DAWES HICKS LECTURE ON PHILOSOPHY

# IS TIME REAL? RESPONSES TO AN UNAGEING PARADOX

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## *Aristotle's Paradoxes*

Is time real? In *Phys.* iv 10, Aristotle (385–322 BC) cites a set of paradoxes designed to show that it is not. These paradoxes and their variants stimulated the invention or application of some of the boldest theories about the nature of time for the next nine hundred years of Greek antiquity, and then on into the medieval period: time comes along in indivisible atoms, or in divisible leaps, time is unreal, time is in the mind, or at least its divisions are, there is a kind of time which does not flow, the whole of time is present, or the present corresponds to the minimum perceptible period. Some of these theories are of particular interest, because counterparts of them have been reinvented by psychologists and physicists in the last hundred years, and even in the last decade.

In at least one instance, I think we can see that Aristotle was too brilliant a thinker to need any elaborate theory of the nature of time in order to dismantle the paradoxes. As a result, his solutions, though more effective, tend to be less interesting than those of many successors. But this claim will need to be argued, because, with one exception,[1] Aristotle does not follow his statement of the paradoxes with a statement of solutions, and so we have to gather from elsewhere in his text how he would have been likely to solve them. He certainly does not intend to accept them.

Of course, we know that time exists. For one thing, there is something self-defeating about denying its existence; for that very denial requires time in which it may take place. The denial of time is self-defeating in the same way as the denial that one exists or thinks, a denial whose self-defeating character was exploited by

[1] The exception is that he does discuss in the next chapter whether the now is always the same or always different. But he does not discuss further the paradox of the parts of time, or of the ceasing instant.

Descartes. In so far, then, as Aristotle's paradoxes suggest that time does not exist (and at least one of them is most naturally put that way), we can know that they are wrong. But that does not put an end to the matter. For one thing, it has not yet been ruled out that time might exist, but with a lower degree of reality than we would have expected.[1] For another thing, however wrong the suggested conclusion may be, it does not follow that the paradoxes should be ignored. Few philosophers will be able to rest happily until they can see how to answer them; and if they were to rest happily, they would forfeit much that can be learnt about the nature of time. Nor is the subject only one for specialists: it concerns everyone. The fear of death, for example is very much bound up with considerations about time and particularly with considerations about what I shall be calling McTaggart's A-series (the term will be explained below). We are not concerned that our death will take place (say) in the twenty-first century, because that century is the twenty-first, but rather because it is *soon*. Again, we feel more horror at the idea of our *future* non-existence than at the idea of our *past* non-existence. Evidently, we value not only life, but the fact of having more of it *to come*. The ideas of 'soon', 'future', and 'to come', unlike the idea of 'twenty-first century', belong with McTaggart's A-series, and if it could be shown that at least the *A-series* did not exist, that already should lend us tranquillity. I do not believe in fact that either A- or B-series can be shown not to exist; at most we may try in some contexts to attach less importance to the A-series.

Let me start with a translation of *Phys.* iv 10, $217^{b}29$–$218^{a}30$.

The next subject to come after those discussed is time. First, it is a good plan to raise some puzzles about it by means of some commonplace ideas, and to ask if it is one of the things that exist (*ontōn*) or not, and then what its nature is. From the following one might suspect that either it does not exist (*estin*) at all, or hardly and obscurely.

$217^{b}33$ Some of it has occurred and is not, while some is going to be and is not yet, and time is composed of these two, whether infinite time or the time one is at any moment taking up. Now what is composed of the non-existent would be thought to be unable to partake of existence (*ousia*).

$218^{a}3$ Further, when a divisible thing exists, if it does, either all or some of its parts must exist. But time is a divisible thing of which some has occurred, while some is going to be, and none is. For *now* is not a part of time, since a part can serve as a measure of the whole, and the whole

[1] A recent version of this view in physics is that of David Bohm, who suggests that time depends on a more fundamental and non-temporal reality: *Wholeness and the Implicate Order* (London 1980), 210–12.

must be composed of parts, whereas time is not thought to be composed of nows.

So far the argument is that time does not exist, for none of its *parts* exists, since neither the past nor the future exists; while if someone pleads the existence of *now*, we reply that, being sizeless, *now* is not a *part* of time, even if it does exist. Certain points call for clarification.

In the word 'now', Aristotle often combines two ideas, although sometimes one idea occurs without the other. The first idea is that now is *present*, the second that it is an *instant*. An instant is not a very short period, but rather the beginning or end (the boundary) of a period. It therefore has no size, for it is not a very short line, but rather the boundary of a line. The idea that there are sizeless instants should be no more controversial than the idea that periods have beginnings and ends. An example of an instant would be two o'clock, which is the end of one hour and the beginning of another. Admittedly, the idea of an exact instant of two o'clock does involve a certain degree of idealization, for it has to be defined in terms of the alignment of certain parts of a clock, and the parts of a clock have a certain thickness. So to define an exact instant of alignment, we should have to idealize, taking three sizeless points, say, three centres of mass, within the parts of the clock. We idealize again when we talk of an alignment between these points, since a straight line is one along which an *ideal* measuring rod has to be placed the smallest number of times, or along which a light ray would travel in *ideal* conditions. So the idea of an instant such as two o'clock is an idealization, and it should be admitted that for ordinary purposes people do not need to concern themselves with idealized instants. Nonetheless, I do not think that that would make it right to say that they do not exist. The degree of idealization involved in talking of instants is not very great; no greater than is familiar from the talk of point-masses in Newtonian mechanics. Nor do I think it possible to dismiss Aristotle's paradoxes on the grounds that they are inapplicable to our world, so long as our world is not idealized. For we should surely be disturbed by the paradoxes, just so long as they apply to our world *as idealized* so as to contain instants.

But why should the present be treated as a mere instant? Aristotle has an argument for this in *Phys.* vi. 3, $234^a9$–19. The central idea is that if the present were an extended stretch of time, it would overlap with the past and future. No doubt, the common intuition that the present is distinct from the past and

future would have to be abandoned if it could be shown to be unsatisfiable. But Aristotle shows that it *is* satisfiable, precisely by construing the present as an instant. At best, he recognises that ordinary language has a secondary use of the word 'now' to refer to what is *near* the present instant.[1] But in view of his 'overlap' argument, he cannot think this use altogether legitimate. Let me now quote Aristotle's next argument.

218ª8. Again, it is not easy to see whether the now which appears to divide past and future always remains one and the same or is for ever different. Suppose it is for ever different: then if none of the ever differing parts of time are simultaneous with each other, except where one is contained and the other contains as the shorter time is contained in the longer; and if a now which does not exist but existed previously must have ceased to exist at some time, in that case nows will not exist simultaneously with each other, and the earlier now must always have ceased to exist. But it cannot have ceased to exist during itself, because it exists then, and it cannot have ceased to exist in another now either. For let it be impossible for nows to be next to each other, as it is for points. If in that case it cannot have ceased to exist in the next now, but has ceased to exist in some other now, then it will have existed simultaneously with the infinitely many nows intervening between itself and the later one; but that is impossible.

The new puzzle starts from the idea that the present instant is ever different. In that case, we may ask when the present instant (say, two o'clock) ceases to exist. It cannot cease to exist while it is existing, for that would involve a contradiction. It cannot cease at the very *next* instant, for instants never are next to each other, any more than are geometrical points on a line. The only remaining alternative seems to be that two o'clock ceases to exist at some later instant, say, at one second past two; but then (absurdly) it would have remained in existence at all the infinitely many intervening instants. Two points call for clarification.

Firstly, the sense of 'exist' here is 'be present'. Secondly, Aristotle is right that instants are never next to each other. To see why, we can imagine trying to name the instant next to two o'clock. Will it occur one-millionth of the way through the ensuing second? But there is an instant closer to two than that: the instant two-millionths of the way through the ensuing second. Nor is that latter instant immediately next to two, for we can take ever smaller fractions *ad infinitum*. Nor is it any good saying that the next instant, like the house next door in a terraced row, is *no* distance away. For then it will not be distinct from two, since, unlike the

[1] *Phys.* iv. 13, 222ª20–4.

house next door, it will not even have any *parts* which are separated by a distance.

Aristotle now blocks off the remaining escape route: the suggestion that the present instant does not cease to exist, but is always the same. There would then, he objects, be only one instant, whereas we need at least two to specify the boundaries of any period. Worse, we should be stuck at the same instant as the people of ten thousand years ago. I shall quote the remaining text.

218$^{a}$21. Yet it is not possible either for it to remain always the same. For no finite divisible thing has only a *single* boundary, whether it be continuous in one dimension or in more; and the now is a boundary, and one can take a finite time.

218$^{a}$25. Again, if being simultaneous rather than temporally earlier or later is being in one and the same now, and if earlier and later things alike are in this now, then things that happened ten thousand years ago would be simultaneous with things that have happened today, and nothing would be earlier or later than anything else.

### *Aristotle's Solution of the 'Ceasing Instant'*

There have been many conjectures about how Aristotle would solve his paradoxes. But, so far as I know, the crucial passages for the paradox of the ceasing instant have not been noticed. Aristotle's solution, I believe, would come in two parts. The first point is that we must distinguish between the present and the perfect tense: we can never say, using the present tense, that the present instant *is* ceasing to exist. But we can say of what we once called the present instant that it *has* ceased to exist. When? The second part of Aristotle's answer would be: at any subsequent instant you like, however close—a millionth of a second later, or a two-millionth. There will be no first subsequent instant.

It so happens that Aristotle phrases his paradox in terms of the *perfect* tense, asking when the present instant *has* ceased to exist. To answer the paradox so phrased, one needs only the second part of the solution. However, the paradox becomes harder, if phrased in terms of the *present*, so that it asks when the present instant *ceases*. And to answer that, both parts of the solution are required.

It should not be very controversial that Aristotle would favour the second part of the solution, which uses the idea of any subsequent instant, however close. He is very much alive to the fact that a given instant has no immediate successor, and that you can for ever choose closer ones. It is the first point which is less familiar, that we can use the perfect tense but not the present. But this point

is suggested by the following passage, which appears in a different context and in a different work.[1]

For besides what has been said, there are also paradoxes about coming into existence and ceasing to exist. It is thought that in the case of a substance, if it now exists without having existed previously or later fails to exist after previously existing, it must be in process of coming into existence or ceasing to exist. [Aristotle expresses this by the *present* tense: *gignesthai*, *phtheiresthai*]. But with regard to points, lines, and surfaces, when they exist at one time without existing at another, they cannot be in process of coming into existence or ceasing to exist. For as soon as bodies come into contact or are divided, the boundaries simultaneously become one if they touch and two if they are divided. Hence when the bodies have been put together, one boundary does not exist but *has* perished [*ephthartai*, perfect tense, $^{b}3$, my italics], and when they have been divided, the boundaries exist which did not exist before (for the point, being indivisible, was not divided into two). And if the boundaries are in process of coming into existence or ceasing to exist, from what are they coming into existence?

It is similar with the now in time; for this too cannot be in process of coming into existence or ceasing to exist, and yet is thought to be ever different, which shows that it is not a substance. Clearly, it is the same with points, lines, and planes, for the same account holds, since all alike are boundaries or divisions.

I have chosen this passage, because it explicitly mentions the present instant, its being ever different and its ceasing to exist. But for the general idea I could have cited a number of others. Thus the idea that a thing can exist at one time and fail to exist at another, without ever being in process (present tense) of coming into existence or ceasing to exist, is applied to indivisible entities in general, and to certain other entities too.[2] Moreover, the use of

[1] *Metaph.* iii. 5, $1002^{a}28$–$^{b}11$.

[2] Aristotle counts as exempt from a *process* of coming into existence: processes themselves (*Phys.* v. 2, repeated vii. 3, $247^{b}13$), the occurrence of contact or of sundering, and the resulting points, lines, and planes; the existence of units, of instants, of pleasure, seeing, hearing, perceiving, and in general of indivisible wholes (*Metaph.* $1002^{a}28$–$^{b}11$; $1044^{b}21$; $1060^{b}18$; *Cael.* $280^{b}26$; *NE* $1174^{b}10$–$13$; *Sens.* $446^{b}4$), the existence of relations between two or more things (*Phys.* $225^{b}11$–$13$; $246^{b}11$–$12$; $247^{b}4$), and the occurrence of coincidences in which two or more states of affairs are accidentally conjoined (*Metaph.* $1026^{b}22$–$4$ and $1027^{a}29$). He further says that white and certain other forms or essences do not undergo a process of coming into existence (*Metaph.* $1039^{b}26$; $1043^{b}14$; $1044^{b}21$). But this is qualified in two ways: first, he considers that certain forms escape such a process merely by being everlasting (*Metaph.* $1034^{b}16$–$18$; $1043^{b}14$). This may be true of the forms of natural substances, but not (*Metaph.* $1034^{b}18$–$19$; $1039^{b}20$–$7$; $1043^{b}15$–$23$; $1044^{b}21$–$4$; $1060^{b}23$–$8$; $1070^{a}13$–$26$) of

the perfect tense, as opposed to the present, is authorized in more than one passage. In the passage quoted, it is authorized at $1002^{b}3$, when Aristotle says that one of the previously exposed end points *has* ceased to exist. The perfect is authorized again, when Aristotle says, talking of essence:[1]

> This then must either be everlasting, or must be capable of ceasing to exist without ever being in process [*phtheiresthai*, present tense] of ceasing, and must *have* come into existence [*gegonenai*, perfect tense, $^{b}15$, my italics] without being in process [*gignesthai*, present tense] of coming.

It might seem that at *Phys.* vi. 6, $237^{b}10$, Aristotle forgets himself and maintains that if a thing *has* come into existence, it must previously have been in process of coming into existence. But on the contrary, the passage only confirms what has been said, because it explicitly exempts indivisible entities from the general statement:

> Hence it is apparent that what has come into existence [*gegonos*] must previously have been in process of coming into existence [*gignesthai*] . . . *in the case of things which are divisible and continuous* [my italics].

I believe, then, that this is how Aristotle would solve the paradox of the ceasing instant. Moreover, I think that the solution is not only brilliantly ingenious, but also entirely effective. It renders unnecessary the alternative solutions of the following nine hundred years.

It is not only from the present tense but also from the aorist that the perfect is dissociated in these examples.[2] That is to say, if something *has* ceased (perfect tense), it does not follow straight off that there is a particular time at which it ceased (aorist). These facts about tense should be familiar from other kinds of example. Thus a man of fifty *has* ceased being a child, but it does not follow that there is a particular time at which he *ceased*, or at which it would be true to say, 'he is ceasing'. Admittedly, the inapplicability of 'ceased' and 'ceasing' in this example is based on quite different considerations—the gradualness of coming of age. But the example is enough to make the logical point that the perfect does not imply the present or aorist. After Aristotle, Diodorus Cronus was to hammer home the point that the perfect tense does

forms such as white or of forms of artefacts. The second qualification is that a stick does undergo a process of coming to be white, even though white does not undergo a process of coming to exist in the stick (*Metaph.* $1044^{b}23$).

[1] *Metaph.* viii. 3, $1043^{b}14$–16.

[2] I am grateful to Michael Leahy and students at Kent University for discussion of this point.

not legitimize an earlier use of the present. His examples may be more entertaining than convincing: of Helen who had three husbands in succession, we can say 'she *has* had three husbands', although no one could ever truly say 'she *now* has three husbands'.[1] Whatever we think of the particular example, the intended moral is surely correct.

## *Solutions of the 'Parts of Time'*

Aristotle's other paradox, that concerning the parts of time, proved harder to solve. Others will have their own ideas about how to solve it, and will not necessarily accept my recommendations. But I shall in any case postpone these recommendations until the end, because I want to concentrate on the solutions that were canvassed over the next nine hundred years after Aristotle.

## *Diodorus Cronus*

Diodorus Cronus has just been mentioned. He was a generation younger than Aristotle. His death has recently been brought down in a masterly biography to around 284 BC.[2] Diodorus is not known to have written down his ideas; he was instead famed for his oral arguments as a dialectician, and his five daughters were called dialecticians as well. There is a story that he died in despair after proving unable immediately to answer some logical conundrums at a banquet given by Ptolemy Soter. He was also known for his wit, and is said to have called his slaves 'Nevertheless', 'His', 'On the one hand' and 'On the other', in order to make a point about language. The nickname Cronus, meaning old codger, was certainly not earned by the sparkling Diodorus, but was merely inherited from his teacher.

It is not certain that Diodorus tried to solve Aristotle's paradoxes of time, but he did delight in tackling paradoxes, some of them at least similar to Aristotle's. One puzzle, for example, which he is known to have discussed asks when a wall ceases to exist—while it is intact, or after it has disintegrated,[3] and it can further be shown that Diodorus sometimes used his belief in atomism in order to provide solutions. What I want to say here

[1] Diodorus *ap.* Sextum Empiricum, *Adversus Mathematicos* (*M*) x. 97–101.

[2] David Sedley, 'Diodorus Cronus and Hellenistic Philosophy', *Proceedings of the Cambridge Philological Society*, NS (1977), 74–120. I am following Sedley for biographical details.

[3] Diodorus *ap.* Sextum, *M* x. 347–9.

is that Diodorus' idea at least gave him the *materials* for solving Aristotle's paradoxes.

The first claim I want to make is that Diodorus believed that time came along in atomic chunks. This has not normally been noticed,[1] and indeed it has been suggested that time-atoms were introduced precisely as a *riposte* to Diodorus.[2] But Nicholas Denyer has independently argued, on the basis of the same passage as myself,[3] that Diodorus accepted time-atoms. A time-atom, in Greek thought, is like an instant in being indivisible, but unlike in that it is supposed none the less to have a positive size. It may seem hard to understand how a time with a positive size *could* be indivisible, but the belief that there are time-atoms has none the less been reintroduced by certain twentieth-century physicists.[4]

Exception may be taken to my saying that Diodorus supported atomism. For since he was a dialectician, this may encourage the belief that he had no doctrines of his own, but simply argued on either side of a question and sought to embarrass others. But I do not believe that this can be the case. For Sextus Empiricus presents Diodorus' ideas on atomic bodies, spaces, and movements as his 'personal doctrine' (*oikeion dogma*, *M* x. 86), and as something he 'taught' (*edidaske*, x. 97; 143). It is the sceptic Sextus who likes to collect arguments on *either* side of every case. But Sextus treats Diodorus as a man with a doctrine in x. 86, and contrasts him with the Pyrrhonian sceptics (*hoi apo tēs skepseōs*). Moreover, he reports no arguments by Diodorus on the other side, against atomism.

The other relevant idea of Diodorus is the one already mentioned, that the perfect tense can sometimes be used in cases where an earlier use of the present would not have yielded a truth. But Diodorus extends this principle far beyond the point where Aristotle would allow it. In particular, he insists that something

[1] Not even by those readiest to detect time-atomism in antiquity: S. Sambursky and H.-J. Krämer. Jürgen Mau remarks in passing that Diodorus had an atomism of time, space, and matter, but this does not look like a considered conclusion, since the texts he cites do not support him as regards time ('Über die Zuweisung zweier Epikur-Fragmente', *Philologus* 99 (1955), 107).

[2] F. Wehrli, *Die Schüle des Aristoteles* v, 1st edn. only (1960), p. 63.

[3] Nicholas Denyer, 'The Atomism of Diodorus Cronus', *Prudentia* (Auckland) xiii (1981), 33–45.

[4] For the history of this reintroduction, see Milic Čapek, *The Philosophical Impact of Contemporary Physics* (Princeton, 1961), pp. 230–41. A more recent proponent of the idea is the American physicist J. A. Wheeler: see his 'Superspace and the nature of quantum geometrical dynamics', in C. M. De Witt and J. A. Wheeler (eds.), *Battelle Rencontres* (1967), p. 242; and again in *American Scientist* 1968; and Isham, Penrose, Sciama (eds.), *Quantum Gravity* (Oxford, 1975), 538.

can *have* moved by disappearing from one place and reappearing further along, without ever being *in course of* moving (present tense) from the one place to the other.[1]

These two ideas taken together would answer Aristotle's paradoxes. For if the present is not a mere sizeless instant, but has the positive length of a time-atom, then Aristotle loses his reason for denying that the present can be a genuine *part* of time. Nor can he complain that the present will overlap fatally with the past and future. For if it is genuinely atomic, it will be indivisible and hence incapable of overlap. At least one part of time, then, will exist, in the sense of being present.

As for *when* the present ceases, Diodorus would be likely to follow Aristotle's solution and to say that it never *is* ceasing, but nonetheless can *have* ceased. He would depart from Aristotle only if asked *when* it will *have* ceased. For his answer would presumably be 'at the very *next* time-atom'.

I am not saying that Diodorus' solutions would be satisfactory. That depends on whether we can make sense of his idea that there are time-atoms, and I must confess that I find it very difficult to make sense of this idea.

## *The Stoics*

The Stoics explicitly discussed the paradox of the parts of time, and the views of three of them are recorded. I shall concentrate on Chrysippus (*c.*280–*c.*206 BC), the best-known of the Stoics. He was the third head of the school, and lived just after Diodorus. The other two Stoics mentioned are Apollodorus of Seleucia on the Tigris (*fl. c.*130 BC) and Poseidonius of Apamea (*c.*135–*c.*55 BC), head of the Stoic school in Rhodes. The information comes from two sources:

> Apollodorus in his *Physics* defines time . . . Some of it is past, some present (*enestēkos*), and some future. But all time is present (*enestanai*), just as we say the year is present (*enestēkenai*), circumscribing a wider band (*kata meizona perigraphēn*). And the whole of time is said to exist (*huparchein*), even though none of its parts exists exactly (*apartizontōs*).

> Poseidonius: . . . as regards *when* in time, some is past, some future, and some present. The last consists of a part of the past and a part of the future surrounding the division between them. But the division is point-like (*sēmeiōdē*). *Now* and such-like are thought of broadly (*en platei*) and not exactly (*kat' apartismon*). And *now* is spoken of also with reference to the least perceptible time surrounding the actual division.

[1] Sextus, *M* x. 91–2; 97–101.

Chrysippus . . . says most clearly that no time is wholly (*holōs*) present (*enistatai*). For since continuous things are infinitely divisible, time as well is all infinitely divisible in this way. Hence no time is present (*enestanai*) exactly (*kat' apartismon*), but is described as present only broadly (*kata platos*). He says that only the present (*enestōta*) exists (*huparchei*), while the past and future subsist (*huphestanai*), but do not exist in any way, except that in which mere accidental predicates are said to exist. E.g. walking about exists in me when I walk about, and does not exist when I lie or sit down.[1]

Chrysippus . . ., in his treatise *On Vacuum* and elsewhere, says that the past and future do not exist (*huparchei*), but subsist (*huphestēkenai*); only the present (*enestēkos*) exists. But in the third, fourth, and fifth books *On Parts* he holds that some of the present is future and some past. Hence it results that such time as exists for him is divided into what does not exist. Or rather no time at all is left existing, if the present has no part which is not either future or past.[2]

What is Chrysippus' position? Plutarch indicates that Chrysippus' statements were divided between different works. Perhaps he first declared that only the present existed, but then, when he came to write on *parts*, realised that some revision was called for. For since the broadly conceived present has a span, it will overlap with the past and future. But what moral did he draw? For the point about overlap might be used in two opposite ways. It might be said that therefore a certain portion of the past and future do after all have existence, because they have presentness. Alternatively, it might be maintained that the present cannot really overlap with the past and future. In that case, the present which was previously declared to be the only existent part of time, will have after all to be viewed as sizeless, and so not a *part* of time at all. This would be to concede the force of Aristotle's paradox, and to allow that in some sense time is not real. Which did Chrysippus intend? I believe he intended the latter. For there is independent evidence that the Stoics thought of time as less than fully real. They distinguished three grades of reality. Only bodies could be called existents (*onta*). Incorporeal entities could be called somethings (*tina*), but not existents (*onta*). After that there were mere conceptions (*ennoēmata*), which were nothings (*outina*).[3] Time was

[1] Arius Didymus, *Epitome*, in H. Diels, *Doxographici Graeci*, p. 461.

[2] Plutarch, *De Communibus Notitiis* (*CN*), Ch. 41, 1081 F.

[3] Some of the relevant texts are collected in Hans von Arnim *Stoicorum Veterum Fragmenta* (SVF) ii. 329–35, and 521, viz., Alexander *in Top.* 301, 19; 359, 12; Sextus, *M* i. 17, x. 218; Seneca, *Letters* 58, 12; Anonymi *Proleg. in Cat.* p. 34B (Brandis, *Schol. in Aristotelem*); Philo, *Legum Allegoria* iii. 175; Plutarch *CN* Ch. 30, 1074D; Proclus *in Timaeum* (Diehl) iii. 95, 10–14. See also Sextus, *PH*

placed in the intermediate category,[1] along with place, vacuum, and statements (*lekta*),[2] that is, things stated. One Stoic reason for denying the status of *onta* to incorporeal entities was that it is a mark of genuine *onta* to act and be acted on.[3]

Chrysippus' satisfaction with Aristotle's paradox should be all the greater, because Aristotle uses the very same word as himself in stating the paradoxical conclusion that time is not one of the *onta*. There is, however, a difference which comes out more clearly in English translation than in the Greek. For the conclusion at least of the paradox of the parts of time is most naturally put in English by saying that time, like the past and future, does not *exist*. Whereas, given the Stoic reason for downgrading time, namely, that it cannot act or be acted on, it might be more natural to render the Greek by saying that time is not *real*.

The interpretation I have offered of Chrysippus has a number of rivals, and one, tentatively suggested by G. E. L. Owen, will be encountered below.

Of the other two Stoics mentioned, Apollodorus, at least, took a different view. He tried to rehabilitate time by pointing out that in ordinary language we speak of quite a broad span, a year, or even a millennium, as being present. But his suggestion that we could therefore treat the *whole* of time as present is unsatisfactory, since this would deprive the word 'present' of its necessary *contrast* with past and future.

Poseidonius referred to the idea that we might use the word 'now' for the shortest *perceptible* period surrounding the division

ii. 86; *M* viii. 32–4; Plutarch *Adversus Colotem* 1116 B–C. There is a particularly helpful discussion by A. A. Long, 'Language and Thought in Stoicism', in his anthology *Problems in Stoicism* (London, 1971). See also J. M. Rist, *Stoic Philosophy* (Cambridge, 1969), ch. 9; Pasquale Pasquino, 'Le Statut ontologique des incorporels', in Jacques Brunschwig (ed.), *Les Stoïciens et leur logique* (Paris, 1978).

[1] Sextus, *M* x. 218 (Time is incorporeal and a 'something'); Diogenes Laertius, *Lives* vii. 141 (incorporeal); Plutarch, *CN* 1074D (not an existent, *on*, not *huparchei*); id. *Adversus Colotem* 1116B–C (a something, but not an existent, *on*); Proclus *in Timaeum* (Diehl) iii. 95, 10–14: incorporeal, inactive, not an existent, *on*, subsisting, *huphistamenon*, in bare thought).

[2] All four are listed at Sextus, *M* x. 218 as incorporeal somethings (*tina*), and at Plutarch, *Adversus Colotem*, 1116B–C as somethings, but not existents (*onta*). In line with this, Plutarch, *CN* 1074D lists various *lekta* as not being existents (*onta*) for the Stoics, while Sextus, *M* x. 3 and *PH*, iii. 124 records Stoic definitions of place and void which treat the occupying body as the only existent (*on*).

[3] So Plutarch, *CN* 1073E. This fits also with Proclus' statement that time and the other incorporeals are downgraded as being inactive (*adranē*), *in Timaeum* (Diehl) iii. 95, 10–14.

between past and future. The idea of a shortest *perceptible* period may well have come from the rival school of Epicurus. But it is not made clear whether Poseidonius wanted to put it forward, in answer to the paradox, as a part of time which has existence.

### *Alexander*

After Diodorus and the Stoics, I come to the most illustrious of Aristotle's followers, Alexander of Aphrodisias (*fl. c.* AD 205). Although Simplicius claims that Alexander handed down no solutions to the paradoxes,[1] he did write a short treatise *On Time*, which is preserved in Latin and Arabic.[2] In this he claims that time in itself contains no divisions; it is only in our *minds* or *thoughts* that we divide it up by means of instants. Instants divide time and exist and come into existence only *in thought*. It would seem to follow that Aristotle's paradoxes, which depend so heavily on instants and on the division of time into past, present, and future, have no bearing on time as it is in itself, but only on our thoughts about time. Perhaps Simplicius is right that Alexander did not himself offer any solutions of the paradoxes. But Simplicius' senior colleague, Damascius, seems to have drawn on these ideas of Alexander, in the course of his solution.[3]

### *Augustine*

The most eloquent and arresting exposition of the paradox of the parts of time is given by Saint Augustine (AD 354–430) in the delightful eleventh book of his *Confessions*, although in coming to him next I am departing from the chronological order. Augustine offered a striking new solution. The only way to save the existence of time would be to treat past, present, and future as three mental states, for then they could all exist at one and the same instant within the mind. The past would be memory, the present

[1] Simplicius *in Phys.* 795, 34.

[2] Alexander, *De Tempore*, translated into Latin, probably from some Arabic version, in the 12th c. by Gerard of Cremona, ed. G. Théry, in 'Autour du décret de 1210: II, Alexandre d'Aphrodise, aperçu sur l'influence de sa noétique', *Bibliothèque Thomiste* 7 (1926), pp. 92–7 (see p. 95, l. 36). The 9th-c. Arabic translation is edited by A. Badawi, in *Commentaires sur Aristote perdus en grec et autres épîtres* (Beirut, 1971), 19–24. A translation, with comments, of the Latin, done by Robert Sharples, in collaboration with F. W. Zimmermann, who has supplied Arabic variants, is due to appear in *Phronesis* 1982.

[3] Damascius *ap.* Simplicium, *in Phys.* 798, 5–799, 8. (Text with English translation in S. Sambursky and S. Pines, *The Concept of Time in Late Neoplatonism* (Jerusalem 1971), pp. 82, 1–84, 12.) This is not, however, the aspect of Damascius' discussion on which I shall concentrate below.

attention, the future expectation.[1] Tentative as he is about this hypothesis, he does go so far as to say that time is an extension or stretch of something, and that it would be surprising if it were not (*mirum si non*) an extension of the *mind* (*animus*). Such is his solution in *Confessions* xi, although it must be admitted that elsewhere he gives accounts of time which do not appear to fit with this one. Indeed, he seems to have more than one theory of the nature of time. In modern philosophy the idea that time is in the mind has reappeared, although in very different forms and on very different grounds, in various thinkers from Berkeley to Bergson. But perhaps closer to Augustine is Leibniz, who used the paradox of the parts of time to show that time is ideal rather than real. By this he did not mean that time was a mental state, but that it had the same standing as genealogical lines, which are ideal, although they express real truth.[2]

## *Iamblichus*

The remaining solutions, which come from the Neoplatonists, are of particular interest. Iamblichus of Syria (died *c.* AD 325) sought to answer the paradoxes by means of a distinction between static and flowing time. His distinction has been compared with that produced by McTaggart in 1908, which has had such an influence on twentieth-century discussions.[3] McTaggart distinguished the flowing series, past, present, and future, from the static series, earlier, simultaneous, and later. Past, present, and future are connected with flow, in the sense that what is now future will become past, and what is past was once future. By contrast, if the battle of Hastings is *later* than the birth of Christ, and *earlier* than the battle of Waterloo, it is *changelessly* so. This distinction is certainly relevant to the paradoxes, for they were both formulated in terms of the flowing series, past, present, and future. Possibly the paradox of the ceasing instant might be reformulated, so that it asks of some instant in the *static* B-series, say, 2 p.m. on 10 February 1982, just where in the series it comes to be missing. But the

[1] Augustine, *Confessions* xi. 20, 26, 27.

[2] Leibniz, Fifth Letter to Clarke §§47–9 (London, 1717), in H. G. Alexander, ed., *The Leibniz–Clarke Correspondence* (Manchester, 1956).

[3] S. Sambursky, 'The Concept of Time in Late Neoplatonism', *Proceedings of the Israel Academy of Sciences and Humanities* ii (Jerusalem, 1968), 153–67, reproduced in S. Sambursky and S. Pines (SP), op. cit. 12–21. The reference is to J. M. E. McTaggart, 'The Unreality of Time', *Mind* NS xvii (1908), 457–74, revised in his *The Nature of Existence* (London, 1927), vol. ii, ch. 3.

paradox of the parts of time could hardly be reformulated: it depends crucially on the past having flowed away and the future not yet having arrived.

In the last few months, D. H. Mellor has published a book arguing that, although time itself is real, the flowing series is not.[1] This moral might be derived also from the paradox of the parts of time: it proves the unreality, not of time, but only of the flowing series. Time itself is real because of the reality of the *static* relations, earlier, simultaneous, and later. It has been argued that Aristotle already recognized McTaggart's distinction and applied it in his verdict on the paradoxes.[2] His conclusion was that the static relations ensured the reality of time, but that the flowing series, if not unreal, was at least *inessential* to time, in the sense that it concerned not time itself, but only our relation to it. Consequently, on this interpretation, the paradoxes cast doubt not on time, but only on our experience of it.

I do not myself share the view that past, present, and future are unreal, nor the view that Aristotle was alive to McTaggart's distinction. But it is interesting to see that, some six hundred years after Aristotle, a Greek philosopher did make a distinction between static and flowing time and apply it to the paradoxes. Simplicius summarises Iamblichus' answer on the parts of time: there are two kinds of time; only the inferior one is divided into past, present, and future and flows.[3] This time is admittedly unreal (*anhupostaton*), although not for the reason alleged, since it is not true that its present is a mere indivisible instant.[4] On the contrary, its present is a period with positive length.[5] What is true is that the higher kind of time has a certain sort of indivisibility, but this does not make it unreal.[6] On the contrary, it is immune to the paradox, precisely because it is not divisible into past, present, and future, and does not flow.

Iamblichus does not directly answer the other paradox, that of the ceasing instant, but he implies an answer, when he responds

[1] D. H. Mellor, *Real Time* (Cambridge, 1981).

[2] Norman Kretzmann, 'Aristotle on the Instant of Change', *Proceedings of the Aristotelian Society*, supp. vol. l (1976), 91–114, developing some suggestions by Fred D. Miller, 'Aristotle on the Reality of Time', *Archiv für Geschichte der Philosophie* lvi (1974), 132–55, esp. 145–7.

[3] Simplicius, *in Phys.* 793, 4–7 (SP 40, 1–4).

[4] Ibid. 787, 10–11 (SP 34, 21–3).

[5] Ibid. 793, 22–3 (SP 40, 22–3, but I would translate differently: 'he wants not merely an instant (*nun*) to be present, but a whole period (*chronon*) between two such boundaries').

[6] Ibid. 787, 10–11 again (SP 34, 21–3).

to the suggestion that the present ceases, by saying that this simply is not true of the higher kind of now.[1]

The passage just referred to is one of several which reveal that Iamblichus thinks of the flow of his inferior time in much the same way as McTaggart. On the other hand, only one half of his distinction is comparable to McTaggart's, I believe. For when he treats the higher kind of time as static, this does not relate to McTaggart's point that the temporal relation between, say, two battles is changeless. On the contrary, Iamblichus' higher time is static for Platonist reasons. It is not the kind of entity which it makes sense to talk of as shifting. He does not call it a Platonic Form, but he does categorize it as one of the *intermediate* entities (*meson*) between the Forms and the world of the senses.[2]

Even if Iamblichus' distinction corresponds only in one half to McTaggart's, I think he none the less has a better claim than others who have been canvassed to have been the first to distinguish between a static and a flowing time and between a static and a flowing now within time. (Neither of these nows is the now of eternity, which involves a different distinction again.) The Neoplatonist period also saw other aspects of McTaggart's distinction brought out for the first time. Thus Damascius, in a passage already referred to, maintains that the division into past, present, and future is merely egocentric, or relative to us (*pros hēmas*), since different people have a different present.[3] Meanwhile Augustine and Ammonius observe that viewing things as past, present, and future involves a *change* in our judgements, as the things alter their temporal status.[4]

## *Damascius*

Damascius was head of the Neoplatonist school at Athens in AD 529, when the Christian Emperor Justinian forbade the school to continue teaching. Damascius solved the paradox of the parts of time by reference to a theory[5] that time comes in infinitely divisible leaps. He was talking of Iamblichus' inferior time, for he accepted that there was in addition a superior time. Damascius'

[1] Simplicius, *in Cat.* 354, 19–23 (SP 28, 24–9).

[2] Proclus, *in Timaeum* (Diehl) iii. 33, 1–34, 7 (SP 46, 21–36). See frag. 64, with commentary, in John Dillon, *Iamblichi Chalcidensis in Platonis Dialogos Commentariorum Fragmenta* (Leiden, 1973).

[3] Damascius *ap.* Simplicium, *in Phys.* 798, 6–9 (SP 82, 3–6).

[4] Augustine *ad Simplicianum* ii. 2.2; *City of God* xi. 21; Ammonius, *in Int.* 133, 15–27; 136, 1–3; 136, 15–20.

[5] Simplicius, *in Phys.* 796, 32–797, 13 (= SP 78, 27–80, 5).

leaps have been taken to be atomic,[1] which would make them like those of Diodorus. But in fact they combine divisibility with indivisibility in ways that atomic leaps do not. The history of the idea of infinitely divisible leaps has not yet, I think, been written: it can be traced to a passage in Aristotle's *De Sensu*;[2] but, to go back no further for the present, leaps of movement had been used by some philosophers, probably Stoics, to answer Zeno's paradox of the half-distances.[3] You cannot leave the room, according to this paradox, or move any distance whatever, because in order to do so, you would first have to go half way, then half the remaining distance and half the remaining distance, *ad infinitum*. The answer proferred was that things progress in a tiny leap by disappearing from one position and reappearing a certain distance further on, without ever having been part way through that distance. So they do not have to go right through the infinity of half-distances. The leaps are both indivisible and, unlike atomic ones, infinitely divisible, and this is made possible by the contrast between *time* and *space*. The leaps are indivisible in that no *time* is taken up in the transition from one place to another, but they are divisible in that *space* is infinitely divisible, and so the *distance traversed* can be as short as you like. The effect is like that of motion on a cinema screen, which is seen as if it were smooth.

Damascius' innovation is to postulate such leaps in *time* as well as in movement. But it is harder to see how an advance in time could combine divisibility with indivisibility. How could it be *indivisible*? Damascius appeals to the stars which provide a celestial clock, and which engage in leaps of motion.[4] They will not mark any instant within the period of rest between transitions (it is, confusingly, the period of rest, not the instant of transition, which Damascius calls a 'leap'), because no part of the clock will be moving then. Instead time advances a certain distance at the end of each period of rest, without ever having advanced part way.

[1] Sambursky interprets the leaps as atomic in SP, p. 18. But he is misled, I believe, by the words 'the same thing' in a passage in which Damascius has been describing a divisible leap of *movement*, and goes on to say that the same thing (that is, a divisible leap) occurs in *time* also: 'But those who said that only an *indivisible* now existed did not recognize the same thing happening in the case of time' (Simplicius, *in Phys.* 797, 2–3 = SP 78, 32–3). Sambursky takes 'the same thing' to be, not the divisible leaps of the surrounding sentences, but the indivisibility of the current one.

[2] Aristotle, *Sens.* 6, $446^{a}20$–$447^{a}11$.

[3] Sextus Empiricus, *M* x. 123–42; cf. *Pyrrhonicae Hypotyposes* (*PH*), iii. 76–8.

[4] Damascius, *in Parmenidem* (= *Dubitationes et Solutiones* (Ruelle), ii. 241–2, in SP 90, 33–92, 16).

That is the theory, but why should we not give sense to the idea of a period of celestial rest having progressed part way, by making use of *additional* clocks which are out of phase with the celestial clock by amounts as small as we please? The tiny period of celestial rest might be divided into sections as small as we liked by the 'ticks', 'tocks', and 'tings', or at least by the tiny transitions, of terrestrial clocks, even though we might have to use indirect means for detecting such closely spaced interruptions. Such divisibility would be avoided, if Damascius synchronized all the leaps throughout the universe. But then the opposite question would press us—in what sense the temporal leaps would still be *divisible*. Damascius calls them divisible *in thought*, and this sounds close to what is sometimes said about the chronons postulated by some twentieth-century physicists. For although chronons are called atomic, rather than divisible, this turns out to be in the sense that no smaller period could ever be measured, and according to some expositions that leaves us free to apply the idea of infinite divisibility to a chronon; it is merely that the idea will not correspond to anything physical.[1] Alternatively, Damascius might ask us to think of divisibility in more concrete terms: the celestial rests could have been punctuated by terrestrial transitions, although they have not been so punctuated in fact. I think the truth is that Damascius has not sufficiently explained, at least in his surviving work, how his temporal leaps combine divisibility with indivisibility. He does need them to be in some sense indivisible, if he is to solve the paradox of the parts of time, but he cannot make the crisp distinction which was available for leaps of *motion* between the divisibility of the *distance* and the indivisibility of the *time* of transition.

Damascius offers solutions to both of Aristotle's paradoxes, the 'parts of time' and the 'ceasing instant',[2] but I shall consider here only his solution to the 'parts of time'. The postulation of a leap is part of his solution,[3] and one might expect it to be enough on its own. For if time progresses in leaps, the present need not be a sizeless instant, but can have the positive length of a leap, and then it can be a genuine *part* of time. That will mean that at least one part of time exists, in the sense of being present. Nor can it be complained that that part will overlap fatally with the past and

[1] G. J. Whitrow, *The Natural Philosophy of Time* (2nd edn., Oxford, 1980), p. 201.

[2] For the 'ceasing instant', see Simplicius, *in Phys.* 799, 35–800, 16 (SP 86, 8–29).

[3] Simplicius, *in Phys.* 796, 27–9 (SP 78, 21–3), referring forward to 799, 18–30 (84, 24–86, 2).

future; for it will not overlap, provided that it is in a suitable sense indivisible. In fact, however, Damascius does not rest content with this first idea, but combines it with several others. Aristotle had distinguished the way in which a day or the Olympic games exist from the way in which other things exist. If I claim that I am writing a book and that it exists already, I should provoke justified derision if it turns out that only the first three pages exist. But a day can exist, in the sense of being present, just so long as *one* of its hours exists, and the Olympic games can be in existence, in the sense of occurring, just so long as *one* of the constituent events is. Such entities exist through one part coming into being after another.[1] Damascius picks up this idea: time exists through one part coming into being after another, as with the games.[2] What are the parts which come into being in this way?—naturally the 'leaps', and this combination of ideas, it is said, will solve the paradox.[3] You do not need *all* the parts of time existing, in order for time to exist; it will be enough if *one* part comes into existence after another.

This solution requires Damascius to rely on the indivisibility of his leaps. For if one were to stress their infinite divisibility, then a question would arise how the leaps could enjoy even the brief existence which is implied by the fact of their coming into existence. Does this brief existence depend on the coming into existence of yet smaller subdivisions? This would start us on a regress, and Damascius will need to stress that there are no further subdivisions, because the leaps are, in some appropriate sense, indivisible.

Damascius takes his idea one step further. For although Aristotle normally speaks of infinity as something potential, not actual, he does just once allow us to describe an infinity like the infinity of days as existing actually (*entelecheiāi*),[4] provided we remember that it exists merely through *one* day coming into existence at a time. In the same spirit, Damascius is prepared to say that the whole of time exists, and exists simultaneously in reality (*hama en hupostasei*), thanks to a successive process of coming into being.[5]

## *Simplicius*

Simplicius,[6] the junior colleague of Damascius, rejects the idea of leaps, and claims that they are incompatible with some of

[1] Aristotle, *Phys.* iii. 6, 206$^{a}$21–3; 29–33.
[2] Simplicius, *in Phys.* 797, 36–798, 4 (SP 80, 22–82, 1).
[3] Ibid. 799, 8–18 (SP 84, 12–24).
[4] Aristotle, *Phys.* iii. 6, 206$^{b}$13–14.
[5] Simplicius, *in Phys.* 775, 33–4; 798, 4 (SP 66, 8–9; 80, 37–82, 1).
[6] Ibid. 797, 27–36 (SP 80, 22–31).

Damascius' other ideas,[1] according to which time contains no real divisions. His solution would be to hang on to another part of what Damascius says, namely, that all that is needed for the existence of time is that one thing should come into being after another. But Simplicius is wrong to think that, having dropped the leaps, he can without further explanation hang on to the idea that time has its being in something's coming to *be*. For he needs to tackle the problem, already mentioned, how any part of time can enjoy *being*, even briefly, unless there are parts which, like Damascius' leaps, are in some appropriate sense indivisible.

## *Islam*

Infinitely divisible leaps of motion recur in early Islamic philosophy in a controversy which took place around AD 800 between Naẓẓām, who believed in infinite divisibility, and Abū 'l-Hudhayl, who was an atomist. Naẓẓām postulated infinitely divisible leaps for much the same reason as the Stoics before him, to answer a version of Zeno's paradox of the half-distances. The atomists had argued that they were in a good position to answer it, because they could deny that there was an infinity of sub-distances to be traversed. But Naẓẓām replied that he too could answer it, simply by postulating leaps of motion, albeit infinitely divisible, rather than atomic, ones.[2] A proper understanding of the Greek sources should help to throw light on these Islamic discussions. For I believe that once again the difference between atom-length leaps and infinitely divisible leaps has not been appreciated, and that various arguments by Naẓẓām, which have been construed as arguments for the leap, appear to have a different purpose, when compared with the Greek originals. The leaps have featured in an unexpected way in a controversy about the extent to which Islamic philosophy of this early date was based on Greek thought. In an influential article, Otto Pretzl argued that much of early Islamic thought was too strange to have come directly from the Greeks, and as a prime example of this un-Greek way of thinking he cited Naẓẓām's belief in infinitely divisible leaps.[3] If only Greek and Islamic historians had been able to cooperate more closely, it

[1] Simplicius, *in Phys.* 798, 5–799, 8 (SP 82, 1–84, 12). The ideas referred to are ones which Damascius probably derives from Alexander.

[2] The fullest account in English is given by J. van Ess, *Theology and Science: The Case of Abū Iṣḥāq an-Naẓẓām*, Second Annual United Arab Emirates Lecture in Islamic Studies, University of Michigan, Ann Arbor 1978 (19 pp.).

[3] Otto Pretzl, 'Die frühislamische Atomenlehre', *Der Islam* xix (1931), 117–30.

would have been appreciated that the infinitely divisible leaps actually are Greek.

It was not only the infinitely divisible leaps, but also the Aristotelian paradoxes, which continued to live after the end of antiquity. But solutions did not improve in medieval Europe, if one can take as typical a recent report of Peter of Spain's treatment of the 'ceasing instant'.[1] The 'parts of time' we have already encountered recurring in Leibniz.

### *Retrospect over the Various Contributions of Antiquity*

Among Anglo-Saxon philosophers the period of ancient philosophy down to Aristotle has long proved attractive, and there has recently been a renaissance of studies in the Hellenistic and post-Hellenistic period down to AD 200. But the succeeding period of Neoplatonism, and of its interaction with Christianity, has been neglected by philosophers; while late Neoplatonism, especially in Athens, has been viewed by almost everyone as dead. The school could only repeat or elaborate scholastic formulae, and in stopping its teaching, Justinian was not interfering with a flourishing growth, but simply burying a corpse.[2]

This is not at all how Iamblichus and Simplicius saw the situation themselves. They speak at one point as if it was Aristotle and the Stoics who had declined (*paratrepein*) from a Pythagorean philosophy of time, which they erroneously suppose to be earlier, while they themselves are returning to the superior tradition.[3] Moreover, elsewhere Simplicius boasts that Aristotle and Alexander had not managed to solve the paradoxes of time, which had found a solution only in his own day with Damascius and himself.[4] I think we could reasonably feel, looking back over the theories of time which we have encountered, that the most interesting ones did come from the Neoplatonist period. There was Iamblichus' static and flowing time, Augustine's time in the mind, and Damascius' leaps. Moreover, this period seems to have had the

[1] Norman Kretzmann, 'Aristotle on the Instant of Change', *Proceedings of the Aristotelian Society*, supp. vol. l (1976), 105, describes Peter of Spain and others as holding that an instant exists, begins to exist, and ceases to exist simultaneously.

[2] This almost universal view is documented in part by one of the few dissenters, Alan Cameron, in his important article, 'The last days of the Academy of Athens', *Proceedings of the Cambridge Philological Society* NS XV (1969), 7–29.

[3] Simplicius, *in Cat.* 351. See the very interesting n. 52 in Philippe Hoffman, 'Jamblique exégète du Pythagoricien, Archytas: trois originalités d'une doctrine du temps', *Les Études philosophiques* 1980, 307–23.

[4] Simplicius, *in Phys.* 795, 33–5.

best insight into the characteristics of McTaggart's A-series: its flow, the corresponding shift in judgements, and the egocentricity of the present.[1] This is not to forget that I have presented Aristotle as much the sharpest thinker in his solution of the paradox of the ceasing instant. Even so, on the other paradox, the 'parts of time', I believe that it was a Neoplatonist exploitation of an Aristotelian insight which came closest to a solution. I have not yet said what I think the solution should be; so I will turn to that now.

### *Recommended Solution of the 'Parts of Time'*

I shall outline two solutions, the first of which supplies a needed correction, but is not on its own sufficient, I believe. The point is that we need not treat the present as a sizeless instant, but can treat it as having a positive length, and hence as being a genuine *part* of time. At least one *part* of time will then exist, in the sense of being present. However, showing this is more complicated than is often recognized.[2] For it is no good simply pointing to ordinary language in which we commonly treat the present as having a positive length, because Aristotle has an argument to show that ordinary language embodies a *mistake*. The mistake is failing to notice that if the present really has a positive length, it will overlap fatally with the past and future. This objection must be answered, if we are to show that our ordinary usage is legitimate.

I would answer that we should distinguish different contexts of discussion. A man who has broken his leg may say, 'I cannot get about so well just now.' His use of 'now' picks out a period which lasts perhaps a few months. The reason why he avoids a fatal overlap is that in stretching out the present to which he is referring, he thereby pushes away the borders of the past and the future. For that context and that purpose, the past is thought of as

[1] The few hints of egocentricity detected in earlier Stoic theory in A. C. Lloyd's very interesting lecture to this Academy are much more indirect than this: A. C. Lloyd, 'Activity and Description in Aristotle and the Stoa', *Proceedings of the British Academy* lvi (1970).

[2] Cf. R. Suter, 'Augustine on Time with Some Criticism from Wittgenstein', *Revue internationale de philosophie* xvi (1962), 387–94, and J. R. Lucas, *A Treatise on Time and Space* (London, 1973), 20–5, who comments that we need not be ashamed of our ordinary practice. What I am looking for is an argument to show how we can avoid being ashamed. J. N. Findlay intends the somewhat different line, I think, that we might just legislate, without explanation, what we will treat as present: 'Time: A Treatment of Some Puzzles', *Australasian Journal of Psychology and Philosophy* xix (1941), 225–7, repr. in A. G. N. Flew, *Logic and Language*, series 1 (Oxford, 1951), 45–7, and J. J. C. Smart, *Problems of Time and Space* (New York, 1964), 346–8.

ending when he broke his leg and the future as beginning when he recovers. Of course, with another turn in the conversation, the borders of the past and future may be treated as closer, with a correspondingly shorter present, or an instantaneous one.

That, I believe, is how it is possible to treat the present as having a positive length, without running into the objection of overlap. G. E. L. Owen has suggested that this solution may actually have been used by the Stoic Chrysippus. But it is certainly not made explicit in the relevant text, and Owen is careful to say that he cannot be sure.[1] Despite its merits, I do not myself want to rely on this solution, because, as Owen recognizes, it may well be that in some contexts and for some purposes we do want to treat the present as a mere instant, and we do not want to have to admit that, at least in those contexts, the paradox is unanswerable. The person who says, in a flash of insight 'now I see!', or who, on his deathbed, divides his life, without remainder, into a wasted past and an all-too-short future, may well be treating the present as sizeless. So too is the man who tells us, idealizing his time signals as well as his instants, that nine o'clock will be present at the beginning of the third stroke.

I would rest the weight of solution, therefore, on a different consideration. We need to ask what is meant when we say that there *is* a past and a future or that they *exist*. The author of the paradox may not have thought out what is meant, but the truth behind his paradox depends on the fact that 'exist' sometimes means 'be present', and that neither past nor future exists in this sense. Of course, when the point is spelt out in this bald way, the non-existence of past and future appears quite uncontroversial, but until it is spelt out, the author of the paradox may well feel that his claim of non-existence is more significant. He is in any case still entitled to ask whether there is some *other* sense in which the past and future do exist, and this question puts an onus on us. For it is not enough simply to affirm that there is such a sense, if we cannot make our claim plausible by spelling that sense out.

It is more natural in English to put the point by saying that there *is* a past and a future,[2] and the sense of this claim can be

[1] G. E. L. Owen, 'Aristotle on Time', in Peter K. Machamer and Robert G. Turnbull (eds.), *Motion and Time, Space and Matter*, Ohio State University, 1976, repr. in J. Barnes, M. Schofield, R. Sorabji (eds.), *Articles on Aristotle* III (London, 1979).

[2] For to say that the past *does* exist is to invite the retort that it merely *did* so *once*, i.e. that it *was* present. No such retort is plausible, when it is said that there is a past, i.e. that the present has antecedents.

brought out by considering a *contrast*: what could be meant by someone who said the opposite? Some astronomers believe that the universe will come to an end with a horrible implosion and that there will be no more events after that. A confirmed pessimist might expect this catastrophe any moment. Alternatively a confirmed sceptic might be convinced by reading Bertrand Russell that the universe could have come into existence a moment ago, with all the fossil layers in place, and our brains stocked with illusory 'memories'. Such a pessimist or sceptic would rule out there being any clock processes five minutes hence, or five minutes ago. He would rule out there being any events at all, and he might well accept an idea which has appealed to many philosophers down the ages, that we cannot make sense of the idea of there being any *time* without events to mark it.[1] In that case, he could express his view by saying, 'there *is* no future', or, 'there *is* no past'. It is in contrast to this denial that we can see a sense for the claim that there is a future and a past; and not only does this claim turn out to have a sense, but it is, furthermore, a claim that any rational person ought to endorse. I put this forward, therefore, as a solution to the paradox: it is only in the irrelevant sense of being present that the past and future do not exist. In the sense that matters, there is a past and there is a future, and so there is time.

The possible reasons for objecting to my proposed answer, and for advocating other answers, are too numerous to consider in this space, and it may well be that oral discussion would be a better medium than print for producing conviction on one side or the other. I will only say, therefore, that if the answer is a good one, it will be interesting to see who came closest to it in antiquity. It is Aristotle's merit to have seen that the verb 'to be' has a different meaning when it is applied to temporal entities like days; and it is the merit of the despised Athenian Neoplatonists, Damascius and Simplicius, to have seen that Aristotle's insight might be applied to solving the paradoxes. This is not to deny that the meaning assigned to the verb 'to be' by these thinkers is a very long way from the one which I have been trying to get at myself. I have in this lecture said a word in defence of the late Athenian Neoplatonists. I hope on another

[1] Aristotle's belief in this principle is illuminated in an outstanding article by Sydney Shoemaker, 'Time Without Change', *Journal of Philosophy* lxvi (1969), 363–81. One of the most famous defences is that of Leibniz, for which see Leibniz in H. G. Alexander (ed.), *The Leibniz–Clarke Correspondence* (Manchester, 1956).

day in the near future to do the same for their contemporaries in Alexandria.[1]

[1] Inaugural lecture, published by the Publicity Office, King's College, University of London (London, 1982). The material in the present lecture will be incorporated in a book, *Time, Creation, and the Continuum*, on treatments of time in antiquity and the early Middle Ages. Fuller acknowledgements will be made there, but I am very grateful to Norman Kretzmann for first drawing my attention to Aristotle's paradoxes.