance on how we should interpret '*πάντως*' in our passage. At this stage we can make no further progress; but once we have settled on an interpretation of ch.30 we will be able to return to this issue with better prospects of success.[8]

[8] One proposal for analysing '*πάντως*' at 200.25 which I do not think can be correct is Sharples' suggestion (commentary, p.165) that it is 'probably Alexander's way of referring to what later [i.e. Neoplatonist] writers will call definite, as opposed to indefinite, foreknowledge.' In these writers the qualification 'definite', in the claim that god has definite foreknowledge of the contingent, attaches to the *knowledge*, but it is surely clear that '*πάντως*' at 200.25 has ontological and not epistemological force, i.e. that it qualifies, in some way, the things which are foreknown. With my discussion of the force of '*πάντως ἐσόμενον*' compare Origen at *SVF* 2.957, 964. Origen distinguishes the same two possible senses as I have done, which suggests that the term may not admit of further disambiguation; this, as I have observed, would be unsurprising in a climate favourable to fatalism. Origen himself rejects the claim that what God foreknows comes about *πάντως*, if by '*πάντως*' we mean 'necessarily'. But if '*πάντως*' simply emphasises that what God foreknows really does come about, the claim is, Origen opines, unobjectionable.

The main question question before us is whether the alleged impossibility referred to in 200.24–5 is that of the gods' foreknowing future contingent actualities *as necessary*, or their foreknowing them *at all*. Does Alexander agree with the protasis of the conditional in 25–7 (foreknowledge destroys contingency), and hence seek (since there is contingency) to detach the apodosis (foreknowledge of contingent actualities is impossible); or does he reject that protasis (so taking foreknowledge to be compatible with the contingency of the foreknown)? Does he accept and contrapose his opponents' inference from foreknowledge to necessity, or repudiate it?

The question is surely settled by our passage. Firstly, the word '*καὶ*' at 200.28 indicates that Alexander and his opponents are agreed that things are as specified in the previous sentence. What the previous sentence says is that if foreknowledge destroys contingency, then if contingency is to be preserved, we must deny foreknowledge. Can just this complex conditional be what is agreed between Alexander and his opponents? Surely not: for that would mean that the agreement concerned (merely) the validity of *modus tollens*. Such an agreement would be too obvious to merit comment, and would not square with the reason which Alexander goes on to give for the claim he makes in the *καὶ*-clause, namely that his opponents use foreknowledge as a basis for their argument to necessity (28–31). It follows that what is agreed between Alexander and his opponents is that foreknowledge destroys contingency.[9]

That this is the right construal is confirmed by two subsequent occurrences of '*καὶ*' at 200.32–3, which indicates that Alexander agrees

[9] *Pace* Sharples, 'Alexander of Aphrodisias *De Fato*: some parallels', p.260 n.186. But the suggestion Sharples here makes that Alexander might be prepared to allow the gods foreknowledge of future contingent actualities is corrected in his commentary, p.165.

with his opponents' claim that foreknowledge destroys the contingency of the foreknown:

> But if necessity is consequential upon the gods' foreknowledge and prediction on their account too (*καὶ κατ' αὐτοὺς*),[10] it follows that if necessity is not present in the things which come to be [i.e. the contingent ones], then according to them [sc. too] the gods would not foreknow the things that are going to be (*οὐκ ἂν κατ' αὐτοὺς οἱ θεοὶ προγνώσκοιεν τὰ μέλλοντα*).[11] As a result they too preserve the same incapacity in the gods (*ὥστε καὶ αὐτοὶ τὴν αὐτὴν ἀδυναμίαν τοῖς θεοῖς φυλάσσουσιν*), if indeed it is right to say that it happens through incapacity and weakness that [the gods] are not able to perform the impossible. (200.31–201.3)

But while his opponents accept the existence of foreknowledge and so argue from there to the necessity of the foreknown, Alexander rejects foreknowledge of contingent actualities. Hence, the 'same incapacity' which the opponents are 'also' forced to ascribe to the gods (201.1–2) must be the inability to foreknow contingent actualities (rather than an inability to render foreknown contingent actualities necessary). So the text we have examined supports the interpretation that Alexander agrees with his opponents that the gods cannot foreknow future contingent actualities (*ἐσόμενα*): any foreknown actualities are *eo ipso* necessary. His opponents believe in universal foreknowledge, and so detrude contingency from their *Weltbild*; Alexander believes in the existence of contingency, and so detrudes foreknowledge of contingent actualities from his.

What we do not yet know is *why* Alexander thinks foreknowledge destroys the contingency of *ἐσόμενα*. Here there are two possibilities. Is it because the sheer *truth* of **FCS**s destroys contingency, and so, since knowledge entails truth, knowledge can be said (indirectly) to destroy

[10] Bruns places a comma after '*ἔπεται*', which I omit, following Sharples, commentary, p.260.

[11] '*καί*' at 200.32 is omitted in the Latin version, contested by Donini ('Note al ΠΕΡΙ ΕΙΜΑΡΜΕΝΗΣ di Alessandro di Afrodisia', *Rivista di filologia* 97, 1969, 298–313, p.311) and Bruns, and extruded by Thillet (*Alexandre d'Aphrodise, Traité du Destin* (Paris, 1984). Reading '*οὐδ' ἄν*' instead of '*οὐκ ἄν*' in the same line, as does Thillet (supported by Donini), would restore the implication of '*καί*', which Thillet and Donini wish to omit. ('*οὐκ ἄν*' is itself a conjecture; V has '*οὐ γὰρ*'.) The Latin has 'neque'. One MS. has '*οὐδέ*'. Had the interpretation which I defend in the text rested solely on this '*καί*', the controversy surrounding it would have been an embarrassment. But my interpretation (as well as this '*καί*') is confirmed by '*ὥστε καὶ αὐτοὶ τὴν αὐτὴν ἀδυναμίαν* . . .' (201.1–2).

contingency? Or is it that although foretruth is harmless, foreknowledge destroys contingency? The former interpretation is recommended (though without argument) by Frede, and would harmonize with my reading of ch.10, as well as with Aristotle's *DI* 9. Are we entitled to find it in the text? I think the next passage does very strongly suggest, if not conclusively so, that Alexander did regard foretruth, and not merely foreknowledge, as destroying contingency. The crucial lines are 201.7–13:

> [On the opponents' approach] it will be possible to demonstrate that all impossible things are possible, on the grounds that it is plausible that the gods are not ignorant of them. For someone could, assuming that it would be absurd if the gods did not know the measure of the infinite, aim to establish on this basis that the measure of the infinite can be known. But if this is so, then it is possible for the infinite to have a determinate measure. For otherwise the gods would not have known its measure.

Alexander's point is that if the gods can foreknow **FCS**s all sorts of impossibilities will be provable. For the argument to be consequential, Alexander must be assuming that a true **FCS** is *already* an impossibility. It follows that if the gods can know such impossibilities, they can know all impossibilities. (No impossibility is any more impossible than any other.) But then we have a short proof to the *truth* of any arbitrary impossibility (for knowledge entails truth). The point here is that the impossibility of foreknowing a **FCS** must lie on the side of the **FCS** rather than the foreknowledge. If Alexander's position were merely that **FCS**s, while capable of being true, could not be foreknown, his argument would be obscure: admittedly, if we assume one impossibility (that the gods foreknow **FCS**s) all impossibilities follow,[12] but why then route the derivation irrelevantly through a step in which the gods are said to *know* all impossibilities (and then *derive* the truth of those impossibilities from that knowledge)? Why not derive the truth of all impossibilities directly from the assumption of the truth of one impossibility? For the intermediate step to make argumentational sense, we must assume that Alexander is generalising *not* from the impossibility of foreknowing a **FCS** (it being left open that there is nothing contradictory in the concept of a true **FCS**), but from the claim that some impossibilities

[12] But only assuming the material implication analysis of the conditional. This analysis was controversial, however (#16), and we have no particular reason to suppose that Alexander accepted it.

(namely **FCS**s) are foreknown. The argument does not, then, have the form: it is impossible for the gods to (fore)know a **FCS**, so if they do it follows that they know all impossibilities, and hence that the impossibilities are all true. That argument would contain an otiose middle step. Rather, the argument has the form: if the gods (fore)know *this* impossibility (a statement about the future which is both contingent and true), then we might as well say that they know *all* impossibilities, and hence that all impossibilities are true.

The final absurdity which Alexander wishes to foist on his opponents is that impossibilities would be true. His example is that there would be a measure of the infinite. The example is surely meant to present a parallel to the content of the gods' foreknowledge on his opponents' account. That also suggests that he regards the truth of a **FCS** as likewise presenting an impossibility.

The impossibility that a **FCS** should be true falls under a variety of necessity which we may call 'metaphysical'. The impossibility of there being a measure of the infinite, on the other hand, is best represented as a logical or mathematical necessity. That Alexander lumps these two species of necessity together for the purpose of his argument – i.e. that the parallel between them works in the way I am speculating (the impossibility of foreknowing a future contingent actuality lies in the thing foreknown and not in the act of foreknowing) – is partially confirmed by the fact that he has already in ch.30 taken such species of necessity together, without registering any relevant difference. At 200.20–22 he pointed out that not even the gods can realise impossibilities, and his examples of impossibilities were the mathematical impossibilities that the diagonal of a square be commensurate with its side, that twice two be five, and the metaphysical impossibility of changing the past.

As I argue in #8, it is plausible to suppose that the impossibility of changing the past is just the mirror-image of the fatalistic inference from the truth of a statement about the future to its necessity. The suggestion is that, in both cases, what supports the metaphysical necessity is nothing more than *truth*. Of course, we cannot simply reason, in cold logic, that because Alexander believes in the unalterability of the past and is therefore committed to the fatalistic inference from truth to necessity in respect of the future, he must have consciously subscribed to that inference. Many subsequent thinkers sought to combine adherence to the unalterability of the past with a rejection of the fatalist's inference: in the medieval discussions of the problem of reconciling

divine foreknowledge with human freedom, the truth of the slogan 'factum infectum fieri nequit' was almost universally accepted,[13] but very few thinkers thought they had to save freedom by taking an Aristotelian line on future contingency (accepting the fatalist's inference and imposing some restriction on **PB**).[14] However, the fact that Alexander commits himself, at 200.22, to a type of metaphysical necessity which is in fact logically indistinguishable from the type of necessity appealed to by the fatalist at least yields a *prima facie* case that he does accept the fatalist's inference. And the further fact that Alexander seems prepared, quite without any sense of impropriety, to group this kind of metaphysical necessity together with mathematical necessities at 200.20–2 strengthens my claim that at 201.7–13 the parallel lies between the mathematical impossibility of there being a measure of the infinite and (still on the side of ontology) the metaphysical impossibility that **FCS**s should be true.

It seems that the above argument is the *only* basis on which we can claim to find in ch.30 a restriction on the scope of **PB**. The following passage, though important for our general understanding of the chapter, unfortunately does not throw any light on the question of Alexander's attitude to **PB**:

> Further,[15] if foreknowing the things that are going to be (*τὰ μέλλοντα*) is a matter of knowing them as being such as they are (for foreknowing is different from bringing about), it is clear that he who foreknows contingencies foreknows them as such. It is not foreknowledge to say that the contingent will be as if it were a thing going to be necessarily. So that even the gods would foreknow contingencies as contingencies (*τὰ ἐνδεχόμενα . . . ὡς ἐνδεχόμενα*), on which [knowledge] necessity will not by any means follow given the type of foreknowledge in question. And indeed that is how we listen to prophets. For those who make prophecies, along with giving advice to someone on what he should choose and do, do not prophesy, concerning the things of which they speak, as of things which will be of necessity.[16] (201.13–21)

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[13] A notable exception was Peter Damian, whose celebrated claim was that God can make a woman a virgin again no matter how may times she has been married: see here Normore, 'Divine Omniscience, Omnipotence and Future Contingency: an Overview'.

[14] Peter de Rivo was one; but his approach was branded heretical by Pope Sixtus IV in 1474: see in general Baudry, *La Querelle des Futurs Contingents*.

[15] I read '*ἔπειτα*' with Hackforth; Bruns has '*ἐπεὶ δέ*'.

[16] I read '*⟨λέγουσι⟩ προλέγουσιν*' with Thillet; the MSS. give '*λέγουσιν*' or '*προλέγουσιν*' only; Bruns reads '*προλέγουσιν λέγουσιν*'.

There is an important shift in this passage from talking of foreknowledge of *τὰ μέλλοντα* (here equivalent to *τὰ ἐσόμενα*: future contingent actualities) to talking of foreknowledge of *τὰ ἐνδεχόμενα* (future contingent possibilities). The passage surely allows that it is possible to foreknow *τὰ ἐνδεχόμενα*, so long as they are foreknown *as such* (as possibilities).[17] If Alexander did not mean to make that allowance, his discussion here would be pointless. He might as well say flatly that it is not possible to foreknow the contingent, and be done with it. Instead he seems to go out of his way to make room for a variety of foreknowledge (*τὴν τοιαύτην πρόγνωσιν*, 201.18) which is compatible with contingency, and which he subsequently distinguishes from the type of foreknowledge countenanced by his opponents (*τὴν τοιάνδε πρόγνωσιν*, 25; *τοιαύτην τὴν περὶ τῶν μελλόντων πρόγνωσιν*, 27), which is not so compatible.[18]

Since we know that Alexander regards foreknowledge of future contingent *actualities* as impossible, in what sense is he allowing the gods to foreknow contingencies in this passage? The answer must be that they can foreknow future contingent *possibilities* (i.e. that something may or may not happen) not future contingent actualities (that something will happen); or perhaps (in the light of the Laius example which follows) they can foreknow that *if* you choose to do such-and-such, then something else will follow, but they cannot foreknow whether you *will* choose such-and-such.

The passage introduces at several points talk of what will *necessarily* happen: at 201.13–16 it is said that foreknowledge must (in effect) not distort the modal status of what is foreknown. The foreknower must

[17] Failure to make this crucial distinction between foreknowledge of *τὰ μέλλοντα* and foreknowledge of *τὰ ἐνδεχόμενα* vitiates Mignucci's otherwise helpful discussion of ch.30 in his 'Logic and Omniscience: Alexander of Aphrodisias and Proclus', *OSAP* 3, 1985, 219–46, at pp.232–4. Mignucci suggests that the foreknowledge of contingencies which Alexander in ch.30 may allow the gods is to be restricted to those contingent *sentences* which do not change their truth-value over time. But Alexander would regard such sentences as necessary. (Cf. ch.10, where Alexander's objection to a Stoic conception of necessity in these terms is not that such sentences are *not* necessary, but that the necessity which they enjoy is not the *only* kind of necessity.)

[18] Hence, although I agree with Sharples' interpretation of these chapters as a whole (commentary, p.165), I do not think we should make anything of the alleged hypotheticality of '*ἄν* ... *προγιγνώσκοιεν*' (201.17), as he implies (cf. his *Cicero: On Fate and Boethius: The Consolation of Philosophy*, p.26 n.2). Alexander *does* here wish to ascribe to the gods foreknowledge of *τὰ ἐνδεχόμενα* ... *ὡς ἐνδεχόμενα*.

foreknow contingencies *as such* and not *as necessities*. In asserting that the foreknower must foreknow contingencies as such, Alexander is not allowing that he can foreknow future contingent actualities. As we have seen, Alexander accepts that foreknowledge of actualities destroys their contingency. So, as I have indicated, he must mean that the gods can foreknow only future contingent *possibilities*. The contrasting position which is rejected by Alexander – i.e. that the gods can foreknow a contingent *ἐσόμενον* – is now represented as tantamount to the claim that they can foreknow it *ὡς ἐσόμενον ἀναγκαίως*: as something which will necessarily happen. This means that Alexander is refusing to find any metaphysical distance between the foreknowledge that something will happen and the foreknowledge that it will necessarily happen. Unfortunately we cannot, just from the passage itself, determine whether foreknowledge plays a crucial modal role here: i.e. whether Alexander thinks that there is no metaphysical distance between the *fact* that *Fp* and the necessity that *Fp*, and *hence* no distance between the foreknowledge that *Fp* and the foreknowledge that *LFp*; or whether he thinks it is the foreknowledge that *Fp* itself which converts the fact that *Fp* into the fact that *LFp*.

The matter is not resolved by 201.16–18, where it is said that the gods foreknow *ἐνδεχόμενα* as such, from which necessity does not in any way (*οὐ πάντως*) follow. This repeats the thought of 201.13–16. The crucial point to bear in mind in interpreting 201.13–18 is again that we have already established that Alexander believes that foreknowledge of future contingent actualities would destroy their contingency, so that the contrast here cannot be (as it might otherwise appear) between foreknowledge of future contingent actualities *as contingencies*, and foreknowledge of future contingent actualities *as necessities*; but rather between foreknowledge of future contingent possibilities, and foreknowledge of future contingent actualities (=necessities). But, again, it is not made clear here whether the conversion of future contingent actualities into necessities is conceived as being prior to their being foreknown (if at all) or is an artefact of their being foreknown.

Finally in our passage, Alexander insists that prophets do not predict *ὡς ἐξ ἀνάγκης ἐσόμενα* (things to be as happening of necessity), because they couple their prediction with advice, implying that the recipient can avoid the outcome of the prediction. Again, it is unclear whether the insertion of the epithet '*ἐξ ἀνάγκης*' is regarded by Alexander as doing no more than spelling out the metaphysical commitment already con-

tained in the notion of predicting *ἐσόμενα*, or whether the necessity is (on the view of prediction and foreknowledge which he rejects) imported by prediction and foreknowledge.

It is at any rate clear that for Alexander there is no gap between foreknowledge of future actualities and foreknowledge of future necessities, however the necessity is conceived as arising. If we read 201.18–21 in isolation, we might suppose that Alexander is making room for a prophet to predict what *will* happen, coupled with giving advice, so long as he does not attempt to predict what *must* happen. But that cannot be Alexander's position, not only for the reasons we have run through, but also because such a line does not cohere with the fact that Alexander goes on, in the remainder of ch.30 and in ch.31, to object to his opponents' position on the grounds that it makes Apollo the author of Oedipus' misery, given that (on their account) Apollo predicted to Laius what *would* happen. For Apollo knew, according to Alexander's construal of his opponents' position, what effect his prediction would have on Laius. In particular he knew that Laius, precisely by seeking to avoid the predicted outcome, would bring it down upon himself and his house. But if a seer (so Alexander) makes a prediction, knowing that its effect will be to realise the predicted events, then the seer cannot escape responsibility for the occurrence of those events. But it would be impious to suppose that the gods are guilty of such misconduct. Alexander's point is that his opponents, in allowing gods to foreknow future contingent actualities, make room for a possibility which cannot (on pain of impiety) be thought to obtain. For Alexander's point to go through, it is not necessary to suppose that the predictor does more than commit himself to what *will* happen. And indeed the quoted prediction of Apollo is expressed in just such terms: 'If you beget a child, your progeny will slay you and your house will wade in blood' (202.10–11). It follows that, for Alexander, the gods' predictions cannot be supposed to indicate even what actually *will* happen, let alone what *must* happen. I say 'let alone'; but, as we have seen, there can in fact be no gap, on Alexander's view, between a prediction of what will happen and a prediction of what must happen. The phrase '*ἐξ ἀνάγκης*' at 201.20 simply reinforces, and does not add to, the content which '*ἐσόμενα*' already has in the context of foreknowledge.

Since Alexander acknowledges that prophecy and foreknowledge are in some sense possible (201.4–5, 28–30), it follows, as we have seen, that such foreknowledge must be restricted to future contingent possibilities (what may happen), or actualities contingent on human decisions; it cannot be extended to future contingent actualities (what will happen) *simpliciter*. The advice of gods enables men to take precautions which they would not otherwise have taken (201.30–2; 202.5–8). That advice cannot contain a prediction of what will happen, because the recipient of the advice is free to follow it or not, and whether or not he does so will in part determine what will happen. The giving of advice itself has an effect on the outcome (201.31–2: *μὴ φυλαξάμενον ἂν μὴ συμβουλεύσαντος τοῦ θεοῦ*). But the advice cannot be so framed as to contain a prediction which takes account of the effect of the giving of the advice, without the predictor incurring responsibility for that effect, an eventuality which Alexander rejects as impious (202.25–203.4), and which he regards as constituting a *reductio* of his opponents' position. The right view is this: Apollo tells Laius that if he begets a son certain consequences will follow; but he does not tell Laius, because he does not know, whether Laius will beget a son. The position rejected by Alexander's opponents, that Apollo in his prophesying did not know that Laius would fail to take his advice ('*οὕτως ... χρῆσαι ὡς οὐκ εἰδότα ὅτι μὴ πεισθήσεται* ⟨sc. *ὁ Λαίος*⟩'), is clearly regarded by Alexander himself as correct (202.12–3).

What we have not been able to ascertain from our consideration of 201.13ff is whether the gods do not know contingent *ἐσόμενα* because there are no such things as contingent *ἐσόμενα* (factuality importing necessity), or whether they do not know such *ἐσόμενα* because in foreknowing them they would render them necessary. But if my interpretation of 201.7–13 was correct, the former explanation will be the right one.

In view of this, we may say that Alexander does not adopt the solution later favoured by Proclus and Boethius, that god has foreknowledge of contingent (or indefinite) actualities but in a non-contingent (or definite) way.[19] We must be careful here. Huber glosses 201.13f as follows: 'Das Objekt der Erkenntnis bestimmt die Art und Weise, wie es vom erkennenden Subjekt wahrgenommen wird'.[20] What

[19] So, rightly, Sharples, commentary, p.165; cf. Mignucci, 'Logic and Omniscience', p.238; Pack, 'A Passage in Alexander of Aphrodisias relating to the Study of Tragedy', *American Journal of Philology* 58, 1937, 418–36, p.428; Huber, *VgV*, pp.13–14.

[20] *VgV*, p.13. Cf. Hager, 'Proklos und Alexander von Aphrodisias über ein Problem der Lehre von der Vorsehung', in Mansfeld and de Rijk eds., *Kephalaion* (Assen, 1975), 171–82, p.177: 'Im 30. Kapitel von *De Fato* geht das Bestreben Alexanders

De Fato 30–1 tells us is that Alexander thought (in contradistinction to the Neoplatonists and Stoics) that future contingent *actualities* cannot be known by god *at all*. As for future contingent *possibilities*, it must presumably be conceded on all sides that god's foreknowledge of these is necessary (since that a state of affairs is possible is itself a necessary truth, at least insofar as the state of affairs is specified in general terms).[21] This is clearly stated by Calcidius, whose position is that divine foreknowledge of contingencies is necessary,[22] but that the contingencies which god necessarily foreknows are merely contingent *possibilities*.[23] Something like this position was probably also adopted by Porphyry, although the view ascribed to him by Proclus – *ὅτι τὸ μὴ ἀραρὸς οὐκ ἀραρός ἐστι παρὰ θεοῖς* (that what is not fixed is not fixed

dahin, zu zeigen, daß aus der Tatsache der göttlichen Vorsehung nicht, wie die Stoiker meinen, die Notwendigkeit aller Ereignisse (auch der kontingenten und zukünftigen) folge, sondern daß die Götter, wenn sie mit ihrer Vorsehung kontingente Ereignisse vorauswissen, sie als kontingent und nicht als notwendig voraussehen.' But it is not clear whether this really is Hager's considered view, for a page later he remarks à propos of Proclus' solution: 'insofern unterscheidet er sich von den Peripatetikern und insbesondere Alexander, die das Kontingente dem Erkenntnisbereich der Vorsehung entziehen'.

[21] Cf. Boethius, *Cons Phil* 5. pr.3.25, who finds Teiresias' claim 'Quicquid dicam aut erit aut non' (Horace, *Satires* 2.5.59) a ridiculous model for the extent of divine foreknowledge. But it is Alexander's model; cf. Sharples, commentary on Boethius, ad loc. (Boethius' point is that divine knowledge of contingencies is not, strictly, *fore*knowledge of *future* contingencies, but knowledge of what is eternally present, so that he can avoid the limitation he mocks in Teiresias.) The position we here ascribe to Alexander coheres well with what we know of his teaching, and that of his school, on divine providence: in the sublunar world providence extends only to species, not to individuals. (See here *De Providentia* 87.5–92.4 in Ruland, *Die arabischen Fassungen zweier Schriften des Alexander von Aphrodisias*, Diss. Saarbrücken, 1976), the latter partially translated by Sharples, *Alexander of Aphrodisias: Quaestiones 1.1–2.15* (London, 1992), p.98 n.315; Freudenthal, 'Die durch Averroes erhaltenen Fragmente Alexanders zur Metaphysik des Aristoteles' (*Abhandlungen*, Berlin, 1884, 1), fr.36; *Quaestio* 1.25, 40.30–41.19; 2.3, *passim*; 2.19; cf. 2.21, 68.5–11; Hager, 'Proklos und Alexander', p.175ff; Moraux, *Alexandre d'Aphrodise: Exégète de la Noétique d'Aristote* (Paris/Liège, 1942), pp.195–202, 'La Doctrine de la Providence dans l'École d'Aristote', in *D'Aristote à Bessarion: Trois Exposés* (Quebec, 1970), esp. p.58ff; Merlan, 'Zwei Untersuchungen zu Alexander von Aphrodisias', *Philologus* 113, 1969, 85–91; Sharples, 'Alexander of Aphrodisias on Divine Providence: Two Problems', *CQ* 32, 1982, 198–211.) But without knowledge of individuals, it is not possible for god to foreknow future contingent actualities (individuals not being regarded, in Leibnizian fashion, as themselves species).

[22] *In Timaeum*, 195.1–17; especially 14–15: 'incertorum necessaria quidem scientia'.

[23] 199.10–11: '(Divinatio) ambiguarum (rerum) vero ... ambigua est et obliqua.' See here Huber, *VgV*, p.19.

for the gods) – perhaps does not allow of precise interpretation.[24] The view probably common to Alexander, Porphyry and Calcidius was, then, that god has no foreknowledge of future contingent actualities, but does have (necessary) foreknowledge of future contingent possibilities.[25] The Neoplatonists accepted the latter, but rejected the former: they allowed god to have (necessary) foreknowledge of future contingent actualities.[26]

Alexander's position is also clearly distinct from that of Carneades, as reported by Cicero (*De Fato* 32–3), namely that the gods cannot foreknow those events which have no efficient causes, but that unrestricted **PB** obtains and does not destoy contingency. So Carneades and Alexander would agree that actualities which the gods do foreknow are

[24] Proclus, *In Timaeum* 1.352.11–13. I say that Porphyry 'probably' went along with the Alexander-Calcidius line, because it is most natural to take the quoted phrase as meaning that god does not have foreknowledge of future contingent actualities *at all*; it is unlikely that the phrase means that god can have (contingent) foreknowledge of future contingent *actualities* – the solution to the problem of divine foreknowledge and human freedom later proposed by Ockham: see *Tractatus*, esp. q.1.

[25] See here Sharples, 'Alexander of Aphrodisias *De Fato*: some Parallels', pp.260–2.

[26] This interpretation of Alexander squares with Proclus' assertion at *De Decem Dubitationibus* Quaestio 2.6., p.10.3–7 Boese: 'Propter hanc enim hii [i.e. the Stoics] quidem providentiam esse concedentes contingentis naturam ab entibus exciderunt, alii [i.e. the Peripatetics] autem ad evidentiam subsistentie contingentis nullatenus contradicere habentes providentiam usque ad hec pertingere abnegarunt; utrique autem recte preaccipientes quod utique et providentiam ipsam necesse cognoscere ea quae providentur et cognoscentem non dubie cognoscere propter dubiam contingentis naturam.' Boese's reconstruction of the Greek here is: '*καὶ προνοοῦσαν αὐτὴν ἀνάγκη γινώσκειν τὰ προνοούμενα καὶ γινώσκουσαν οὐκ ἀμφιβόλως γινώσκειν ⟨διὰ⟩ τὴν ἀμφίβολον τοῦ ἐνδεχομένου φύσιν*.' The references of 'hii' and 'alii' to the Stoics and Peripatetics respectively are secured by the following passage in *De Providentia* cap.16.63, p.169.1–5 Boese: 'Sed hii quidem falsum esse aiunt deum determinate nosse omne, sed indeterminari aiunt etiam ipsum in fientibus indeterminate, ut salvent contingens; alii autem determinatam cognitionem attribuentes deo, admiserunt necessitatem in omnibus que fiunt: Peripateticorum et Stoicorum heresum sunt hec dogmata.' Boese reconstructed the Greek version on the basis of Isaac Sebastocrator's version of *Ten Problems*: '*Ἀλλ' οἱ μὲν ψεῦδος εἶναι ἔφασαν τὸν θεὸν ὡρισμένως εἰδέναι πᾶν, ἀλλ' ἀορισταίνειν καὶ αὐτὸν τοῖς ἀορίστως γινομένοις, ἵνα φυλάξωσι τὸ ἐνδεχόμενον· οἱ δὲ τὴν ὡρισμένην γνῶσιν ἀποδόντες τῷι θεῷι τὴν ἀνάγκην ἐπὶ πάντων τῶν γινομένων παρεδέξαντο*.' Note that in this passage Proclus does not say that the Peripatetic view is that god has indefinite *foreknowledge* about the indefinite, but simply that he *is indefinite* (indeterminari, *ἀορισταίνειν*) about the indefinite, which should be taken (given the assertion in *De Decem Dubitationibus*) as meaning that he has definite foreknowledge only of contingent possibilities, not actualities. Hager discusses these passages in 'Proklos und Alexander', but his account is unclear on this crucial point.

necessary, but they would disagree on the sort of necessity involved, Carneades opting for causal, Alexander for metaphysical, necessity.

Finally, let us return to the question of the meaning of '*πάντως*' in 200.25. In my discussion of the Mower Argument, I speculated that since the Argument works by refusing to acknowledge a logical gap between the truth of an **FCS** and its necessity, it might be impossible in principle to settle the question whether '*πάντως*' as it functions in that argument merely emphasises the truth from which the inference moves, or introduces the necessity to which it moves. A similar difficulty surely now recurs in our present passage, at least, on the assumption that my interpretation of 201.7–13 is correct (i.e. that Alexander accepts the fatalist's inference from truth to necessity). But that does not mean that we should be indifferent whether '*πάντως*' in 200.25 is rendered in a way which simply reinforces the *truth* of the qualified item, or qualifies it as *necessary*.

Of course, if I am right that Alexander accepted the fatalist's inference, there is no logical gap for him between the truth of a statement about the future and its necessity. So '*πάντως*' can be thought of as having the force of 'necessarily' if the fatalist's inference is built into that content. In that case its meaning would be something like 'truly, hence necessarily'. In contexts such as the present one, where (if I am right) the fatalist's inference is presupposed to the dialectic, there seems to be no harm in taking this line. A parallel context is the end of Ammonius' commentary on *DI* 9 where, again, it may be acceptable to construe '*πάντως*' in this way.[27] But the construal cannot work for all contexts, for there are many contexts where the word is employed in which the fatalist's inference from truth to necessity is not at issue. No doubt in some of these contexts 'necessarily' is a reasonable construal of its sense, but in others it will not do at all. One such is Alexander's own report of the Master Argument (cf. #15): *τὸ γὰρ ἢ ὂν ἢ ἐσόμενον πάντως δυνατὸν μόνον ἐκεῖνος ἐτίθετο* (Diodorus claimed that only what is or at all events will be is possible). '*πάντως*' cannot here have the

[27] *In De Int* 154.21–155.8, especially 154.34, 37. Cf. *SVF* 2.939, p.270.31: the context is Chrysippus' doctrine that foreknowledge entails the necessity of the foreknown events. Chrysippus also subscribed to an implication from unrestricted **PB** to universal causal determinism (Cicero, *De Fato* 20–1): that would provide a plausible link between foreknowledge and necessity. So in the claim that the misfortune which is foreknown is *πάντως ἐσόμενον ... εἰ μὴ φυλαξαίμεθα*, '*πάντως*' looks as if it contains both senses I am distinguishing ('really', 'necessarily').

force of 'necessarily', because that would contradict Diodorus' definition: a possibility is constituted *either* if it is now actualised *or* if it will be actualised. So its *future* actualisation is indeed not necessary, but only sufficient. Hence '*πάντως*' functions here not as a modal operator but simply as a device for reinforcing the point that, on Diodorus' definition of possibility, if I can be in Corinth, say, but am not there now, then I *really will* be in Corinth at some future time.[28]

That suggests, returning to *De Fato* 200.25, that we should construe '*πάντως*' there as simply reinforcing the *truth* of what it qualifies, and register the fatalist's inference from truth to necessity as a corollary of the dialectic, rather than building it into the semantic range of '*πάντως*' itself. In that case the function of '*πάντως*' at 200.25 provides a useful parallel to the function of the commentators' qualification 'definitely' as I have interpreted that (#12).[29]

[28] Cf. also *Quaestio* 1.18, 30.28 (with Sharples, 'Alexander of Aphrodisias: Problems about Possibility I', n.42).

[29] Frede has suggested ('Could Paris', p.286) that the fatalist's inference from truth to necessity can be found not only in *De Fato* ch.30 but also at 187.22–188.3 and 197.9–17. On the former of these passages I agree: see Appendix 3 n.10 (and cf. Sorabii, *NCB*, p.111). The latter passage is more problematic. 197.9–17 is reminiscent of *DI* 9, especially the phrase '*οὐχ ὁμοῖον τὸ ἀληθὲς ... γεγονότων*'. But this passage cannot on its own establish that Alexander followed Aristotle in restricting **PB** with respect to **FCSs**. What the passage actually says is that truth applies differently to the future from the way it applies to the present and the past, not in the sense that **PB** must be restricted with respect to the future, but in the sense that whereas it is true that this man has the ability to become virtuous (or skilled) and the ability not to do so, it is not true, if a man is already virtuous (skilled), that he has the ability not to be virtuous (skilled). Now Alexander may indeed think that the explanation for this difference between future and present/past is that the future is metaphysically indeterminate (in a way which should be reflected in a restriction of the scope of **PB**). Given that he seems to commit himself in this passage to the necessity of the present as well that of the past, and given my interpretation of chs. 10 and 30, this gloss acquires considerable plausibility; but it nevertheless goes beyond the literal purport of the text. Cf. Sharples, 'Alexander of Aphrodisias *De Fato*: some Parallels', n.221; commentary, pp.161–2.

Appendix 3: [Alexander] *Quaestio* 1.4

Alexander's commentary on *DI* is lost. It was exploited by Porphyry, through whom it was probably transmitted to Boethius, and was known to Ammonius. Hence it is possible that Ammonius' and Boethius' interpretation of *DI* 9 found an earlier exposition in its pages.[1] There is good evidence that Alexander committed himself, in his *De Fato*, to a restriction of **PB** with respect to **FCS**s (and that accordingly he must have so interpreted Aristotle's intention in *DI* 9).[2] Unfortunately, however, we cannot deduce from *De Fato how* Alexander thought the restriction should proceed, whether in line with **C**, or with **AR**. But the following speculation naturally suggests itself. We may note first, following Zimmermann, that Boethius' interpretation of *DI* 9 is self-consciously anti-Stoic, a position which he may derive (perhaps indirectly) from Alexander. Now according to Boethius the Stoics accused Aristotle of taking **FCS**s to be neither true nor false.[3] If Boethius' polemic harks back to Alexander at this point, that would suggest that Alexander was an (the?) originator of the interpretation I am calling **C**, since what makes **C** distinctive is its interpretation of *DI* 18b17ff as rejecting the 'neither true nor false' thesis, in apparent (if not in real) opposition to **AR**. It is instructive in this connection to look at what is probably the earliest extant Peripatetic discussion of future contingency and necessity, *Quaestio* 1.4, ascribed to Alexander of Aphrodisias. We cannot be sure of Alexander's authorship of this text; but it is at least evidence of the position accepted among Alexander's pupils.

The dialogue aims to refute Stoic determinism. In the crucial second and third parts of the dialogue (I follow Bruns' divisions) the author appears to argue that future truth, introduced using the device of predictions (11.9ff and 12.9ff), entails necessity. Sharples suggests that since the text presupposes the opponents' position that everything comes about in accordance with fate (i.e. is causally determined) it is

[1] See here Zimmermann, *Al-Farabi's Commentary and Short Treatise*, p.lxxxv.
[2] See my 'Alexander's Sea Battle: a Discussion of Alexander of Aphrodisias *De Fato* 10', and Appendix 2 above.
[3] *In De Int* 2.208.1ff.

not able to provide good evidence of the author's view as to whether future truth *itself* entails necessity.[4] Since, as we shall see, the fourth and final part of the dialogue unmistakeably draws the connection between (definite) truth and necessity, it would be surprising if the author, while not being in doubt about the entailment from truth to necessity, made no use of that entailment anywhere in his argument. What would be the point of introducing prediction into the argument, if the predicted events were conceived as being anyway necessary, so that the entailment from truth to necessity could not be exploited? On Sharples' reading, the argument of parts 2 and 3 would be an idle detour, taking the implausible form: all events are necessary; so if they are truly predicted they are necessary.[5]

But we can do better for the author. Although the connection between fate and causal determinism is an accepted datum of the dialogue (9.26–7), and indeed of Stoicism,[6] the further inference to necessity is not. The opponents' position is precisely that while all events are fated, or causally determined, it does not follow that they are all necessary.[7] Our author has already, in the first part of the dialogue, rejected that position. At 8.31–9.32 he argues that if everything happens in accordance with fate (=is causally determined), what happens is prevented from happening otherwise or not happening, *and so* is necessary. Then, at 10.8–11.3, the author argues against the efficacy of a distinction drawn by his opponents between what happens of necessity (*ἐξ ἀνάγκης*) – i.e. what comes about by force (*βίαι*) – and what happens necessarily (*ἀναγκαίως*) – i.e. what happens in accordance with the succession of causes (*κατὰ τὴν τῶν αἰτίων ἀκολουθίαν*)).[8] The oppo-

[4] 'An Ancient Dialogue on Possibility: Alexander of Aphrodisias *Quaestio* 1.4', *AGPh* 64, 1982, 23–38, p.35; *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.32 n.73. I argued against a similar line taken by Sharples on *De Fato* 10 in my 'Alexander's Sea Battle'.
[5] 'That the truth of a prediction implies the necessity of the event predicted is certainly true if all events are predetermined and whatever is predetermined is necessary' (Sharples, *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.32 n.73).
[6] Cf. Sharples, 'An Ancient Dialogue on Possibility', p.29, with reference to *SVF* 2.917, 918, 921, 946.
[7] Cicero, *De Fato* 12–16 = *SVF* 2.954; Plutarch, *De Stoic Rep* 1055d–e = *SVF* 2.202; Boethius, *In De Int* 2.235.6–9. The Stoics believed in unrestricted **PB** and inferred universal causal determinism from this (Cicero, *De Fato* 20–1; cf. *De Natura Deorum* 3.14 = *SVF* 2.922), but combined this position with an insistence on contingency.
[8] There is no connection (so, rightly, Sharples, 'An Ancient Dialogue on Possibility', p.32; *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.31 n.64) between this distinction and the superficially similar one in Alexander *De Fato* 10.

nents are aiming to arrive at a sense in which causally determined events are not of necessity (*ἐξ ἀνάγκης*), but the author rejects their position as inconsequential, arguing that the distinction between two kinds of necessity fails to achieve its aim because, if everything is fated, while it is true that nothing comes about by force (*βίαι*), since fate does not *force* events to comply with it, it nevertheless remains the case that what happens could not be otherwise. The author's refusal in this passage to allow his opponents a sense in which fated events are not necessary is of a piece with his insistence, in the preceding passage, that fated events are necessary not only in the sense (accepted by his opponents) that they are causally determined, but also in the sense (rejected by his opponents) that they are non-contingent (incapable of being otherwise).

Part 2 now contains a further argument, based on considerations relating to future truth, against the Stoics' position (11.4–29). The argument is plainly that fate (causal determinism) provides the basis for true predictions about the future, and that truth entails necessity: $Tp \rightarrow Lp$. That the claim is not of the form '$L\,[p \rightarrow p]$' is obvious from (at least) the fact that the final sentence of the argument (11.29) *detaches* 'Lp' from the foregoing argument, which must accordingly contain the premisses '$Tp \rightarrow Lp$' and 'Tp'. 'Tp' follows from the Stoics' claim that everything is fated or determined, for that determinism provides the basis for true predictions. The entailment from truth to necessity is a vital part of the author's strategy at this point of the argument. The author assumes the opponents' determinism, derives from that the truth of predictions about the future (so he in effect assumes unrestricted **PB**, since future truth is the controversial area: no one disputes the application of **PB** elsewhere), and uses the entailment from truth to necessity to yield the necessitarianism which he seeks to pin on them and which they seek to avoid.

The initial moves in the passage (11.4ff) in fact represent the *final* dialectical moves of the argument The author first states that what necessarily does not occur (i.e. what is prevented from occurring) cannot occur:

> And besides, if those things which[9] do not happen because they are prevented from doing so necessarily fail to happen, then they are not able to happen either, if, that is, the possible is that which can happen and is not prevented from happening (*εἴ γε δυνατὸν ⟨ὃ⟩ οἷόν τε γενέσθαι ἀκώλυτον ⟨ὄν⟩*) ... So things which necessarily fail to happen cannot happen. (11.4–8)

The author then proceeds to fit on to the front of this inference the entailment from truth of a prediction to the necessity of the predicted event (11.9–16), and finally fits on to the front of *this* inference the inference from universal causal determinism to (in effect) unrestricted **PB**:

> But if concerning all things which are contrary to fate it is possible for him who predicts that they will not be to speak the truth, then it will not be possible for any of the things contrary to fate to happen. (11.17–19)

The inference from causal determinism to unrestricted **PB** comes in the protasis of this sentence, and the author goes on (as he did at 11.13–14) to draw the conclusion of necessitarianism. He then applies the conclusion to positive as well as negative predictions (11.21–6). At 11.26ff he generalises the argument to *all* events, for given universal causal determinism we have **PB** utterly generally. Hence (his conclusion) nothing which comes about in accordance with fate can fail to come about. (The remainder of part 2 tries to deduce modal collapse and is not germane to our purpose.)

Sharples takes both the reference, in the first quoted passage (11.4–5; so too the reference at 12.12, quoted below), to what is prevented from occurring, and the reference to fate in the second quoted passage (at 11.17), to indicate a *restriction* of the argument to what is anyway necessary; but, as I have indicated, such a restriction would have the undesirable effect of trivialising the argument. It is more plausible to draw a distinction between the ways in which the notions of what is prevented and what is fated figure in the argument of part 2: the notion of prevention figures in the conclusion, not as a premiss of the argument, and functions by way of introducing a parallel to the strong kind of necessity to which the author means to commit his opponents. Fate, on the other hand, figures in the premisses of the argument, as an equivalent of causal determinism. The form of the argument is, in brief, this: if fate (causal determinism), then unrestricted **PB** (his opponents accept this lemma); but if unrestricted **PB**, then necessitarianism (the author is trying to foist this further move on his opponents).[10]

[9] *ταῦτα* Bruns. Bruns conjectured '*ἃ*'; I follow Sharples' suggestion of '*ταῦθ' ἃ*': *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.121.

[10] Cf. part 1, where the author argues directly for an implication from causal determinism to necessitarianism. Hence *Quaestio* 1.4 mirrors the structure of *De Fato* 10:

Turning to the brief third part of the *Quaestio*, I think we can see the argument I have just sketched admirably stated at 12.9–12. But here we have to understand the notion of 'what is prevented' differently: it needs to figure in the *premiss* as tantamount to what is determined not to occur:

> For how is it possible to say that that, concerning which a predictor says truly that it will not be, can happen? For it is clear that even if it was able to occur otherwise as far as its own nature was concerned, still, in virtue of the fact that it was prevented from occurring, the prediction which was made about it – that it would not happen – was true. (12.9–12)

The second limb (unrestricted **PB** entails necessitarianism) is stated first. The lemma (causal determinism entails unrestricted **PB**) is then given.

How can the notion of what is prevented figure first as part of the conclusion of the argument (11.4–5), and then as part of the premiss (12.12)? The answer is that the Stoic definition of the possible as that which can come to be, not being prevented (11.5–6; cf. 9.6–7),[11] cannot, consistently with a commitment to universal causal determinism, be applied to actual events so as to yield cases of possible events which do not occur. For if everything is causally determined, then what does not happen *has* been prevented from occurring by the operation of those causes which bring about whatever happens instead, and so is not possible on the Stoics' definition: this is the argument of 8.31–9.9. So the Stoics' commitment *both* to their definition of possibility (given that they wish to apply it in the above way) *and* to universal causal determinism already contains the seeds of necessitarianism without the need for an extra argument *via* **PB**. Hence, in giving that extra argument, it is understandable that our author should at one moment (11.4–5) seem to have reached the desired conclusion, on the basis of this double commitment, without the need for further argument; and at the next moment (12.12) be prepared to deploy the notion of what is prevented from happening simply as a variant of what is causally determined not

on the one hand we have an argument directly from causal determinism to necessitarianism; on the other hand we have a quite separate argument in which causal determinism supplies us with unrestricted **PB**, and the argument proceeds from *that* assumption to necessitarianism. See further my 'Alexander's Sea Battle'. This latter argument seems to be what is in question too at *De Fato* 187.22–188.3.

[11] DL 7.75 = LS 38D = *SVF* 2.201.

to happen (although its nature would permit its happening). Hence at 11.4–5 my reconstruction locates the notion of what is prevented in the conclusion of the argument which is about to be given: the ensuing argument aims to arrive, *via* **PB**, at the conclusion that everything happens by necessity (= is prevented from not happening: the definition of possibility here to the fore). But at 12.12 I take the reference to what is prevented to be to what is *causally* prevented, but which is otherwise, just so far, possible (*δυνατὸν ἄλλως*); the argument then being that the assumption that it is causally prevented from happening licenses a prediction that it will not happen; and the *truth* of that prediction yields necessity.[12]

In the final part of the dialogue the author outlines the solution to the problem of future contingency which is more fully developed by Ammonius and Boethius.[13] The author starts by defining the possible as that which, when assumed to be actual, results in nothing impossible (12.13–4). This definition is Aristotelian (cf. #22). The author then remarks that '*MFp*' cannot cohere with '$T \neg Fp$' since the assumption, on the back of '*MFp*', of '*TFp*', yields contradiction with '$T \neg Fp$' ('$T \neg Fp$' implies '$\neg TFp$'): 12.14–16. But his opponents believe that one of the members of a **FCA** is determinately (*'ἀφωρισμένως'*) true, so they thereby remove contingency:

> [Given the Aristotelian definition of possibility] none of the things concerning which one member of an antiphasis about the future is determinately (*ἀφωρισμένως*) true would be contingent. But their claim is that in all cases one member of an antiphasis *is* determinately true. (12.16–18)

The argument prompts the following objection:[14] in assuming '*TFp*' on the back of '*MFp*', one should not hold the fact that '$T \neg Fp$' fixed. Rather, one is precisely assuming '*TFp*' instead of (what is in fact the case) '$T \neg Fp$'. The objection simply brings out the author's implicit acceptance of the fatalist's inference from truth to necessity. In refusing

[12] In his 'Pseudo-Alexandre, Critique des Stoïciens (*Quaestiones* 1.4)', *Proceedings of the World Congress on Aristotle* (Thessaloniki, 1978), Athens 1981, 198–204, Mignucci makes the tentative suggestion that the author of *Quaestio* 1.4 may be relying on the necessity of the past in his derivation of the necessity of predicted events from the truth of (anterior) predictions: but I detect no sign of this reliance.

[13] In particular, by their introduction of the notion of indefinite truth, which is not explicitly present here: Sharples, *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.35 n.81.

[14] Cf. Sharples, *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.34 n.80.

to reason as this objection wants, the author betrays his adherence to the doctrine of modality relative to the facts. Given that doctrine, contradiction is the inevitable consequence of trying to apply the Aristotelian definition of possibility to the combination '*MFp* & $T\neg Fp$'. In other words, the author accepts '$Tp \rightarrow Lp$'. At 12.20–2 the author restates the conclusion in terms reminiscent of the beginning of *GC* 2.11: if something will be (*ἔσται*) then it must be. At 12.22–5 the text is very uncertain. We can gain some leverage on what ought to be said at this point if we look ahead. The author goes on to argue at 12.25–13.2 that contingency is two-sided, and thence that the contingency of each member of an antiphasis cannot cohere with the definite truth of one member and falsity of the other:

> But if, similarly, the same thing can contingently happen and not happen, surely it would be absurd to say that in these cases one member of the predictive antiphasis is true, and the other false, when in fact the relevant thing is likewise capable of both [happening and not happening]. (13.2–5)

For (here again applying the Aristotelian definition of possibility) that would lead to contradiction, which the author expresses as both members of the **FCA** being true, and then as both members being false: if '*Fp*' and '$\neg Fp$' are both true, then (by **PB**) '$\neg Fp$' and '*Fp*' are both false (13.5–8). Given that this is the overall shape of the dialectic, we can specify what *ought* to be said at 12.22–5. The author ought to state that his opponents cannot commit themselves to the contingency of *one* of the members of a **FCA** (as they seek to do, combining this with the truth of the other member) without committing themselves to the contingency of the *other* member. He can then continue as he does: 'for (*γὰρ*, 25) contingency is two-sided . . .' It is necessary to emend the text somewhat to yield this sense.[15]

[15] I propose the following text at 12.22–4: '*εἰ γάρ τις ἐφ' οὗ* [*ψεῦδος*] ⟨*ἓν*⟩ *μὲν τῶν λεγομένων* ⟨*τὸ γενέσθαι ἓν δὲ*⟩ *τὸ μὴ γενέσθαι λέγοι τὸ ἕτερον τούτων ἐνδεχόμενον. . .*' At 12.22–3 Bruns prints: '*εἰ γάρ τις ἐφ' οὗ ψεῦδος ἓν τῶν λεγομένων* ⟨*ἢ τὸ γενέσθαι ἢ*⟩ *τὸ μὴ γενέσθαι. . .*' '*ἓν*' is Bruns' emendation for the MSS' '*μὲν*'. I retain '*μὲν*' but also adopt '*ἓν*' (omission by haplography), since something like that is needed to pick up the genitive '*τῶν λεγομένων*'. '*ψεῦδος*' is doubly inappropriate: the opponents want to combine the *truth* of one of the members of an **FCA** with the possibility of the other member (cf. 12.14–5); and our author wishes to argue that contingency is incompatible with *either* truth-value attaching to a member of a **FCA** (12.20–2). As soon as one rejects '*ψεῦδος*' and adopts Bruns' '*ἓν*' the rest of the emendation follows naturally. It is easy to see how '*ψεῦδος*' might have intruded: once the text had become damaged, one might naturally (but incorrectly) take '*ἕτερον*' in 12.24 as 'the *other* member' (so Sharples, 'An Ancient Dialogue on Possibility', p.37; *Alexander of Aphrodisias: Quaestiones 1.1–2.15*, p.35) rather than '*either* member'. In that case, one might suppose that the first member had to be false if the other member is being said to be possible. But 13.3–5 makes it clear that the position our author is attacking is that the members should have *either* truth-value (not merely falsity) given – what must be conceded – that both are possible.

Finally, how is '*ἀφωρισμένως*' used by our author? It seems clear that it has the syntactic function outlined in #12. Given that the author accepts '$Tp \rightarrow Lp$', the way to avoid necessitarianism will now be to disallow the *distribution* of those truth-values within a **FCA**. If we adhere strictly to the text, I think we can go no further. It is possible that the introduction of the term '*ἀφωρισμένως*' is designed, as it is in the commentators Ammonius and Boethius, to make room for some role for **PB** in the domain of **FCS**s, but not to permit an application of **PB** entirely parallel to its application in the domain of statements about the present and past. So although there is no mention of indeterminate truth in *Quaestio* 1.4, it is possible that the commentators' position is meant to be implicit in the dialogue. The author claims that the members of a **FCA** are not determinately true or false. Certainly, on the syntactic interpretation of 'indeterminately' which I have favoured, the author is not thereby committed to finding a sense in which those members are *indeterminately* true/false, but it may be that he would have accepted that while **FCS**s are not either true, or alternatively false, they are either-true-or-false.

That '*ἀφωρισμένως*' is not modal in force (that it does not mean 'necessarily', following Rescher's suggestion) is clear from the occurrence of the word at 12.17, which I quoted above. The point here is that the assumption of the truth of one of the members of a **FCA** (the false one), on the back of its possibility, conflicts with the fact that the other member is *ἀφωρισμένως* true. If '*ἀφωρισμένως*' meant 'necessarily' here, the introduction of the Aristotelian definition of possibility, allowing one to assume the truth of a given possibility, would be pointless. A contradiction would immediately arise between the necessity of the true member and the the supposed possibility of the false member. Of course, as I have pointed out, a member of a **FCA** is determinately true if and only if it is necessarily true. So the contradiction which our author arrives at is tantamount to the one I have just specified. But the point is that the contradiction which the author seeks to derive lies not between a necessity and a possibility ($L\neg Fp$ & *MFp*) but

– *via* the Aristotelian definition of possibility – between two truths (*TFp* & ¬*TFp*). That shows that the author understands '*ἀφωρισμένως*' as a syntactic distributor of truth-values, and not as a modal operator. Further, given the material equivalence of the two contradictions, and the way the author applies the Aristotelian definition of possibility, we can articulate the author's conception of truth and necessity in the form of an acceptance of the theorem '$Tp \rightarrow Lp$'.

Bibliography

1 *Aristotelian Texts*

Aristotelis Opera, 5 vols ed. I.Bekker (Berlin, 1831–70).
Aristotelis Categoriae et Liber De Interpretatione ed. L. Minio-Paluello (Oxford, 1949).
Aristotelis Analytica Priora et Posteriora ed. W.Ross (Oxford, 1964).
Aristotelis Topica et Sophistici Elenchi ed. W.Ross (Oxford, 1958).
Aristotelis Physica ed. W.Ross (Oxford, 1950).
Aristotelis De Caelo ed. D.Allan (Oxford, 1936).
Aristotelis De Anima ed. W.Ross (Oxford, 1956).
Aristotelis Metaphysica ed. W.Jaeger (Oxford, 1957).
Aristotelis Ethica Nicomachea ed. I.Bywater (Oxford, 1894).
Aristotelis De Arte Poetica Liber ed. R.Kassel (Oxford, 1968).
Aristotelis Ars Rhetorica ed. W.Ross (Oxford, 1959).

2 *Other Ancient Texts*

Alexander: *Alexandri Aphrodisiensis Scripta Minora, Quaestiones, De Fato, De Mixtione* ed. I.Bruns (Berlin, 1892) = *Supplementum Aristotelicum* 2.2.
Alexander: *Alexandre d'Aphrodise, Traité du Destin* ed. P.Thillet (Paris, 1984).
Alexander: *De Providentia* in H–J.Ruland, *Die arabischen Fassungen zweier Schriften des Alexander von Aphrodisias* (Diss. Saarbrücken, 1976).
Augustine: *De Civitate Dei* eds. B.Dombart and A.Kalb (Turnhout, 1955).
Boethius: *Boethii Philosophiae Consolatio* ed. L.Bieler (Turnhout, 1957).
Boethius: *De Syllogismo Hypothetico*, *PL* 64.
Calcidius: *Timaeus a Calcidio Translatus Commentarioque Instructus* ed. J.Waszink (London, 1962).
Callimachus: *Fragmenta* ed. R.Pfeiffer (Oxford, 1949).
Cicero: *Academica* ed. C.Müller (Leipzig, 1898).
Cicero: *De Divinatione, De Fato* ed. W.Ax (Stuttgart, 1977).
Cicero: *Epistulae ad Familiares* ed. W.Watt (Oxford, 1982) [*Ad Fam*].
Cicero: *De Natura Deorum* ed. W.Ax (Stuttgart, 1980).
Epictetus: *Dissertationes* ed. H.Schenkel (Leipzig, 1894) [*Diss*].
Horace: *Opera* ed. H.Garrod (Oxford, 1901).
Jerome: *Dialogus contra Pelagianos*, *PL* 23.
Lucian: *Vitarum Auctio* ed. M.MacLeod (Oxford, 1974) [*Vita Auct*].
Macrobius: *Commentarii in Somnium Scipionis* ed. J.Willis (Leipzig, 1970).
Nemesius: *De Natura Hominis* ed. C.Matthaei (Halle, 1802).
Origen: *Contra Celsum* ed. P.Koetschau (Leipzig, 1899).
Plato: *Timaeus* ed. A.Rivaud (Paris, 1956).
Plutarch: *Quaestionum Convivalium*, in *Plutarchi Moralia* vol.4 ed. C.Hubert (Leipzig, 1938) [*Quae Conv*].

Plutarch: *De Tuenda Sanitate Praecepta*, in *Plutarchi Moralia* vol.1 eds. W.Paton, I.Wegehaupt and M.Pohlenz (Leipzig, 1974) [*De Tuend San*].
Plutarch: *De Communibus Notitiis contra Stoicos*, in *Plutarchi Moralia*, vol.6.2 eds. M.Pohlenz and R.Westman (Leipzig, 1959) [*Comm Not*].
Plutarch: *De Stoicorum Repugnatiis*, in ibid. [*De Stoic Rep*].
[Plutarch]: *De Fato*, in *Plutarch's Moralia*, vol.7 eds. P.de Lacy and B.Einarson (London, 1959).
Proclus: *In Timaeum* ed. E.Diehl (Leipzig, 1906).
Proclus: *In Parmenidem*, in *Procli Philosophi Platonici Opera Inedita* ed. V.Cousin (Paris, 1864).
Proclus: *Commentaire sur le Parménide de Platon, Traduction de G. de Moerbeke* vol.1 libri 1–4 ed. C.Steel (Leuven/Leiden, 1982).
Proclus: *De Decem Dubitationibus, De Providentia*, in *Procli Diadochi: Tria Opuscula* ed. H.Boese (Berlin, 1960).
Proclus: *Institutio Theologica*, in E.Dodds ed., *Elements of Theology* (Oxford, 1963).
Sextus Empiricus: *Adversus Mathematicos* 8–11, in *Sexti Empirici Opera* vol.2 ed. H.Mutschmann (Leipzig, 1914) [*AM*].
Sextus Empiricus: *Outlines of Pyrrhonism* ed. R.Bury (London, 1933) [*PH*].
Stobaeus: *Eclogae* ed. C.Wachsmuth (Berlin, 1884).
Tatian: *Oratio ad Graecos* ed. M.Whittaker (Oxford, 1982).
Themistius: *Orationes* vol.1 ed. G.Downey (Leipzig, 1965).

3 *Ancient and Medieval Aristotelian Commentaries*

Commentaria in Aristotelem Graeca [*CIAG*] (Berlin, 1882–1907):
I *Alexandri Aphrodisiensis in Aristotelis Metaphysica Commentaria* ed. M.Hayduck (Berlin, 1891).
II.I *Alexandri Aphrodisiensis in Aristotelis Analyticorum Priorum Librum I Commentarium* ed. M.Wallies (Berlin, 1883).
IV.5 *Ammonii In Aristotelis De Interpretatione Commentarius* ed. A.Busse (Berlin, 1897).
VIII *Simplicii In Aristotelis Categorias Commentarium* ed. C.Kalbfleisch (Berlin, 1907).
XIII.2 *Ioanni Philoponi in Aristotelis Analytica Priora Commentaria* ed. M.Wallies (Berlin, 1905).
XIV.2 *Ioanni Philoponi in Aristotelis Libros De Generatione et Corruptione Commentaria* ed. H.Vitelli (Berlin, 1897).
XVIII.3 *Stephani in Librum Aristotelis De Interpretatione Commentarium* ed. M.Hayduck (Berlin, 1885).
Albert the Great: *Liber 1 Perihermeneias*, in *Opera Omnia* vol.1 ed. A.Borgnet (Paris, 1890).
Alexander: 'Die durch Averroes erhaltenen Fragmente Alexanders zur Metaphysik des Aristoteles' ed. J.Freudenthal (*Abhandlungen*, Berlin, 1884, 1).
Al-Farabi: *Al-Farabi's Commentary and Short Treatise on Aristotle's De Interpretatione* ed. F.Zimmermann (Oxford, 1981).
Anonymous: *Commentary on Aristotle's De Interpretatione* ed. L.Tarán (Meisenheim, 1978).
Antonius Andreas: *Super Artem Veterem* (Venice, 1496).
Augustino Nifo: *Aristotelis Perihermeneias* (Venice, 1537).
Averroes: *Averroes' Middle Commentaries on Aristotle's Categories and De Interpretatione* ed. C.Butterworth (Princeton, 1983).
Boethius: *Commentarii in Librum Aristotelis De Interpretatione* editio prima et secunda, ed. C.Meiser (Leipzig, 1887–80).

John Buridan: *Quaestiones Longe Super Librum Perihermeneias* ed. R.van der Lecq, *Artistarium* 4 (Nijmegen, 1983).
Julius Pacius: *Aristotelis Organum* (Paris, 1619).
Levi ben Gershon (Gersonides): *Supercommentary on Averroes on Aristotle's De Interpretatione* (Venice, 1552), translated by N.Kretzmann, (Oklahoma: Translation Clearing House, 1980).
Luis de Molina: *Quaestio de Futuris Contingentibus*, in *Geschichte des Molinismus* (*Band 1: Neue Molina Schriften*) ed. F.Stegmüller (Münster, 1935).
Peter Abelard: *Glossae Magistri Petri Abelardi Super Peri Ermenias Ch.9* (*Logica Ingredientibus* part 3), in B.Geyer ed., *Peter Abaelards Philosophische Schriften = Beiträge zur Geschichte der Philosophie des Mittelalters* 21.3 (Münster, 1927), 417.33–447.4.
Peter Abelard: *Introductiones Dialecticae: Editio Super Aristotelem De Interpretatione*, in M.dal Pra ed., *Pietro Abelardo: Scritti di Logica* (Florence, 1969), translated by N.Kretzmann (Oklahoma: Translation Clearing House, 1981).
Sylvester Maurus: *Aristotelis Opera Quae Extant Omnia* (Rome, 1668).
Thomas Aquinas: *S. Thomae Aquinatis In Metaphysicam Aristotelis Commentaria* ed. M.Cathala (Turin, 1926).
Thomas Aquinas: *S. Thomae Aquinatis In Aristotelis Libros De Caelo et Mundo* ed. R.Spiazzi (Turin, 1952).
Thomas Aquinas: *S. Thomae Aquinatis In Aristotelis Libros Peri Hermeneias Expositio* ed. R.Spiazzi (Turin, 1955).
Walter Burley: *Middle Commentary on Aristotle's De Interpretatione*, in S.Brown, 'Walter Burley's Middle Commentary on Aristotle's *Perihermeneias*', *Fransiscan Studies* 33, 1973, 42–134, translated by R.Andrews (Oklahoma: Translation Clearing House, 1984).
Walter Burley: *Final Commentary on Aristotle's De Interpretatione*, in *Super Artem Veterem* (Venice, 1497), ff.66^{rb}–69^{rb}, translated by N.Kretzmann (Oklahoma: Translation Clearing House, 1981).
William of Ockham: *Super I Librum Perihermeneias*, in A.Gambatese and S.Brown eds., *G. de Ockham: Opera Philosophica* (New York, 1978), vol.2.

4 *Other Medieval Texts*

Adam Wodeham (Goddam): *Super Quattuor Libros Sententiarum* (Paris, 1512).
Albert of Saxony: *Quaestio de Futuris Contingentibus*, in *Expositio Aurea et admodum utilis super artem veterem edita per venerabilem inceptorem G de Ockham cum quaestionibus Alberti parvi de Saxonia* (Bologna, 1496); ed. A. Muñoz García, *Alberti de Saxonia: Quaestiones in Artem Veterem* (Maracaibo, 1988), 616–626, translated by N.Kretzmann (Oklahoma: Translation Clearing House, 1981).
Anselm: *De Libertate Arbitrii*, in F.Schmitt ed., *Opera Omnia* (Edinburgh, 1946) vol.1.
Bonaventura: *In Sententias* (Mainz, 1515).
Bonaventura: *In Hexaemeron*, in *Opera Omnia* (Florence, 1891) vol.5.
Gregory of Rimini: *Lectura Super Primum et Secundum Sententiarum* vol.3 eds. A.Trapp and V.Marcolino (Berlin/New York, 1984).
John Duns Scotus: *Ordinatio*, in P. Balić ed., *Opera Omnia* (Civitas Vaticana, 1963), vol.6.1.
John Duns Scotus: *Lectura*, in ibid., 1966, vol.17.
Pseudo-Scotus: *Opus Secundum in Duos Libros Perihermeneias*, in Scotus: *Opera Omnia* ed. L.Wadding (Lyons, 1639), vol.1.
John Major: *In Primum Magistri Sententiarum Disputationes* (1530).

Peter Abelard: *Petrus Abelardus Dialectica* ed. L.de Rijk (Assen, 1956).
Peter of Ailly: *Quaestiones Super Libros Sententiarum* (Strasbourg, 1490; Frankfurt, 1968).
Peter Damian: *De Divina Omnipotentia in Reparatione Corruptae et Factis Infectis Reddendis*, *PL* 145.
Peter de Rivo: *Quaetio Quodlibetica Disputata*, in L.Baudry, *La Querelle des Futurs Contingents* (Paris, 1950), translated by N.Kretzmann (Oklahoma: Translation Clearing House, 1981).
Richard of Lavenham: *Treatise On Future Contingents*, in P.Øhrstrøm, 'Richard Lavenham on Future Contingents', *Université de Copenhague: Cahiers de L'Institut du Moyen-Age Grec et Latin* 44, 1983, 180–86.
Richard of Middletown (Ricardus de Media Villa): *Super Quattuor Libros Sententiarum* (Brescia, 1591).
Robert Holcot: *Super Sententias* (Lyons, 1518; Frankfurt, 1967).
Thomas Aquinas: *De Veritate*, in *Quaestiones Disputatae* ed. R.Spiazzi (Turin, 1949).
Thomas Bradwardine: *De Futuris Contingentibus*, in J–F. Genest, 'Le *De Futuris Contingentibus* de Thomas Bradwardine', *Recherches Augustiniennes* 14, 1979, 249–336, translated by N.Kretzmann (Oklahoma: Translation Clearing House, 1981).
William of Moerbeke: *Aristoteles Latinus 2.1 De Interpretatione vel Periermeneias* ed. G.Verbeke revisit L.Minio-Paluello (Bruges/ Paris, 1965).
William of Ockham: *The Tractatus de Praedestinatione et de Praescientia Dei et de Futuris Contingentibus* ed. P.Boehner (New York, 1945) [*Tractatus*].
William of Ockham: *Ordinatio*, in G.Etzkorn and F.Kelley eds., *G. de Ockham: Opera Theologica* (New York, 1979), vol.4.
William of Ockham: *Summa Logicae*, in P.Boehner, G.Gál and S.Brown eds., *G. de Ockham: Summa Logicae* (New York, 1974).

5 *Modern Aristotelian Commentaries*

Ackrill, J: *Aristotle's Categories and De Interpretatione* (Oxford, 1963).
Balme, D: *Aristotle's De Partibus Animalium 1 and De Generatione Animalium 1* (Oxford, 1972).
Barnes, J: *Aristotle's Posterior Analytics* (Oxford, 1975).
Burnyeat, M et al: *Notes on Books Eta and Theta of Aristotle's Metaphysics* (Oxford: Subfaculty of Philosophy, 1984).
Charlton, W: *Aristotle's Physics I, II* (Oxford, 1970).
Hussey, E: *Aristotle's Physics III, IV* (Oxford, 1983).
Kirwan, C: *Aristotle's Metaphysics* Γ, Δ, E (Oxford, 1971).
Ross, W: *Aristotle's Metaphysics* 2 vols (Oxford, 1924).
Ross, W: *Aristotle's Prior and Posterior Analytics* (Oxford, 1949).
Smith, R: *Aristotle: Prior Analytics* (Indianapolis, 1989).
Williams, C: *Aristotle's De Generatione et Corruptione* (Oxford, 1982).

6 *Modern Literature*

Ackrill, J: Review of G.Patzig, *Die Aristotelische Syllogistik*, *Mind* 71, 1962, 107–117.
Adams, M: *William Ockham* (Indiana, 1987).
Albritton, R: 'Present Truth and Future Contingencies', *PR* 66, 1957, 29–46.

Angstl, H: 'Bemerkungen zu Jules Vuillemin, Die Aporie des Meisterschlusses von Diodoros Kronos und ihre Lösungen', *Allgemeine Zeitschrift für Philosophie* 11, 1986, 79–82.
Anscombe, E: 'Aristotle and the Sea Battle', in J.Smart ed., *Problems of Space and Time* (New York, 1964), 43–57.
Bäck, A: 'Sailing Through the Sea Battle', *Ancient Philosophy* 12, 1992, 133–51.
Bärthlein, K: 'Untersuchungen zur aristotelischen Modaltheorie', *AGPh* 45, 1963, 43–67.
Balme, D: *Greek Science and Mechanism*, *CQ* 33, 1939, 129–38.
Balme, D: 'Teleology and Necessity', in A.Gotthelf and J.Lennox eds., *Philosophical Issues in Aristotle's Biology* (Cambridge, 1987), 275–85.
Barnes, J: 'La Doctrine du Retour Éternel', in J.Brunschwig ed., *Les Stoïciens et leur Logique*, Actes du Colloque de Chantilly, 1976 (Paris, 1978), 3–20.
Barnes, J: 'Review of J.Vuillemin, *Nécessité ou Contingence*', *Classical Review* 36, 1986, 77–9.
Barreau, H: 'Le Maître Argument de Diodore', *Fundamenta Scientiae* (Strasbourg) 46, 1975, 1–51.
Barreau, H: 'Reponses aux Remarques de L'Article de Mme Picolet', *Fundamenta Scientiae* (Strasbourg) 72, 1977, 13–27.
Barreau, H: 'Cléanthe et Chrysippe Face au Maître Argument de Diodore', in J.Brunschwig ed., *Les Stoïciens et leur Logique*, Actes du Colloque de Chantilly, 1976 (Paris, 1978), 21–40.
Barreau, H: 'Conception Diodorienne et Conception Stoïcienne du Maître Argument', *Fundamenta Scientiae* (Strasbourg) 88, 1978, 13–53.
Baudry, L: *La Querelle des Futurs Contingents* (Paris, 1950).
Baylis, C: 'Are Some Propositions Neither True nor False?', *Philosophy of Science* 3, 1936, 156–66.
Becker, A: 'Bestreitet Aristoteles die Gültigkeit des 'Tertium Non Datur' für Zukunftsaussagen?', *Actes du Congrès International de Philosophie Scientifique* 6, Paris 1936, 69–74.
Becker, O: 'Über den κυριεύων λόγος des Diodoros Kronos', *Rheinisches Museum* 99, 1956, 289–304.
Becker, O: 'Zur Rekonstruktion des 'Kurieuon Logos' des Diodoros Kronos', in J.Derbolav and F.Nicolin eds., *Erkenntnis und Verantwortung* (Düsseldorf, 1960), 25–63.
Becker-Freyseng, A: *Die Vorgeschichte des philosophischen Terminus 'contingens'. Eine Untersuchung über die Bedeutung von 'contingens' bei Boethius und ihr Verhältnis zu den Aristotelischen Möglichkeitsbegriffen* (Heidelberg, 1938).
Benthem, J van: 'Tense Logic as a System of Logic', *Logique et Analyse* 80, 1977, 41–83.
Blanché, R: 'Sur l'Interpretation du κυριεύων λόγος', *Revue Philosophique de la France et de l'Étranger* 155, 1965, 133–49.
Bosley, R: 'An Interpretation of *On Int* 9', *Ajatus* 37, 1977, 29–40.
Bostock, D: 'Aristotle on Continuity in *Physics* 6', in L.Judson ed., *Aristotle's Physics* (Oxford, 1991), 179–212.
Boudot, M: 'Temps, Nécessité et Prédétermination', *Les Études Philosophiques* 1973, 435–73.
Boudot, M: 'L'Argument Dominateur et le Temps Cyclique', *Les Études Philosophiques* 1983, 271–98.
Bradley, R: 'Must the Future be what it is going to be?', *Mind* 68, 1959, 193–208.
Burgess, J: 'The Unreal Future', *Theoria* 44, 1978, 157–79.
Butler, R: 'Aristotle's Sea Fight and Three-valued Logic', *PR* 64, 1955, 264–74.
Cahn, S: *Fate, Logic and Time* (Yale, 1967).
Celluprica, V: *Il capitolo del De Interpretatione di Aristotele: Rassegna di Studi 1930–73* (Bologna, 1977).

Celluprica, V: 'L'argomento dominatore di Diodoro Crono e il concetto di possibile di Crisippo', in G.Giannantoni ed., *Scuole socratiche minori e filosofia ellenistica* (Bologna, 1977), 55–73.
Celluprica, V: 'Necessità Megarica e fatalità stoica', *Elenchos* 3, 1982, 361–85.
Chadwick, H: *Boethius: the Consolations of Music, Logic, Theology and Philosophy* (Oxford, 1981).
Christian, C: 'Zur Interpretation der diodoreischen Modalgesetze und der diod. Implikation', *Anzeiger der östereichischen Akademie der Wissenschaften* (Vienna) 101, 1964, 235–243.
Conybeare, F: *Anecdota Oxoniensia: a Collation with the Ancient Armenian Versions of the Greek Text of Aristotle's Categories, De Interpretatione etc.* (Oxford, 1892)
Cooper, J: 'Hypothetical Necessity', in A.Gotthelf ed., *Aristotle on Nature and Living Things* (Pittsburgh and Bristol, 1985) 151–167.
Cooper, J: 'Hypothetical Necessity and Natural Teleology', in A.Gotthelf and J.Lennox eds., *Philosophical Issues in Aristotle's Biology* (Cambridge, 1987), 243–274.
Courcelle, P: *La Consolation de Philosophie dans la Tradition Littéraire* (Paris, 1967).
Courcelle, P: *Late Latin Writers and their Greek Sources* (Cambridge (Mass), 1969).
Craig, W: *The Problem of Divine Foreknowledge and Future Contingents from Aristotle to Suárez* (Leiden, 1988).
Dancy, R: 'Aristotle and the Priority of Actuality', in S.Knuuttila ed., *Reforging the Great Chain of Being*, 73–115.
Davies, M: 'Boethius and Others on Divine Foreknowledge', *Pacific Philosophical Quarterly* 64, 1983, 313–29.
Denniston, J: *The Greek Particles* (Oxford, 1954).
Denyer, N: *Time, Action and Necessity* (London, 1981).
Denyer, N: 'The Atomism of Diodorus Cronus', *Prudentia* 13, 1981, 33–46.
Denyer, N: 'Time and Modality in Diodorus Cronus', *Theoria* 47, 1981, 31–53.
Dickason, A: 'Aristotle, the Sea Fight and the Cloud', *JHP* 14, 1976, 11–22.
Donini, P-L: 'Note al ΠΕΡΙ ΕΙΜΑΡΜΕΝΗΣ di Alessandro di Afrodisia', *Rivista di filologia* 97, 1969, 298–313.
Donini, P-L: 'Stoici e Megarici nel *De fato* di Alessandro di Afrodisia?', in G.Giannantoni ed., *Scuole socratiche minori e filosofia ellenistica* (Bologna, 1977), 174–194.
Donini, P-L: *Ethos: Aristotele e il determinismo* (Alessandria [Turin], 1984) [*Ethos*].
Dummett, M: *Truth and Other Enigmas* (London, 1978).
Dummett, M: *Frege: Philosophy of Language* 2nd ed. (London, 1981)
Ebbesen, S: 'Boethius as an Aristotelian Commentator', in R.Sorabji ed., *Aristotle Transformed* (London, 1990), 373–91.
Evans, G: 'Does Tense Logic Rest on a Mistake?', in his *Collected Papers* (Oxford, 1984), 343–363.
Fine, G: 'Aristotle on Determinism: a Review of Richard Sorabji's *Necessity, Cause and Blame*', *PR* 90, 1981, 561–579.
Fine, G: 'Truth and Necessity in *De Interpretatione* 9', *History of Philosophy Quarterly* 1, 1984, 23–47 ['TN'].
Fraassen, B van: 'Singular Terms, Truth-value Gaps and Free Logic', *JPhil* 63, 1966, 481–95.
Fraassen, B van: 'Presupposition, Implication and Self-Reference', *JPhil* 65, 1968, 136–52.
Fraassen, B van: 'Presuppositions, Supervaluations and Free Logic', in K.Lambert ed., *The Logical Way of Doing Things* (Yale, 1969), 67–91.
Frede, D: *Aristoteles und die Seeschlacht* (Göttingen, 1970) [*Seeschlacht*].
Frede, D: 'Omne quod est quando est necesse est esse', *AGPh* 54, 1972, 153–67.
Frede, D: 'Review of J.Hintikka, *Time and Necessity*', *Philosophische Rundschau* 22, 1974, 237–42.

Frede, D: 'Could Paris (Son of Priam) Have Chosen Otherwise?' *OSAP* 2, 1984, 279–92.
Frede, D: 'The Sea Battle Reconsidered', *OSAP* 3, 1985, 31–87 ['Sea Battle'].
Frede, D: 'Aristotle on the Limits of Determinism: Accidental Causes in *Metaphysics* E.3', in A.Gotthelf ed., *Aristotle on Nature and Living Things* (Pittsburgh and Bristol, 1985), 207–225.
Frede, M: *Die Stoische Logik* (Göttingen, 1974).
Frede, M: 'On the Original Notion of Cause', in M.Schofield et al ed., *Doubt and Dogmatism* (Oxford, 1980), 217–249.
Frege, G: 'Der Gedanke', in *Logische Untersuchungen* ed. G.Patzig (Göttingen, 1976), 30–53.
Fritz, K von: 'Review of P-M. Schuhl, *Le Dominateur et les Possibles*', *Gnomon* 34 1962, 138–152.
Fritz, K von: 'Review of D. Frede, *Aristoteles und die Seeschlacht*', *Gnomon* 44, 1972, 241–250.
Gaskin, R: 'Do Homeric Heroes Make Real Decisions?', *CQ* 40, 1990, 1–15.
Gaskin, R: 'Alexander's Sea Battle: a Discussion of Alexander of Aphrodisias *De Fato* 10', *Phronesis* 38, 1993, 75–94.
Gaskin, R: 'Conditionals of Freedom and Middle Knowledge', *PQ* 43, 1993, 412–430.
Gaskin, R: 'Fatalism, Foreknowledge and the Reality of the Future', *The Modern Schoolman* 71, 1994, 83–113.
Gaskin, R: 'Molina on Divine Foreknowledge and the Principle of Bivalence', *JHP* 32, 1994, 27–47.
Gegenschatz, E: 'Die Freiheit der Entscheidung in der *Consolatio Philosophiae* des Boethius', *Museum Helveticum* 15, 1958, 110–29.
Gegenschatz, E: 'Die Gefährdung des Möglichen durch das Vorauswissen Gottes', *Wiener Studien* 79, 1966, 517–30.
Giannantoni, G: 'Il κυριεύων λόγος di Diodoro Crono', *Elenchos* 2, 1981, 239–272.
Goodman, N: *Fact, Fiction and Forecast* (Harvard, 1983).
Gould, J: *The Philosophy of Chrysippus* (Leiden, 1970).
Guerry, H: 'Rescher's Master Argument', *JPhil* 64, 1967, 310–2.
Haack, S: *Deviant Logic* (Cambridge, 1974).
Hager, F: 'Proklos und Alexander von Aphrodisias über ein Problem der Lehre von der Vorsehung', in J.Mansfeld and L.de Rijk eds., *Kephalaion* (Assen, 1975), 171–82.
Harris, L: 'Solving the Naval Battle', *PAS* 78, 1977–8, 45–61.
Hartmann, N: 'Der megarische und der aristotelische Möglichkeitsbegriff', *Sitzungsberichte der Preussischen Akademie der Wissenschaften*, Berlin 1937, 44–58.
Henry, D: *The Logic of St. Anselm* (Oxford, 1967).
Hintikka, J: *Time and Necessity* (Oxford, 1973) [*TN*].
Hintikka, J (in collaboration with U.Remes and S.Knuuttila): *Aristotle on Modality and Determinism* (Amsterdam, 1977) = Acta Philosophica Fennica 29 [*AMD*].
Huber, P: *Die Vereinbarkeit von göttlicher Vorsehung und menschlicher Freiheit in der Consolatio Philosophiae des Boethius* (Zürich, 1976) [*VgV*].
Issac, J: *Le Peri Hermeneias en occident de Boèce à St. Thomas* (Paris, 1953).
Jordan, Z: 'Logical Determinism', *Notre Dame Journal of Formal Logic* 4, 1963, 1–38.
Judson, L: 'Eternity and Necessity', *OSAP* 1, 1983, 217–55.
Judson, L: 'Chance and 'Always or For the Most Part'', in L.Judson ed., *Aristotle's Physics* (Oxford, 1991), 73–99.
Kahn, C: 'The Place of the Prime Mover in Arisotle's Physics', in A.Gotthelf ed., *Aristotle on Nature and Living Things* (Pittsburgh and Bristol, 1985), 183–205.
Kamp, H: 'Formal Properties of 'Now'', *Theoria* 37, 1971, 227–73.
King-Farlow, J: 'Sea Fights Without Tears', *Analysis* 19, 1958–9, 36–42.
Kirwan, C: 'Aristotle on the Necessity of the Present', *OSAP* 4, 1986, 167–187.
Kleene, S: *Introduction to Metamathematics* (Amsterdam, 1967).

Kneale, W and Kneale, M: *The Development of Logic* (Oxford, 1962) [*DL*].
Kneale, M: 'Eternity and Sempiternity', *PAS* 69, 1968–9, 223–238.
Knuuttila, S: 'The Statistical Interpretation of Modality in Averroes and Thomas Aquinas', *Ajatus* 37, 1978, 79–98.
Knuuttila, S: ed., *Reforging the Great Chain of Being* (Dordrecht, 1981).
Knuuttila, S: 'Time and Modality in Scholasticism', in S.Knuuttila ed., *Reforging the Great Chain of Being*, 163–257.
Knuuttila, S: 'Modal Logic', in N.Kretzmann et al ed., *The Cambridge History of Later Medieval Philosophy* (Cambridge, 1982), 342–357.
Knuuttila, S: *Modalities in Medieval Philosophy* (London, 1993).
Kretzmann, N: 'Nos Ipsi Principia Sumus', in T.Rudavsky ed., *Divine Omniscience and Omnipotence in Medieval Philosophy*, 23–50.
Kretzmann, N: 'Boethius and the Truth about Tomorrow's Sea Battle', in L.de Riik et al ed., *Logos and Pragma* (Nijmegen, 1987), 63–97.
Kutschera, F von: 'Zwei Modallogische Argumente für den Determinismus: Aristoteles und Diodor', *Erkenntnis* 24, 1986, 203–17.
Lear, J: *Aristotle: the Desire to Understand* (Cambridge, 1988).
Leibniz, G: *Die Philosophischen Schriften von G.W.Leibniz* ed. C.Gerhardt (Berlin, 1875–90), 7 vols.
Linsky, L: 'Professor Donald Williams on Aristotle', *PR* 63, 1954, 250–2.
Lockie, R: 'Attributing Actuality', unpublished paper.
Long, A: 'Stoic Determinism and Alexander of Aphrodisias *De Fato* (i–xiv)', *AGPh* 52, 1970, 247–68.
Long, A: *Hellenistic Philosophy* 2nd ed. (London, 1986).
Lovejoy, A: *The Great Chain of Being* (Harvard, 1936).
Lowe, M: 'Aristotle on the Sea Battle: a Clarification', *Analysis* 40, 1980, 55–9.
Łukasiewicz, J: *Aristotle's Syllogistic* 2nd ed. (Oxford, 1957).
McCall, S: 'Temporal Flux', *APQ* 3, 1966, 270–81.
McCall, S: *Polish Logic* (Oxford, 1967).
McCall, S: 'Time and the Physical Modalities', *Monist* 53, 1969, 426–446.
McCall, S: 'The Strong Future Tense', *Notre Dame Journal of Formal Logic* 20, 1979, 489–504.
McDowell, J: 'Truth-value Gaps', in L.Cohen et al. ed., *Logic, Methodology and the Philosophy of Science* 6, Amsterdam 1981, 299–313.
McKim, V: 'Fatalism and the Future: Aristotle's Way Out', *Review of Metaphysics* 25, 1971–2, 80–111.
McKirahan, R: 'Diodorus and Prior and the Master Argument', *Synthese* 42, 1979, 223–53 ['DPM'].
Madigan, A: '*Metaphysics* E.3: a Modest Proposal', *Phronesis* 29, 1984, 123–36.
Magris, A: 'Aristotele e i Megarici. Contributo alla storia del determinismo antico', *Atti della Academia delle scienze di Torino* 111, 1977, 113–133.
Maier, H: 'Die Echtheit der aristotelischen Hermeneutik', *AGPh* 6, 1899, 23–72.
Mansion, S: *Le Jugement d'Existence chez Aristote* (Louvain, 1976) [*JEA*].
Martin, C: *The Philosophy of Thomas Aquinas* (London, 1988).
Mates, B: *Stoic Logic* (Berkeley, 1961).
Merlan, P: 'Zwei Untersuchungen zu Alexander von Aphrodisias', *Philologus* 113, 1969, 85–91.
Michael, F: 'What is the Master Argument of Diodorus Cronus?', *APQ* 13, 1976, 229–235.
Michalski, C: *Le Problème de la volonté à Oxford et à Paris au XIV^e siècle* (Commentatorium Societatis Philosophiae Polonorum vol.2. Studia Philosophica, Leopoldi, 1937).
Mignucci, M: 'L'Argomento Dominatore e la teoria dell'implicazione in Diodoro Crono', *Vichiana* 1966, 3–28.

Mignucci, M: 'Sur la Logique Modale des Stoïciens', in J.Brunschwig ed., *Les Stoïciens et leur Logique*, Actes du Colloque de Chantilly, 1976 (Paris, 1978), 317–346.
Mignucci, M: '*Ὡς ἐπὶ τὸ πολύ* et Nécessaire dans la Conception Aristotélienne de la Science', in E.Berti ed., *Aristotle on Science* (Padua, 1981), 173–203.
Mignucci, M: 'Pseudo-Alexandre, Critique des Stoïciens', *Proceedings of the World Congress on Aristotle* (Thessaloniki, 1978), Athens 1981, 198–204.
Mignucci, M: 'Logic and Omniscience: Alexander of Aphrodisias and Proclus', *OSAP* 3, 1985, 219–246.
Mignucci, M: 'Truth and Modality in Late Antiquity: Boethius on Future Contingent Propositions', *Atti del Convegno Internazionale di Storia della Logica, Le teorie della modalità* (Bologna, 1989), 47–78.
Moline, J: 'Provided Nothing External Interferes', *Mind* 84, 1975, 244–54.
Moraux, P: *Alexandre d'Aphrodise: Exégète de la Noétique d'Aristote* (Paris/Liege, 1942).
Moraux, P: *D'Aristote à Bessarion: Trois Exposés* (Quebec, 1970).
Normore, C: 'Future Contingents', in N.Kretzmann et al ed., *The Cambridge History of Later Medieval Philosophy* (Cambridge, 1982), 358–381.
Normore, C: 'Divine Omniscience, Omnipotence and Future Contingents: An Overview', in T.Rudavsky ed., *Divine Omniscience and Omnipotence in Medieval Philosophy*, 3–22.
Nuchelmans, G: *Theories of the Proposition* (Amsterdam, 1973).
Obertello, L: 'Proclus, Ammonius and Boethius on Divine Foreknowledge', *Dionysius* 5, 1981, 127–164.
Øhrstrøm, P: 'The Master Argument of Diodorus Cronus', *International Logic Review* 11, 1980, 60–5.
Owen, G: 'Tithenai ta Phainomena', in his *Logic, Science and Dialectic* (London, 1986), 239–51.
Pack, R: 'A Passage in Alexander of Aphrodisias relating to the Study of Tragedy', *American Journal of Philology* 58, 1937, 418–436.
Patch, H: 'Necessity in Boethius and the Neoplatonists', *Speculum* 10, 1935, 393–404.
Patzig, G: *Die Aristotelische Syllogistik* (Göttingen, 1963).
Patzig, G: 'Hegels Dialektik und Łukasiewicz's dreiwertige Logik', in *Das Vergangene und die Geschichte*, Festschrift für R.Wittram (Göttingen, 1973), 443–60.
Picolet, F: 'A Propos d'une Reconstruction Récente du Maître Argument de Diodore Cronos', *Fundamenta Scientiae* (Strasbourg) 72, 1977, 1–12.
Picolet, F: 'Nouvelles Remarques à propos de Diodore', *Fundamenta Scientiae* (Strasbourg) 88, 1978, 7–11.
Plass, P: 'Timeless Time in Neoplatonism', *The Modern Schoolman* 55, 1977, 1–19.
Prior, A: 'Three-valued Logic and Future Contingents', *PQ* 3, 1953, 317–26.
Prior, A: 'Diodoran Modalities', *PQ* 5, 1955, 205–13.
Prior, A: *Time and Modality* (Oxford, 1957).
Prior, A: 'Diodorus and Modal Logic', *PQ* 8, 1958, 226–30.
Prior, A: 'Tense Logic and the Continuity of Time', *Studia Logica* 13, 1962, 133–49.
Prior, A: *Formal Logic* 2nd ed. (Oxford, 1962).
Prior, A: *Past, Present and Future* (Oxford, 1967) [*PPF*].
Prior, A: *Papers on Time and Tense* (Oxford, 1968).
Purtill, R: 'The Master Argument', *Apeiron* 7, 1973, 31–6.
Quine, W: *Mathematical Logic* (Harvard, 1940).
Quine, W: 'On a So-called Paradox', *Mind* 62, 1953, 65–7.
Remes, U: 'Aristotle's Sea Fight: a Discussion', *Ajatus* 37, 1977, 41–7.
Rescher, N: *Studies in the History of Arabic Logic* (Pittsburgh, 1963).
Rescher, N: 'A Version of the Master Argument of Diodorus Cronus', *JPhil* 63, 1966, 438–445.
Rescher, N: 'Truth and Necessity in Temporal Perspective', in R.Gale ed., *The Philosophy of Time* (London, 1968), 183–220.

Rescher, N and Urquhart, A: *Temporal Logic* (Vienna/New York, 1971).
Rijen, J van: *Aspects of Aristotle's Logic of Modalities* (Dordrecht, 1989).
Ross, W: *Aristotle* (London, 1964).
Rudavsky, T: ed., *Divine Omniscience and Omnipotence in Medieval Philosophy* (Dordrecht, 1985).
Ryle, G: *Dilemmas* (Cambridge, 1969).
Sainati, V: *Storia dell' organon aristotelico* (Florence, 1968).
Sambursky, S: 'On the Possible and the Probable in Ancient Greece', *Osiris* 12, 1956, 35–48.
Sambursky, S: *Physics of the Stoics* (London, 1959).
Saunders, T: 'A Sea-fight Tomorrow?', *PR* 67, 1958, 367–78.
Schuhl, P-M: *Le Dominateur et les Possibles* (Paris, 1960).
Sedley, D: 'Diodorus Cronus and Hellenistic Philosophy', *Proceedings of the Cambridge Philological Society* 203, 1977, 74–120.
Sedley, D: 'The Negated Conjunction in Stoicism', *Elenchos* 5, 1984, 311–16.
Sedley, D: 'On Signs', in J.Barnes et al ed., *Science and Speculation* (Cambridge, 1982), 24–68.
Seel, G: *Die Aristotelische Modaltheorie* (Berlin/New York, 1982) [*DAM*].
Seel, G: 'Diodore domine-t-il-Aristote?', *Revue de Métaphysique et de Morale* 87, 1982, 293–313.
Serene, E: 'Anselm's Modal Conceptions', in S.Knuuttila ed., *Reforging the Great Chain of Being*, 117–162.
Šešić, B: 'Ein antiker dialektischer Streit', *Živa Antika* 9, 1959, 41–55.
Sharples, R: 'Aristotelian and Stoic Conceptions of Necessity in the *De Fato* of Alexander of Aphrodisias', *Phronesis* 20, 1975, 247–74.
Sharples, R: 'Responsibility, Chance and Not-being (Alexander of Aphrodisias *mantissa* 169–172), *BICS* 22, 1975, 37–64.
Sharples, R: 'Temporally Qualified Necessity and Impossibility', *Liverpool Classical Monthly* 3, 1978, 89–91.
Sharples, R: 'Alexander of Aphrodisias *De Fato*: some Parallels', *CQ* 28, 1978, 243–66.
Sharples, R: 'If What is Earlier, then of Necessity What is Later? Some Ancient Discussions of Aristotle, *De Generatione et Corruptione* 2.11', *BICS* 26, 1979, 27–44.
Sharples, R: 'Alexander of Aphrodisias on Divine Providence: Two Problems', *CQ* 32, 1982, 198–211.
Sharples, R: 'An Ancient Dialogue on Possibility: Alexander of Aphrodisias *Quaestio* 1.4', *AGPh* 64, 1982, 23–38.
Sharples, R 'Alexander of Aphrodisias: Problems about Possibility I', *BICS* 29, 1982, 91–108.
Sharples, R: 'Alexander of Aphrodisias Problems about Possibility II', *BICS* 30, 1983, 99–110.
Sharples, R: *Alexander of Aphrodisias on Fate* (London, 1983).
Sharples, R: *Cicero: On Fate and Boethius: The Consolation of Philosophy* (Warminster, 1991)
Sharples, R; *Alexander of Aphrodisias: Quaestiones 1.1–2.15* (London, 1992).
Shiel, J: 'Boethius' Commentaries on Aristotle', in R.Sorabji ed., *Aristotle Transformed* (London, 1990), 349–72.
Sorabji, R: 'Aristotle on the Instant of Change', *PAS* Supplementary vol.50, 1976, 69–89.
Sorabji, R: *Necessity, Cause and Blame* (London, 1980) [*NCB*].
Sorabji, R: *Time, Creation and the Continuum* (London, 1983) [*TCC*].
Stahl, G: 'Une Formalisation du Dominateur', *Revue Philosophique* 88, 1963, 239–43.
Stallmach, J: *Dunamis und Energeia* (Meisenheim, 1959).
Stallmach, J: 'Vertritt Aristoteles *Metaphysik IX.5* selbst den megarischen Möglichkeitsbegriff?', *AGPh* 47, 1965, 190–205.

Strang, C: 'Aristotle and the Sea Battle', *Mind* 69, 1960, 447–65.
Striker, G: 'Notwendigkeit mit Lücken', *Neue Hefte für Philosophie* 24–5, 1985, 146–64.
Sutula, J: 'Diodorus and the Master Argument', *Southern Journal of Philosophy* 14, 1976, 323–42.
Talanga, J: *Zukunftsurteile und Fatum* (Bonn, 1986).
Talanga, J: Review of F.Zimmermann, *Al-Farabi's Commentary and Short Treatise, AGPh* 68, 1986, 306–7.
Taylor, R: 'The Problem of Future Contingencies', *PR* 66, 1957, 1–28.
Theiler, W: 'Tacitus und die antike Schicksalslehre', in his *Forschungen zum Neuplatonismus* (Berlin/New York, 1966), 46–103.
Thomason, R: 'Indeterminist Time and Truth-value Gaps', *Theoria* 36, 1970, 264–81.
Trzesicki, K: 'Is Discreteness of Time Necessary for [the] Diodorean Master Argument?', *Bulletin of the Section of Logic* 16, 1987, 125–135.
Vogel, C de: 'Boethiana I', *Vivarium* 9, 1971, 49–66.
Vuillemin, J: 'L'Argument Dominateur', *Revue de Métaphysique et de Morale* 84, 1979, 225–57.
Vuillemin, J: 'Éternel Retour et Temps Cyclique: Quelle Solution Cléanthe a-t-il donnée de l'Argument Dominateur?', *Archives de Philosophie* 45, 1982, 375–409.
Vuillemin, J: *Nécessité ou Contingence: l'Aporie de Diodore et les Systèmes Philosophiques* (Paris, 1984) [*NC*].
Vuillemin, J: 'Die Aporie des Meisterschlusses von Diodoros Kronos und ihre Lösungen', *Allgemeine Zeitschrift für Philosophie* 10, 1985, 1–19.
Vuillemin, J: 'Zur Rekonstruktion des Meisterschlusses: Antwort an Helmut Angstl', *Allgemeine Zeitschrift für Philosophie* 11, 1986, 83–7.
Vuillemin, J: 'Reply to Wiggins', in C.Brittan ed., *Causality, Method and Modality* (Dordrecht, 1991), 211–21.
Waterlow, S: *Passage and Possibility* (Oxford, 1982) [*PP*].
Weidemann, H: 'Möglichkeit und Wahrheit', *AGPh* 61, 1979, 22–36.
Weidemann, H: 'Überlegungen zu einer temporalen Modalanalyse', *Zeitschrift für Philosophische Forschung* 34, 1980, 405–422.
Weidemann, H: 'Review of S. Waterlow, *Passage and Possibility*', *AGPh* 67, 1985, 303–313.
Weidemann, H: 'Die Aristotelische Modaltheorie: eine Auseinandersetzung mit dem gleichnamigen Buch von Gerhard Seel', *Zeitschrift für Philosophische Forschung* 40, 1986, 104–20.
Weidemann, H: 'Aristoteles und das Problem des kausalen Determinismus', *Phronesis* 31, 1986, 27–50 ['APkD'].
Weidemann, H: 'Das sogenannte Meisterargument des Diodoros Kronos und der aristotelische Möglichkeitsbegriff', *AGPh* 69, 1987, 18–53 ['DSM'].
Weidemann, H: 'Zeit und Wahrheit bei Diodor', in K.Döring and T.Ebert eds., *Dialektiker und Stoiker* (Stuttgart, 1993), 319–29.
Whitaker, C: *An Analysis of Aristotle's De Interpretatione*, Ph.D thesis, Cambridge, 1993.
White, M: 'Aristotle and Temporally Relative Modalities', *Analysis* 39, 1979, 88–93.
White, M: 'Facets of Megarian Fatalism: Aristotelian Criticisms and the Stoic Doctrine of Eternal Recurrence', *Canadian Journal of Philosophy* 10, 1980, 189–206.
White, M: 'Necessity and Unactualised Possibilities in Aristotle', *Philosophical Studies* 38, 1980, 287–98.
White, M: 'Fatalism and Causal Determinism: an Aristotelian Essay', *PQ* 31, 1981, 231–41.
White, M: 'Time and Determinism in the Hellenistic Philosophical Schools', *AGPh* 65, 1983, 40–62.
White, M: 'Causes as Necessary Conditions: Aristotle, Alexander of Aphrodisias and J.L.Mackie', *Canadian Journal of Philosophy* Supplementary vol.10, 1984, 157–189.

White, M: 'The Necessity of the Past and Modal-Tense Logic Incompleteness', *Notre Dame Journal of Formal Logic* 25, 1984, 59–71.
White, M: *Agency and Integrality* (Dordrecht, 1985).
Wieland, W: 'Zur Deutung der aristotelischen Logik', *Philosophische Rundschau* 14, 1966, 1–27.
Wieland, W: 'Zeitliche Kausalstrukturen in der aristotelischen Logik', *AGPh* 54, 1972, 229–37.
Wieland, W: 'Aristoteles und die Seeschlacht', *Berichte zur Wissenschaftsgeschichte* 2, 1979, 25–33.
Wiggins, D: 'Towards a Reasonable Libertarianism', in his *Needs, Values, Truth*, 2nd ed. (Oxford, 1991), 269–302.
Wiggins, D: 'Temporal Necessity, Time and Ability: a Philosophical Commentary on Diodorus Cronus' Master Argument as given in the Interpretation of Jules Vuillemin', in C.Brittan ed., *Causality, Method and Modality* (Dordrecht, 1991), 185–206.
Williams, C: 'Aristotle and Corruptibility', *Religious Studies* 1, 1965, 95–107, 203–15.
Williams, C: 'True Tomorrow, Never True Today', *PQ* 28, 1978, 285–99.
Williams, C: 'What is, necessarily is, when it is', *Analysis* 40, 1980, 127–31.
Williams, D: 'The Sea Fight Tomorrow', in P.Henle et al. eds., *Structure, Method and Meaning* (New York, 1951), 282–306.
Wippel, J: 'Divine Knowledge, Divine Power and Human Freedom in Thomas Aquinas and Henry of Ghent', in T.Rudavsky ed., *Divine Omniscience and Omnipotence In Medieval Philosophy*, 231–41.
Wolff, P: 'Truth, Eternity and Contingency', *Mind* 69, 1960, 398–402.
Wright, G von: *Logical Studies* (London, 1957).
Wright, G von: 'Determinismus, Wahrheit und Zeitlichkeit', *Studia Leibnitiana* 6, 1961, 161–78.
Wright, G von: 'Time, Truth and Necessity', in C.Diamond and J.Teichman eds., *Intention and Intentionality* (Sussex, 1979), 237–250.
Wright, G von: 'The 'Master Argument' of Diodorus', in E.Saarinen et al ed., *Essays in Honour of Jaakko Hintikka* (Dordrecht, 1979), 297–307.
Wright, G von: *Truth, Knowledge and Modality* (Oxford, 1984).
Yourgrau, P: 'On the Logic of Indeterminist Time', *JPhil* 82, 1985, 548–59.
Zagzebski, L: *The Dilemma of Freedom and Foreknowledge* (Oxford, 1991).
Zeller, E: *Die Philosophie der Griechen* (Leipzig, 1875).
Zeller, E: 'Über den κυριεύων des Megrikers Diodorus', *Sitzungsberichte der Preussischen Akademie der Wissenschaften* (Berlin, 1882), 151–9.

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