# "WITH PARTICULARS THAT ARE GOING TO BE IT IS DIFFERENT"

## Aristotle and the Problem of Future Contingents

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TABLE OF CONTENTS

# INTRODUCTION

What follows will be an investigation of Aristotle's theory of time and potentiality, focusing on his discussion of future contingents in On Interpretation. I hope to show how Aristotle's particular solution to the problem of future contingents sheds light on his general theory of time and vice versa. Since both his general and his particular theory admit of rival interpretations, my attempt to relate the two will necessarily have a somewhat dialectical character, weighing reciprocal determinations, rather than being purely linear and deductive.

In Chapter One, I shall present my interpretation of Int. IX, defending it against rival interpretations (primarily Hintikka's) on internal evidence alone. In Chapters Two through Four, I shall attempt to arrive at the same conclusion by relying on external evidence alone. Chapter Two will set forth an interpretation of Aristotle's theory of potentiality; Chapter Three will do the same for time; and Chapter Four will combine these various accounts into a view of future contingents. Finally, in an appendix, I will examine some of the external evidence offered by Hintikka in light of the accounts of future contingents in Chapters One through Four.

# CHAPTER ONE

## The Sea Battle

Aristotle's discussion of the problem of future contingents in On Interpretation IX has been the subject of controversy since antiquity. In recent years, what is usually called the "traditional interpretation" of the passage has come under sharp attack. I take the traditional interpretation to assert[1] that Aristotle intends to deny the applicability of the Law of Bivalence (the principle that every proposition is either true or false) to statements affirming or denying particular future states of affairs whose outcome is not yet determined. More precisely, if "p" is a statement affirming a future contigent event, then although the disjunction "p or not-p" is already true (since, by the Law of Excluded Middle, that much has already been determined), neither of the individual disjuncts "p" and "not-p," taken separately, is as yet either true or false. The view which the traditional interpretation ascribes to Aristotle in Int. IX is thus in essence the same as that defended on its own merits by Łukasiewicz in this century:

> I maintain that there are propositions which are neither true nor false but indeterminate. All sentences about future facts which are not yet decided belong to this category. Such sentences are neither true at the present moment, for they have no real correlate, nor are they false, for their denials too have no real correlate. (p. 126)

This interpretation is the one accepted, with minor variations[2], by such philosophically diverse commentators as Richard Sorabji, Martha Kneale, Colin Strang, Abraham Edel, Dorothea

Frede, Jan Łukasiewicz, and W. V. Quine; it has also been subjected to severe criticism from numerous quarters. Out of the spectrum of alternative readings of Int. IX, that advanced by Jaakko Hintikka has received the most attention. Hintikka ridicules "the intrinsic absurdity of this alleged doctrine of Aristotle's" (p. 163), denies that Aristotle held, considered, or even discussed such a doctrine, and offers a novel and idiosyncratic interpretation of Int. IX. In what follows, I shall present a "traditional" reading of the argument as I understand it, also discussing some of the objections raised by Hintikka and others, and the possible responses which might be available to a proponent of the traditional interpretation. Since Hintikka's is the most radical of the wide variety of non-traditional interpretations, I will be focusing on it; nevertheless, I hope my investigation will also have some relevance for the many critical views which, owing to limitations of space, I have discussed only briefly or not at all.

Aristotle begins the chapter by summarising the conclusions he has reached concerning truth and falsity in the preceding chapters of On Interpretation.

> With regard to what is and what has been it is necessary for the affirmation or the negation to be true or false. And with universals taken universally it is always necessary for one to be true and the other false, and with particulars too, as we have said; but with universals not spoken of universally it is not necessary. But with particulars that are going to be it is different. (18 a 28-33)

Several opponents of the traditional interpretation (e. g. Anscombe) think that, in this chapter, Aristotle is primarily

concerned with necessity (or necessary truth) rather than with truth per se. But this would make Int. IX a rather irrelevant digression in a work on the logic of statements. (The subsequent discussion of possibility and necessity at Int. XII-XIII is concerned with the relations to one another of statements about necessity and possibility (21 a 34-36), not with actual things which are necessary or possible.) This introductory passage, while it does speak of necessity, suggests a strong continuity with the earlier parts of the work. The principles summarised do not suggest that necessity is what is at issue. Furthermore, the statements here qualified by "necessary" reappear elsewhere without this qualification -- at 18 a 37 and 19 a 20, for instance -- which implies that it is truth and falsity, not necessary truth and falsity, which form the focus of the chapter.

Some of the obscurity concerning Aristotle's attitude toward bivalence may be due to the fact that the principle Aristotle discusses, while it is closely related to the Law of Bivalence, has a somewhat different form. The Law of Bivalence says that every statement must be either true or false. But the principle which Aristotle has established in the earlier chapters of On Interpretation is rather that, for every statement and its negation, one must be true, the other false. I shall call this, following Frede (p. 3), the Law of Alternation. The Law of Alternation is simply the conjunction of the Law of Bivalence and a third principle: namely, that the truth of a statement implies the falsity of its negation and vice

versa.

Ideally there should be no conflict between bivalence and alternation; but, since alternation includes an additional claim about negation, an eccentric view of the latter will affect the former. Aristotle holds that negation is of two types, contrary and contradictory. The contradictory negation of "A man is white" is "No man is white," but the contrary negation of "A man is white" is "A man is not white." (Int. 17 b 17, 18 a 5) In this second case, both statements can be true (or both false) without contradiction; but since he considers one the (contrary) negation of the other, he is obliged to consider statements of the form "A man is white" or "A sea battle is happening" to be exceptions to the Law of Alternation as he has stated it. (Such statements are called "universals not spoken of universally" because, while they involve a universal term like "man" rather than a singular term like "this man" or "Kallias," they do not refer to the entire class.) He suggests (17 b 35), however, that if contrary negation is assimilated to contradictory negation, the Law of Alternation remains in force. Thus, from a modern standpoint, Aristotle's technical exception for universals not spoken of universally should not be taken as an exception to the Law of Bivalence (or to the Law of Alternation, if we limit negation to what Aristotle calls contradictory negation). Aristotelean alternation may not hold for contrary negation in the case of universals not taken universally, but it does hold for contradictory negation in such cases.

And the primary dichotomy at the beginning of Chapter IX is not between statements of universals not taken universally and some other class of statements, but rather between statements about the past and present on the one hand, and statements about the future on the other. Aristotle begins by asserting alternation of all statements of the past and present. He goes on to break down such statements into the various types he has considered, including his technical exception, and then asserts that the case of future particulars is "different." The nature of this difference remains to be specified.

Gail Fine admits (p. 40) that this passage is "somewhat awkward" for her view that Int. IX involves not only "no rejection or modification of bivalence" but also "virtually no past-future asymmetry." But she feels (p. 39) that it would be inconsistent for Aristotle to deny alternation of future particulars at 18 a 33 when he has just asserted it for all particulars at 18 a 30. But on any interpretation he also denies it of universals not taken universally at 18 a 31 after asserting it for all nonfuture statements at 18 a 28. Both cases seem less like self-contradictions than like the simple act of making an exception. In any case, one might legitimately suppose that the opening sentence ("With regard to what is and what has been ....") is meant to be understood as stipulating that the examples which follow are cases of "what is and what has been"; under such an interpretation, the particulars referred to at 18 a 30 would be past and present particulars only.

Aristotle proceeds to argue that, if alternation/bivalence is maintained in all cases whatsoever, contingency is abolished. (That he does not regard the Law of Alternation as fundamentally different from the Law of Bivalence, at least in cases that do not depend on the double meaning of "negation," is clear from his slide from "if every affirmation or negation is true or false" (18 a 34) to "if every affirmation is true or false" (18 a 37).)

> ... if it is true to say that it is white or it is not white, it is necessary for it to be white or not white; and if it is white or not white, then it was true to say or deny this. If it is not the case it is false, if it is false it is not the case. So it is necessary for the affirmation or the negation to be true. 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 (since either he who says or he who denies is saying what is true). For otherwise it might equally well happen or not happen, since what is as chance has it is no more thus than not thus, nor will it be. (18 a 39-b 9)

The argument appears to be thus:

1) For every pair of an affirmation and its negation, one must be true and the other false. (from the posited universality of the Law of Alternation)
2) For every fact, there corresponds a possible affirmation and also a possible negation. (from Int. VI)
3) For every fact, there corresponds either a true affirmation or a true denial. (from (1) and (2))
4) A fact to which there corresponds a true statement must be as the statement indicates.
5) Every fact must be as it happens to be, and thus could not have been otherwise. (from (3) and (4))

The controversial step is obviously (4). Fine thinks the argument is intended to be fallacious, and that Aristotle's solution depends on distinguishing between necessitas consequentiae (Necessarily: if "p" is true, then p) and necessitas

consequentis (If "p" is true, then necessarily: p); she sees (4) as masking an illicit inference from the first to the second. The plausibility of this pro-bivalence interpretation will be considered shortly; in the meantime, I will merely attempt to show that there is a sort of intuitive sense to the notion that truth implies necessity of some kind (and thus is a view which Aristotle could have held without obvious absurdity, and one which might help to explain his argument.) The sense lies in the correspondence theory of truth, i.e., the doctrine that a statement is true if it corresponds to the way things are in the actual world. Aristotle endorses this doctrine toward the end of the chapter: "statements are true according to how the actual things are." (19 a 33) If a statement, to be true, must correspond to some actual state of affairs or feature of the world, then, for a statement about the future to be true, it would seem that the predicted outcome must already be definitely decided (though not necessarily known).

Let me explain why this is so. The truth of prediction "p" is of course inconsistent with the truth of prediction "not-p"; that is, "p" and "not-p" cannot possibly both be true at the same time. For if "p" and "not-p" are both true, then both p and not-p will happen, which is a violation of the Law of Non-Contradiction (assuming p is a particular event). But if a prediction is true now, it cannot become false later (at least before the predicted event); for if a prediction is true before the event, the event will happen, and if it is false before the event, the event won't happen -- and it can't both

happen and not happen. If the prediction is true, the event will occur, and that fact is inconsistent with the prediction's being false at any time before the event. Now whatever is incompatible with something to which there is at present no alternative is impossible (perhaps not throughout time, but for whatever period the corresponding fact holds). Thus, once a prediction is true, it is impossible for it to be false before the event; and so it is equally impossible for its negation to be true. If prediction "p" is true, then, it follows that prediction "not-p" cannot be true, and so the state of affairs predicted by "not-p" can't be realised. The assumption that a prediction -- say, "You will mow the lawn tomorrow"-- is true conflicts with the ascription of possibility to its negation. "If you regard the condition as fulfilled, i.e. you will mow, then the consequence is guaranteed and the possibilities are no longer to be regarded as open." (Frede, p.6) If an event's not occurring is possible, it must be possible for a statement affirming its non-occurence to come true; but this cannot be so if affirmation of the event's occurence is already true and the possibility of its being false is thereby forestalled.

Aristotle's move from truth to necessity is certainly compatible with the interpretation I have sketched.

> ... if it was always true to say that it was so, or would be so, it could not not be so, or not be going to be so. But if something cannot not happen it is impossible for it not to happen; and if it is impossible for something not to happen it is necessary for it to happen. (18 b 11-14)

A statement is true if it corresponds to the way things really are. But if there is a determinate "state of things" with re-

gard to the future, then the present truth of a prediction renders the predicted fact necessary (19 a 1-6); or, more precisely (since the truth does not cause the fact but vice versa), the truth of the prediction presupposes that there is some determinate and decided fact of the matter, and thus that what it predicts cannot fail to occur.

It follows that the Law of Bivalence, if applied without exception, entails fatalism. For the truth of a prediction involves the necessity of what is predicted; so if every prediction is already true or false, i.e. if bivalence holds, then everything that happens was necessary all along. Aristotle finds this an unpalatable conclusion; but the attempt to avoid fatalism by maintaining that no prediction is true until it is fulfilled initially leads to still worse problems: "Nor, however, can we say neither is true ...." (18 b 17) For, under bivalence, if the prediction is not true it is false; but the negation is also a prediction and so ex hypothesi must be false: "though the affirmation is false the negation is not true, and though the negation is false the affirmation, on this view, is not true." (18 b 19-20) The claim that both the affirmation and the negation are false does not save contingency; since the truth-value of statements corresponds to the necessity of the facts they assert or deny, what occurs under this "solution" would be necessary anyway -- but it would now violate the law of Non-Contradiction as well: "Take a sea battle: it would have neither to happen nor not to happen." (18 b 25)

The fact that Aristotle considers modifying truth-values

in this passage suggests once more that it is truth and falsity that are at issue in Int. IX. But modification of truth-values will not help so long as bivalence is preserved. Denying truth of both disjuncts is in fact the solution to the problem; but bivalence/alternation requires us to move from denying their truth to asserting their falsity, which involves a contradiction. And in the very next line, this contradiction is said to follow from the Law of Alternation, not from the modification of truth-values.

The chapter is obviously structured as a reductio ad absurdum of the fatalist's argument. Aristotle shows, first, that it yields the presumably false conclusion that everything is due to necessity, and second, that an attempt to escape this dilemma without rejecting bivalence/alternation leads to the still more absurd conclusion that what is predicted must both occur and fail to occur. (18 b 25) He immediately writes: "These and others like them are the absurdities that follow if it is necessary for every affirmation and negation, either about universals spoken of universally or about particulars, that one of the opposites be true and the other false ...." (18 b 26) It seems clear that what is being reduced to the absurd is the assumption of definite truth-values before the event. But on Fine's interpretation, Aristotle upholds bivalence and instead criticises the move from necessitas consequentiæ to necessitas consequentis. To justify this interpretation, one would like to see Aristotle claim at this point that "these and others like them are the absurdities that follow if the necessity of the conditional is taken to imply the

necessity of the consequent." Instead, he lays the blame on the unrestricted applicability of the Law of Alternation.

Strang, on the other hand, sees Aristotle as introducing a distinction between "straight" and "loaded" statements about the future. A "straight" statement carries no fatalistic conclusions, and with regard to these [redacted] statements the Laws of Bivalence and Alternation hold without exception. But statements of the form "It will be" or "It won't be" are "sometimes, almost always, loaded utterances: loaded, that is, with some kind of implication about the present." (p. 463); a prediction is "loaded" if it suggests that the present state of things is such that what it predicted will inevitably occur. Strang argues that "Aristotle regarded the thesis [the Law of Alternation] as ambiguous" (p. 449), and that when he says that, in regard to statements about future contingents, "it is not the case that it is necessary that one should be true and the other false .... He means ... if the last words [true and false] are taken in their strong ["loaded"] sense." (p. 447) Since, as Strang partly admits (p. 465), the distinction between "straight" and "loaded" statements or truth-values is nowhere to be found in the text of Int. IX, it seems reasonable to reject the distinction (as an interpretation of Aristotle, at any rate) if it can be shown, as I am trying to do, that Aristotle thinks prior truth-value of any variety entails the necessity of the stated fact.

Aristotle's reductio against the fatalist is only effective, of course, if the conclusion (universal necessity) to which the argument is reduced is truly objectionable. In sup-

[illegible] of fatalism [illegible]

port of his rejection of fatalism, Aristotle appeals to the notion of human freedom of choice: "we see that what will be has an origin both in deliberation and in action ...." (19 a 7) He has already noted earlier (18 b 31) that "there would be no need to deliberate or to take trouble" if everything came about of necessity. He seems to take it as close to self-evident that human deliberation and choice are genuine determining factors of future events, and not merely pointless affirmations of already decided outcomes. He also considers it self-evident that something may be possible without ever coming to pass, for he says "Many things are obviously like this" (19 a 13) and goes on to give the example of the cloak which is capable both of being cut and of never being cut.

Fine sees this defense of contingency as an actual weak spot for the traditional interpretation. She feels that Aristotle defends the contingency of <u>all</u> chance events, not just future ones. "Just as it is not necessary," she writes, "that my cloak be cut up (since it is possible for it to wear out instead), so it is not necessary even now that it have been cut up (it might have worn out instead)." (p. 34) If all chance events are contingent, she argues, then the past-future asymmetry required for the traditional interpretation is invalidated. But Aristotle can surely speak of past events as contingent and still uphold the necessity of the past; for he may simply mean that past chance occurrences were <u>once</u> contingent. One may say "the energetic man is dead," although clearly no dead man

is energetic (or, for that matter, a man, according to Aristotle). In such a case, the adjective "energetic" clearly means "formerly energetic (but now dead)" -- and so "contingent" can mean "formerly contingent (but now past and so necessary)."

In any case, Aristotle does not explicitly assert the contingency of past chance events anywhere in the chapter; on the contrary, Aristotle writes that "what holds for things that are does not hold for things that are not but may possibly be or not be ...." (Int. 19 b 3) Fine's claim that "'things that are' refers to things that are always (or are always not)" (p. 45n) seems to be without foundation in the text; it is far more plausible to interpret the passage as assigning a special status to the future. As Frede notes, "all the examples seem to be chosen to illustrate the problem of the truth of contingent statements about the future (cf. 18b35; cf. also the coat 19a13, and, not to forget, of course, the sea-battle tomorrow 19a28)." (p.34)

If the Law of Alternation applies to the future as well as the past, nothing is capable of happening unless it is actually going to happen; [illegible] thus, the Law of Alternation clashes with a feature of possibility which Aristotle finds obvious. This opposition sets the stage for Aristotle's solution:

What is, necessarily is, when it is;

> and what is not, necessarily is not, when it is not. But not everything that is, necessarily is; and not everything that is not, necessarily is not. For to say that everything that is, is of necessity, when it is, is not the same as saying unconditionally that it is of necessity. (19 a 23-26)

Fine takes the "when" in "what is, when it is, is necessary" in a logical rather than a temporal sense. She interprets the phrase as meaning "it is necessarily the case that if p, then p." According to her interpretation, Aristotle is once more criticising the move from the necessity of the conditional to the necessity of the consequent. Thus, on Fine's reading, the point of the solution is that one cannot go from "Necessarily: if p, then p" to "If p, then necessarily: p." But the apparent stress on past-future asymmetry at the beginning and end of the chapter, and the repeated use of examples concerning the future, should lead us to suppose it plausible to take "when" in a temporal (or at least situational) sense; as Fine points out, "what is, when it is, is necessary" could then be taken as affirming the necessity of the present and past. The point of the passage would then be that, while any fact is necessary once it is indeed the case, or relative to its having come about, it is not therefore necessary "unconditionally" (19 a 26); for if it were necessary unconditionally or <u>simpliciter</u>, it would be necessary before it happens as well, and that is precisely the conclusion Aristotle finds unacceptable.

At this point, Aristotle is not yet denying bivalence, because he is not talking about statements, but facts.

(Truth and falsity are properties of statements; necessity, possibility, and so forth are properties of facts.) He affirms the Law of Excluded Middle, "Necessarily: p or not-p." "... it is necessary for there to be or not to be a sea-battle tomorrow; but it is not necessary for a sea-battle to take place tomorrow, nor for one not to take place." (19 a 30-33) The disjunction, as a logical truth, is necessary all along, independent of any particular facts; whatever happens, it has to be one or the other. But neither disjunct is yet necessary, since it doesn't have to be p and it doesn't have to be not-p. Eventually, of course, since one or the other must happen in the end (since the disjunction is necessary), either p or not-p will become necessary when it happens (or shortly before).

But Aristotle is not here interested in the necessity or contingency of events as such; On Interpretation is is not a work on physics. He is interested in the properties of statements about necessary or contingent events. Accordingly, he invokes the correspondence theory of truth to pass from the denial of necessity to the denial of truth-value.

> ... since statements are true according to how the actual things are, it is clear that wherever there are such as to allow of contraries as chance has it, the same necessarily holds for the contradictories also. This happens with things that are not always so or are not always not so. With these it is necessary for one or the other of the contradictories to be true or false -- not, however, this one or that one, but as chance has it .... (19 a 33-38)

> ... everything necessarily is or is not, and will be or will not be; but one cannot divide and say that one or the other is necessary. (19 a 27)

A statement affirming the disjunction of p and not-p will always be true, because the Law of Excluded Middle is a logical truth independent of any particular circumstances; but predictions of the disjuncts taken separately are not logical truths, but depend on correspondence to the actual situation (which is not yet determinate). Where the facts are such as to allow of opposite potentialities of <u>being</u>, the contradictory statements must correspondingly both be open to the possibility of <u>being true</u>. The statements have indeterminate truth-value [3] because the objects of those statements are themselves indeterminate. As Edel says, "there is now no such thing as what will be tomorrow":

> For statements of the present and the past there is no problem; Aristotle dismisses them at the beginning of the chapter. There already are definite realities to correspond to. The statement that there will be a sea battle tomorrow has nothing yet to correspond to. Hence both the affirmation and the negation will be held up, pending the formation of the reality. To assign them a present truth-value (even though uncertain which) is already to presuppose a reality for them to correspond to. (pp. 395-396)

On the interpretation I have defended, then, Aristotle upholds a definite past-future asymmetry for the truth-values of statements. The Laws of Bivalence and Alternation hold for events which have already come to pass, but are suspended in the case of future events which are not yet decided.

> Clearly, then, it is not necessary that of every affirmation and opposite negation one should be true and the other false. For

> what holds for things that are does not hold for things that are not but may possibly be or not be; with these it is as we have said. (19 b 1-4)

Hintikka, on the other hand, has proposed a fundamentally different interpretation of Int. IX. On Hintikka's view, Aristotle treats potentiality primarily as a statistical notion. A fact is necessary if it is always the case, contingent if it is sometimes the case (and sometimes not), and impossible if it is never the case. To say that something is possible is simply to say that it will eventually occur:

> Statements of possibility were taken by Aristotle to be primarily statements of frequency, wherefore they involve a range of cases. Saying that an individual event is possible is for him normally an elliptical way of saying that the relative frequency of similar events on similar occasions is different from zero. (p. 162)
>
> It is well-nigh axiomatic for Aristotle that possibility equals sometime truth ...." (p. 160)
>
> In the last analysis, all modal statements should admit of reformulations in temporal (but otherwise wholly extensional) terms. (p. 113)

As Hintikka sees it, then, Aristotle is committed to the Principle of Plenitude, i.e., the rule that whatever is capable of happening must inevitably come to pass.

It is in terms of this account of potentiality that Hintikka reads Aristotle's worry that "if it was always true to say that it was so, or would be so, it could not not be so, or not be going to be so." (18 b 11; emphasis added) Hintikka thinks that it is not the fact that the

assertion was true before the event, but the fact that it was always true, which renders the event necessary.

> Aristotle's main problem was not a metaphysician's vague worry about whether present truth about the future prejudges future events ....It was generated rather by the fact that statements about individual future events have always been true if they are true at all, and always false if false at all. Statements of this kind were thought of by Aristotle as being true of false necessarily. Aristotle's problem is thus primarily that of omnitemporal truth -- or, more accurately, that of infinite past truth -- rather than that of future truth. (pp.152-153)

Aristotle's reference to statements' being true through "the whole of time" (19 a 2) is also taken to support this interpretation.

But the assertion that Aristotle is concerned mainly with infinite past truth in Int. IX does not seem plausible. Aristotle mentions the necessitarian implications of a statement's being true before the fact in several cases which give no indication that anything is supposed to turn on the statement's having always been true:

> For if one person says that something will be and another denies this same thing, it is clearly necessary for one of them to be saying what is true ....(18 a 35)

> For if it is true to say that it is white or is not white, it is necessary for it to be white or not white; and if it is white or not white, then it was true to say or deny this. (18 a 39-b 3)

> ... if it is true to say that something is white and large, both have to hold of it, and if true that they will hold tomorrow, they will have to hold tomorrow ....(18 b 20-23)

It might be objected that these are only examples of the necessity of the conditional, and are simply explicating the Law of Alternation or the correspondence theory of truth. But these examples are in each case closely followed by the conclusion that nothing can happen as chance has it (18 b 5, 24), and are in any case quite similar in structure to the example involving "always true" (18 b 11), which is itself closely followed by the conclusion that nothing can happen as chance has it (18 b 15); the same thing occurs again at 19 a 1-6. These examples are clearly intended to be seen as leading to necessity; and the fact that the word "always" is present in some but absent from most suggests that it is simply the claim that statements about the future are true earlier, not the claim that they have always been true, which Aristotle sees as leading to fatalism.

Hintikka's account of the solution to this problem of truth and necessity is naturally influenced by his conviction that Aristotle adheres to an extensional account of possibility. By the Principle of Plenitude, which Hintikka attributes to Aristotle, whatever is possible has to happen (from which it clearly follows that whatever happens had to happen, since nothing happens which is not possible). Hintikka concludes that all events, considered as tokens, are necessary, since, for example, the War of 1812 never fails to happen in 1812 and is thus necessary by Hintikka's frequency interpretation of modal terms. But considered as a type of event which could occur in a different year, the

War of 1812 is not necessary.

> In a sense, whatever happens at a moment could not fail to happen at it; 'possibly p at $t_0$' implies 'p at $t_0$'. In Aristotle, this nevertheless does not prove determinism, for what really counts as showing that something is possible at a given moment of time is whatever happens in similar circumstances at other (future) moments of time. (p.161)

In short, Hintikka argues that Aristotle would unhesitatingly concede the very fatalist claim which the traditional interpretation takes him to be opposing. Considered as a particular moment, everything is necessary throughout time (since its prediction has infinite past truth). But this necessity of the token is not the sort of necessity Hintikka thinks Aristotle was worried about. Given an extensional account of possibility, one is interested in the necessity of the type; the token is trivially necessary. Thus, on this view, refuting the claim that something is necessary is simply a matter of showing that it is not always existent, i.e., that there is not always something of that type.

> I have suggested that Aristotle considers the occurrence of a sea fight tomorrow contingent because in similar circumstances in the past and future it sometimes is true and sometimes false to say 'a sea fight will take place tomorrow'. In other words, if one assert the contingency of tomorrow's sea fight, one is not any more speaking of this individual naval engagement; one is speaking, however elliptically, of similar sea fights in the past and future. (p. 172)

The claim seems to be that an event is contingent only if events of its type sometimes happen and sometimes do not; on this view, the "fatalist" position Aristotle is attack-

ing is simply that events like sea battles always happen.

On the traditional interpretation, Aristotle's claim that contingent events are necessary when they are but not throughout time should be understood as follows:

> If there is a sea battle on August 6, then on August 6 it is necessary that there be a sea battle on August 6, but it is not thereby necessary throughout time (e.g., on August 5) that there be a sea battle on August 6.

Hintikka, on the other hand, seems to take Aristotle to mean something like this:

> If there will be a sea battle tomorrow, and tomorrow is August 6, it is throughout time necessary that there be a sea battle on August 6, but it is not thereby necessary that there be a sea battle on every given tomorrow.

The chief difference between Hintikka's interpretation and mine is that, while we both take "when" temporally rather than logically, I take the term "tomorrow" to be designating rigidly the token "that particular day which right now happens to be tomorrow" (say, August 6), while Hintikka appears to take "tomorrow" to refer to the type. In other words, if the statement "there will be a sea battle tomorrow" is necessary throughout time, I take that to mean that throughout time there is a necessity that a sea battle occur on that real date which presently happens to be "tomorrow" from the standpoint of the date on which the assertion is made, whereas Hintikka seems to think that if "there will be a sea battle tomorrow" is necessary throughout time, that means that the description "tomorrow", which is eventually predicated of every day at one time or another, carries having a sea

battle along with it, so that there would have to be a sea battle every day. According to Hintikka, this is the conclusion that Aristotle is trying to avoid, while the weaker conclusion that it has all along been necessary that there be a sea battle on August 6 is one that he accepts. Since there is not a sea battle every day, then, on Hintikka's view, we can call tomorrow's sea battle contingent, since, while the token is either necessary or impossible, the type is neither. The traditional interpretation, on the other hand, proposes that Aristotle is arguing against the necessity of the token (hence the talk of particulars that are going to be; 18 a 33). In fact, the stronger view (that there must be a sea battle every day) seems too blatantly wrong to need so lengthy and subtle a refutation as that found in Int. IX.

If "tomorrow" is a token-term, it refers to a particular date, supporting the traditional interpretation; if a type-term, it refers to every date when and insofar as it is a "tomorrow," supporting Hintikka's interpretation. Hintikka's case for types over tokens relies heavily on Aristotle's preference for temporally indefinite sentences of the form "p will occur tomorrow," as opposed to dated sentences of the form "p will occur at time t." (p. 161) If "tomorrow" is a token-term, it picks out a particular date; but Aristotle believes that temporally indefinite sentences of this sort change their truth-value when the date changes while remaining the same sentence. (Categories 4 a 12-b 2) We would consider two different utterances of "there will

be a sea battle tomorrow" on different days to be different propositions because "tomorrow" does not mean the same day in both cases; but Aristotle is willing to call them the same statement, thus suggesting that he sees "tomorrow" as a type-term which preserves its meaning through change in extension.

Nevertheless, an endorsement of types over tokens in certain cases is not an exclusive commitment. Hintikka himself admits that the evidence is strongly in favour of interpreting Int. IX in terms of tokens, thus counting against his extensional account of possibility:

> ... when he [Aristotle] speaks of predicting an event 'ten thousand years beforehand' (18b34), and says that it does not matter how old thepredictions are, he is clearly thinking of predictions pertaining to one and the same moment or period of time. Likewise, when Aristotle discusses the possibility or necessity of a sea fight tomorrow, he clearly has in mind a sea fight on a specific day. He is not thinking of the predictions which on different days might be made by uttering the same form of words 'there will be a sea fight tomorrow'. [i.e., he is taking "tomorrow" as a token, not a type]. (p. 169)

Nevertheless, Hintikka sees this primarily as evidence that Aristotle was confused or that there was a conflict in his ideas, rather than as a sign of a defect in Hintikka's own interpretation.

> ...deep tensions... seem to have been operative in Aristotle's thinking. He believed in indeterminism and in the special role of modal notions. Yet in his very own conceptual apparatus there were factors that tended to push him towards an extensional (tense-logical) reduction of modal notions to temporal ones. (p.113)

Hintikka is not unduly disturbed by the fact that some of the passages in Int. IX conflict with his interpretation because he thinks he has overwhelming evidence for his statistical account of Aristotelean potentiality. This evidence will be considered in the appendix; for the present, it is sufficient to point out that the main tension in Int. IX appears to be between the text and Hintikka's interpretation, not within the text itself.

On Hintikka's view, an assertion of the possibility of a sea battle's occurring or a cloak's being cut is a disguised statement about many different battles and cloaks at different points in time. Thus, not only tensed terms but the very subjects themselves -- "cloak" and "sea battle" -- must be understood as type-terms rather than token-terms. Discussing Aristotle's example (19 a 13-16) of the cloak which may be cut up or may instead wear out (an apparent contradiction of the Principle of Plenitude, which Hintikka attributes to Aristotle), he writes:

> Aristotle can equate possibility with sometime truth only if he thinks he is dealing with statements of the form 'a coat will wear out' and 'a coat will be cut' or perhaps 'such and such a coat will wear out' and 'such and such a coat will be cut', not with the statements '<u>this</u> coat will wear out' and '<u>this</u> coat will be cut' .... A mere generalization with respect to time is not enough. Aristotle apparently also has to generalize with respect to individuals. (p.172)

But Hintikka's determination to save his extensional interpretation does violence to the text. If Aristotle had written of "<u>a</u> cloak," there might be some ground for de-

bating whether it was meant as a type or a token. But the phrase "this cloak" (19 a 14), along with the stress on particulars (18 a 33, b 27), seems to indicate unequivocally that it is the individual case that concerns Aristotle, not the general class.

The text contains further difficulties for Hintikka's interpretation. On his extensional account, the necessity Aristotle is combating is not that of the event's having all along been inevitable, but that of its happening throughout all time. But it is then very strange for Aristotle to invoke the fact that humans can be starting-points of future facts as counter-evidence to fatalism: "But what if this is impossible? For we see that what will be has an origin both in deliberation and in action ...." (19 a 7) If necessity equals omnitemporality, the reference to deliberation seems somewhat irrelevant, especially since much stronger arguments are available to him: if Aristotle were really attacking the sea-battle-every-day view, wouldn't it be simpler for him to point out that some things just aren't omnitemporal, that there is not in fact a sea battle every day? If modal claims are elliptical for temporal ones, there is no obvious conflict between necessity and deliberation; but Aristotle suggests that there is (18 b 31, 19 a 7), and that suggestion makes perfect sense under the traditional interpretation.

Again, in arguing against universal necessity, why should an extensionalist Aristotle appeal to the notion that "in things that are not always actual there is the possibi-

lity of being and of not being" (19 a 9) when all he needs to say is that some things are indeed not always actual? The wording suggests that Aristotle thinks his hypothetical fatalist opponent already accepts the existence of non-eternal things, which would mean that the necessity Aristotle is worried about is not purely extensional. Furthermore, even if, on Hintikkâs view, Aristotle never rejects the Law of Alternation, the fact that he even considers a modification of truth-value or deems it relevant to his discussion (as he does at 18 b 17) makes it likely that Aristotle is up against a more severe problem than the straw-man that everything has to happen all the time.[4] And finally, if Aristotle were going after the straw-man as Hintikka claims, he would still be committed (via bivalence and correspondence) to a fatalism he shows every sign of trying to avoid.

In contrasting Hintikka's interpretation of Int. IX with the traditional one, I have stayed primarily with the text of the chapter itself, not relying on external evidence. I have tried to show that Hintikkâs interpretation cannot account for numerous passages in Int. IX which lend themselves much more neatly to the traditional interpretation, and thus that, on the basis of that text itself, the reading which ascribes to Aristotle a suspension of bivalence for statements of future contingents enjoys an interpretive advantage.

But Hintikka's defense of his interpretation does not

limit itself to considerations drawn solely from Int. IX. Rather, he backs up his argument with a general theory of Aristotle's views on the relation between temporal and modal notions in the corpus as a whole. If Aristotle is truly committed elsewhere to the position Hintikka ascribes to him here, that fact constitutes strong evidence in favour of Hintikka. In what follows, I shall present a rival account of Aristotle's theory of time and potentiality -- one which is anti-statistical and which defends the priority of modal notions over temporal ones (rather than reducing the former to the latter, as Hintikka does). Basing my account solely on evidence outside of Int. IX, I shall attempt to show that the general theory thus obtained suggests the same solution to the problem of future truth as that ascribed to Aristotle by the traditional interpretation. Finally, in the Appendix, I will review Hintikka's textual evidence in favour of extensional modality and the Principle of Plentitude, and will try to reinterpret this evidence in light of the traditional interpretation of Int. IX as reached by internal and external evidence alike.

Needless to say, this approach does not exactly yield a definitive proof of the traditional interpretation. The mere existence in the Aristotelean corpus of assertions that conflict with Hintikka's interpretation does not render the interpretation indefensible; Hintikka can simply claim, as he does, that Aristotle perhaps changed his mind (p. 175) or even never made it up (p. 113). But I hope to establish a) that it is at least possible to contruct an internally consistent account of

Aristotle's general theory of time and potentiality which incorporates the traditional interpretation, and b) that this account is also more compatible with the Aristotelean texts than is Hintikka's, and can account for apparently anti-traditionalist passages better that Hintikka can account for apparently pro-traditionalist passages.

I do not wish to suggest, however, that my primary focus is on attacking Hintikka. I hope rather to keep my discussion centered on Aristotle's text and theory, not Hintikka's. But Hintikka's interpretation is extremely valuable as a foil to illuminate crucial issues and distinctions in Aristotle's theory of time and potentiality.

Notes to Chapter One:

1 Some writers, e.g. Hintikka (p. 148), have a different conception of what the traditional interpretation is supposed to be. Since no importance is here attached to any interpretation's traditionality as such, the expression "traditional interpretation" as I use it may be taken as a mere label without injury to the argument.

2 Frede, for example, thinks that Aristotle suspends the Law of Excluded Middle as well as the Law of Bivalence; and Colin Strang's interpretation (which involves a distinction between "straight" truth, for which bivalence holds, and "loaded" truth, for which it does not) is so eccentric that it only barely falls within the pale of the traditional interpretation. The point is that all proponents of the traditional interpretation see Aristotle as modifying the Law of Bivalence in some respect.

3 I have spoken primarily of truth; but my argument is meant to apply to falsity as well. As I understand it, it is only the bivalence component of alternation that Aristotle finds objectionable; the negation component (that the truth of a statement entails the falsity of its negation and vice versa) is preserved, except in the case of universals not taken universally. Thus, where p is a particular, the claims that "p" is false and that "not-p" is true are identical, and so the indeterminacy of prior truth ipso facto involves the indeterminacy of prior falsity.

4 Paradoxically, Hintikka (p. 167) calls this very passage "as effective a counter-example to the traditional interpretation as one could wish." To be sure, it does contain a rejection of one solution involving truth-value modification; but Aristotle's bringing up the subject nevertheless tells against the view that truth-values have nothing to do with his problem.

# CHAPTER TWO

## Modality

In Chapter One, I argued that the traditional interpretation of Int. IX accounts for the content of the text better than do its competitors. Hintikka's rival interpretation, however, is backed up by a theory about the relation between time and potentiality in Aristotle's corpus as a whole. In this chapter, I shall try to show that Hintikka's account of this relation is flawed. I shall be denying Hintikka's claim that Aristotle "always or for the most part" reduces modal notions to temporal ones, and shall argue instead that for Aristotle modal notions are, in a sense, independent of temporal ones.

If we are to understand Aristotle's view, we must overcome certain automatic ways of thinking about time which until recently have characterised our post-Renaissance scientific worldview. Oresme and Galileo appear to have been among the first to graph motion as a function of time and distance, thus subtly incorporating into the outlook of the Scientific Revolution the implicit assumption that time is somehow more fundamental than motion and change, which presuppose it. (This assumption became explicit with Newton and Kant.) The gap between Aristotle and the moderns was only widened by the Humean-Kantian move of identifying cau-

sality with lawlike succession in time, that is, of reducing causal notions to temporal ones. The modern conception of a law of nature (interpreted as a material conditional) as the basic explanatory principle of science, along with the widespread statistical definition of probability (which assimilates propensity to frequency), reflects the modern assumption of the priority of time over change and potentiality, and of temporal notions over modal ones. In short, the modern view of time and modality is precisely what Hintikka is trying to read back into Aristotle.

But Aristotle, as I shall show in Chapter Three, defines time in terms of change (Physics 219 b 1), and change in terms of potentiality (Phys. 201 a 10). Unless Aristotle's account is circular, he is employing notions of potentiality and change which are not derived from that of time. For the reasons noted above, this may seem very odd to a modern reader, who may be inclined either to suppose Aristotle's account circular or else to deny (as Hintikka must) that Aristotle means what he says. The alternative is to interpret Aristotle as presenting an account of potentiality as basic and not derived from time; that is the interpretation I shall defend.[1]

Aristotle thinks that there are two kinds of possibility: possibility for a single outcome (call this one-way possibility), and possibility for an outcome or its opposite (call

this two-way, or disjunctive, possibility). So he can say that necessary beings lack (two-way) potentiality without implying that they are impossible. But of the two, Aristotle generally prefers the two-way kind of potentiality: "Every potentiality is at one and the same time a potentiality of the opposite." (Metaphysics 1050 b 9) If a potentiality remains unactualised, it clearly also possesses the potentiality not to be actualised, and so is a potentiality both for a given actuality and for its privation.

But Aristotle recognises that certain potentialities, namely those of necessary beings, are not capable of existing unactualised, and so he modifies his general principle that every potentiality is for opposites; for otherwise, "the necessary to be will be admissible not to be; but this is false. ... it is evident that not everything capable either of being or of walking is capable of the opposites also." (Int. 22 b 35-37) But two-way potentiality remains Aristotle's paradigm case of possibility; necessary things are considered possible only if we are speaking ambiguously or "homonymously." (Prior Analytics 32 a 20)

Aristotle identifies an individual substance's potentiality with its matter (Meta. 1042 a 27, 1050 a 16; On the Soul 412 a 9). But it is not potentiality in general but Aristotle's preferred two-way potentiality that is the material component of substance: "all things produced either by nature or by art have matter; for each of them is capable both of

being and of not being, and this capacity is the matter in each." (Meta. 1032 a 20) Note that it is not just any two-way potentiality (such as the power to-walk-or-not-to-walk) which is identified with matter, but the two-way potentiality to-be-or-not-to-be. It is not a man's matter, but the man himself, that is potentially walking-or-not-walking; but it is the man's matter that is potentially a man-or-not.

> For the subject and substratum differ by being or not being a 'this'; the substratum of accidents is an individual such as a man, i.e. body and soul, while the accident is something like musical or white. ... Wherever this is so, then, the ultimate subject is a substance; but when this is not so but the predicate is a [substantial] form or a 'this', the ultimate subject is matter and material substance. (Meta. 1049 a 27-36)

It is therefore somewhat misleading to say unqualifiedly, as Aristotle often does (e.g. On the Soul 412 a 9) that matter is potentiality; his considered view seems to be that matter is two-way potentiality with respect to substance.

That this is indeed his view is confirmed by what he says about necessary beings; they are said to have no matter (Meta. 1044 b 26-28) because they are not open to the alternative of not-being, although they do possess two-way potentiality with respect to non-substantial predication. The imperishable heavenly spheres, for example, possess two-way potentiality with respect to location, since they are capable of being at a certain point along their orbit, and also of not being there.

> ... 'without qualification' means 'in substance'. Nothing, then, which is without qualification imperishable is without qualification potentially (though there is nothing to prevent its being potentially in some respect, e.g. potentially of a certain quality or in a certain place) .... if there is an eternal mover, it is not potentially in motion (except in respect of 'whence' and 'whither'; there is nothing to prevent its having matter for this). (Meta. 1050 b 16-23)

The reference (here, and also at 1042 b 5) to an eternally moving object's "having matter for" accidents in the category of location may seem to contradict my claim that matter is only potentiality in respect to substance.[2] Now Aristotle does refer to the potentialities inherent in a form as the proximate matter which is included in the definition of that form (Meta. 1035 a 5-25). Such matter is part of the actuality and cannot exist separately. So, like potentiality, matter can be either one-way or two-way, proximate or remote; but when it is one-way and proximate, it is really a part of the substance's actuality, so that the matter is the same as the form, though regarded from a different aspect (Soul 412 b 5-8; Meta. 1045 b 17-21), and so can serve as the substratum of accidents -- a role which Aristotle denies to matter in Meta. 1049 a 27-36.

Thus, Aristotle's claim that necessary beings can have matter for accidents should be understood as referring to proximate matter, which is one-way with respect to substance and two-way with respect to accidents. But, since Aristotle has a preference for two-way possibility, he similarly has

a preference for two-way matter; his most usual view is thus that matter is the two-way potentiality for substantial predication. This explains why he says that whatever has matter must be capable of not existing (Meta. 1088 b 20).

But matter does not appear to be purely potential. For matter is that out of which substances are made (Phys. 194 b 24), and is identified with definite materials (wood, bronze, flesh, etc.). Such a material may be considered solely qua potentiality to serve as the matter of a substance, or alternatively in terms of its own intrinsic qualities, which it retains whether or not it constitutes a higher-order substance. Considered as the matter of a man, flesh is defined organically and is an inseparable component of the substance man; but considered in itself, it is separable. (Gen. Corr. 321 b 16-34) "... immediately after pointing out that the homeomerous parts have functions, Aristotle himself acknowledges that it is also possible to regard flesh and blood in themselves and not as parts of a functional whole -- that is, to regard them in terms of differentiae such as hardness or softness ...." (Whiting, pp. 227-228) Formally, blood is essentially hot, but considered in its material aspect it is not. (Parts of Animals 649 b 21-28)

Thus, the same entity may be considered as matter from one point of view and as substance from another; form and matter are contextual and hierarchical, with each level serv-

ing as the actuality of the level below it and the potentiality for the level above it: "a casket is not wood but of wood, and wood is not earth but made of earth, and [what it is "of"] is always potentially ... the thing which comes after it in this series." (Meta. 1049 a 19-23) (Aristotle also affirms this hierarchy in Meteorology 390 a 5-7.)

Straw and clay are something in themselves actually, and bricks potentially; bricks are bricks actually, and a house potentially. It is because bricks have the actual qualities of solidity, sturdiness, evenness of shape, and so forth that they can serve as potential components of a house; potentiality arises from actuality. The acquisition of an actuality confers new potentialities (or newly proximate potentialities) on its bearer; in learning French, an actualisation of one's potential-to-learn-French, one acquires the potential-to-speak-French "just as earth is not yet potentially a statue, for it must change in order to become bronze." (Meta. 1049 a 17)[3]

Each material component of a substance, then, is a substance and actuality in its own right; but considered as that out of which something is made, it is the potentiality to receive a form. A brick does not lose its own nature by becoming part of a house; and even when the material component is regarded as absorbed into a larger whole, as in a chemical compound, it nevertheless retains its individual identity (Gen. Corr. 328 b 17-19; Part. An. 649 b 14-19).

Yet Aristotle does say that "a substance cannot consist of substances present in it actually [but only potentially]" (Meta. 1039 a 4), and this may seem to contradict my claim that the material components of substances are themselves substances. But Aristotle's theory of form and matter as relative to a hierarchy implies that one and the same entity can indeed be a substance and also the matter of a higher-order substance; and he does explicitly claim that the material substratum is the same before and after becoming informed (Meta. 1033 a 19-21). How, then, are we to understand Aristotle's claim that no substances can be present in another substance?

I think Aristotle must be interpreted as meaning that no substances qua substance can be present in another substance qua substance. Aristotle often enough uses terms this way; for example, in On the Soul he moves from saying that the soul "can be moved incidentally ... in the sense that the vehicle in which it is can be moved" (408 a 31-33) to saying simply that "the soul cannot be moved" a few lines later (408 b 30). In such cases, "his claims that a property does not belong to a subject can and often must be interpreted as elliptical for claims that the property does not belong essentially to that subject." (Whiting, p. 65)

Insofar as we consider a man in his actuality, his material components are regarded as mere features of the whole, i.e., are considered only under their aspect of being able

to take on the form of man. It is not *qua* independently characterisable amalgamation of chemicals but *qua* potential human that an amalgamation of chemicals can be the matter of a man.

> ... the bronze is potentially a statue, but .... it is not the same thing to be a statue and to be potentially something .... The case is clear with opposites: to be capable of being healthy and to be capable of being sick are different -- otherwise being sick and being healthy would be the same thing -- but the underlying subject, that which is healthy and that which is diseased, be it moisture or blood, is one and the same. (*Phys.* 201 a 30-b 3)

Although, considered as the matter of a statue, bronze is just the potentiality to be a statue (and as *such* is interchangeable with copper, marble, and so forth), that particular potentiality does not exhaust its nature as bronze.

Since bronze can exist without being a statue, bronze's potential in that direction is a two-way potentiality for an *accidental* attribute; having such-and-such a shape is only accidental to the *bronze*. The potentiality for shape X is thus contained within the actuality of bronze the same way the potential for speaking a language is contained within the actuality of having learned it. Having that same shape X, however, is essential to the statue of Hermes which is made out of the bronze; a human shape is part of the essence of the statue, as it is not of the lump of bronze. The statue's potentiality for that shape, then, cannot be a *two-way* potentiality. Thus, while a substance's (two-

way) potentialities for accidents can be explained in terms of its own actuality, that substance's potentiality for not existing as that substance (and thus for not existing) must be explained in terms of the potentiality (and thus the actuality) of its material substratum.

I do not mean to suggest that a substance's higher-level capacities can be reduced to the lower-level capacities of its matter, for Aristotle is committed to the existence of processes which can only be described as the actualisation of the potential of a higher-order substance, not of the sum of the potentials of its chemical components.[4] But a substance's actuality is nevertheless somehow dependent on the nature of its matter.[5] A substance must meet definite requirements in order to serve as the matter of a given actuality:

> All, however, that these thinkers do is to describe the specific characteristics of the soul; they do not try to determine anything about the body which is to contain it, as if it were possible, as in the Pythagorean myths, that any soul could be clothed in any body -- an absurd view, for each body seems to have a form and shape of its own. It is as absurd as to say that the art of carpentry could embody itself in flutes; each art must use its tools, each soul its body. (Soul 407 b 19-26)

It is clear, then, that Aristotle sees potentiality as naturalistic[6] rather than "logical" or conceptual; for if potentiality is derived from the actual properties of substances, then the conceivability of a state of affairs cannot in itself constitute evidence for the possibility of its actually

obtaining or coming to obtain in the real world. In the words of Lugenbehl, "To say of a state of affairs that it is possible is to affirm the existence of a certain capacity (set of traits) in a thing or group of things which already exist." (p. 157)[7]

It may appear, however, that Aristotle does take possibility as conceptual in Prior Analytics 32 a 18-20. There, he writes: "I use the terms 'to be possible' and 'the possible' of that which is not necessary but, being assumed, results in nothing impossible." But this passage need not be taken as endorsing conceptual possibility; for the impossible result Aristotle refers to may be a naturalistically impossible result. Aristotle's wording implies that he is concerned to show that, though a situation may not appear impossible considered in itself, it must nevertheless be accounted impossible if it leads to an impossible result. In any case, I would paraphrase the passage as follows: Something is possible (in the sense of two-way possibility or contingency, as usual) if it meets the two following conditions: first, it is not (naturalistically) necessary; and second, assuming that (though it's not necessary) it does occur, it involves nothing (naturalistically) impossible. This reading is supported by Aristotle's reiteration of the second condition in language which suggests naturalistic rather than conceptual possibility:

> ... a thing is capable of doing something if there is nothing impossible in its having the actuality of that of which it is said to have the capacity. I mean for instance, if a thing is capable of sitting and it is open to it to sit, there will be nothing impossible in its actually sitting .... (Meta. 1047 a 24-27)

Potentiality is thus naturalistic, not conceptual.

I have argued that Aristotle identifies matter with two-way potentiality for substance. But it is not obvious why Aristotle should make such an equation. An interpretation is strengthened if it can be shown that a philosopher had some theoretical motivation for adopting the views the interpretation attributes to him; therefore, I shall now try to show that Aristotle had good reasons for thinking that matter is two-way potentiality with respect to substance.

Matter in the primary sense is "that out of which a thing comes to be" (Phys. 194 b 24) but which exists both before and after the coming to be (Meta. 1033 a 19-21). A material object is made of something with an independent nature, something which can exist and have form without being that particular substance's matter; while the potentiality to be a statue is a component of bronze's nature, it is not the only component (bronze qua bronze is not identical with statue-stuff), and so bronze may continue to exist without actually being a statue (Phys. 201 a 30-32).

For necessary beings, however, the potentiality is identical with the actuality, since it cannot exist unactualised, and so does not inhere in a nature distinct from its

own. "The necessary in the primary and strict sense is the simple; for this does not admit of more states than one ...." (Meta. 1015 b 12) "... of the things which have no [non-proximate] matter ... none of these has any reason outside itself for being one, nor for being a kind of thing ...." (Meta. 1045 a 36-b 5) Necessary beings aren't made of anything but themselves -- they aren't constituted by something which could be different, something which could be characterised separately from the substance as a whole -- and so they have no matter (except in the sense of proximate matter, which is part of the form). The fact that the material substratum of a substance is able to exist without being the matter of that substance is what shows that this material substratum is itself a substance: "clearly matter also is substance; for in all the opposite changes that occur there is something which underlies the changes ...." (Meta. 1042 a 33) But it is also that very fact which makes the material substratum a two-way potentiality with respect to its higher-order substance.[8]

All potentiality thus derives from actuality. A substance's potentiality for accidents is inherent in that substance's actuality (as proximate matter); its two-way potentiality for being that substance or not derives from the actuality of the substance which serves as its material substratum;[9] and, finally, its one-way potentiality for being that substance just is its actuality (considered, once more,

as proximate matter). A substance's actuality is its form, its identity: "what we seek is the cause, i.e. the form, by reason of which the matter is some definite thing; and this is the substance of the thing." (Meta. 1041 b 7-8) An individual substance's essence or form is "its primary substance" (1032 b 2), "the primary cause of its being" (1041 b 29).[10]

Form or essence, then, appears to be a fundamental explanatory entity for Aristotle: "to ask why fire moves upward and earth downward is the same as to ask why the healable, when moved and changed qua healable, attains health and not whiteness." (On the Heavens 310 b 16-19) A substance does what it naturally does, that which is in accord with its essence, its what-it-was-for-it-to-be.[11] All of a thing's capacities can be explained either in terms of its formal properties or in terms of the formal properties of some other thing (either its matter or its efficient cause).[12]

This naturalistic account of modal notions allows Aristotle to identify matter/potentiality as a cause (one of the standard four) of change in a substance, rather than as a mere substratum. To explain an action is (among other things) to refer it to the potentiality of an agent.

> ... Aristotle makes no use, and certainly no explanatory use, of the concept of law .... Explanation ... is for Aristotle subsumption (not under general laws but) under the natures and potentials of the acting and changing entities .... (Gotthelf, pp. 232-234)

In place of modern science's temporal notion of a law of nature (generally interpreted statistically, or assimilated

to the material conditional) as an explanation, Aristotle appeals to the modal notion of natural potentiality; the fact that an entity's behaviour is predictable or "lawlike" is not an explanation but the thing to be explained. (This is not to say, of course, that any philosophy of science which expresses its explanatory concepts in terms of laws of nature is thereby committed to the priority of time over modality; a law of nature need not be purely statistical or extensional.)

Since Aristotle's modal explanations are given in terms of actual properties, a substance's matter is more than an occult quality or "dormitive virtue" arbitrarily invoked to explain phenomena. The material aspect of something is no mere abstract possibility or indeterminate Platonic receptacle, but a naturalistic component of substance with positive properties of its own[13] -- and thus (contra Hintikka) not parasitic on time.

Notes for Chapter Two:

1 In what follows, I shall not be drawing any distinction between potentiality, potency, possibility, power, ability, capability, and capacity.

2 On the other hand, it might be supposed that, in contrasting the way in which necessary beings can have matter with the way in which they cannot, Aristotle is suggesting that corporeal, changing things are composed of sensible matter, while necessary beings like the heavenly spheres or God are composed, as geometrical figures are said to be, of intelligible matter. But such a reading is implausible. Intelligible matter does not seem to be a different kind of "stuff," however ethereal; Aristotle instead describes it as matter which is "present in sensible things not qua sensible, i.e. in the objects of mathematics." (Meta. 1036 a 1) Aristotle claims that mathematics deals with "sensible magnitudes, not however qua sensible but qua possessed of certain definite qualities" (1077 b 23); that is, he has an abstractionist theory of mathematical objects. Mathematical objects cannot really exist except in sensible matter (1076 b 12; Phys. 193 b 24); but, like concavity and unlike snubness, they can be defined without reference to any particular matter: "mathematical properties are truly instantiated in physical objects and, by applying a predicate filter, we can consider these objects as solely instantiating the appropriate properties." (Lear, p. 170) Intelligible matter is thus an abstraction from sensible matter, and not an independent kind of matter; therefore, to say that God and the heavenly spheres are composed of intelligible matter but not sensible matter is to make them dependent on the human intellect (presumably an undesirable conclusion).

3 It might be objected that examples involving artefacts cannot be appropriate in an exposition of Aristotle's views on substance, since he sometimes suggests that only natural objects are really substances. But whether Aristotle thinks artefacts are non-substances, or just inferior (but genuine) substances, his writings on substance are so replete with analogies to artefacts that we may assume he would not consider such examples misleading.

4 See Gotthelf's article for a discussion of this claim.

5 As Cynthia Freeland writes:

> Aristotle attempts to link natures of complexes to those of their components. "The fine," for example, is said to be composed of "the moist" because both are "such as to spread out" (cf. Gen. and Corr. II, 2). ... it seems he envisaged explanatory links of some kind between natures -- not structures -- at different levels of ontological complexity .... (p.443)

6 It is difficult to decide whether to call potentiality a purely physical or also a metaphysical component of substance, since what Aristotle calls physical we are often inclined to call metaphysical. I have thus used the term "naturalistic" to convey the fundamental and inherent naturalness and inseparability of potentiality as an aspect of substance more strongly than "physical" might but without committing myself to "metaphysical."

7 It would seem, then, that the modern notion of "possible worlds" is not a fruitful tool for approaching the study of Aristotelean modality. Interpreted metaphysically, the doctrine of possible worlds conflicts with Aristotle's view that all potentialities are properties of things in the world; no possible situation can be an alternative to the entire world, including its potentialities, but can only be a possible state of this one. (On the Heavens 279 a 8-11) "A 'world' is not something whose existence is possible," writes Waterlow (p. 48), "since possibility and its opposite belong only within the world, being assigned to times in actual history." Nor could Aristotle accept the purely logical version of the doctrine, according to which "'Possible worlds' are stipulated, not discovered ...." (Kripke, p. 44) For, if possibilities are based on formal features of things in the world, they must indeed be discovered, not stipulated.

8 One might ask what the directions of explanation are here, e.g., do substances have or lack matter because they have or lack capacity, or do they instead have or lack capacity because they have or lack matter? But if Aristotle is identifying matter and capacity, this problem is illusory; we are talking about the same thing under different descriptions. In that case, all Aristotle is doing is showing that these different descriptions (matter and capacity) pick out the same thing essentially.

9 The question whether potentialities arising from prime matter constitute an exception to this principle is beyond the scope of my inquiry, as an answer would require an investigation into the precise nature of the relations of interconvertibility among the four elements, a subject Aristotle treats somewhat obscurely.

10 In speaking of an individual's form or essence, I do not wish to raise the issue of whether that form is unique to the individual or whether it is instead shared by other members of the same class; an attempt to answer this question would require a separate investigation. But my argument, while compatible with individual forms, does not require them; for even the opponents of individual forms can admit the existence of individual actualities in the sense of individual instances of a universal: "your matter and form and moving cause / are / different from mine, while in their universal formula they are the same." (Meta. 1071 a 28) Buchanan has introduced a distinction between a universal mode or pattern of being, and an individual's actually being in that mode or existing in that pattern. (p. 49) This distinction is useful, because it is vague enough not to commit us to either side in the debate over individual forms, yet precise enough to allow us to speak meaningfully of an individual actuality anyway. (Of course, Buchanan may have thought his distinction did commit us to one side or the other; but it is not clear which side he took.)

11 As Den Uyl and Rasmussen note: "To understand what something is, to grasp the identity of a thing, is to reach rock bottom -- the point where inquiry ends and explanation begins. This is the crucial Aristotelean metaphysical insight ...." (p. 4)

12 I do not wish to suggest that causation for Aristotle is always "upward," that explanation must always be in terms of the level below, not the level above. But material causation must be "upward"; actuality is dependent on potentiality in the sense that nothing can be if the capacity to be is lacking.

13 The conception of potentialities -- called, variously, "propensities," "affordances," or "capacities" -- as dispositional properties deriving from the identifiable formal characteristics of things in the world has been developed in its own right in the work of Popper, Gibson, Lugenbehl, and others.

# CHAPTER THREE

## Time

In Chapter Two, I have argued that potentiality is a naturalistic aspect of physical substance for Aristotle, and so that modal terms are not merely elliptical for temporal ones. I shall now try to support this claim by offering evidence that potentiality is in fact prior to time.

As I noted at the beginning of Chapter Two, Aristotle defines time in terms of change and change in terms of potentiality. But this does not in itself constitute evidence that potentiality is prior to time; Aristotle might simply be pointing out the relations which exist among three phenomena on an equal ontological level. Indeed, Aristotle actually says that time and change are defined in terms of each other (Phys. 220 b 16).

On the other hand, definitional reciprocity is no proof of equality either. Aristotle says that "all propositions in the mode of possibility are convertible into one another." (Pr. An. 32 a 30) Nevertheless, he believes that some modal notions are prior to others (Int. 23 a 18-24). One thing can be prior to another even if the two are somehow interdependent: "For of things which reciprocate as to implication of existence, that which is in some way the cause of the other's existence might reasonably be called prior by nature." (Cat. 14 b 11) Thus, even if the notions of time, change, and potentiality are in some sense interconvertible, poten-

tiality may be prior to time.

Though, as I have said, Aristotle's defining time by change and change by potentiality cannot constitute conclusive evidence for the priority of potentiality over change and change over time, the fact that Aristotle defines the notions in this way "always or for the most part" suggests that it seemed most natural to him to proceed in this order; I shall therefore follow his example. Having dealt extensively with the notion of potentiality in Chapter Two, I shall proceed directly to that of change.

Aristotle's definition of change as the actualisation of the potential qua potential (Phys. 201 a 10) has become infamous for being ridiculed by Descartes as incomprehensible verbiage. But I think the formulation may be rendered more perspicuous if we take the first "potential" as a token-term, the second as a type-term.[1] Thus understood, change is defined as the actualisation of that real, particular substance which happens to be a potential such-and-such -- not, however, the actualisation of its whole nature, but only of its potentiality for such-and-such.

> The actuality, then, of what is potentially -- when being in actuality it is operating, not qua itself but qua changeable -- is change. I mean 'qua' thus: the bronze is potentially a statue, but yet it is not the actuality of bronze qua bronze that is change. For it is not the same thing to be bronze and to be potentially something: if indeed it were, without qualification and by definition, the same thing, then the actuality of the bronze, qua bronze, would be change, but, as has been said, it is not the same thing. (201 a 27-34)

What is singular about this notion of change is that Aristotle has not invoked the notion of time in defining it. While it may seem axiomatic for modern thinkers that change is a function of time and some series of states (on a "worldline," say), Aristotle has instead defined change modally. And if time is in turn defined in terms of change, then it, too, is defined modally. (Of course, Aristotle can always turn the arrow of definition in the other direction; 220 b 16. But the fact that he chooses to explain change in non-temporal terms is a sign that for him change may not be as deeply conceptually rooted in time as it is for the moderns.)

Aristotle defines time as "a number of change in respect of the before and after." (Phys. 219 b 1) If "before" and "after" are taken in their modern sense, as signifying earlier and later positions in time, then this definition is crudely circular. But Aristotle indicates that, as used here, before and after are best understood as attributes of change rather than of time: "The before and after are in change, and time is these qua countable." (223 a 28) Precisely what attributes of change is he talking about?

Aristotle's commitment to teleological explanation allows him to deny that the direction of a change -- the order of its constituent events -- is determined purely by temporal coordinates. A change from A to B is of a fundamentally different nature from a change from B to A, since the iden-

tity of a change is determined by its end state: "it is that to which rather than that from which the motion proceeds that gives its name to the change." (224 b 7) This is only natural, since change, as the actualisation of the potential qua potential, is characterised by the actuality toward which it is directed.[2] Thus, when Aristotle defines time as a number of change in respect of the before and after, he is saying that what time is a number of is not simply change per se, but change qua characterised by a (time-independent) directional order.

But what does it mean to say that time is a "number" of change? We have seen[3] that Aristotle holds an abstractionist theory of mathematical objects; it is thus not surprising that he ties the concept of "number" to the activities of counting and measuring: "we call number both (a) that which is counted and countable, and (b) that by which we count." (219 b 7) It might seem plausible, from a Newtonian point of view, to assume that time is a number in the second sense, i.e., that change is measured by its duration in time; such an interpretation would indeed make time prior to change. But Aristotle insists that that which is counted or measured must be of the same type as that which is used to measure it: "each thing is counted by some one thing of the same kind ...." (223 b 13)

> The measure is always homogeneous with the thing measured; the measure of spatial magnitudes is a spatial magnitude, and in particular that of length is a length, that of breadth a breadth, that of articulate sounds an articulate sound, that of weights a weight, that of units a unit. (Meta. 1053 a 24-27)

The number of change in the sense of that by which we count or measure it must therefore itself be a change (and so not time). "Time is that which is counted and not that by which we count." (Phys. 219 b 8)

Changes are measured by changes; but time can still be called a measure of change because "it measures change by defining some change which will measure out the whole change (just as the cubit measures length by defining some magnitude which will measure off the whole magnitude) ...." (Phys. 221 a 1-4)

> Knowing how many there are in [a] group is not a matter of comparing it with some number in a Platonist heaven. It is simply a matter of knowing how to count it, i.e., of knowing what the unit is. [Similarly] to know how long a process took ... is not a matter of comparing it with the passage of Time, as we might be tempted to think if we conceive of Time as a something objectively progressing against which we can measure processes as they occur. (Julia Annas, p. 103)

Instead, we measure change by picking some particular change -- say, the motion of the hands of a clock, or the revolution of the heavenly sphere -- as the unit against which to compare the change in question. Time, being not number numbering but number numerable, is not a standard against which to measure change, but that aspect of the change which admits of being measured -- the quantifiable aspect of change:

"time is not change but the way in which change has a number." (219 b 3) This quantifiable aspect of time turns out to be the before and after: "The before and after is in change, and time is these qua countable." (223 a 28) In other words, time is the directional order of change, not per se, but insofar as that order is regarded as capable of being counted.

I have argued that, as an aspect of change (i.e., as an aspect of the actualisation of the potential qua potential), time is posterior to and presupposes potentiality. Annas, on the other hand, denies that time's being the quantifiable aspect of change makes it posterior to change (and therefore to potentiality): "it would in fact be an error to make time logically derivative from motion, because motion or change already involves time." (p. 101n) But the fact that, for Aristotle, neither time nor motion can exist without the other does not mean he thought the two to be on the same ontological footing, as we saw from Cat. 14 b 10-13.

Furthermore, it would seem that anything is prior to its attributes -- and Aristotle calls time an attribute of change (Meta. 1071 b 10). An entity can't exist without any attributes, so in that sense they reciprocate as to implication of existence. But while the existence of either change or time entails the existence of the other, change is nonetheless prior to time.

For that matter, Aristotle does not even appear to be

unqualifiedly committed to the view that change necessarily involves time. For he allows that in one sense there would be no number numerable in change (and thus no time) if the act of counting were rendered impossible by the absence of intellects capable of counting; though of course that underlying aspect of change which is accidentally quantifiable -- i.e., the before and after, the teleological order -- would still exist (Phys. 223 a 22-28). Since change can then exist at least in some sense without involving time, while on the other hand "there is no time apart from change and alteration" (218 b 39), change appears to be quite definitely prior to time.

Thus far, I have tried to show that Hintikka's interpretation of Aristotelean potentialities as mere statistical-temporal generalisations is made implausible by the fact that Aristotle regards potentialities as naturalistic components of substance and sources of change, and time as the countable aspect of their actualisation. Nothing I have said is meant to deny the importance of such statistical-temporal generalisations as inductive tools for determining the modal status of natural occurrences; for, as Frede observes, "omnitemporality is so important in Aristotelean natural science [because] statistics is often the only thing we can go by ...." (p. 50n) But Aristotle's modal explanations, far from being reducible to statistical claims, appeal to underlying explanatory features of which statistical regularity is a consequence.

Notes for Chapter Three:

1 See the discussion of type-terms and token-terms in Chapter One.

2 As Gotthelf puts it: "The existence and stages of a development can be understood only in terms of its end ... the identity of the development is its being irreducibly a development to that end, irreducibly the actualization of a potential for form." (p. 253) Since every process has a sequence of "parts and relations which are essential to its being that process" (Randall, p. 167), it is "not because Time goes on" that a substance is said to be "'on the way' from a Whence to a Whither .... from its innermost potentiality to the actualization of this potentiality." (Riezler, p. 75)

3 See Chapter Two, note 2.

# CHAPTER FOUR

## Victory at Sea

In Chapter One, I argued in favour of attributing to Aristotle a rejection of bivalence for future contingents on the basis of the text of On Interpretation IX alone. I shall now attempt to show, drawing on the account of time and modality presented in Chapters Two and Three, that there is strong evidence for attributing to Aristotle this same view on the basis of texts outside Int. IX.

The interpretation I am defending, which views Aristotle as suspending the Law of Bivalence in certain cases, runs up against a categorical defense of the universal applicability of this law in On the Soul 430 b 26: "Assertion is the saying of something concerning something, and is in every case either true or false ...." Similar claims are to be found in the Categories (2 a 8, 13 b 1) and in the Metaphysics (1011 b 27). Such statements as these are admittedly embarrassing for proponents of the traditional interpretation; but if it can be shown that the texts outside of Int. IX suggest a view (involving suspension of bivalence) that in turn makes the best sense of the text of Int. IX itself, traditionalists may then perhaps be justified in explaining away Aristotle's categorical defense of bivalence as arising in contexts in which Aristotle is primarily concerned with what is already actual and so does

not consider the case of future contingents.

I argued in Chapter Two that Aristotle views potentiality as a naturalistic component of substance, and not as a byproduct of statistical analysis. But my claim that potentiality arises from form or actuality might instead be seen as supporting a statistical account of potentiality, if the form were taken as the universal rather than as the individual actuality. Hintikka thought possibility claims generalise with respect both to times and to individuals; i.e., to say that a certain individual is possible at a certain time is really to make a claim about many individuals and many times. (Hintikka's evidence for this interpretation is considered in the Appendix.) Loening has put forward the more conservative view that possibility claims generalise with respect to individuals only. But on either view, possibility claims involving a single substance are elliptical for assertions about classes or types of substance; to say that it is possible for this dog to bark is really to say nothing more than that some dogs bark (and some don't). If potentiality arises from the form, and the form is interpreted as the species-form or the type, this could be regarded as support for a generalisation view.

But Aristotle's use of modal statements does not fit this theory very well:

> Loening's interpretation is hard to square with NE III 5, 1114 a 13-21, where Aristotle says it is no longer possible ... for the man of ingrained character not to be wicked, but that it was once possible for him not to become so, and for certain sick men not to be sick. Loening wishes to see all references to possibility in this context as reference to a possibility _in abstracto_ [i.e., generalizing with respect to individuals]. But Aristotle is unlikely to mean merely that there was once a possibility _in abstracto_ of not becoming wicked or sick. For it is unclear why a merely abstract possibility should have ceased to exist. (Sorabji, p. 325)

It seems much more plausible to suppose that ingrained habits (in the case of the wicked man) and prolonged deterioration (in the case of the sick man) have at long last overcome a naturalistic capacity for the other state.

There are other problems for the statistical interpretation. As we saw in Chapter II, Aristotle identifies potentiality with matter. If potentiality is purely extensional, it is hard to see why it would be so identified. Again, Aristotle tells us that the primary meaning of potentiality is a source or cause of change (_Meta_. 1025 a 5, 1046 a 10, 1049 b 5). Any statistical interpretation must find it difficult to explain how a purely temporal notion like "sometimes the case" or "always the case" could possibly serve as a cause of change. Causality requires a "community of nature" (_Soul_ 407 b 18) which seems to be missing here; such a community of nature, however, is supplied by my naturalistic interpretation, by which the matter is potentially that which the substance is actually.

Furthermore, Aristotle's principle of individuation of

substance is generally thought to be either matter or the individual form (assuming such exists). Now if it is matter, and matter is a substance's potentiality, then potentiality will be something individual and not a generalisation over individuals; and again, if it is the individual form or actuality, from which potentiality arises, then potentiality will once more be a property of something individual and not a generalisation. Two-way possibility or contingency, then, is not a property of classes but of individuals.

While compatible with the indeterminism ascribed to Aristotle by the traditional interpretation of the defense of coningency in Int. IX, this account does not decide the issue definitely in favour of indeterminism. For even if possibility claims do not generalise with respect to individuals, might they not generalise with respect to times? Two-way potentiality might mean the potentiality to do this, if that is the case, or not to do this, if that is not the case, which is compatible with each individual instance of the potentiality's being the only one possible at that moment.

How can it be shown whether Aristotle thinks there is two-way possibility, not only in particular substances, but also at particular times or situations? The example of the cloak in Int. IX supports the second, indeterminist reading.

If Aristotle's reference to the cloak's possibilities is not a generalisation with respect to individuals (as the expression "this cloak," along with the arguments just given, implies it is not), then it also cannot be a generalisation with respect to times; for the two possibilities involved -- being able to be cut up and being able to wear out without ever being cut up -- will not both be actualised even at different times if they are attributes of a single individual (for the actualisations are in this case incompatible).

But I cannot build my case solely on this example of the cloak, for the example is from Int. IX, which we have already seen to suggest an anti-generalisation viewpoint when considered solely on its own terms; while I am trying to show that the traditional interpretation is justified on the basis of external evidence.

Although I cannot now undertake a detailed discussion of Aristotle's views on determinism, I can offer some evidence in favour of the indeterminist reading. If Aristotle is a determinist, then in his world the outcomes of future events are as definitely decided as the outcomes of past events, and "the past and the future coexist on equal terms, like the two rays into which an arbitrarily chosen point divides a straight line." (Layzer, p. 69) Instead (and contra Fine), he upholds a definite past-future asymmetry:

"No capacity relates to being in the past, but always being in the present or future." (Heavens 283 b 12) "... what is past is not capable of not having taken place ...." (Nikomachean Ethics 1139 b 9) "... there is no contingency in what has now already happened." (Rhetoric 1418 a 5) Aristotle clearly believes that the past is necessary in a way that the future is not; and this suggests that contingent events are capable of happening or not happening until they do in fact happen or fail to happen (or perhaps some finite time before they happen or fail to happen), at which point they become necessary or impossible.

While I consider Aristotle's commitment to past-future asymmetry good evidence for taking him to uphold situation-relative contingency, this is clearly not conclusive. I propose, therefore, simply to assume that there can be genuine two-way possibility relative to a particular situation as well as to a substance. In other words, I am assuming that Aristotle is an indeterminist. This assumption is not strong enough to make my argument circular, since one can presumably be an indeterminist and still uphold bivalence (for example, Sorabji). Nor does it force my subsequent argument into mere question-begging against those who believe Aristotle to be a determinist. For if the assumption of indeterminism, when coupled with the view of modality and time presented in Chapters Two and Three, would naturally have led Aristotle to a suspension of bivalence (as I shall

argue in this chapter), and if such a suspension makes the best sense of Int. IX (as we saw in Chapter One), then we have an indirect argument (though admittedly not a conclusive one) for attributing indeterminism to Aristotle.

Time, Aristotle tells us, is a number of change in respect of the before and after. We know from Chapter Three that this means time is the directional order, qua quantifiable, of the actualisation of a substance's formal characteristics insofar as they constitute a potential for some actuality. Relative to any particular stage in the directional order of this actualisation, then, the future is all those stages which are further along in the direction of change, while the past is all those stages that lie behind, i.e., away from the direction of actualisation. If Aristotle is an indeterminist and a past-future asymmetrist, then an event is necessary once it comes to pass, but may be contingent before then. Thus, relative to any given stage in a process, all the stages behind it will be fixed and determinate -- only one state will correspond to each possibility -- but there will be stages further along in the direction of change which will be indeterminate, that is, there will be two incompatible states corresponding to such future stages.

These incompatible states, of course, do not yet exist; they are purely potential. Since potentiality is an aspect

of the actuality of a substance, the future is not a separate realm (not, for instance, someplace that it even makes sense to think of "visiting" in a time machine), but is itself an aspect of the actuality of a substance. "The past is the actualized part of possibilities, the future the part waiting to be actualized." (Riezler, pp. 94-95) Once a potential state is actualised, it is then necessary and unchangeable (though future states may still be contingent).

This account of contingency has implications for truth-value. It is not only in Int. IX that Aristotle accepts the correspondence theory of truth: "It is not because we think that you are white, that you are white, but because you are white we who say this have the truth." (Meta. 1051 b 6-8) "... it is because the actual thing exists or does not that the statement is called true or false." (Cat. 14 b 23) As I argued in Chapter One, there is a natural connection between the correspondence theory and the view that truth entails necessity. If truth is correspondence to reality, there must be a definite reality to correspond to if a claim is to be true; and so, if a claim is true, that is a sign that the fact it asserts is already definite and decided.

Aristotle indeed appears to endorse the truth-entails-necessity view in texts outside Int. IX: "if the word signifies something and this can be truly asserted of it, it necessarily is this; and it is not possible that that which is necessary should ever not be ...." (Meta. 1062 a 20-23)

"... that of which it is true to say that it will be is something of which it must be true to say sometime that it is ...." (Gen. Corr. 337 b 4-6) It might be objected that these are cases of necessitas consequentiæ only; but in the larger context of the second quotation, at least, Aristotle is contrasting necessity with contingency in general, and links the truth of "it will be" to the former.

Since Aristotle is committed to the view that the truth (or falsity) of a prediction entails the necessity (or impossibility) of the event it predicts, he is faced with the conclusion that either all events are necessary or some predictions are neither true nor false beforehand. The correspondence theory once again explains his choice of the second option. For what is the status of a future contingent event?

> ... it is necessary that he who lives shall one day die; for already something has happened -- e.g. the presence of contraries in the same body. But whether he dies by disease or by violence, is not yet determined, but depends on the happening of something else. Clearly then the process goes back to a certain starting-point, but this no longer points to something further. This then will be the starting-point for the fortuitous, and will have nothing else as cause of its coming to be. (Meta. 1027 b 8-14)

The disjunctive event of a sea battle's either-happening-or-not-happening-tomorrow is necessary and so, in a sense, already actual; reality has already determined and limited itself to that extent. Statements about this disjunctive event are about something that is fully real and definite now, and so can admit of truth or falsity. One can only

make true statements about things which really exist; in this respect, what Aristotle says about knowledge in the Categories (7 b 29-30) could apply equally to truth-value: "if there is not a knowable there is not knowledge -- there will no longer be anything for knowledge to be of ...." If there is not a fact there is not a true statement asserting it -- there will not be anything for the statement to be true of.

Every statement must have something real to correspond to; statements about the future are actually statements about presently existing capacities (since, as we have seen, there is no "future" over and above unactualised potentiality). For one-way capacities there is no problem; they satisfy the correspondence requirement because they are already definite. But the individual events (a sea battle's happening tomorrow, and a sea battle's not happening tomorrow) exist at present only as the same two-way potentiality (which is itself a composite of various active and passive two-way potentials of generals, ships, etc.). There is no definite event one way or the other, only an indeterminate potentiality which will eventually be decided. Nothing can be truly asserted of the indeterminate (Meta. 989 b 7); since neither the assertion nor the negation corresponds univocally to the facts of the case, neither can be true. By the negation principle (see Chapter One, note 3), if neither of two contradictory statements is true, neither

is false. Thus, the Law of Bivalence is suspended for statements affirming or denying future contingent events.

I have argued that, if we assume that Aristotle is an indeterminist (an assumption for which there is at least some support in the corpus), the texts outside Int. IX strongly suggest the same view of future contingents that the traditional interpretation ascribes to Int. IX itself. While no decisive argument for that enabling assumption is here offered, the fact that the assumption of indeterminism yields the same view as that presented by an interpretation of Int. IX which does not make that assumption but which explains internal evidence better than its rivals makes the assumption more plausible.

# APPENDIX

The objective of this investigation has been to construct and defend an interpretation of Aristotle's theory of time and potentiality which supports the traditional reading of On Interpretation IX. In Chapter One, I defended this traditional reading against the objections of Hintikka and others on the basis of internal evidence alone. Since Hintikka's interpretation relies heavily on a theory of Aristotelean modality drawn from external evidence, it was to texts outside of Int. IX that I then turned. In Chapters Two and Three, I attempted to derive from these external texts alone a view of the relation between temporal and modal notions which is incompatible with Hintikka's interpretation; and in Chapter Four, I argued that the theory so arrived at, coupled with the correspondence theory of truth and the assumption of indeterminism, leads to the very same view of the truth status of statements about the future as that attributed to Aristotle by the interpretation of Int. IX which Chapter One showed to be the most plausible on its own terms. We have thus taken two independent paths -- one by internal evidence alone, the other by external evidence alone -- to the traditional interpretation.

I have yet, however, to consider the external evidence which Hintikka adduces to support his statistical interpretation of Aristotelean potentiality. My method has been to

present evidence for my interpretation that cannot easily be explained by Hintikka's interpretation. But if Hintikka's rival evidence is equally difficult to explain in terms of my interpretation, then I have only succeeded in showing that Aristotle is inconsistent (something Hintikka already suggests), thus leaving the interpretation of Int. IX up for grabs -- as far as external evidence is concerned, anyway. The purpose of this appendix, then, is to see if Hintikka's external evidence can be incorporated into the theory of future contingents which I have attributed to Aristotle.

Hintikka claims that his view that Aristotle's possibility ascriptions generalise with respect to individuals is "strongly suggested by An. Pr. I 13. 32b4ff." (p. 172) In this passage, Aristotle points out that possibility (and here he clearly means two-way possibility) is of two kinds: "In one it means to happen [only] for the most part and fall short of necessity .... In another way it means the indefinite, which can be both thus and not thus ...." Hintikka thinks that the ascription of possibility to what happens "for the most part" is an endorsement of statistical potentiality. But the distinction here parallels one in Int. IX itself, between what happens "as chance has it," for which "of the affirmation and the negation neither is true rather than the other," and other cases in which "it is one rather than the other and as a rule, but still it is possible

for the other to happen instead." (Int. 19 a 19-23) The distinction appears to be between cases in which one of the two outcomes is more probable, and cases in which the two outcomes are equally probable; and Aristotle concludes by suspending bivalence for both types of case (Int. 19 a 36-39).

What other evidence does Hintikka offer for his statistical interpretation of Aristotle? He claims that "As Aristotle illustrates his point, when an animal is said to be indestructible now, what is really meant is that it is now an animal that will never be destroyed." (p. 161) If Aristotle indeed draws such an identity, it constitutes strong evidence for Hintikka's view that for Aristotle modal terms are reducible to temporal ones.

But the two references Hintikka gives -- Topics 145 b 27-30 and On the Heavens 282 a 27-30 -- are not worded as Hintikka paraphrases them. The differences are small but crucial. The Topics passage reads: "Whenever, then, we say that a living thing is at present immune from destruction, we mean that it is at present a living thing of such a kind as never to be destroyed ...." Being of such a kind as never to be destroyed implies that it is some present fact about the living thing -- perhaps its simplicity (Meta. 1015 b 12), or, what amounts to the same thing, the absence of contraries within it (Meta. 1027 b 10) -- which is the basis for its never being destroyed in the future. This fits well with my interpretation of a substance's future states as dependent on present naturalistic capacities.

And in the passage from On the Heavens, Aristotle uses the term "'indestructible' for that which now is and cannot at any future time be truly said not to be." Aristotle is telling us that something is indestructible if at no time in the future can it be truly said not to be, i.e., something is indestructible if its true negation will never be possible. Since truth and being reciprocate as to implication of existence (Cat. 14 b 15), what Aristotle's claim comes to is that something is indestructible if at no time in the future can it not be, i.e., if its non-existence will never be possible; this is hardly a statistical claim.

On the other hand, Aristotle says "it is possible for a destructible thing to escape destruction at a given time, whereas it is not possible for it to escape without qualification." (Topics 115 b 17-19) Hintikka thinks this claim that whatever is destructible must eventually be destroyed constitutes an endorsement of the Principle of Plenitude (the doctrine that whatever is possible must occur). But we already know that Aristotle assigns a naturalistic reason for the inevitability of destruction: the inherently unstable situation of the coexistence of contraries (Meta. 1027 b 10). Aristotle's motivation for asserting the inevitability of destruction seems more physical than logical; thus, there is no obvious reason to read this passage as a blanket endorsement of plenitude. And if we indeed take the claim at Topics 115 b 17-19 to be analogous to the contraries

passage (Meta. 1027 b 10), which states that a man's death is necessary, but the kind or time of death is not, we are left with a definite rejection of the Principle of Plenitude; for it is possible, Aristotle tells us, for the man to die of disease or by violence -- and both possibilities cannot be actualised. (That Aristotle is not, at least in this passage, generalising over individuals or ascribing possibility solely to types is suggested by his use of the phrase "this man"; Meta. 1027 b 1.)

Another passage which Hintikka takes as supporting the Principle of Plenitude and the extensional account of possibility behind it is Metaphysics 1047 b 3: "evidently it cannot be true to say 'this is capable of being but will not be' ...." But what is involved here is a statement about the future; and we have seen that there is good reason for suspecting that, for Aristotle, statements about the future are subject to certain restrictions. If prediction "not-p" is now true, then on the interpretation I have developed in the preceding chapters, p cannot occur, and is therefore not admissible of possibility ascription. The truth of "this is capable of being" requires that the possibility of its being be open, while the truth of "this will not be" requires that its not being be already decided; the two statements are thus incompatible, and so their conjunction "this is capable of being but will not be" must be false.

The same account holds for Aristotle's claim that what-

ever is eternal is necessary (Gen. Corr. 338 a 3). To say that something is eternal is to make a statement about the future as well as the present and past -- it is to say that the entity in question will never go out of existence. If the entity is eternal, the statement affirming its eternality must be true (by the correspondence theory), and so its existing forever must already be decided and necessary.

In On the Heavens 281 b 15-24, Aristotle argues as follows: an individual can have a capacity whose actualisation is incompatible with its present actual state: a sitting man is capable of standing. But the reason we can say he retains the second capacity even after he has actualised the first is because he can stand at a later time; he no longer has the capacity-to-stand-at-that-time, since his sitting at that time has occurred and so is necessary. (Thus, Aristotle is not endorsing a generalisation-over-times account; the question whether the man had to sit before he did is not relevant to the point here, which is that he now has to have sat (since he did); any capacity for standing that he retains must always refer to the future.)

But an eternal being with a capacity not to be is not like a sitting man with a capacity not to sit; it cannot actualise its potential-not-to-be at a later time, since it exists for all time: "another time is impossible and the times must coincide." (Heavens 281 b 19) The eternal being's capacity not to be can then only be actualised while the being is eternal. Aristotle, as we saw in Prior Analytics

32 a 19, holds that whatever is possible may be assumed to occur without involving any impossibility.

> ... if anything which exists for infinite time is destructible, it will have the capacity of not being. Now if it exists for infinite time let this capacity be actualized; and it will be in actuality at once existent and non-existent. (281 b 20-23)

"Let this capacity be actualized" does not mean, as it would under the Principle of Plenitude, that the capacity will be actualised; Aristotle admits that, even if the case did not involve an impossibility, the assumption could be false: "Thus a false conclusion would follow because a false assumption [the eventual actualisation of the capacity] was made; but if what was assumed had not been impossible its consequence [though false] would not have been impossible." (281 b 23-24) That a statement affirming the eventual actualisation of a potential could be false but not impossible definitely conflicts with the Principle of Plenitude, and with the reduction of modality to extension. Under ordinary circumstances, the falsity of the assumption would not involve unconditional impossibility, since the claim could be true at another time. In this case, however, no "other time" is available. Aristotle has reduced the notion of destructible eternals to absurdity, and so concludes: "Anything then which always exists is absolutely imperishable." (281 b 25) This is not a statement of logical identity; Aristotle has surely not gone through such a subtle argument simply to prove a tautology.

Bibliography:

Annas, Julia, "Aristotle, Number and Time," Philosophical Quarterly 99 (1975): 97-113

Anscombe, G.E.M., "Aristotle and the Sea Battle," J.J.C. Smart, ed., Problems of Space and Time. New York: Macmillan Publishing, Inc., 1979: 43-57

Aristotle. The Basic Works of Aristotle. Richard McKeon, ed. New York: Random House, 1941

Aristotle. The Complete Works of Aristotle: The Revised Oxford Translation. In two volumes. Jonathan Barnes, ed. Princeton: Princeton University Press, 1984

Aristotle. De Generatione et Corruptione. C.J.F. Williams, trans. Oxford: Clarendon Press, 1982

Aristotle. Physics, Books III and IV. Edward Hussey, trans. Oxford: Clarendon Press, 1983

Balme, D.M., "Aristotle's Use of the Teleological Explanation," Inaugural lecture at Queen Mary College, 1965

Buchanan, Emerson. Aristotle's Theory of Being. University (Mississippi): Greek, Roman, and Byzantine Monographs, 1962

Clark, Stephen R.L. Aristotle's Man: Speculations upon Aristotelian Anthropology. Oxford: Clarendon Press, 1975

Den Uyl, Douglas, and Rasmussen, Douglas, "Ayn Rand's Realism," Douglas Den Uyl and Douglas B. Rasmussen, eds., The Philosophic Thought of Ayn Rand. Urbana: University of Illinois Press, 1984: 3-20

Edel, Abraham. Aristotle and His Philosophy. Chapel Hill: University of North Carolina Press, 1982

Fine, Gail, "Truth and Necessity in De Interpretatione 9," History of Philosophy Quarterly 1 (1984): 23-47

Frede, Dorothea, "The Sea-Battle Reconsidered: A Defense of the Traditional Interpretation." Unpublished.

Freeland, Cynthia, Review of Nature, Change, and Agency in Aristotle's Physics and Passage and Possibility: A Study of Aristotle's Modal Concepts by Sarah Waterlow, Philosophical Review XCIII.3 (1984): 439-443

Gibson, James J. The Senses Considered as Perceptual Systems. Boston: Houghton Mifflin Company, 1966

Allan Gotthelf, "Aristotle's Conception of Final Causality," Review of Metaphysics 118 (1976): 226-254

Jaakko Hintikka. Time and Necessity: Studies in Aristotle's Theory of Modality. Oxford: Clarendon Press, 1973

Kneale, William, and Kneale, Martha. The Development of Logic. Oxford: Clarendon Press, 1968

Kripke, Saul. Naming and Necessity. Cambridge: Harvard University Press, 1980

Layzer, David, "The Arrow of Time," Scientific American 233, no. 6 (1975): 56-69

Lear, Jonathan, "Aristotle's Philosophy of Mathematics," Philosophical Review XCI.2 (1982): 169-192

Lugenbehl, Dale, "The Argument for an Objective Standard of Value," Personalist, Spring 1974: 155-164

Łukasiewicz, Jan. Selected Works. L. Borkowski, ed. Amsterdam: North-Holland Publishing Company, 1970

Popper, Karl R. The Open Universe: An Argument for Indeterminism. Totowa: Rowman and Littlefield, 1982

Randall, Jr., John Herman. Aristotle. New York: Columbia University Press, 1960

Riezler, Kurt. Physics and Reality: Lectures of Aristotle on Modern Physics at an International Congress of Science. New Haven: Yale University Press, 1940

Sorabji, Richard. Necessity, Cause, and Blame: Perspectives on Aristotle's Theory. Ithaca: Cornell University Press, 1980

Strang, Colin, "Aristotle and the Sea Battle," Mind, LXIX.276 (1960): 447-465

Waterlow, Sarah. Passage and Possibility: A Study of Aristotle's Modal Concepts. Oxford: Clarendon Press, 1982

Whiting, Jennifer, "Individual Forms in Aristotle." Unpublished.