

The Discussion of Time in Aristotle's Physics

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Aristotle begins his discussion of time by asking whether it exists, and by presenting arguments that it either does not exist at all or else barely does. For time, he says, is composed of the past, which has been but is not, and the future, which is about to be but is not yet, and it would seem impossible for that which is composed of things that are not to share in being. Again, he continues, since time is divisible, at least some of its parts must exist when it does, if indeed it does, but the parts of time either have been or are about to be, but none of them are; for he claims that the now, or the present instant, is not a part of time, on the grounds that a whole is measured by its parts, and composed of them, whereas time is not thought to be composed of nows (any more than a line is composed of points). A third and final argument raises further questions about this apparently instantaneous now. By presenting these arguments that time does not exist, Aristotle is continuing the practice he had employed with regard to the infinite, place, and void; his discussions of these had also included arguments that they do not exist. But in the case of time, and only in this case, he characterizes the arguments for its non-existence as exoteric, i.e., merely popular or vulgar, or appropriate for an audience that has not entered upon the path of true philosophy. By this fact, together with the fact that he never responds to these arguments explicitly, Aristotle indicates that he does not take the denial of the existence of time as seriously as he does those regarding the infinite, place, and void. And yet there must be some reason that he includes these arguments. Let me suggest,

then, that they are a kind of challenge to us as readers. To respond to them successfully, and to say, on the basis of Aristotle's own indications, why time does exist and how it does, is to see further into his teaching about it than one would from his explicit remarks alone. This assumption, at any rate, and more generally the assumption that Aristotle has deliberately left work for us, will guide me in my interpretation.

I will return to this question of the existence of time. But first, let me follow Aristotle in his attempt to articulate what it is. He begins with a twofold argument that time is not, as it is mostly believed to be, a motion or a kind of change. For the change or motion of each thing exists only in that thing itself, or only where it happens to be, whereas time is equally everywhere and among all things. Also, time cannot be a motion because a motion is always faster or slower than other motions, whereas time is never faster or slower. For faster and slower are defined in terms of time (i.e., how much time it takes to cover a given distance), so that time itself cannot be characterized as either of these.¹ But though time is not motion, it does not exist without it, for as Aristotle observes, when we do not mark off any change, but our soul appears to remain in one indivisible state, then we do not believe that there has been time. And since, moreover, when we do perceive and mark off motion, we do think that there has been time, Aristotle also asserts that time is something of motion, something that belongs to it. And to answer the question of what it is about motion that is time, he introduces the notion of "the before and after." His claim is that we become aware of time whenever we mark off motion in terms of the before and after in it, and that we do so

by taking these as different from one another, with something else between them. "For whenever we apprehend the extremes as different from the middle, and the soul says that the nows are two, one before and one after, then we say that there is time and that this is it. For that which is marked off by the now is believed to be time" (219a26-30). Aristotle continues that "when we perceive the now as one, neither as before and after in motion nor as the same but in relation to something before and after, no time is believed to have occurred, because also no motion. But whenever [we do perceive] the before and after, we speak of time; for this is time: a number of motion in respect of the before and after" (219a30-b2). In support of this definition of time as a kind of number, Aristotle observes that we judge the more and less by number, and that we judge motion to be more or less by time. And in response to the implicit objection that time is continuous, whereas numbers are thought to be discrete, he explains that time is a number in the sense of what is countable or counted, not in the sense of a number with which we count. In other words, time is more like the twelve numbered inches of a ruler than an abstract twelve of pure arithmetic.

This account, however, raises as many questions as it answers. In the first place, it is difficult, despite Aristotle's explanations, to see how time can be defined as a number of anything. For even though a year, for instance, is indeed a number of seasons, this is only to count one time as a multiple of some other, and it hardly tells us in general what time is (cf. 220a16-21). It is true that Aristotle has presented our first awareness of time as the result of counting, of counting the two nows that are before and after in motion. But he added

that time is believed to be the interval between these nows, an interval that is different from the nows themselves. It is, moreover, one interval, and Aristotle agrees with Euclid that a number is many ones, so that one of anything would not be a number of it (Metaphysics 1053a30; 1056b23-24; cf. Euclid, Elements, Book Seven, Definition Two). [By the way, it is not merely a prejudice of ancient Greeks to deny that one is a number; rather, it is a consequence of the natural meaning of number, a meaning that still comes to light in our ordinary language. After all, if I say that "there are a number of things I want to tell you," I mean two or more, and never just one, let alone a half or the square root of two.] But to return to the Physics, since a time is primarily one interval of motion, how can this be a number? To be sure, Aristotle will go on to say that though two is the least number in the unqualified sense of number, in the case of certain counted numbers, such as time, where there is no least magnitude, the least in terms of number may indeed be one (220a27-32). But on what grounds can he say this? And what is it about time, as distinct from motion, say, or magnitude, that leads him to define it as a number?

Rather than try directly, however, to answer this difficult question, let me first prepare the ground for it by turning to another question about the definition of time. Aristotle defines time as a number of motion in respect of the before and after in it. But what does he mean by the before and after in motion? As he presents it in this discussion (where he treats locomotion as the example of motion), there are three different senses of the before and after, primarily as it exists in place or in magnitude, derivatively as it exists in motion, and still more deriv-

atively as it exists in time (219a14-19). Now the before and after in motion are presumably not places that the moving body passes through, since the number of the motion with respect to these before and afters would be the distance covered between them, and not time. Aristotle has helped us to be clear about this point by calling the before and after in motion the nows that are before and after, for these nows are surely not places. But what are they then? Are they not what we in English would call the earlier and the later, i.e., moments in time? Yet Aristotle has said that the before and after in motion is prior to the before and after in time, as indeed it would seem to have to be in order to be mentioned in the definition of time. But what is there in motion that can be called the before and after other than the different places that the moving body passes through or the different moments at which it passes through these places?

Aristotle addresses this question in the sequel to his definition, in the course of trying to explain why despite the fact that time, like motion, is always different, the whole time, taken together, of a motion is one and the same.² He says that this is true because the now -- which, insofar as it is before and after, measures time -- is in a sense the same. Or more precisely, "that which, being whatever it is, is the now," is the same, even though "to be now" (or "the now," as he also says) is different. In other words, it appears that what we call "the now" is in each case only a particular state of some unchanging substrate; of these particular nows, one is before and another after, but the substrate itself is always the same. And Aristotle goes on to identify this substrate of the different nows

with the before and after in motion, which he thus distinguishes from the now or the nows proper, which this substrate also is, but only insofar as it is countable. Hence, the unchanging substrate of the ever different nows would seem to be what we were looking for as the before and after in motion, that aspect of motion in respect of which time is called its number.

Aristotle is aware, however, that it is difficult to conceive of a single substrate of the many different nows. He thus offers some analogies to explain what he means. He compares the now to a moving body that remains the same throughout its motion, while also being different, as the sophists at any rate contend, by virtue of its being in different places. Yet in comparing to a single body the now, which we experience only as many different nows, this analogy lacks initial credibility. And the sophistic notion that the moving body is also a different one in each new place hardly helps to make anything clear. And it is perhaps to overcome the weakness of this analogy that Aristotle also compares the now to a mathematical point. For every point on a line is distinct from every other, and so these points are more clearly analogous to the different nows. But here of course the difficulty is to see in these different points something analogous to a single substrate of the nows. Conceivably, this would be possible if we did not begin with a line, but instead, as is suggested by Aristotle's presentation, with a point that is in motion and that generates the line as a result (219b16-19; cf. On the Soul 409a3-5). There could thus be a sense in which this one point, like a substrate, is also each different point on the line (cf. 222a14-17). Yet it is hard to believe that Aristotle could have been serious about this view of a line as being generated by

the motion of a point. For he thinks that mathematical objects have no separate existence apart from perceptible bodies (Metaphysics 1061a28-b3; 1078a21-31). And later in the Physics he will argue at some length that a point by itself cannot be in motion (240b8-241a14). But without this dubious notion of a moving point producing a line, there is no basis that I can see for maintaining that its different points have any more intimate sameness than sameness in kind. And to return then to the question of the substrate of the nows, does not the failure of these analogies help to make it clear that there are nows only as different nows, as earlier and later ones, and that these can not be understood as different states of some one unchanging something? Is it not illusory to imagine a before and after in motion that is always the same, and that is only derivatively countable as different nows? And to the extent that we were led to this illusion in order to explain how the whole time of a motion is one and the same, were we not demanding a kind of sameness that time doesn't have? I think so. Later, I will try to say something about Aristotle's reasons for encouraging such illusions. But for now, we are back to the question of the before and after in motion. For if we cannot say anything other than that these are nows, or moments in time, we have not really made sense of the definition of time as a number of motion in respect of the before and after.

To help resolve this question, along with the still remaining question of how time is a number, let me take one last detour by turning to yet another, related difficulty in Aristotle's account. If time is a number of motion in the sense of something counted in it, it might well appear that different but simulta-

neous motions would have times that are also different but simultaneous. For to use one of Aristotle's own analogies, even though a hundred horses and a hundred men have the same number, namely, a hundred, they are different hundreds; what we count as a hundred in the one case is a different multitude from what we count as a hundred in the other. And would it not likewise be the case with regard to simultaneous motions that what is counted in them can only be the same amount of time, but not the same time? Yet Aristotle will say explicitly that when motions begin and end together, they do have the same time; and the analogy of the different hundreds, as he uses it himself, has nothing to do with simultaneous motions, but is intended rather to illustrate how the different times of non-simultaneous motions can have the same amount (220b5-14). On the other hand, Aristotle does seem to be aware of the difficulty I have just raised. For later, he treats the sameness of the number seven, in the case of seven dogs and seven horses, as an analogy for how motions that begin and end together have the same time; he thus completely disregards -- though he had stressed it in the other analogy, and will soon do so again at the very end of his account of time -- that what is counted in the two cases are different multitudes (223b3-12; cf. 224a2-15). In this way, he deliberately calls attention, I think, to the difficulty of reconciling his definition of time as a (counted) number with his commonsensical view that different motions can have the same time.

But this reminder that motions which begin and end together have the same time can also help us to interpret the definition. For by indicating that a time is not as particular as any one particular motion, it points the way toward an understanding of

what it is in a motion that we count when we count its time. To see how this is so, let us consider Aristotle's statement about the way in which time is measured. He tells us that in addition to measuring motion by time, we also measure time by motion, in the sense that we measure a number by the one thing numbered (220b14-20). In other words, just as we count the number of horses by treating each of them as a unit horse and taking this unit again and again, so also we measure the time of a motion in terms of some unit motion, which exhausts the motion in question by being repeated. But what is it that makes this measurement a measurement of time? After all, if in walking I make five trips around the block, my motion can be measured as a multiple of one of these trips, but to do this is not yet to measure its time. What I will have counted is trips, or motions around the block, and the number of these motions is not time. Where, then, is the time? Does it even exist in my walking, considered by itself? Is it not the case, rather, that I can measure the time of my walking only in terms of some other motion, some other motion that is not merely a part of the whole? Isn't it only by noticing some such motion as that of my neighbor, who runs twice around the block while I walk around it once, that I measure the time of my one circuit, namely, twice as long as it takes my neighbor to cover that distance? It is true that I can be aware of a time without being able to measure it as some multiple of another, but I still do so only by comparing different motions. Thus, it is by noticing that my hike begins with the sun in the east and ends with it in the west that I perceive its time, namely, less time than that of the sun's entire motion across the sky.³ And in all cases the comparison of motions is reciprocal:

the motion with which I compare a motion in order to perceive its time is itself seen to possess time by being compared to it in turn. And when I compare two motions, or parts of motions, that begin and end together, the time they are seen to possess is one and the same. Since this time does not belong to either motion apart from its being comparable to the other one, it is not something different in each of them, but belongs equally to both, and indeed to any other motion with the same endpoints.

This suggestion about the manner in which time belongs to motion can also help us with our earlier question about the before and after in motion. For as long as our attention is limited to a single motion, we can say only that the moving body arrives at one place before another, i.e., that one place comes before another along its path. And as we have already noted, a number of motion in respect of this before and after is not time. But by introducing the comparison between two different motions, we can grasp the before and after in the relevant sense. I can say, for instance, that I start hiking just as the sun is rising and that I then stop for lunch when it is overhead. The former of these coincidences between stages of the different motions can be seen to come before the latter one, and the interval between this before and this after is perceived as time. Thus, in defining time as a number of motion in respect of the before and after, Aristotle is calling it an interval of motion as marked off by such (non-local) coincidences. And to the objection that these moments of coincidence are moments in time (so that the definition of time would seem to be circular), I would reply that one cannot entirely avoid such circularity, but that we do come to a clearer understanding of what time is by seeing how the

moments that mark it off first come to light in coincidences between stages of different motions.

This suggestion, moreover, that time appears only in the comparison of different motions has the further advantage of allowing us finally to understand why Aristotle has defined time as a number. For we now see that time, unlike other quantities that can be measured, is characterized by the fact that no part of it is ever the one, or the unit of measure. For the measure is always a motion, and a different motion from the one whose time we seek. Thus, for instance, when we measure the number of days in a lengthy hike, we are using a different motion, namely, that of the sun around the earth, to measure the time of the motion we are directly concerned with. And even in our initial grasp of an interval of time as one, we perceive this time in a motion only by seeing that the motion's endpoints coincide with definite stages of some other motion. Thus, the one interval of time of this motion is like any other number in being apprehended only in relation to a unit that is not the numbered (motion) itself. It is true that Aristotle does say that time is measured by time, as a number of units are measured by a unit and a number of horses by a single horse; but he goes on to make it clear that he was only speaking loosely, and that in fact we measure time, as we do motion, by motion, though we can call it measurement by time since that other motion is determinate in respect to time (223b13-18; compare 220b14-24 with 220b32-221a4). And as for his calling that other motion determinate in respect to time, this does not mean that there exists an independent unit of time, but rather that the motion is uniform, at least in the best case, either as measured in relation to some more primary uniform

motion or else by being itself the primary motion. Admittedly, there is the question of how one could ascertain that the primary motion is really uniform, but Aristotle does not try to escape this difficulty by appealing to an independent unit of time; in fact, he admits in the Metaphysics that the motion of the heavenly sphere, which he speaks of himself as the primary measure of time, is merely taken as being uniform by supposition (223b18-20; Metaphysics 1053a10-12). The uniformity of this motion, then, does not contradict his view that time is a number, which belongs to motion, and which appears in a motion only as compared to another one.

We have now made progress, I think, in explaining Aristotle's definition of time as a number of motion in respect of the before and after. But there still remains a question as to why he calls the before and after in motion nows. For the awareness, say, that I start hiking as the sun comes up and stop when it is overhead marks these endpoints of my motion as before and after in the relevant sense, but it does not yet identify them as nows. What does it mean, then, to speak of these moments as nows? To try to answer this question, let me turn to the example of our perception of a single motion, the motion, say, of a bird flying across the sky. In observing this motion I can first say that the bird is here and then that it is there, or else I can first say that it is here now and then that it is there now. My locution in the former statements suggests that I am paying attention only to the motion of the bird, whereas in the latter ones, where I use the word "now," what comes to light is that I am also aware of my own act of perceiving the bird's motion. For in saying that the bird is here now, and there now,

I mean that it is here at the moment when I perceive its being here, and there at the moment when I perceive its being there; and to be able to make these comparisons, I must also be aware of the different stages in my own act of perceiving. Now my perceiving of the bird's motion is itself a kind of motion, a change in the state of my mind or soul.⁴ And so in saying that the moving bird is here now and there now, I am comparing the bird's motion, the primary object of my perception, to the motion in my perceiving soul, and noting the coincidences of different stages that occur in these two motions. In other words, I am making the same kind of comparison that I have already described as the basis for the awareness of time. And indeed I am aware that the bird's motion takes time, even without comparing it to the motion of another body. More than that, an awareness of the before and after as nows, and hence a comparison between the motion that I primarily perceive and the motion in my own perceiving soul, is necessary in order for there to be a full awareness of time. For if I am so absorbed in observing a motion, or even in comparing several motions, that I don't say "now" or pay attention to the different stages in my act of perceiving, I lose track of time; and unless one of the motions I am observing is that of the sun, or of some other such clock, I am surprised when I later learn how much time had passed. It makes sense, then, for Aristotle to call the before and after in motion nows, for it is only the self-awareness that makes them manifest as nows that gives us access to time in its fullest sense.

There is textual evidence for saying that Aristotle endorsed this view that awareness of our own perceiving, and a comparison between this motion and the motion that we primarily perceive, is

the basis for the full awareness of time. However, to appreciate that there is this evidence, we first have to do a little unpacking. Early in his discussion, in a passage that I have already summarized, but in an oversimplified way, Aristotle uses more or less the same argument twice to support two different claims, first, that there is no time without motion, and second, that time is something belonging to motion. In each case his argument is roughly that the awareness of motion is both a necessary and sufficient condition for believing that there has been time. Now this premise, even if true, would prove at most that there is no time without motion; it would not prove that time is something belonging to motion, since motion might instead be something belonging to time, with time being the more fundamental fact. But perhaps the priority of motion to time is sufficiently clear so as not to need an argument. Yet why does Aristotle present his claim that time is something belonging to motion as if it were simply another consequence of the argument he had just used to show that there is no time without motion? Let me suggest that he does so in order to call attention to the difference between these two conclusions, and thus also to call particular attention to the first one, that there is no time without motion, which claim, though it follows more directly from his argument, plays no explicit role in the subsequent discussion. Let us keep this claim in mind, then. And if we now look more closely at the supporting argument itself, we see the further peculiarity that the only motion to which it refers explicitly is motion in our own mind or soul. Aristotle begins, "When we ourselves do not change at all in our mind or when we are unaware of our changing, we do not believe that there has been time" (218b21-23). It

does, to be sure, appear that in his rephrasing of this argument he is about to suggest that all he really meant was that without the awareness of some motion, of motion of whatever kind, we do not believe that there has been time. But what he in fact presents as the grounds for not believing that there has been time is if "our soul [emphasis mine] appears to remain in one indivisible state" (218b31-32). And when he later adds positively that the perception of motion is sufficient to make us believe that there has been time, his words are that "even if it is dark and we are not at all acted upon through the body, but there is a certain motion in the soul, immediately together with this it is believed that there has also been a certain time" (219a4-6). To be sure, Aristotle seems here to be using motion in the soul only as an illustration of motion, in the extreme case where we do not perceive any other kind. But even though his wording does indeed lead us to assume that the perception of any other motion would also bring forth the belief that there has been time, he does not say this. And let me suggest that in these statements he means exactly what he says, that a necessary and sufficient condition for the belief that there has been time is the perception of a certain change in our own soul. More specifically, the perception that he has in mind, as it seems to me, is the perception of change in our act of perceiving some more primary change. I have already indicated how a comparison between the motion we perceive primarily and the motion of our own act of perceiving gives rise to the awareness of different nows, and therefore of time. And to return to the two conclusions of Aristotle's argument, the time that we are aware of belongs in the first place to whatever motion(s) we primarily perceive, rather than to the motion that

is our perceiving, though it belongs to this too; but we would not believe that there was time, at least not in the fullest sense, if we were not aware of this motion in particular, and so it makes particular sense to say that there would be no time without it.

The position we have now reached allows us to understand, and to understand better than Aristotle's explicit account presents it, one of the more striking of his suggestions about time, namely, that it could not exist if there were no soul. Aristotle makes this suggestion on the basis of his definition of time as a number, i.e., something counted or countable. And he argues that "if it is impossible for there to be that which is going to count, it is also impossible for there to be anything countable," "And if," he continues, "nothing else is of such a nature as to count except soul and the intellect of soul, it is impossible for there to be time if there is no soul" (223a22-26). In other words, in the absence of living beings, or of soul, it would be impossible for there to be intellect,⁵ or at least the kind of intellect of such a nature as to be able to count; and since the countable is countable only in relation to that which can count, it would also be impossible for there to be anything countable, such as time. For even if as a result of some unforeseeable accident, a being that is able to count might come to exist, this does not mean that prior to the occurrence of such an accident there could be anything countable, at least not in the strong sense that Aristotle is using the term here (cf. Topics 138b27-37). Now in asserting that nothing countable could exist in the absence of soul, what Aristotle means is that there could not be anything countable insofar as it is countable. He

does not therefore deny that what we know of as being countable might in fact be some substrate, which just happens to be countable now, and which would still be what it basically is even in the absence of a counting soul. And he suggests, in particular, that even if there were no soul "that which, being whatever it is, is time," might still exist. He further suggests that there might be motion without soul, and he adds that "the before and after are present in motion," and that "time is these insofar as they are countable" (223a27-29). He has thus qualified his assertion of the dependence of time upon soul by suggesting that there is a substrate of time, the before and after in motion, that might still exist even in the absence of soul. But I have argued earlier that Aristotle was not serious about the claim that the before and after in motion exists as an unchanging substrate apart from being countable as different nows. And I have also tried to show that in his view these nows exist only through the coincidence between different stages in the motion that the soul perceives primarily and different stages in its own act of perceiving. And so it seems to me that in his serious view, even what he presents here as the substrate of time is dependent on a perceiving and counting soul. And his explicit assertion of the dependence of time upon soul states the core of his position, although he pretends, for the less demanding of his readers, that he believes that time has an unchanging substrate whose permanence does not depend on a counting soul.

This assertion of the dependence of time upon soul, especially once the prop of a permanent substrate is removed, brings us back, however, to the perplexities regarding the existence of time with which Aristotle began his whole discussion. It was

argued, we recall, that time does not exist, since its only parts are the past, which does not exist any longer, and the future, which does not yet exist. And on the basis of the account that I have offered so far, it could appear that in addition to being dependent upon soul, time is also an illusion produced by the soul, which, in marking off the interval between a past now and the present one, treats what no longer exists as still existing. And yet common sense tells us that time is not illusory, and I have already said that Aristotle agrees with this common view (cf. 222b27-29). Presumably, then, there is something wrong with these arguments that deny that time exists. But what? Well, they share the assumption that the now, or the present, which would seem to be the only part of time that could truly exist, is an instantaneous boundary between past and future. It is this notion of the now as an instantaneous boundary that led Aristotle to argue that it can not even be a part of time. And since there seems to be something wrong with the claim that there is no present time, this assumption on which it is based deserves to be questioned. It is troubling, to be sure, that Aristotle explicitly maintains this view of the now, not only in these exoteric arguments that there is no time, but in his own thematic treatment of time as well; indeed, later in the Physics, he will offer several arguments in its support. Still, since this view of the now as an instant leads to such an unacceptable conclusion with regard to time, it is worth a closer look at what he says.

Aristotle's most extensive argument that the now is an instantaneous, or to use his term, an indivisible, boundary between past and future occurs in Book Six of the Physics (233b33-234a24). There he distinguishes the now in itself, which

he also calls the primary now, from the now that is spoken of in the derivative sense of the word, as for instance when we speak of the present year as now, since it includes the primary now within itself. His argument refers, of course, only to the now in the primary sense. He begins by asserting that there is an extremity of the past, on this side of which there is nothing of the future, and also an extremity of the future, on that side of which there is nothing of the past. He then says, implying that these two extremities are the same, that we call this a limit of both. And he adds that if it is shown that this is of such a kind, and if it is shown that it is the same extremity of the past and of the future, then it will also be clear that it is indivisible. For if, he says, the extremities of the past and of the future were different, the one could not be next to the other, since this would mean that time is composed of such extremities; but nothing continuous, as time is, is composed of things without parts. And if the two extremities, he continues, are separate from one another, there will be time between them, which, since time is continuous, will also be divisible; and so it follows, among other things, that the original now, or this interval between the two first extremities of past and future, could not have been the now in itself. Having thus argued that the extremity of past and future is one and the same, Aristotle easily concludes that it is indivisible. Yet he has already assumed that the now is indivisible, by saying that a divisible now could not be the now in itself. And he has assumed, even before this, that there is a unique extremity of the past and a unique extremity of the future, by which he implies, if not directly that these are the one indivisible now, at least that

each of them is indivisible (234a7; cf. Metaphysics 1022a4-5).⁶ He has assumed the existence of such extremities without argument, even though he has explicitly told us that it must be shown, not only that the extremities of past and future are the same, but also that what he has called an extremity is indeed "of such a kind," i.e., a true or indivisible extremity. And yet by thus calling attention to his failure even to try to show the truth of this key premise in his argument, Aristotle makes it clear that he himself is aware of the argument's weakness.

Aristotle does offer further support for his claim that the now is an indivisible extremity by arguing in a later chapter that "that in which" what has changed has first changed must be indivisible, i.e. an instant (235b30-236a7). But this argument assumes that one can specify, at least in principle, exactly when a body has first changed, or completed its change (236a10-13); and one might well have doubts that this is so. Aristotle himself argues that there is no exact beginning of change, but that any changing thing must already have been changing before (236a13-27; 236b32-237b22). Likewise, he argues that there is no exact beginning of being at rest (239a10-22). So why does there have to be an exact endpoint when a change is first complete? Aristotle even encourages our doubts as to whether there is one by an argument that he presents near the end of the Physics. He argues there that unacceptable consequences will follow unless one "makes" (emphasis mine) the point of division between an earlier time and a later one belong to the later one with respect to the thing's state (263b9-264a6). What this means, for example, is that when a leaf turns yellow, we should posit that at the instant between the earlier time, when it is not yellow, and

the later time, when it is, it has just turned yellow. Despite his earlier argument, then, that there is an indivisible instant at which the changing thing has first changed, or is first in its final state, he now says that it is we who must "make" this so. And the reason for his retreat from his earlier assertion becomes clear if we consider the new context. Aristotle has just argued that a moving body is never actually at any of the midpoints along its path, on the grounds that this would mean treating that one point as two, as the end of the motion's first half and the beginning of the second, and therefore bringing the motion to a stop (263a11-b9; cf. 220a10-18). Or to put this argument differently, as Aristotle suggests we do, a moving body never actually exists at a single now, for this would mean treating that one now as two, as the endpoint of the earlier time and the beginning of the later one; and since there is always some interval of time between two nows, the body in motion would have to be at rest during this time, which is impossible. Now the two nows that limit this hypothetical stretch of time are not truly distinct nows, but rather two ways of conceiving the original now (cf. 263b12-14). And so what Aristotle is ultimately suggesting by this argument is that any now at which a body can be said actually to exist encompasses, or rather is, a stretch of time.⁷ And his reason for suggesting this is indicated, it seems to me, by his reminder that it takes time to say "now" or even to think it (262b6-7; 263a29-31). In other words, a true now, at which a body truly exists, is a now as we are aware of it; and since we are never aware of a timeless or instantaneous now, a true now can also not be an instant.⁸ There is of course no definite least duration of such a now, and this means, to return to our

earlier question about change, that there is no exact endpoint when a change is first complete. Whatever happens when a change ends happens largely beneath the threshold of any possible perception, and so there is no clear basis for saying more than that the changing thing was not and then is in its final state.⁹ To be sure, if one persists in speaking of nows as timeless instants, it makes sense to say that a change is first complete at the exact instant between the time of a thing's not being and that of its being in its final state. But this assertion is now seen to be a mere positing on our part, rather than a disclosure of a genuine truth.

This suggestion that for Aristotle the true now is a stretch of time allows us to make sense of some passages in his discussion of time that would otherwise seem inconsistent with his views. For instance, there is a remark, which I earlier mentioned in passing, that the now "measures" time (219b11-12; cf. 218a6-8). Also, Aristotle speaks of the now as holding time together, and as dividing past from future only potentially; and he compares the now in its primary sense of holding time together, not to a point, but to a mathematical line.¹⁰ In keeping with this analogy, moreover, he speaks of the now not only as a unifier of time, but as its unity (222a19-20; cf. 222a10). He is suggesting, in other words, that time is not continuous because of some timeless now, which holds past and future together, but rather because the true now, which is time, is itself continuous. The clearest indication, however, that he thinks of the now as time occurs in the following passage, in which he speaks of the now as a number. "Insofar as the now is a limit," he says, "it is not time, but a concomitant; but insofar as it numbers, it is

a number" (220a21-22; cf. 220a4). Aristotle contrasts here the now understood as a limit, which he tells us is not time, but a concomitant of time, with the now insofar as it counts, which he calls a number, or in other words, time. For even though he characterizes the now as a number that counts, whereas earlier he had called time a counted number, the number that is time is also a kind of counting number, since any interval of time can be thought of as a unit by which to count the greater time of another motion. A now, in particular, can be thought of in this way, and I can say "now now now now," using the number, or more precisely the numbered motion, that is the first of these nows as the unit by which to measure the whole time. To be sure, it is more usual to think of nows as limits of time, as endpoints and beginnings of its successive intervals. But in doing so, as we are surely free to do for the sake of convenience, we are disregarding the time stretch of the nows themselves.

This view of the now as time allows us to reject the argument that time does not exist, since we now see the falsity of the premise of that argument, which is that time consists only of past and future. But in presenting his faulty argument, Aristotle had also suggested that even if time exists, it barely does (217b32-33). And on the basis of what I have argued, this suggestion might seem true, since the now, or the present time, is never simply itself, but is always (becoming) other and again other (220a14; cf. 206a21-22, 29^a-33). Even our perception of an ever so brief now involves some degree of retention of what is no longer simply present, and so time is not fully itself except through memory. But does it follow from these facts that the now, or that time, barely exists? Compared to what? For is it

not the case, if to a lesser extent, that all natural beings are always becoming other and again other?¹¹ Aristotle says explicitly that living beings, at any rate, are always undergoing motion, since motions such as breathing and digestion still continue even when the beings are asleep (253a11-20; 259b7-15). Indeed, the cumulative effect of all these motions is great enough to lead eventually to the death of the beings themselves.¹² Yet for all that, we do not say that living beings are not in the true sense beings. We do not even say of these motions that they barely share in being, although motion, like time, is always other and again other without its also being an underlying "this". Accordingly, there is no reason to say of time that it barely shares in being. For those who are too uncomfortable with the fact that being as we know it is so permeated with otherness and change, Aristotle has framed the doctrine of the before and after in motion as an unchanging substrate of time. But especially to the rest of us he has given the greater benefit of helping us to understand what time is.

ENDNOTES

1. That time can seem faster or slower is of course another matter.

2. 219b10. Others have translated and interpreted this sentence as claiming that all simultaneous time, though it measures different motions, is the same (cf. 220b5-6; 223b6-12). But on this interpretation the continuation of Aristotle's discussion makes no sense. Also, the phrase "the whole time" (ὅ ... πᾶς χρόνος) is more appropriately taken to refer to the time that measures one whole motion than to the time of indeterminately many motions. As for the use of the word ἄμα here, compare the somewhat similar use at 226b21-22.

3. This suggestion helps to explain, by the way, how in addition to measuring motion, time can also measure rest, as Aristotle of course acknowledges that it does (221b7-12). For we become aware of the time during which a body remains at rest in relation to some motion that we also perceive.

Note also that Aristotle's argument that all change is in time is based on the claim that all change is faster or slower, a claim that of course implies a comparison between different changes (222b30-223a4; cf. 218b13-17).

4. In the Metaphysics, Aristotle distinguishes seeing from motion proper, on the grounds that, like thinking, living well, and being happy, it is complete while it is going on, whereas motion has an end beyond itself. But despite this distinction, he still holds that all perception is an alteration or motion, as it clearly must be, especially if, as here, what is perceived is itself something in motion (244b10-12; Metaphysics 1048b18-35; On the Soul 417a14-418a6; Nicomachean Ethics 1174a13-b14). Also, I will follow Aristotle's lead in speaking of motion in the soul, even though according to his more precise characterization, all such motion is motion, because of the soul, in the living being (contrast 218b31-32 and 219a5-6 with On the Soul 408b13-18).

5. cf. Plato, Timaeus 30b3; Sophist 249a4-8.

6. For a fuller critique of this argument, which I have summarized only in part, see Sarah Waterlow, "Aristotle's Now," The Philosophical Quarterly 34 (1984), 105-106, and also Michael Inwood, "Aristotle on the Reality of Time," in Aristotle's Physics: A Collection of Essays, ed. L. Judson (Oxford: Clarendon Press, 1991), 160-163. See also Simplicius, In Aristotelis Physicorum Libros Quattuor Posteriores Commentaria, in Commentaria in Aristotelem Graeca x, ed. H. Diels (Berlin: 1895), 956.17-957.2.

7. Compare Martin Heidegger, The Basic Problems of Phenomenology, trans. A. Hofstadter (Bloomington: Indiana University Press, 1982), 248-251.

8. The difficulty of this conclusion helps to account for Aristotle's surface teaching that there is a timeless now. Compare

my "Continuity and Infinite Divisibility in Aristotle's *Physics*," Ancient Philosophy 13 (1993), 323-340.

9. Compare 222b14-15 with Plato, Parmenides 156c1-e7.

10. 222a10-20. In keeping with Aristotle's denial of the existence of a "flowing point" (cf. pp. 6-7), I interpret both $\mu\acute{\iota}\alpha$ and $\eta\ \alpha\upsilon\tau\eta$ at 222a17 as referring to the line, rather than to the point. However, the text admittedly allows for other interpretations.

11. cf. "Continuity and Infinite Divisibility in Aristotle's *Physics*," 334-335.

12. Aristotle tells us that everything in motion is in time, from which it follows, as he claims, that a greater time can be taken than that which measures the thing's existence, or in other words that the thing is perishable (222b30-31; 221a26-28; cf. 221b28-31). These assertions cause a difficulty, however, with regard to the heavenly bodies, for Aristotle teaches elsewhere that they are everlasting (e.g., On the Heaven 269b18-270b31; 283b26-284b5; Metaphysics 1073a23-35). It appears, then, that he was speaking loosely in saying that everything that is in motion is in time; at all events, after promising to show that "every change and everything that is in motion" is in time, he concludes merely that "every change and every motion" is in time (222b30-31; 223a14-15). And every motion, or revolution, of a heavenly body is indeed in time, even if the heavenly body is everlasting. Still, it is striking that in the immediate sequel to this argument, Aristotle reminds us that all things in the heaven, as on earth and in the sea, are moveable things [or things in motion] (223a16-20).