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HOW FAST DOES TIME PASS?

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1 Introduction

I believe that time passes. In the last one hundred years or so, many philosophers have rejected this view. Those who have done so have generally been motivated by at least one of three different arguments: (i) McTaggart's argument, (ii) an argument from the theory of relativity, and (iii) an argument concerning the alleged incoherence of talk about the rate of the passage of time. There has been a great deal of literature on McTaggart's argument (although no consensus has been reached).¹ There has been a relatively small amount of literature on the argument from the theory of relativity, but this is perhaps not surprising, since most of us philosophers don't understand that theory.² Meanwhile, there has not been a great deal of literature on the rate of passage argument, and this *is* surprising, I think, considering that the argument is easy to

¹ McTaggart, John M.E., "Time," in Gale, Richard M., *The Philosophy of Time* (London: Routledge & Kegan Paul, 1968), pp. 86-97. For criticism of the argument, see, for example, Prior, Arthur N., *Past, Present and Future* (Oxford: Oxford University Press, 1967), Chapter I; and Gale, *The Language of Time* (London: Routledge & Kegan Paul, 1968). For attempts to defend the argument, see, for example, Dummett, Michael, "A Defense of McTaggart's Proof of the Unreality of Time," *Philosophical Review* 69 (1960), pp. 497-504; and Mellor, D.H., *Real Time* (Cambridge: Cambridge University Press, 1981).

² For discussions of this matter, see Putnam, Hilary, "Time and Physical Geometry," in Putnam, *Mathematics, Matter and Method* (Cambridge: Cambridge University Press, 1975), pp. 198-205; and Stein, Howard, "On Einstein-Minkowski Space-Time," *Journal of Philosophy* LXV (1968), pp. 5-23.

understand, is quite plausible, and is suggested in one of the most famous articles in the literature on time.³

This paper has two main aims. The first is to say exactly what I mean by 'Time passes'. The second is to spell out the rate of passage argument, and then defend the view that time passes against that argument. In the course of trying to accomplish the first of these aims I hope to make it clear that there are really several quite distinct controversies – linguistic and metaphysical – that are relevant to the controversy over whether time passes. In the course of trying to accomplish the second of these aims I hope to show that the rate of passage argument is not a very good argument against the view that time passes.

2 What I Mean by 'Time Passes'

Let us begin by considering what is involved in saying that time passes. I think it is fair to say that anyone who asserts this is committed to the following general thesis.

The passage thesis: Time is unlike the dimensions of space in at least this one respect: there are some properties possessed by time, but not possessed by any dimension of space, in virtue of which it is true to say that time passes.

In saying that time passes, then, I am baldly asserting the passage thesis. But in what specific ways do I claim that time is so strikingly different from any dimension of space that it makes sense to say that time passes while space does not? In what follows I will spell out three such ways.

To begin with, I think that there are some key linguistic differences between time and space that are relevant here. One linguistic issue that has seemed to many philosophers to be central to the debate over time's passage is a controversy that may be characterized by the following pair of theses.

³ Smart, J.J.C., "The River of Time," in Flew, Antony (ed.) *Essays in Conceptual Analysis* (New York: St. Martin's Press, 1966), pp. 213-227.

The tensed view of propositions: Propositions (or whatever entities are taken to be the bearers of truth and falsity) have truth-values *at times*; the most fundamental semantical locution is "P is v at t", where the term in place of 'P' refers to some proposition, the term in place of 'v' refers to some truth-value, and the term in place of 't' refers to some time.⁴

The tenseless view of propositions: Propositions (or whatever entities are taken to be the bearers of truth and falsity) have truth-values *simpliciter*; the most fundamental semantical locution is "P is v", where the term in place of 'P' refers to some proposition and the term in place of 'v' refers to some truth-value.⁵

One who holds the tenseless view of propositions will accordingly say that a t1 token of the sentence

(1) It is snowing in Boston

expresses the proposition that it snows in Boston at t1, which is a tenseless proposition, i.e., one that simply has a truth-value (but cannot appropriately be said to have truth-values *at times*); whereas one who holds the tensed view of propositions will accordingly say that a t1 token of (1) expresses the proposition that it is snowing in Boston, which is a tensed proposition, i.e., one that has truth-values *at times*.

There is more to the controversy between the tenseless view of propositions and the tensed view of propositions than just this, however. For one who holds the tenseless view of propositions will also be naturally inclined to hold the following thesis about the correct analysis of the past and future tenses of our ordinary language.

The eliminability of tense: The past and future tenses of our ordinary language are to be analyzed away.⁶

Thus, for example, one who holds the tenseless view of propositions and the eliminability of tense will say that a t1 token of the sentence

⁴ See, for example, Prior, *Past, Present and Future* and *Papers on Time and Tense* (Oxford: Oxford University Press, 1968).

⁵ See, for example, Goodman, Nelson, *The Structure of Appearance* (Cambridge: Harvard University Press, 1951), Chapter XI; Quine, Willard van Orman, *Word and Object* (Cambridge: MIT Press, 1960), pp. 170ff; and Smart, "The River of Time."

⁶ See the works cited in the last footnote.

(2) It will be snowing in Boston

is equivalent to a t_1 token of some allegedly "tenseless" sentence like

(2a) There is a time later than this token at which it snows in Boston

or

(2b) There is a time later than t_1 at which it snows in Boston.

Meanwhile, one who holds the tensed view of propositions will also be naturally inclined to hold the following thesis about the correct analysis of the past and future tenses.

The ineliminability of tense: The past and future tenses of our ordinary language are, like the present tense, to be treated as primitive.⁷

Thus, for example, one who holds the tensed view of propositions and the ineliminability of tense will say that any token of (2) is in fact an irreducibly future-tensed sentence token that is not equivalent to any tenseless sentence token.

Let us call the combination of the tenseless view of propositions and the eliminability of tense "the tenseless conception of semantics", and let us call the combination of the tensed view of propositions and the ineliminability of tense "the tensed conception of semantics". Then the linguistic component of my view that time passes is the tensed conception of semantics, together with the claim that nothing analogous to the tensed conception of semantics is true with regard to any dimension of space.⁸

Next I want to discuss a controversy that combines linguistic and metaphysical issues, and that has long been thought to be central to the debate over whether time really passes. This is

⁷ See, for example, Prior, *Past, Present and Future* and *Papers on Time and Tense*; and Chisolm, Roderick M., *On Metaphysics* (Minneapolis: University of Minnesota Press, 1989), p. 163.

⁸ For an example of one who holds spatial views analogous to the tensed conception of semantics see Sosa, Ernest, "Propositions and Indexical Attitudes," in Parret, H. (ed.), *On Believing* (Water de Gruyter Verlag, 1983), pp. 316-332.

My reasons for rejecting the spatial analogue of the tensed conception of semantics have to do with my belief that time is strikingly different from the dimensions of space in certain metaphysical ways spelled out below. But of course a non-passage theorist will not be impressed by this argument.

the issue of whether there really are such properties as the apparently monadic, temporal properties *pastness*, *presentness* and *futurity*, or whether, instead, talk that appears to be about such properties is really analyzable in terms of talk about such binary, temporal relations as *earlier than*, *simultaneous with* and *later than*.

Let us agree to refer to monadic, temporal properties such as *pastness*, *presentness* and *futurity* – if there are any such properties – as *A-properties*. Similarly, let us agree to refer to binary, temporal relations such as *earlier than*, *simultaneous with* and *later than* as *B-relations*.⁹ Then the two sides to the controversy can be characterized by the following theses.

The A-property thesis: There really are A-properties; talk that appears to be about the possession of A-properties by times, events or things cannot be correctly analyzed in terms of B-relations among those entities.¹⁰

The B-relation thesis: There are no genuine A-properties; talk that appears to be about the possession of A-properties by times, events or things can be correctly analyzed in terms of B-relations among those entities.¹¹

Anyone who accepts the tenseless conception of semantics should also accept the B-relation thesis. In order to see why, consider the following sentence.

(3) The 1983 World Series was nine years ago.

(3) appears to attribute to a certain event – the 1983 World Series – the property *being nine years past*. But according to the tenseless conception of semantics, (3) does no such thing. This is because, according to the tenseless conception of semantics, (3) can be correctly analyzed into something like the following.

(3a) The 1983 World Series is nine years earlier than this token.

If (3) *could* be correctly analyzed into something like (3a), then something that appears to be talk about the possession of an A-property by an event could be analyzed in terms of talk about B-

⁹ I am here following Gale, who in turn has followed McTaggart. See McTaggart, "Time," and Gale, *The Language of Time*.

¹⁰ See, for example, Prior, *Past, Present and Future*, esp. pp. 4-7.

¹¹ See, for example, Smart, "The River of Time."

relations among events. Similar remarks would, presumably, apply to the tenseless conception of semantics and its treatment of other sentences that appear to attribute A-properties to times, events or things. Thus the tenseless conception of semantics entails the B-relation thesis.

Meanwhile, anyone who accepts the *tensed* conception of semantics should also accept the A-property thesis. For according to the tensed conception of semantics, (3) is an irreducibly past-tensed sentence that cannot be correctly analyzed into anything like (3a). If (3) cannot be correctly analyzed into anything like (3a), this must be because (3) *expresses* something that cannot be expressed by anything like (3a). And what (3) appears to express is that the event in question possesses the property *being nine years past*, which is an A-property. Similar remarks would, presumably, apply to the tensed conception of semantics and its treatment of other sentences that appear to attribute A-properties to times, events or things. Thus the tensed conception of semantics entails the A-property thesis.

In addition, it seems to me that the A-property thesis entails the tensed conception of semantics. For suppose that there really are such monadic, temporal properties as *being nine years past*. Then presumably sentence (3) above attributes *being nine years past* to the 1983 World Series. Apparently, then, there is such a proposition as the proposition that the 1983 World Series has the property *being nine years past*. But surely this proposition is one that has been false in the past, is true now, and will be false again in the future; and if there is such a proposition then the tensed conception of semantics is correct.

The A-property thesis, together with the claim that there are no spatial properties analogous to A-properties, is the second component of my view that time passes.¹²

¹² Let us agree to refer to monadic, spatial properties such as *being north*, *being south* and *being west* – if there are any such properties – as *C-properties*. Similarly, let us agree to refer to binary, spatial relations such as *being north of*, *being south of* and *being west of* as *D-relations*. Then the two sides to the spatial controversy can be characterized by the following theses.

The C-property thesis: There really are C-properties; talk that appears to be about the possession of C-properties by places, events or things cannot be correctly analyzed in terms of D-relations among those entities.

Suppose that the A-property thesis is correct, i.e., suppose that there really are genuine, monadic, temporal properties like *being nine years past*. Then a number of questions naturally arise concerning the nature of A-properties. What exactly are A-properties? Which things may possess them? What are the conditions under which it is true that a thing possesses an A-property?

I don't know exactly how to answer all of these and related questions about the nature of A-properties. In fact, I'm not even sure that it would be appropriate to try to answer all of these questions. In particular, I think that it would be a mistake to try to analyze talk about A-properties in terms of some other, allegedly better understood, concepts (even if those other concepts were not B-relations). I think that this would be a mistake for two main reasons. First, I can't imagine what such an analysis would look like. What might be the other concepts in terms of which we could analyze talk about A-properties? And second, given that it is impossible to analyze everything, so that it is necessary to take some concepts as primitive, it seems to me that A-properties are excellent candidates for the kind of property that we ought to take as primitive. After all, everyone already has a fairly intuitive sense of what it means to say that a certain time or event is *past*. So there is no particularly pressing need to come up with a scheme for analyzing away such talk.

Still, it may be helpful to say some things about the nature of A-properties. For starters we can safely say that times and events are among the things that may possess A-properties. Thus, for example, we can say that the year 2000 currently possesses the property *being future*, and that the 1983 World Series currently possesses the property *being past*.

The D-relation thesis: There are no genuine C-properties; talk that appears to be about the possession of C-properties by places, events or things can be correctly analyzed in terms of D-relations among those entities.

The C-property thesis is the spatial analogue of the A-property thesis; but although I hold the latter, I reject the former. I do not think that there are any genuine, monadic, spatial properties like *being north*.

Another point that seems to me an important component of the A-property thesis is that talk about A-properties does not merely describe some linguistic or mind-dependent phenomenon. That is, it seems to me that it is a genuine and objective fact about the world that 3:38 p.m., Thursday, March 19 is currently present, that various other times are currently past or future, and that, moreover, these things would be true even if there were no conscious beings and no language users in the world.

Another crucial point to be made about A-properties is that there is a certain inexorability about the process by which times and events successively possess different A-properties. January 1st, 2000 is currently future, but it is becoming less and less remotely future all the time, and there is nothing that anyone can do to halt or even to slow this process.

A final point that it seems to me important to make about A-properties is that there is no spatial analogue to any phenomenon involving A-properties. There are no genuine, monadic, spatial properties analogous to pastness, presentness and futurity; there are certainly no such properties as *being north*, *being south* or *being west*, although there are such binary, spatial relations as *being north of*, *being south of* and *being west of*. Since there are no spatial analogues of the A-properties, it of course follows that there is no spatial analogue to the process by which times and events successively possess different A-properties. Moreover, there is not any sense in which either locations in space or events successively stand in different binary, spatial relations – like *being north of* – to one another in some *inexorable* way.

In what follows, I will refer to the process by which times and events successively possess different A-properties as *the pure passage of time*, and I will refer to the thesis that there is such a process as *the pure passage of time thesis*. It should be obvious, given these definitions, that anyone who holds the A-property thesis should also hold the pure passage of time thesis.¹³

¹³ I suppose it would be consistent to hold that there really are A-properties, but deny that times and events successively possess different A-properties. That is, there would be no outright contradiction in holding the A-property thesis and at the same time rejecting the pure passage of time thesis. For one could hold, in effect, that time is stuck; i.e., that 3:38 p.m. on March 19th, 1992, for example, is, always has been and always will be present, while certain other times

The pure passage of time thesis, then, together with the claim that there is no spatial analogue to the pure passage of time, is the third component of my view that time passes.¹⁴

At the beginning of this section I characterized the passage thesis as saying that there are certain properties possessed by time, but not possessed by any dimension of space, in virtue of which it is true to say that time passes. So far I have said that I hold several different views about time: the tensed conception of semantics, the A-property thesis, and the pure passage of time thesis. I've also said that I reject the spatial analogues of these theses. Now, I think it is pretty clear that my subscription to a package consisting of the relevant theses that I hold about time, together with the rejections of their spatial analogues, gives me ample justification for saying that time passes.

Here are just two reasons for this claim. (i) In virtue of my subscription to the tensed conception of semantics, and my rejection of its spatial analogue, I can justifiably say that many propositions (or whatever are the bearers of the truth-values) pass, over time, from being true to being false and *vice versa*, whereas no proposition does any such thing over any dimension of space. (ii) In virtue of my subscription to the A-property thesis and the pure passage of time thesis, together with the denial of their spatial analogues, I can justifiably say that times and events pass inexorably, over time, from being future to being present and then on to being more and more remotely past, whereas places and events do no analogous thing over any dimension of space. Note that while (i) involves a semantical claim, (ii) involves a purely metaphysical claim. As I see it, the A-property thesis and the pure passage of time thesis together constitute the essential, metaphysical core of the view that time passes, while the tensed conception of semantics is simply the semantical view that naturally accompanies that metaphysical core.

always have been and always will be past, while still others always have been and always will be future. But I can't imagine why anyone would hold such a thing.

¹⁴ I'm not sure what the spatial analogue of the pure passage of time thesis would amount to, actually, but I'm sure that I would want to deny it if I understood it. For I don't think that locations in space or events undergo any kind of change that could be considered the spatial analogue of the pure passage of time.

3 The Rate of Passage Arguments

In this section I will discuss two distinct but closely related arguments that have been brought against the view that time passes. As far as I can tell, these arguments, or arguments very much like them, were first suggested in the literature by C.D Broad.¹⁵ But J.J.C. Smart has probably been the most earnest proponent of The Rate of Passage Arguments, and it is to him that I will look for a statement of the arguments.

In his famous article, "The River of Time," Smart argues against the idea that time can properly be thought of as something that flows like a river.

If time is a flowing river we must think of events taking time to float down this stream, and if we say 'time has flowed faster to-day than yesterday' we are saying that the stream flowed a greater distance to-day than it did in the same time yesterday. That is, we are postulating a second time-scale with respect to which the flow of events along the first time-dimension is measured. 'To-day', 'to-morrow', 'yesterday', become systematically ambiguous. They may represent positions in the first time-dimension, as in 'to-day I played cricket and to-morrow I shall do so again', or they may represent positions in the second time-dimension, as in 'to-day time flowed faster than it did yesterday'. Nor will it help matters to say that time always flows at the *same* rate. Furthermore, just as we thought of the first time-dimension as a stream, so will we want to think of the second time-dimension as a stream also; now the speed of flow of the second stream is a rate of change with respect to a third time-dimension, and so we can go on indefinitely postulating fresh streams without being any better satisfied.¹⁶

As I see it, the argument that Smart is suggesting here begins with the claim that we can understand the idea of time's *flowing* or *passing* only if we posit some second time-dimension in terms of which we can explicate the flowing or passing of normal time. This claim would presumably be justified by an appeal to some principle about the meaning of the words 'flow' and 'pass' when applied to time. The principle might be formulated as follows.

¹⁵ Broad, C.D., "Ostensible Temporality," in Gale, *The Philosophy of Time*, p. 124. See also Smart, "The River of Time," pp. 214-216; Smart, *Philosophy and Scientific Realism*, p. 136; Prior, "Changes in Events and Changes in Things;" Schlesinger, "How Time Flies," *Mind* XCI (1982), pp. 501-523, esp. 507ff.; and Zwart, *About Time* (Amsterdam: North Holland Publishing Co., 1976), chapter V.

¹⁶ Smart, "The River of Time," pp. 214-215.

P1: For any time-dimension, T, if T *flows* or *passes*, then there is some time-dimension, T', such that T' is distinct from T, and the flow or passage of events in T is to be measured with respect to T'.

The argument also involves the claim that if time flows or passes, then in order for *any* time-dimension to be a legitimate time-dimension, it must flow or pass. This claim would presumably be defended by appeal to a principle that could be formulated as follows.

P2: If flowing or passing is a characteristic of time, then flowing or passing must be an essential characteristic of any time-dimension.

More is needed, however, in order to ensure that, as Smart says, "we can go on indefinitely." It must also be claimed that the passage of any time-dimension is to be measured only with respect to some previously unmentioned time-dimension. This principle might be formulated as follows.

P3: For any series of time-dimensions, T₁, ..., T_n, such that the passage of each of the first n-1 members of the series is to be measured with respect to the next member of the series, the passage of T_n must be measured with respect to some time-dimension, T_m, such that T_m is distinct from each member of the series T₁-T_n.

Now the argument can be formulated as follows.

The First Rate of Passage Argument

(1) If time flows or passes, then there is some second time-dimension with respect to which the passage of normal time is to be measured.

(2) If there is some second time-dimension with respect to which the passage of normal time is to be measured, then the second time-dimension must flow or pass.

(3) If the second time-dimension flows or passes, then there must be some third time-dimension with respect to which the passage of the second time-dimension is to be measured, and, hence, some fourth time-dimension with respect to which the passage of the third time-dimension is to be measured, and so on *ad infinitum*.

(4) It's not the case that there is some third time-dimension with respect to which the passage of the second time-dimension is to be measured, and, hence, some fourth time-dimension with respect to which the passage of the third time-dimension is to be measured, and so on *ad infinitum*.

(5) It's not the case that time flows or passes.

Whatever plausibility this argument has is due to premises (2)-(4). If acceptance of the view that time passes commits one to some kind of infinite series of time-dimensions, then that view would surely be untenable to any but the most wildly free-spending of ontologists. But I can see no reason why I should accept premise (1) of this argument, or P1, the principle on which that premise is based. For although the linguistic and metaphysical components of my view give me ample reason for asserting the passage thesis, Smart has said nothing yet to demonstrate that I am in any way committed to a second time-dimension with respect to which the passage of normal time is to be measured. So I reject premise (1) of The First Rate of Passage Argument. (I will have more to say below about the details of my rejection of premise (1) of The First Rate of Passage Argument.)

Immediately after the passage quoted above from "The River of Time," Smart goes on to say some things that are, I think, intended to provide justification for the claim that if time flows or passes, then there must be some second time-dimension with respect to which the passage of normal time is to be measured.

A connected point is this: with respect to motion in space it is always possible to ask 'how fast is it?' An express train, for example, may be moving at 88 feet per second. The question, 'How fast is it moving?' is a sensible question with a definite answer: '88 feet per second'. We may not in fact know the answer, but we do at any rate know what sort of answer is required. Contrast the pseudo-question 'How fast am I advancing through time?' or 'How fast did time flow yesterday?' We do not know how we ought to set about answering it. What sort of measurements ought we to make? We do not even know the sort of units in which our answer should be expressed. 'I am advancing through time at how many seconds per ____?' we might begin, and then we should have to stop. What could possibly fill in the blank? Not 'seconds' surely. In that case the most we could hope for would be the not very illuminating remark that there is just one second in every second.¹⁷

The argument suggested here, it seems to me, is based on the claim that to say that time passes is to raise a question that cannot be coherently answered. The question is 'How fast does time pass?'

¹⁷ Smart, "The River of Time," p. 215.

That this question arises from the claim that time passes would presumably be defended by an appeal to something like the following principle.

P4: For any thing, x , if x changes, then x changes at some rate.

That the question 'How fast does time pass?' cannot be coherently answered would presumably be defended in part by an appeal to a definition like the following.

R is a *rate* =df there is some parameter, P , and number, n , such that $R = n$ units of P per unit of time.

To this definition would be added two further claims: (i) the claim that the first parameter involved in the rate of the passage of time would have to be time, so that the rate of the passage of time would be something of the form " n units of time per unit of time"; and (ii) a claim to the effect that something of the form " n units of time per unit of time" does not express a coherent rate. The definition of 'rate', then, together with these two claims, would justify the premise that the question 'How fast does time pass?' cannot be coherently answered.

Finally, the argument also depends on some principle like the following.

P5: For any thing, x , if x flows or passes, then it is possible to state coherently the rate at which x flows or passes.

This second rate of passage argument can now be formulated as follows.

The Second Rate of Passage Argument

- (1) If it makes sense to say that time passes, then it makes sense to ask 'How fast does time pass?'
- (2) If it makes sense to ask 'How fast does time pass?', then it's possible for there to be a coherent answer to this question.
- (3) It's not possible for there to be a coherent answer to this question.

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- (4) It doesn't make sense to say that time passes.

This, it seems to me, is a very interesting argument, and one that raises several important issues about the ways in which we talk about the passage of time, in particular, and rates of

change, in general. But I also think that once these issues are spelled out, it can be shown that the argument fails.

In order to explain this it will first be necessary to say some things about rates. In order to discuss a paradigm case involving the rate of some process, let us suppose that it is 1964 and we are watching Abebe Bikila run in the Olympic marathon in Tokyo. For the sake of simplicity we will suppose that Bikila's rate is constant throughout the race. What exactly is the procedure that we would go through in order to find out how fast Bikila is running? Well, it might be something like this: we first check Bikila's position on the course by noting that he is passing a certain mile-marker, and, at roughly the same time, we check the time; then we note when Bikila passes the next mile-marker, and again check the time; if we find that five minutes have passed while Bikila has run one mile then we will know that he is running at the rate of one mile per five minutes, or twelve miles per hour.

But of course we check the time at the appropriate moments during this procedure by consulting a clock. Thus, our investigation reveals that while Bikila's position on the course changes by one mile, the position of the hands on the clock change by the amount that marks off five minutes. Since we can assume that the rate of Bikila's change in position is constant, and also that the rate of the change in position of the hands on the clock is constant, we are in effect comparing the rates of these two changes to one another. But, of course, we really have no special interest in the rate of the change in position of the hands on that particular clock; our interest in the clock is only due to the fact that we take it to be so calibrated that it changes at a constant rate; a rate, that is, that by convention we use to measure periods of time. This conventional rate is not just any old rate; it is supposed to be the rate at which the sun changes its position in the sky. Really, then, the clock is a stand-in for the sun; and what we have really done in carrying out our procedure is to compare the rate of Bikila's change of position to the rate of the sun's change of position. Our investigation has revealed that while Bikila's position on the course changes by one mile, the sun's position in the sky changes by roughly one and one-quarter degrees.

Such are the mechanics of our talk about the rates of such physical processes as Bikila's motion. It may seem, however, that there is something deeper going on when we make the appropriate investigations and find out that Bikila is traveling at the rate of twelve miles per hour. While we have in practice merely compared the rate of one physical change to the rate of another, it may seem that we have at least *attempted* to do something quite different. For just as we are not really interested in the rate of the change of position of the hands on our clock, so we are not, it seems, really interested in the rate of the change of position of the sun; the latter change is also meant to be a stand-in for a more important change, namely, the pure passage of time. Indeed, it seems that our assumption that the sun's position changes at a constant rate amounts to the assumption that the sun's position changes at the rate of *fifteen degrees per hour*, i.e., that every time the sun moves fifteen degrees across the sky, one hour of pure time passes. So it at least appears that what we are after in trying to determine the rates of various physical processes, such as Bikila's running of the marathon, are the rates at which those processes occur in comparison to the rate of the pure passage of time.

Of course, such comparisons are not possible if the pure passage of time thesis is false. For suppose that the pure passage of time thesis is false. Then the sentence 'Bikila is running at the rate of twelve miles per hour' cannot mean that Bikila runs twelve miles in each hour of pure time; rather, it must mean something like this: Bikila runs twelve miles each time the sun's position changes by fifteen degrees. This latter change would then be simply a standard, chosen by convention, for comparing rates and lengths of various changes. But the standard wouldn't stand for anything else – it would not serve as a marker for approximating the pure passage of time. And if it should turn out one day that the motion of the sun in the sky appears to speed up drastically relative to other changes, then we should say, not that the motion of the sun has sped up drastically relative to the pure passage of time, while every other change has maintained its rate, but, rather, simply that the sun's motion has sped up relative to the other normal changes. We may then want to choose another standard for comparing the rates and lengths of changes, especially if the speed of the sun seems to have become erratic.

So if the pure passage of time thesis is false, then all of our talk about the rates of different changes must be understood as talk that is meant to compare the rate of one ordinary change to the rate of another; a question such as 'How fast does x change?' must be a question about the speed of the change in x relative to the speed of some other change(s). It just so happens that in answering such questions we generally select the change in the position of the sun as the second change, to which the first one is compared.

On the other hand, if the pure passage of time thesis is true, as I think it is, then talk about rates can be understood in either of several ways. We could say that such talk simply consists of comparisons between the rates of different changes, sometimes including the pure passage of time; or we could say that talk about rates essentially involves comparisons between the rates of different changes and the rate of the pure passage of time. If we say the latter, then we must say that whenever we select some observable change (such as the change in the position of the sun, or the change in the position of the hands on a clock) for the purpose of measuring a particular change whose rate we are interested in, that observable change is merely a stand-in for the pure passage of time.

Two main questions arise, then, concerning our talk about rates: Is there really such a thing as the pure passage of time? And even if there is such a thing, what is essential about rate talk – the comparison of any two changes, or the comparison of one change to the pure passage of time?

All of this is relevant to The Second Rate of Passage Argument, since, as one who says that time passes, I am compelled to answer these two questions. I have already made it clear that I give an affirmative answer to the first question. Since I say that there is such a thing as the pure passage of time, it at least appears that I should admit that 'Time passes' is literally true, so that I cannot easily reject premise (1) of The Second Rate of Passage Argument. But I have a choice to make about how to answer the second question about rate talk.

Suppose I claim that talk about any rate essentially involves a comparison between two different changes, but that it need not be the case that one of the changes compared is the pure

passage of time. (I might support this position by pointing out that in at least some instances we speak of a certain rate without appearing to make any reference to time. For example, one can sensibly say that during the 1989 NFL season, Joe Montana's passing totals increased at the rate of 21 completions per game.) Then I will think that any time one gives the rate of some change in terms of some second change, one has likewise given the rate of the second change. (If, for example, I tell you that Montana's passing totals increased at the rate of 21 passes per game, then I have also told you that the games progressed at the rate of one game per 21 completions by Montana.) Hence, whenever one gives the rate of some normal change in what is admittedly the standard way, i.e., in terms of the pure passage of time, then one has likewise given the rate of the pure passage of time in terms of the first change. If I tell you that Bikila is running at the rate of twelve miles per hour of the pure passage of time, for example, then I have also told you that the pure passage of time is flowing at the rate of one hour for every twelve miles run by Bikila.

If I take this line then I should reject premise (3) of The Second Rate of Passage Argument, while still insisting that it is literally true that time passes. For I will in this case think that it is possible to state coherently the rate at which time passes, and that this information is in fact given each time the rate of some normal change is described in terms of the pure passage of time. Moreover, if I take this line then I will be rejecting premise (1) of The First Rate of Passage Argument on the grounds that the passage of time is a change whose rate may be measured with respect to the rate of any normal change, so that there is no need for me to posit any second time-dimension with respect to which the passage of normal time is to be measured.

Suppose I claim that all talk about rates is essentially talk comparing some change to the pure passage of time; there is still, it seems to me, an important choice for me to make with regard to how we are to understand rate talk. For I might believe that there are no restrictions on what kinds of change can be sensibly compared to the pure passage of time; in particular, it may be sensible to compare the pure passage of time to itself. According to this view, the question 'How fast does time pass?' is a sensible question with a sensible answer: time passes at the rate of one hour per hour. Thus, if I take this line, then I should reject premise (3) of The Second Rate

of Passage Argument, but I will still be able to maintain that it is literally true that time passes.¹⁸ Moreover, if I take this line, then I will be rejecting premise (1) of The First Rate of Passage Argument on the grounds that the passage of time is a change whose rate may be measured with respect to itself, so that there is no need for me to posit any second time-dimension with respect to which the passage of normal time is to be measured.

Finally, I may choose to say that what is essential about rate talk is that it involves a comparison between some normal change and the pure passage of time. According to this view, it does not make sense to ask about the rate of the passage of time, for to do so is to make a category mistake: the answer would have to involve a comparison between the pure passage of time and the pure passage of time, but such an answer would not make sense because the pure passage of time has a unique status among changes – it is the one to which other, normal changes are to be compared. It is the paradigm, and, as such, it alone among changes cannot be measured.¹⁹ If I take this line then I should accept premise (3) of The Second Rate of Passage Argument, but then I will be compelled to reject premise (1) of that argument, and I will still be able to maintain that time literally passes. Moreover, if I take this line then I will be rejecting premise (1) of The First Rate of Passage Argument on the grounds that the passage of time is a change whose rate simply cannot be measured, so that there is no need to posit any second time-dimension with respect to which the passage of normal time is supposed to be measured.

¹⁸ Prior suggests something like this as a possible response in "Changes in Events and Changes in Things," pp. 2-3.

¹⁹ Wittgenstein makes analogous remarks about the standard meter: "There is *one* thing of which one can say neither that it is one metre long, nor that it is not one metre long, and that is the standard metre in Paris. -- But this is, of course, not to ascribe any extraordinary property to it, but only to mark its peculiar role in the language-game of measuring with a metre-rule." (Wittgenstein, Ludwig, *Philosophical Investigations*, translated by G.E.M. Anscombe, third edition (New York: Macmillan Publishing Co., 1968), 50.)

4 Conclusion

I have spelled out what I mean by 'Time passes'. Then I have considered two related arguments, suggested by Smart, against my view. The first of these involves a premise that says that if time passes then there is some second time-dimension with respect to which the passage of normal time is to be measured. I claimed that there was no reason for me to accept this premise, and so I rejected the first of Smart's arguments.

Consideration of The Second Rate of Passage Argument proved to be more complicated. But I have argued that that argument raises certain questions about how we should understand our talk about rates. Then I have tried to show that, whichever one I choose from among the coherent ways of answering those questions, there is some premise of Smart's argument that is, according to the way I have answered the relevant questions, clearly false.

I conclude that, while the rate of passage arguments raise some interesting questions about the pure passage of time and how we ought to understand our talk about the rates of various changes, these arguments pose no real threat to my version of the view that time passes.²⁰

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