

Time & Necessity

STUDIES IN
ARISTOTLE'S THEORY OF MODALITY



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ISTITUTO DI FILOSOFIA
INVENT. N. 8436.....

OXFORD
AT THE CLARENDON PRESS

1973

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ARISTOTLE ON THE REALIZATION OF POSSIBILITIES IN TIME

1. *The relation of modality to time in Aristotle is problematic*

AN attentive reader of the Aristotelian corpus can scarcely fail to notice that in certain respects the Stagirite used the *modal notions* of possibility and necessity in a manner different from our modern ways with them. A case in point is the relation of modality to time. That there is something not quite familiar about the way Aristotle was wont to operate with the concepts of necessity and possibility is already betrayed by his repeated statements to the effect that the past is necessary.¹ Natural though such statements sound, the sense of necessity involved here is not a familiar part of the conceptual repertoire of today's philosophers.

Another indication of a difference between Aristotle's modal notions and ours is the close connection that there is for him between necessary (apodeictic) truths and plain (assertoric) general truths, in short between necessity and universality. This is brought out strikingly by the role he ascribed to the assertoric syllogism as a vehicle of scientific demonstration. Since he also held that 'the truth obtained by demonstrative knowledge will be necessary' (*An. Post.* I 4. 73^a21-4) and that 'demonstrative knowledge must be knowledge of a necessary nexus, and therefore must clearly be obtained through a necessary middle term' (*An. Post.* I 6. 75^a12-14), an assertoric syllogism must clearly be capable of establishing necessity. On the other hand, Aristotle distinguished between assertoric (simple) and apodeictic (necessary) premisses and conclusions. Since even the assertoric syllogisms were seen to be capable of establishing necessary scientific

¹ See, e.g., *Rhet.* III 17. 1418^a3-5; *Eth. Nic.* VI 2. 1139^b7-9; *De Caelo* I 12. 283^b13 ff., and cf. Chapter IX below.

truths, one may expect that they are somehow related to the apodeictic syllogisms in a closer manner than we are accustomed to.

2. *The realization of possibilities in time*

There is an assumption concerning the interrelations of time and modality which has undoubtedly played a much more important role in the history of Western thought—in the history of metaphysics, theology, logic, philosophy of nature, and even speculative poetry—than any other assumption concerning their relationships. This is the assumption that *all genuine possibilities*, or at least all possibilities of some central and important kind, *are actualized in time*. Any such possibility thus has been, is, or will be realized; it cannot remain unrealized through an infinite stretch of time; in a sense, everything possible will happen in the long run. —

Obviously, this assumption admits of many variants, some of which will be distinguished from each other later in this chapter. For one thing, it is not clear what kind of possibility is intended in it. Possible events? Possible courses of events? Possible kinds of individuals? Possible individuals (particulars)? Some of these distinctions turn out to be crucial for the study of the later stages of the history of this principle.²

If the principle is applied to possible kinds of individuals, it says that *all* possible kinds of individuals are realized in the course of time—in that particular ‘possible world’ that is in fact actualized, as Leibniz would have said. In a sense, the assumption under consideration thus amounts to saying that the actual world is as full as it can be, that it is the fullest or most plentiful world possible. This has led Arthur O. Lovejoy to call the assumption ‘the principle of plenitude’. In the absence of any other convenient designation, I shall adopt this term, although it is important to realize that this locution can be highly misleading when used in contexts different from the rather limited one Lovejoy has primarily in mind. For us it will be a mere *terminus technicus*.

² See, e.g., my paper ‘Leibniz on Plenitude, Relations, and the “Reign of Law”’, in *Modern Studies in Philosophy: Leibniz*, ed. by Harry Frankfurt (Doubleday, Garden City, N.Y., 1972). —

3. *A. O. Lovejoy on the principle of plenitude*

Lovejoy has studied the history of the principle of plenitude in his book *The Great Chain of Being*.³ This work is impressive as a documentation of the importance of the principle of plenitude in Western thought. It has been widely influential, especially among literary historians. As a contribution to the history of philosophy, however, it leaves a great deal to be desired. Important aspects of the role of the principle of plenitude, conceived of as a precise ontological assumption, remain almost completely unexamined by Lovejoy. They include its role in Stoic thought, in the philosophy of nature of the late Middle Ages, in the methodology of early modern science, and in certain parts of the thought of Leibniz and Descartes, to mention only some of these 'gaps in *The Great Chain of Being*'. They are not the business of the present chapter, however. It is more important here to note that Lovejoy seems to be almost consistently wrong about the early stages of the principle, provided again that we understand it in a fairly literal sense, as Lovejoy in fact does himself. Lovejoy claims that Plato adopted and used the principle while Aristotle did not. The truth, it seems to me, is precisely the opposite: Plato rejected for most relevant purposes the principle of plenitude, whereas Aristotle was not only inclined to think that it is true, but made conscious use of it in philosophical arguments and gave some reasons for believing it. As far as Plato is concerned, his relationship to the principle has been discussed by Erkkä Maula.⁴ Here we shall concentrate our attention on Aristotle.

4. *A plenitude of formulations of the principle*

In order to bring out some aspects of the role of the principle of plenitude, it may be useful already at this stage to state some of its alternative formulations. The principle itself may (tentatively and approximately) be formulated as follows:

each possibility is realized at some moment of time.

Later, we shall see that in order to catch Aristotle's intentions it must probably be expressed in a slightly qualified form:

³ Arthur O. Lovejoy, *The Great Chain of Being: a Study of the History of an Idea* (Harvard University Press, Cambridge, Mass., 1936).

⁴ Erkkä Maula, 'Plato on Plenitude', *Ajatus*, 29 (1967), 12-50. <

(T) [no unqualified possibility remains unactualized through an infinity of time.

Hence, if something can possibly exist, it sometimes will exist in fact. Hence the only things that *never* are, are the impossibilities. Thus we obtain the following variant of (T) :

(T)₁ that which never is, is impossible. <

By the same token, what never fails to be, cannot fail to be, that is, is necessarily :

(T)₂ what always is, is by necessity. <

For some purposes, we might reformulate (T)₂ as follows :

what is eternal, is by necessity.

However, we are not entitled to mean by 'eternal' here anything more than omnitemporality. Hence if someone wants to make a distinction between what is omnitemporally and what is timelessly (eternally in *one* sense of the word), he cannot use this formulation.

In so far as we can disregard this point, however, it can be said that whoever adopts the principle of plenitude makes such attributions as 'eternal' and 'necessary' at least materially equivalent, and the same goes without qualifications for such attributes as 'necessary', 'imperishable', 'indestructible', 'omnitemporal', and 'always existing'.

As far as Aristotle is concerned, it is in fact the case that he did not distinguish 'eternal' and 'omnitemporal'. When he spoke of certain things being 'not in time', he made clear that he merely meant that they are not 'in the middle of time', so to speak, i.e. that their existence is not limited by the earlier and later moments of time. In other words, 'not being in time' was simply tantamount to 'omnitemporal'. (For evidence, see *Phys.* IV 12.)

For Aristotle what is contingently is not by necessity, and hence possibly is not. If this possibility is sometimes realized, the contingent cannot be eternal. Thus contraposition yields the following form of the principle :

(T)₃ nothing eternal is contingent.

By 'contingent' we mean here 'neither necessary nor impossible'.

It is clear that, with the exception of (T)₃, the implications we have formulated can be (on suitable assumptions accepted by

Aristotle) strengthened into equivalences. The converse implications are in fact unproblematic, and also independent of the principle of plenitude. Hence they will not be discussed here.

It must be emphasized that the equivalence of the four forms of the principle listed above is not a projection of our latter-day logic back to Aristotle. On the contrary, all the assumptions that are needed to move from one to another are explicitly formulated by Aristotle in *De Int.* 12–13 (cf. Chapter III above). Moreover, Aristotle in fact used himself the resulting possibilities of reformulating the principle (T). He frequently operates with the other forms as well in a way which indicates that he identifies them with each other and with (T). Furthermore, he occasionally sketches arguments that relate some of the variants of the principle to each other. A case in point is found in *Met.* Θ 8. 1050^b6–24. Thus whatever evidence (or counter-evidence) there is for (or against) one version of the principle of plenitude in Aristotle, is thus also evidence for (or against) all the others.

5. Contra Lovejoy

Lovejoy tries to present some evidence against thinking that Aristotle subscribed to the principle of plenitude. He refers to two passages, and to two only, in support of his view. These are *Met.* B 6. 1003^a2 and *A* 6. 1071^b13–14. Lovejoy apparently does not realize, however, that both these passages are ambiguous. They are quoted by him as follows: ‘... it is not necessary that everything that is possible should exist in actuality’; ‘... it is possible for that which has a potency not to realize it’.

These may be construed in several ways. They are statements about the failure of a potentiality to be actualized. We have to ask: Do these equivocal statements pertain to *each* potency, or only to *some* potencies? Furthermore, we have to ask: Do they refer to a mere *temporary* failure of a potentiality to be actualized, or can the failure in question *last infinitely long*? According to the answers that are given to these questions we obtain four possible interpretations of Aristotle’s thesis:

- (a) Some potentialities may *sometimes* fail to be actualized.
- (b) Some potentialities may fail to be actualized *ever*.
- (a)’ Each potentiality may *sometimes* fail to be actualized.
- (b)’ Each potentiality may fail to be actualized *ever*.

The text does not seem to allow a clear-cut decision between these readings. Hence the context will have to decide.

Of the interpretations listed, (a) and (a)' are compatible with the principle of plenitude in the form in which we are here considering it, and therefore fail to support Lovejoy's claim that Aristotle rejected the principle, whereas the readings (b) and (b)' contradict the principle. Hence we have to decide which of the two kinds Aristotle is presupposing.

There is no obvious way of excogitating Aristotle's meaning in *Met. B 6. 1003^a2*; and even if there were, it would not settle the question one way or the other, for Aristotle is in this passage formulating a problem rather than giving his own considered opinion.

Although the second passage quoted by Lovejoy is also quite terse, the context there makes his sense clear. A few lines later Aristotle writes: 'Further, even if it [sc. a Platonic Form] acts, it will not be enough, if its essence is potency; for there will not be eternal movement, since that which is potentially may possibly not be' (*Met. A 6. 1071^b18-20*; translation by Sir David Ross). The principle Aristotle is appealing to in the last clause is evidently the same he announced a few lines earlier in the passage Lovejoy quotes. The way he is using it here shows, first of all, that Aristotle is presupposing a sense of potentiality in which that which potentially is also potentially is not. In other words, Aristotle is using potentiality in the sense of two-way possibility (contingency); for him, the possibility (in the sense of contingency) of being entails the possibility of not being. x

Aristotle is using the principle to argue that a Form that exists merely potentially cannot guarantee eternal movement because (being merely potential) it may fail to be actualized at some moment of time and hence incapable of supporting the movement at that time. Obviously, the formulations (b) and (b)' are beside this avowed purpose of Aristotle's. (He is not claiming here that a potential form could *never* be a principle of motion.) Hence he does not deny the principle of plenitude in his argument, but rather assumes one of the weaker formulations (a)-(a)'. x

Of the two remaining alternatives, (a) is clearly too weak to support Aristotle's argument. Aristotle wants to argue that if a Form is a mere potentiality, it may fail to exist. For this purpose, it does not suffice to assume that *some* potentialities may fail to

exist, for those potentialities might then not include the forms. Hence Aristotle must assume (a)' and not (a).

But even this is not enough for Aristotle's purposes. Even if it is true of each merely potential being that it *may* fail to exist at some moment of time, it may still *happen* to exist all through an eternity. Or, rather, it may so exist unless it is assumed that its possibility of not existing is at some time actualized. Now it is clear that Aristotle must make this assumption; for otherwise it might be alleged that the forms enjoy an accidental eternity, and hence can support eternal movement after all. (Such accidental eternity was perhaps ascribed to Plato's Forms in *Met. A* 9. 990^b29-991^a7.) In other words, Aristotle is tacitly giving the principle he mentions the following strong sense:

(a)" Each mere possibility (contingency) will in fact fail to be actualized at some moment of time.

→ This principle is an instance of the principle of plenitude; it says that the possibility that each merely possible (potential) being has of not being cannot remain unactualized for an infinity of time. Hence we may turn the tables against Lovejoy. Instead of demonstrating that Aristotle rejected the principle of plenitude (in the form in which we have been discussing it), the passage we have considered shows that Aristotle was in fact relying on it. x

6. *Plenitude is not a 'unit idea'*

Lovejoy's mistakes on Plato and Aristotle can be traced to a deeper source. For some reason he considers the principle of plenitude in one context only. It is, he says, 'an attempted answer to a philosophical question' (op. cit., p. 14, my italic), and according to Lovejoy it could scarcely be anything else, for then it would not be a 'unit idea' in his sense any more than the concept of God is one.⁵ This single question Lovejoy clearly takes to pertain to the relation of the creator to his creatures and more generally to the idea of creation. x

This seems to me to be a seriously oversimplified view, however. The assumption which Lovejoy calls the principle of plenitude occurs in the history of philosophy in many different x

⁵ Lovejoy, op. cit., p. 4.

contexts, as an answer (as it were) to many different kinds of questions. Notwithstanding his own injunction, Lovejoy himself notes in the course of his discussion certain connections between the principle and the idea of determinism and of evolution, neither of which is necessarily connected with the idea of creation. In Diodorus Cronus the principle of plenitude occurs as an alleged consequence of a logical argument, the lost 'Master Argument' which was famous in antiquity.⁶

7. *Other apparent counter-evidence*

Apart from the evidence Lovejoy offers, there might seem to be passages and whole theories in Aristotle that contradict the principle of plenitude. A case in point is Aristotle's conception of infinity which is often formulated by saying that according to the Stagirite infinity exists merely potentially—that it is conceivable but never realized. In Chapter VI below I shall discuss the Aristotelian theory of infinity in some detail and show that it is not only compatible with the principle of plenitude but relies on it, and hence cannot be fully understood without appreciating the role of the principle in Aristotle. I also suspect that the ever-unrealized possibilities mentioned in the *De Interpretatione* are various kinds of infinity, which in fact are mentioned in *Metaphysics* in a rather similar context.

Another piece of apparent counter-evidence is Aristotle's example in *De Interpretatione* 9: 'For example, it is possible for this cloak to be cut up, and yet it will not be cut up but will wear out first.' Here we in fact have a clear instance of possibility that according to Aristotle will not be realized. It does not go to show that the principal forms of the principle of plenitude cannot be attributed to Aristotle, however. The possibility of a particular cloak's being cut up is a possibility concerning an individual object, and not a possibility concerning kinds of individuals or kinds of events. Nor does the unfulfilled possibility Aristotle mentions remain unfulfilled through an infinity of time, for when the cloak wears out, it goes out of existence, and no possibility can any longer be attributed to it. Thus Aristotle's example does show that the 'genuine' possibilities which the principle says are actualized do not for him include possibilities concerning indi-

⁶ See Chapter IX below.

vidual objects which only exist for a certain period of time.^x However, it does not show that Aristotle did not believe in some other forms of the principle which *prima facie* are much more plausible anyway.

A few further examples of apparently disconfirmatory evidence have to be disposed of. For instance, in a passage of *An. Post.* (see I 6. 75^a31-5), Aristotle says that accidental attributes (*τὰ συμβεβηκότα*) are not necessary, and if we draw a conclusion by their means, we therefore do not necessarily know why the conclusion is true; not even if the attributes belong always, but not *per se*, as in syllogisms through signs. Here Aristotle might seem to be denying (T)₂. However, this impression is rather misleading. First of all, it is not clear that Aristotle's statement is not counterfactual, for the optative *εἴη* scarcely commits Aristotle to holding that there *in fact* are cases of the kind he is describing. The only thing we can definitely extract from the passage is that even an attribute that always belongs to a subject is not necessarily-known to do so, which of course does rule out that the attribute could belong (unknownst but) necessarily to the subject. In fact, the passage continues as follows (Oxford translation): '... for though the conclusion be actually essential, one will not know it as essential or know its reason'. Hence, no exception to the principle of plenitude is being contemplated by Aristotle here.

Some editors and commentators have tried to find room in *Phys.* III 1. 200^b26 (and in *Met.* K 9. 1065^b5) for potentialities that are not actualized. As pointed out by Ross in his edition of the *Physics* (Clarendon Press, 1936, ad loc.), this does not have any support in the manuscripts of the *Physics*, in the best manuscripts of the *Metaphysics*, or in Alexander, Themistius, Porphyry, Philoponus, and Simplicius.

A counter-example to the principle of plenitude might seem to be offered by *Top.* IV 5. 126^a34 ff. Although too complicated to be analysed here, this passage does not contradict the principle.

A few other apparent counter-examples can be explained away in terms of Aristotle's distinction between absolute and relative necessity and possibility. A more difficult problem is presented by the mare's nest of perplexing arguments we find in *Met.* Θ 3-4. At times, Aristotle there seems to declare his adherence to the principle and yet he also very definitely wants to criticize the Megarians who do likewise. Since the interpretation of Aristotle's

polemic against the Megarians admittedly turns on collateral evidence offered by the rest of the Aristotelian corpus, I shall postpone my examination of this difficult problem to a later stage of our discussion, merely registering here my belief that *Met.* Θ 3-4 strongly supports my attribution of the principle of plenitude to Aristotle.

8. *The role of the principle of plenitude as a bridge between time and modality*

A word of warning seems to be in order here. However firmly Aristotle may have believed in the principle of plenitude, it is very dubious whether he ever considered it as giving us a definition of his concept of possibility. In other words, however strongly he assumed that something is possible if and only if it is sometimes the case, he did not on most occasions think of this as exhausting the meaning of assertions of possibility. Occasionally, he seems to have been pushed to this by the intrinsic difficulties in his own conception of possibility. (Cf. the discussion of his criticism of the Megarians below.) Furthermore, some of his occasional pronouncements point to this direction.

It is true that occasionally Aristotle seems to go as far as to be ready to *define* certain particular modal expressions in temporal terms. A case in point is found in *Top.* VI 6. 145^b27 ff.: 'Whenever, then, we say that a living thing is now indestructible (*ἀφθαρτον*), we mean (*τοῦτο λέγομεν*) that it is at present a living thing of such a kind as never to be destroyed.' A closely similar explanation of the meaning of *ἀφθαρτον* and *ἀγένητον* is given by Aristotle in *De Caelo* I 12. 282^a27-30: 'I use the words "un-generated" and "indestructible" in their proper sense (*τὰ κυρίως λεγόμενα*), "un-generated" for that which now is and could not at any previous moment of time have been truly said not to be; "indestructible" for that which now is and cannot at any future time be truly said not to be.'

Yet the general modal notions like possibility and necessity are apparently never defined by Aristotle (unlike Diodorus Cronus) in purely temporal terms.

Defining necessity and possibility in temporal terms, using the formulations (T) and (T)₂ of the principle of plenitude (strengthened into equivalences) as a bridge between time and modality,

would have meant for Aristotle to base his modal notions entirely on what might be called a *statistical* model of modality: Something's being possible must be shown by its *sometimes* happening, and what is always must be by necessity. Applications of modal notions reduce in effect to comparisons of what happens at different moments of time. Such a classificatory approach to modal concepts was not foreign to Aristotle. A good illustration is offered by his distinction between different subcases of contingency in *An. Pr.* I 13. 32^b4-18. They include what happens 'in most cases' (*ὡς ἐπὶ τὸ πολὺ*), and what 'inclines by nature in the one way no more than in the opposite' (*οὐδὲν μᾶλλον οὕτως πέφυκεν ἢ ἐναντίως*). Elsewhere Aristotle adds rare events to the list. It is extremely natural to include necessary events into this statistical classification as events that *always* happen, and impossible ones as those that *never* do. In fact, Aristotle seems to do this in the very passage mentioned, for in this context 'falling short of being necessary' can scarcely mean anything but 'falling short of always happening'. If so the passage will parallel *Met. E* 2. 1026^b27-37. In any case, this is what the scholastics subsequently did in so many words. The sun rises necessarily, they said, 'ut semper'.⁷ The same way of thinking was not far from Aristotle's mind, either, as shown by his acceptance of the principle of plenitude. We shall in fact find further indications in the sequel that the whole statistical model can be said to have been one of the conceptual paradigms of Aristotle's theory of modality. It was not the only one, however, and hence did not quite yield to him *definitions* of the different modal notions.

9. Confirming evidence

After all the apparent counter-examples have been refuted, it is in order to marshal the positive evidence for the attribution of the principle of plenitude to Aristotle, over and above the references already given.⁸

⁷ See Anneliese Maier, 'Notwendigkeit, Kontingenz und Zufall' in *Die Vorläufer Galileis in 14. Jahrhundert: Studien zur Naturphilosophie der Spätscholastik*, Edizioni di Storia e Letteratura (Rome, 1949), pp. 219-50.

⁸ The attribution of the principle of plenitude to Aristotle has been discussed (with reference to my earlier work) by C. J. F. Williams in 'Aristotle and Corruptibility', *Religious Studies*, 1 (1965) 95-107, 203-15, especially 210-14. I am in several respects indebted to Williams's comments.

Here are some passages supporting the attribution: '... that which is capable of not existing is not eternal, as we had occasion to show in another context' (*Met. N 2. 1088^b23-5*). It is not clear what the address of Aristotle's reference is, although it illustrates the attention Aristotle paid to the principle. In any case, Aristotle offers a kind of proof for the principle in *De Caelo I 12. 281^a28-282^a25*. Here Aristotle is mainly concerned with the thesis (T), although occasional other versions come into play as well: 'Anything then which always exists is absolutely imperishable' (*De Caelo I 12. 281^b25*). Here we have an instance of (T)₂. The same version is found in *De Gen. et Corr. II 11. 338^a1-3*: 'Hence a thing is eternal if it is by necessity; and if it is eternal, it is by necessity. And if therefore the coming-to-be of a thing is necessary, its coming-to-be is eternal; and if eternal, necessary.'

As to the version (T)₃, it is announced in so many words in *Met. Θ 8. 1050^b7-8* and 20: 'No eternal thing exists potentially' (ἔστι δ' οὐθὲν δυνάμει αἰδίου); 'Nor does eternal movement, if there be such, exist potentially' (οὐδὲ δὴ κίνησις, εἴ τις ἐστὶν αἰδίου).⁹

The form (T)₁ seems to make its appearance in *Met. Θ 3. 1047^a12-14*: τὸ δ' ἀδύνατον γενέσθαι ὁ λέγων ἢ εἶναι ἢ ἔσεσθαι ψεύσεται (τὸ γὰρ ἀδύνατον τοῦτο ἐσήμαινεν) . . . Sir David Ross translates this: 'He who says of that which is incapable of happening either that it is or that it will be will say what is untrue; for this is what incapacity means.' Here Aristotle seems to go as far as to say that the principle of plenitude yields the very meaning of modal terms like 'impossible'. In this respect, however, the passage is perhaps somewhat inconclusive, for ἐσήμαινεν might possibly be a weak term here, to be translated in terms of 'indicating' rather than 'meaning'. In any case, the principle of plenitude is asserted here by Aristotle in no uncertain terms, barring of course the possibility that the quotation does not represent Aristotle's considered opinion. This lingering doubt will be dispelled later when we return to the interpretation of *Met. Θ 3-4*.

⁹ I fail to understand why C. J. F. Williams thinks that Aristotle is here saying that 'the eternal must lack the potentiality of being' (op. cit. p. 211). Aristotle says in so many words that in the sense he is presupposing 'every potency is at the same time a potency of the opposite'. Hence a lack of potency of being in this sense is *ipso facto* lack of potency of not being. Be this as it may, Williams agrees that Aristotle is here presupposing some form or other of the principle of plenitude.

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(An Pr. A.
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In *De Int.* 9. 18^b11-15 we find another passage which in its most literal sense agrees very well with the principle of plenitude, but whose interpretation is such a notorious mess that only an extended subsequent argument (to be given below in Chapter VIII) can ascertain that it, like J. L. Austin, means what it says. Aristotle there infers 'it could not not be so' from 'it was *always* true to say that it is so or would be so' (my italics in both cases). Further evidence is found in a number of passages, for instance in *Top.* II 11. 115^b17-18 (what is destructible *haplōs* will be destroyed), *Phys.* III 4. 203^b30 (in the case of eternal things what may be is not different from what is), and *Phys.* IV 12. 221^b25-222^a9.

In some passages 'necessary' and 'always' are not in so many words asserted to be equivalent, but rather lumped together by Aristotle without explicit comment. Cases in point are the following: *Top.* II 6. 112^b1 ff.; *De Gen. et Corr.* II 9. 335^a32-^b7; *De Part. An.* I 5. 644^b21-3; *Met. E* 2. 1026^b27-37; *Met. K* 8. 1064^b32 ff. They support my ascription especially when combined with Aristotle's remarks in *An. Pr.* I 13. 32^b4 ff. on the classification of events into necessary, general, indeterminate, and rare, and with *De Caelo* I 12.

Additional evidence will be found in later chapters, especially in Chapter VI, and in sections 11 and 13 of the present one. In the absence of any counter-examples that would withstand critical scrutiny, we can safely ascribe the principle of plenitude to Aristotle. His formulations suggest, moreover, that the version of the principle involved is just our (T), that is, the version that rules out an infinitely long frustration of a possibility. Even possibilities concerning individual objects fall within the scope of this principle, provided of course that the individual in question does not pass away, for there are in Aristotle's view no possibilities concerning non-existent particulars.

10. *Why the principle of plenitude?*

As Aristotle himself could have said, it is one thing to establish that someone adheres to the principle of plenitude and another thing to show *why* he does. It is not easy to appreciate Aristotle's reasons for holding the principle of plenitude, it seems to me. The most explicit argument, or approximation to an argument, is

found in *De Caelo* I 12. 281^a28-282^a5. It has been analysed by C. J. F. Williams,¹⁰ and will also be commented on in Chapter IX below. There certain connections between the principle of plenitude and other Aristotelian doctrines will likewise be pointed out.

The reasons for adopting the principle which are aired in *De Caelo* I 12 seem to me to be connected with the type of reason that we shall find later in this chapter (see section 12 below).

Aristotle's other reasons for holding the principle are more difficult to pinpoint, and may not have been completely articulated by him. One of them is connected with his analysis of change or movement (*kinesis*). It would require a fuller discussion than can be given here. Suffice it therefore to indicate the most salient points. As Aristotle's very definition of *kinesis* shows, the only way in which a potentiality can exist for him without already being realized is as a movement towards the realization. (*Kinesis* is the full reality of potentiality, in so far it is a [mere] potentiality, according to *Phys.* III 1. 201^a10-11.) What exists potentially in such a change is its outcome, for instance 'house' in the case of 'building', to use Aristotle's own example.

The most striking feature of Aristotle's theory of *kinesis* is that the change always has as its beginning an actual instantiation of the same 'form' as the outcome existing potentially during the change. This actual individual may be a member of the same species as the outcome ('man begets man') but it may also be the 'form' realized in the mind of a conscious producer of the outcome according to a plan. In all cases, however, there will have to be such an antecedently existing form which initiates the *kinesis*. 'The mover or agent will always be the vehicle of a form . . . which, when it acts, will be the source and the cause of the change . . .' (*Phys.* III 2. 202^a9-11). The same doctrine is explained, e.g., in *Met.* Z 7 and in *Met.* Θ 8.

From this it follows that whenever it is true to say that a certain universal ('form') exists potentially, there must have been an earlier exemplification of the same universal actually existing. But this is but one version of the principle of plenitude.

This version is weaker than the ones we have been discussing so far, for it concerns only the realization of the possible kinds of individuals and events. It looks weaker also in that the kind of

¹⁰ Op. cit. (note 8, p. 103 above).

possibility it pertains to is apparently some sort of *natural* possibility rather than a *logical* one. (The weaker the kind of possibility is that a version of the principle of plenitude claims to be instantiated, the more sweeping the version.) In Chapter VI, section 6, below, it will be seen that there was no sharp distinction in Aristotle between logical and natural possibility. Hence the form of the principle of plenitude which was just found to be a corollary to Aristotle's theory of *kinesis* is no weaker in this respect than others. Needless to say, it belongs to an entirely different order of ideas than the pseudo-logical argument for the principle of plenitude in *De Caelo* I 12. Perhaps for this very reason, the convergence of those entirely different lines of thought served to reinforce Aristotle's belief in the principle.

I suspect that the Stagirite had further reasons for adopting the principle of plenitude. However, as I have emphasized, they are rather elusive. What has been said already suffices to indicate the deep connections between the principle and such central Aristotelian ideas as the priority of actuality with respect to potentiality and the permanence of species.

11. *The interpretation of Metaphysics* Θ 4

Very strong support for our ascription of the theses (T)-(T)₃ to Aristotle also seems to be forthcoming from *Met.* Θ 4. 1047^b3-6:

If what we have described is identical with the potential or convertible with it, evidently it cannot be true to say 'this is possible but will not-be', which would imply that things incapable of being would on this showing vanish.

The text reads;

εἰ δέ ἐστι τὸ εἰρημένον τὸ δυνατόν ἢ ἀκολουθεῖ, φανερόν ὅτι οὐκ ἐνδέχεται ἀληθὲς εἶναι τὸ εἰπεῖν ὅτι δυνατόν μὲν τοδί, οὐκ ἔσται δέ, ὥστε τὰ ἀδύνατα εἶναι ταύτῃ διαφεύγειν

The evidential value of this passage is not undisputed, however. It has been pointed out by G. E. L. Owen and by Martha Kneale that another reading of Aristotle's words is also possible here (private communications). We can 'understand the ὥστε-clause (ὥστε with infinitive, not with indicative) in lines 5-6 as qualifying the preceding τὸ εἰπεῖν . . . οὐκ ἔσται δέ and not as stating a consequence that could be inferred from it. We then

understand the sentence as follows: "It cannot be true to say that this is possible but will not happen and to say this *to such effect* that the existence of the impossible will escape us in this way" (Martha Kneale, private communication).

Both the original quotation and Mrs. Kneale's translation are philologically possible. In order to use the evidence of *Met.* Θ 4. 1047^b3-6 for my purposes, I must hence rule out the latter-reading. This can be done as follows. In the passage under consideration, Aristotle is warning us against a mistake. This mistake is different on the two different interpretations. On the former, Aristotle tells us that whatever is possible will be the case, i.e. he warns us against assuming that something is possible-but will never be. On Mrs. Kneale's interpretation, Aristotle is allowing for a possibility never to be realized, as long as this assumption does not let the impossible escape us altogether—whatever that means.

The sequel shows which of these warnings Aristotle has in mind:

Suppose, for instance, that a man—one who did not take account of that which is incapable of being—were to say that the diagonal of the square is capable of being measured, but will not be measured, because a thing may well be capable of being or coming to be, and yet not be or be about to be. (1047^b6-9, Oxford translation) —

This shows quite clearly, it seems to me, that the mistake Aristotle is worried about is assuming that a possibility can remain for ever unrealized. (See especially the last clause of the quotation.) The reading he is presupposing is therefore the one originally given and not the one Mrs. Kneale is favouring.

It may be thought that this does not completely rule out Owen's and Mrs. Kneale's interpretation, if supplemented by the assumption that the mistake he is warning us against is 'to suppose that *whenever* we can say "It will never happen" we can also say "It is possible"' (Mrs. Kneale). For several reasons this nevertheless cannot very well be what Aristotle means. For one thing, he is not envisaging a man who says that a diagonal can be measured because it never will be, but one who says that it can be measured and yet (*μέτροι*) will not be measured. For another, I do not see that a fallacious general inference from 'never' to 'possibly' is what Aristotle's alleged formula 'to say that something is possible but will never be—and to say this to such effect

that the existence of the impossible will escape us' can naturally express. This formula deals with one case only, not with the general fallacy—which Aristotle could have described much more simply anyway. A third reason is that a view as far off the mark as the fallacious inference in question is very unlikely to have merited Aristotle's explicit rejection. (There is no indication anywhere else in Aristotle that he was worried about this fallacy.) Furthermore, a separate analysis will show that there is nothing in *Met.* Θ 3 that commits him even to the view that sometimes a possibility can remain unrealized for ever so as to encourage the fallacy in question, contrary to what the critics of my interpretation seem to assume.

Hence it seems to me clear that the current reading of 1047^b3–6 with which I agree is correct. This means that this passage offers us strong evidence for Aristotle's adherence to the principle that each genuine possibility is sometimes realized.

12. *Plenitude and Aristotle's definition of possibility*

If the reading favoured here is correct, further interesting conclusions will ensue. One fact that may have led interpreters astray is that Aristotle's example about the diagonal seems to involve a principle altogether different from the realization of all possibilities in time. What Aristotle argues for there is apparently not that each possibility will be realized, but that it can be assumed to be realized without implying any contradictions. What has been found strongly suggests that Aristotle is here assimilating the two principles together. (Note that Aristotle had just before appealed to the latter principle in *Met.* Θ 3. 1047^a24–9.) This observation is important for understanding his theory of modality in general. Aristotle's view is probably motivated by the idea that the only way in which we can think of a possibility to be realized is at some moment of time in our actual 'history of the world'. But if other things than those assumed actually take place at that moment, a contradiction does seem to result. Hence the second principle may seem to imply the first.¹¹

Be this as it may, we can now see why Aristotle thought that a

¹¹ This suggestion will be elaborated below in Chapter IX. Note that *De Caelo* I 11. 281^a5–7 shows clearly that the assumption which Aristotle took to give rise to impossibilities was that a commensurate diagonal should exist at some particular moment of time.

denial of his thesis of the realization of all possibilities in time would have lost sight of all instances of impossibility in a very strict sense of the phrase. Aristotle's very definition (working characterization) of possibility is as follows: 'I use the terms 'possibly' and 'the possible' of that which is not necessary but, being assumed, results in nothing impossible' (*An. Pr.* I 13. 32^a18-20). Because of the assimilation of the two principles to each other, an unrealized possibility would have meant for Aristotle a possibility that cannot ever be assumed to be realized without running into impossibilities, and would therefore have involved the destruction of Aristotle's principal characterization of what is possible and (by implication) what is impossible. This would indeed involve losing sight of what is impossible and what is possible according to Aristotle's definition of these notions.

In fact, the above characterization of possibility is likely to be precisely the assumption Aristotle has in mind in the continuation of our quotations from *Met. Θ* 4:

But from the premisses this necessarily follows, that if we actually supposed that which is not, but is capable of being, to be or to have come to be, there will be nothing impossible in this; but the result will be impossible, for the measuring of the diagonal is impossible. (1047^b9-13; Ross's italics)

The piece of reasoning is in precise agreement with *An. Pr.* I 13. 32^a18-20.

We can thus understand very well what Aristotle meant by 'the vanishing of the things that are incapable of being'. If we accept his characterization of possibility, as well as his assimilation of the two principles mentioned above to each other, possibilities can remain unrealized only at the expense of declaring a good number of impossibilities not to be impossible at all—perhaps all of them.

We can also now see, albeit only in its general features, another reason why Aristotle was tempted to assume the principle of plenitude, besides the ones mentioned above in section 10. It was encouraged by Aristotle's way of understanding his own definition of possibility. The kind of assumption that a possibility is realized which was used in the definition meant for Aristotle assuming that it is realized at some moment of *our* time (the actual succession of 'nows'). This, for reasons that we can here only surmise, encouraged Aristotle to assume that every possibility *is in fact* realized in time.

13. *The interpretation of Metaphysics* Θ 3-4

What has been found does not presuppose the emendation of Zeller who wants the text to read: *εἰ δ' ἐστί, τὸ εἰρημένον, δυνατόν (<ᾧ ἀδύνατον>) μὴ ἀκολουθεῖ. . .* Needless to say, Zeller's emendation and interpolation are encouraged by observations of the same kind we have made.

Another consequence is that no reason remains not to take the evidence of *Met.* Θ 3 at its face value. It was already noted above in section 9 that *Met.* Θ 3 yields one of Aristotle's most outspoken assertions of the principle of plenitude. (See 1047^a11-14.) Now we can see that this was not retracted by Aristotle, and may even suggest his partial willingness to put the principle to use as supplying us with definitions of modal notions. Further remarks on *Met.* Θ 3 will be offered later in Chapter VIII.

14. *Consequences of the principle: Aristotle on his predecessors*

Aristotle's acceptance of the principle of plenitude was not without consequences for the rest of his philosophy. Here only one of them—a particularly important one—will be noted.

It has often been pointed out that Aristotle's attitude to his predecessors is unhistorical. He did not discuss their views as an antiquarian exercise, but as material from which he could extract his own position by means of critical and comparative analysis. As a consequence, he has been accused of reading his own problems and doctrines back to earlier philosophers.

No matter how these charges of unhistoricity against Aristotle's frequent historical surveys are to be judged, it must be emphasized that his attitude was not due to blind prejudice. The principle of plenitude gave Aristotle an important theoretical reason for his peculiar relation to his predecessors. If no possibility can remain unactualized for an infinity of time, every possible truth must—presumably have been thought of some time or other. Hence a sufficiently comprehensive survey of the opinions of earlier thinkers will comprise each desired truth within its scope. The central problem thus lies in the sifting of the true opinions from the false ones rather than in the difficulty of discovering the truths in the first place; and, of course, also in collecting a large enough sample of well-established earlier opinions.

This rationale of Aristotle's method of discussion is explained in *Met. A* 8. 1074^a38–^b14. Especially instructive is the following passage:

But if one were to separate the first [original] point from these [later] additions and take it alone . . . and reflect that, while probably each art and each science has often been developed as far as possible and has again perished, those opinions, with others, have been preserved until the present like relics of the ancient treasure. It is only in this way that we can explain the opinions of our ancestors and forerunners. (My italics, of course.)

In *Politics* VII 10. 1329^b25–35 Aristotle expresses a closely related idea as follows:

We must also believe that . . . most other institutions . . . have been invented in the course of years on a number of different occasions—indeed an infinite number. . . . We ought to take over and use what has already been adequately expressed before us, and confine ourselves to attempting to discover what has hitherto been omitted. (tr. Barker)

This passage is especially interesting in that it hints at the source of Aristotle's antiquarian interest which led him, *inter alia*, to compile the famous lost collection of constitutions. In this way, we begin to understand the relation of Aristotle's search for factual material to his theory of induction.

The same idea is expressed in *Politics* II 5. 1264^a1–5 as follows: 'We are bound to pay some regard to the long past and the passage of years. . . . Almost everything has already been discovered, though some of the things discovered have not been coordinated, and some, though known, have not been put into practice' (tr. mostly Barker's). A similar point is made in *Meteor.* I 3. 339^b27 ff.

15. *Consequences of the principle: modal and non-modal logics are inseparable*

Another consequence of the principle of plenitude is that if there can be exceptions to a temporally unrestricted generalization, there will in fact be such exceptions. In other words, the only true unrestricted generalizations will be the necessary ones. Since Aristotle assumed that in syllogistic premisses one is quantifying over individuals past, present, and future without any temporal restrictions (see *An. Pr.* I 15. 34^b7–11), this holds for the general-

izations Aristotle dealt with in his syllogistic and also in his theory of science. Thus one of the puzzles mentioned in the beginning of this chapter receives a definitive explanation.

Indeed, we have a contrary problem in our hands. The outcome of our analysis is almost paradoxical. The very difference between assertoric and apodeictic generalizations seems to disappear for Aristotle. This is paradoxical, for Aristotle was the founder of modal logic. Furthermore, modal notions played a vitally important role in his philosophy. Yet for him, as for anyone who accepts the principle of plenitude, there should not be any sharp distinction between modal logic and plain syllogistic. In the last analysis, all modal statements should admit of reformulations in temporal (but otherwise wholly extensional) terms. On the contrary, the thinkers who (like some of the characteristically modern ones) reject the principle are the ones who might be expected to occupy themselves with modal logic and modal notions in general. For them, there can be a distinction between merely contingently true generalizations ('eternal accidents') and necessary ('lawlike') generalizations, as there cannot be for Aristotle. Yet the historical situation is to a large extent a mirror image of this legitimate expectation. There is something of a correlation between the demise of the principle and the decline of modal logic.

I do not have a simple answer to this problem. Maybe it is indicative of the deep tensions that 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 determinism and towards an extensional (tense-logical) reduction of modal notions to non-modal ones. In the next few chapters we may perhaps catch a few glimpses of the problems and manoeuvres to which Aristotle was led because of these tensions.