

Presentism and the Micro-Structure of Time *

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The standard account of the micro-structure of time is based on Cantor's conception of continuity and thus views the time line as consisting of undenumerably many instants ordered by the B-theoretic *earlier than* relation. This may seem problematic for an A-theory of time such as presentism, according to which only what is present exists, for it seems to leave no room for the instants of a Cantorean time line. This paper defends a version of presentism that can accommodate the Cantorean conception and more generally any approach to the micro-structure of time based on durationless instants.

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I. Introduction

Presentism is an A-theory of time, according to which only present things exist. It is very much debated nowadays and has many supporters, although it is probably a minority view, since the B-theory of time, or B-eternalism, appears to enjoy a larger consensus. Indeed, much of the literature on presentism involves criticisms of it by B-theorists, or even by non-presentist A-theorists, such as A-eternalists or growing block theorists. As a matter of fact, despite its commonsensical appeal, there are many serious difficulties that presentism must confront. Most notoriously, the truth-maker problem and the problem of cross-temporal relations. However, I shall not deal with them here (for my take on them, see Orilia 2016).

I shall rather focus on a further problem for presentism, which, with reference to the Cantorean account of the continuity of time, has been raised as follows in the call for papers for this issue of *Philosophy kitchen* (consulted on April 6, 2020):

It is important to underline that the Cantorean account was originally construed to formalize certain properties of the continuum of space. This leaves open the question whether such an account can be applied to temporal case. Is the time-continuum to be thought as an actual (uncountable) infinity of instants? In the contemporary debates about time in analytic metaphysics, the Cantorean account of the continuum is often presupposed. This raises a series of questions. It is not clear how this understanding could be compatible with Presentism. Insofar as it presupposes an actual infinite of distinct temporal points, the Cantorean continuum seems to imply commitment to Eternalism. Moreover, the Cantorean model gives priority to the temporal order based on the relation “earlier than”. Hence, the challenge of integrating this model holds for any theory which considers temporal passage to be more fundamental than temporal relations (A-Theory). These problems raise a fundamental issue: that of reconciling the continuous nature of time with its dynamic. How can time be conceived simultaneously as something continuous, hence extensive, and passing?

I shall argue that presentism, or at least an appropriate version of presentism, *substantivalist presentism*, can successfully address these problems, and thus be considered compatible with Cantor’s account of the continuum, as applied to time. More generally, I shall argue that a presentism of this sort is compatible not only with the Cantorean conception, but with what I would like to call *instantism*. By this I mean a general standpoint regarding, in the terminology of Newton-Smith (1980, ch. 6), the *micro-structure of time*, which, like the Cantorean conception, admits durationless instants as fundamental. The opposite general standpoint, according to which durations, or intervals of time, are fundamental, may be called *durationism*, and can be traced back to Aristotle’s conception of the continuum (*Physics*, 6). This, I shall also argue, indeed constitutes a hurdle for presentism.

I shall proceed as follows. In §2 I shall briefly review the main different theoretical options regarding the nature of times, i.e., instants and intervals, and the micro-structure of time, how times are connected. In §3, I shall briefly review the main standpoints in temporal ontology and introduce substantival presentism. In §4, I shall explain why this view is well equipped to deal with the challenges posed by the above quotation. In §5, we shall see that, if we look at events from the point of view of instantism, substantival presentism can deal with them. However, if we look at them from the point of view of durationism, a presentist account is more problematic. This, in my view, suggests that presentism should favour instantism over durationism. I

shall conclude, in §6, with some ruminations on which version of onstantism may be better for the presentist.

II. Times and the Micro-structure of Time

Are there times? Although some philosophers endorse or at least take as a serious option eliminativism about times (Chisholm 1990; Hestevold 2008), this option is most problematic. It is hard to deny that we succeed in referring to something with dates, e.g., “April 11, 2020, 2.30 p.m. Greenwich time.” Dates are not empty terms like “the winged horse” or “the round square,” and what do we refer to with dates if not to times? Let us assume then that there are times and that they are the referents of dates. Times may be either intervals, e.g., the hour going from today’s noon sharp to today’s 1 p.m. sharp, or the instant of the beginning of this interval, today’s noon sharp. Such items are what we are discussing about in considering Instantism and Durationism, but before turning to that, let us briefly consider the options regarding the nature of times.

What are times? There is a primitivist option and various reductionist options, not all of which are equally open to the different ontological views to be reviewed below. The primitivist option is *substantivalism* (about time; there is an analogous doctrine about space (Dainton 2010, 2)), according to which times are *sui generis* entities (with instants or durations as more fundamental, depending on whether instantism or durationism is accepted), and the occurrence of events at them is a primitive and unanalyzable relation. As regards reductionism, let us first consider *relationism* (about time; there is an analogous doctrine about space (Dainton 2010, 2)), according to which times are reduced to events. A time is either a complete class of simultaneous events (Russell 1914; Whitehead 1929) or a complete mereological sum of simultaneous events (Pianesi & Varzi 1996), where completeness must be understood as no lack of any event simultaneous with some event comprised in the class or sum in question. Given this line, occurring at a time is being a member of a certain set, or being a part of a certain whole. An alternative reductionist option, proposed by Prior (Prior 1968, ch. 11), is to view times as *world propositions*, which represent in all details how the world may be at an instant; the world proposition true now is the present instant, while world propositions that were true count as past instants, and propositions that will be true count as future instants. In this account, to occur at a time is for a proposition to be entailed by a certain world proposition; for example, that the death of Caesar occurred at a certain time means that the world proposition that were true when Caesar died entails the proposition <Caesar dies>.

Let us go back to *instantism* and *durationism*. According to the former, durationless or point-like instants are fundamental and any duration (interval, extension, or stretch of time) is somehow made up of them. According to the latter, durations are fundamental, and any duration is infinitely divisible into smaller and smaller intervals, without ever reaching durationless instants, which exist, at best, as derivative entities; i.e., to use a now-fashionable terminology, time is *gunky*, and the intervals that compose it are *gunks*.

We can further distinguish three alternative roads within Instantism. *Instant-discretism* holds that time is discrete, i.e., it has the structure of the set of (negative and) positive integers. *Instant-densitism* holds that time is dense, i.e., it has the structure of the (negative and) positive rational numbers. *Instant-continuism* holds that time is continuous, i.e., it has the structure of the (negative and) positive real numbers (negative numbers enter the picture if time is taken to have no

beginning). In instant-discretism, any instant has an immediate successor. In contrast, in both instant-densitism and instant-continuism, no instant has an immediate successor, for in between any two instants there are infinitely many other instants; denumerably or undenumerably many, depending on the former or the latter option, respectively.

Instant-continuism amounts to the Cantorean conception of the micro-structure of time, mentioned in the quotation from the Call for papers in the introduction. This arguably constitutes the standard view nowadays (Dainton 2010, 301), capable of answering Zeno's paradoxes (Grünbaum 1968). However, durationism, or more generally the Aristotelian conception of the continuum, has had its own notable supporters, including Peirce and Whitehead, and recently has seen something like a revival (see Dainton 2010, § 17.7, for references).

III. Temporal Ontologies

We traditionally distinguish between A- and B-theories of time (see, e.g., Loux 2006 for a survey and references to supporters of such views). According to the former approach, there are in a most fundamental sense objectively exemplified properties such as pastness, presentness and futurity. Such properties are taken to account for time passage understood as the becoming present of some temporal items that were previously future, while some other temporal items that were previously present become past. These temporal items may be times, events, or even propositions, as we shall see. As so understood, pastness, presentness and futurity are called *A-properties*, and are taken to be more fundamental than *B-relations* such as being earlier or simultaneous. These are typically considered, to the extent that they are admitted, somehow reducible to A-properties. According to the latter approach, in contrast, B-relations are most fundamental and are objectively exemplified by times or events, which are past, present or future only in a subjective sense, dependent on their being ordered by B-relations. Thus, there is no time passage understood in terms of A-properties.

According to *A-eternalism*, what is often called the *spotlight view of time*, past, present and future are equally real, they all exist. Thus, pastness, presentness and futurity objectively accrue to both events and times. For example, there are the events of Socrates' drinking the hemlock, of my pressing the *K* key on my laptop and of (let us suppose) the first human landing on Mars. The first of them objectively exemplifies pastness, the second presentness and the third futurity. Furthermore, there are the times at which such events take place, which also exemplify pastness, presentness and futurity, respectively. Finally, even the objects involved in such events, Socrates, the cup with the hemlock, myself, my laptop, the human landing on Mars, all exemplify pastness, presentness or futurity. All the entities that exemplify such properties also exemplify B-relations at best in a derivative sense. For example, Socrates' drinking the hemlock is earlier than the human landing on Mars inasmuch as the former event is past and the latter is future.

According to another A-theoretical approach, *pastism*, or the *growing block theory*, only past and present exist, and the future is not real. Thus, going back to the previous examples, there exist Socrates' drinking the hemlock, my pressing the *K* key on my laptop, the objects involved in such events, and the times of such events, exemplifying pastness and presentness, as the case may be. Futurity may at most be attributed to propositions, to the extent that they will be true; for example, the future-tensed proposition <a human will land on Mars> is true, and accordingly

the corresponding present-tensed proposition “a human is landing on Mars” will be true, and can thus be said to exemplify futurity. Consequently, the former proposition could be said, in a sense, to be earlier than the latter (it may be worth noting that when the present-tensed proposition “a human is landing on Mars” will be true, it will no longer exemplify futurity, but rather presentness).

A further sort of A-theory is *presentism*, or, let me say, *standard presentism*, as I will distinguish in a while different types of Presentism. Standard Presentism holds that only what is present exist. Hence, still relying on the previous examples, only my pressing the *K* key on my laptop, the objects involved in it and the time of its occurrence exist, and they all enjoy presentness. Pastness and futurity may at most be attributed to propositions, to the extent that they were or will be true; for example, the past-tensed proposition <Socrates drank the hemlock> is true, and accordingly the corresponding past-tensed proposition < Socrates is drinking the hemlock > will be true, and can thus be said to exemplify pastness. Again, the former proposition could then be said, in a sense, to be earlier than the latter.

In the B-theoretical camp, we shall mention just *B-eternalism*, typically simply called *the B-theory* (though there are many variants, as we turn to fine-grained ontological details, which need not detain us here). According to this approach, past, present and future are also real, but in a different sense: events and times are objectively arranged in terms of being earlier or simultaneous, and, on the basis of this, they are past, present or future, but only in a subjective sense pretty much as things are spatially here, near or far in relation to a given subject. For example, Socrates’s drinking the hemlock is past in that it is earlier than my tokening this sentence, which is simultaneous with my pressing the *K* key on my laptop, and earlier than the first human landing on Mars; which makes the latter two events, present and future, respectively. In a similar way, the times at which such events occur and thus the objects involved in them are also past, present, or future.

This brief survey should make it evident that, whereas both A- and B-eternalists could accept a reduction of times to events, this option is not open to Pastism and Presentism, for the former lack future events and thus cannot construct future times, and the latter also lack past events, and thus cannot construct past times as well. Thus, presentists, following the lead of Prior, have typically resorted to a reduction of times to world propositions. Once times are so viewed, even the presentist can say that there are past and future times. There is however a widespread opinion that times are somehow presupposed in this approach, so that it cannot be endorsed without circularity (see, e.g., Newton-Smith 1980, ch. 6, §6; Meyer, 2013, ch.9). Be this as it may, there are a number of other difficulties with this proposal or at least advantages for the substantivalist option. First, we may note a problem shared with the reduction of times to events, namely that the possibility of time passage without change can hardly be accounted for (Newton-Smith 1980, ch. 6, §6). If there were a period of time without change, i.e. a sequence of times with the very same events occurring at all the times in the sequence, only one world proposition could be true for the whole period, which would mean, given the identification of times with world propositions, that there would be a single instant, rather than, contrary to the supposition, a sequence of distinct times. Yet, a changeless period of time seems possible, and in certain peculiar imaginary circumstances even inferable (Shoemaker 1969). Second, it has been claimed that presentism is in trouble in accounting for the direction of time, because it cannot rely on the being earlier relation freely available to the B-theorist (Oaklander, 2002; 2003). Given substantivalism, however, times must be viewed as ordered by this relation, with presentness thus shifting from one time to

another in the order provided by the relation. Third, a reduction of times to propositions is hardly lined up with commonsense (Hinchcliff, 1996, 124), the preservation of which is typically taken to be a presentist asset.

In Orilia 2012, I have proposed that, in order to circumvent these difficulties, the presentist could subscribe to a substantialist approach to time and thus accept times as primitive irreducible entities. Moreover, I have also proposed therein that, in order to tackle many other well-known challenges that Presentism must confront, the presentist could also accept the “ex-concrete objects” endorsed in Williamson’s (2002, 2013) *permanentism*. According to it, as Williamson puts it (2013, 4), “always everything is always something;” thus, for example, Socrates still presently exists, though it is no longer a concrete object, as he used to be, and he is rather ex-concrete. Presentism with substantial times and ex-concrete objects, which I have called *moderate presentism*, is elaborated and defended in Orilia 2016. However, the reasons that motivate that endorsement of ex-concrete objects need not detain us here and we can concentrate for our purposes on *substantial presentism*, i.e., a presentism that simply incorporates substantial times and leaves it open whether or not there are ex-concrete objects.

According to substantial presentism, all times, understood as *sui generis* primitive entities, always exist, always permanently ordered by the being earlier relation, though only the present time is such that events occur at it. That is, we may say, only the present time is filled with events and thus with the objects involved in such events. The other times exist, but are, we may also say, *empty*. Such times are past or future, as the case may be, in that events occurred at them before the present time became present, or will occur at them when the present time will no longer be present. But they are not *merely* past or future, since they also exist at the present time just as much as the present time, though with no events occurring at them. For it is at the present time that there occur all the permanent facts of the sort *time t1 is earlier than time t2*. A comparison may be useful. The sun is a present entity that is involved in events that occur at the present time, but it is also a past and future entity in that there were events that occurred at earlier times and events that will occur at later times, involving the sun; so that the sun also existed at those earlier times, and will exist at those later times. In other words, the sun is a past and future entity, besides being a present entity, but it is not a *merely* past or future entity. Following McTaggart, we are used to think that *past*, *present* and *future* are incompatible determinations. This is fine if by *past* and *future* we mean *merely past* and *merely future*. However, of an entity that endures through time we can say that it existed, exists now, and will exist, and thus that it is past (existed at a past time), and it is future (will exist at a future time), while adding that it is not merely past or future, since it is also present (exists at the present time). This is what we think of the sun. The idea is to view the times that are earlier and later than the present time in the same fashion. It may be worth noting that the fact that all times exist at the present time is perfectly compatible with the present time’s being a durationless instant. For the existence of the times at the present time is simply due to the occurrence at the present time of all the facts of the sort *time t1 is earlier than time t2*. As constituents of such facts, which occur at the present time, all times occur at the present time, and this is perfectly compatible with the present time being an instant.

Of course, which time is the present time keeps changing, and here the dynamical A-theoretical aspect that we expect in any form of presentism enters the picture. Thus, one time after the other becomes present, thus ceasing to be empty and coming to host ordinary events and the objects involved in them, e.g., let us

suppose, John's kissing Mary, John and Mary, as well as the peculiar events, if we may call them so, which are the facts of the sort *time t_1 is earlier than time t_2* , and the times which are constituents of such facts. And correspondingly, one time after the other ceases to be present, thereby becoming empty. (Somewhat analogous views, although framed in terms of spacetime, rather than simply time, are defended by Zimmerman 2011 and Sullivan 2012).

IV. Instantism from the Perspective of Substantival Presentism

Let us now reconsider in detail the passage of the *Philosophy Kitchen* call for papers quoted in the introduction, with the goal of then evaluating it from the point of view of substantival Presentism. This passage raises the following difficulty for presentism: instant-continuism appears to presuppose eternalism, since it appears to presuppose that there are, tenselessly speaking, undenumerably many instants, only one of which, at most, can be present. Hence, instant-continuism appears to entail that there are some non-present entities, and thus it appears to be incompatible with presentism. Moreover, the passage raises a problem for A-theories in general, and thus implicitly a further difficulty for presentism: The undenumerable series of instants presupposed by instant-continuism is ordered by the B-theoretic being earlier relation, and thus this relation seems to be given ontological priority over A-properties. However, A-properties are taken to be fundamental in an A-theory, as they are taken to account for time passage, understood as losing futurity and acquiring presentness and then pastness.

It should be noted that these two issues could be raised in precisely the same manner from the point of view of instant-densitism and instant-discretism. All that really matters is the assumption of a series of instants arranged by the being earlier relation, independently of whether this series is continuous, in which case the instants are undenumerably many, or rather dense or discrete, in which case the instants are denumerably or countably many. Hence, the answers that substantival presentism can offer are equally valid, regardless of which version of instantism is assumed. Let us turn to such answers.

The first difficulty can be immediately disposed of in the light of the preceding section. Substantival presentism makes room for the series of instants presupposed by instantism. However, it takes all these instants to exist at the present instant, *qua* constituents of B-relational facts of the form *t is earlier than t'* , which are taken to occur at the present time. In so doing it remains a form of presentism.

As regards the second difficulty, the problem here is whether there is still room for time passage in terms of A-properties, once a most fundamental being earlier relation that arranges instants has been acknowledged. Now, given substantival presentism there clearly is such room. For this approach does not view the presentness of an instant subjectively in terms of simultaneity, as in the B-theory, but in terms of its objectively having events occurring at it. Since the instant that exemplifies such presentness keeps changing, and correspondingly futurity and pastness are lost and acquired by other instants, there is A-theoretical passage. The dynamic aspect of time is captured by the fact that instants, one after the other, as they become present, are filled with events, while all the other events are empty: only present events exist, thereby constituting total present reality, or the present total state of affairs, we may say. This is so, even though there is an irreducible being earlier B-relation permanently arranging the instants. Its presence in no way hinders the fundamentality of the A-properties in accounting for passage. It simply gives a direction to this

passage, in the sense that which instants become present, after the present instant ceases to be present, depends on which instants are earlier and which are later than the present instant. That is, if t_1 is present and t_0 and t_2 are, respectively, earlier and later than t_1 , it is t_2 that will become present, whereas t_0 will always remain past.

V. Dynamic Events

In Casati's and Varzi's (2015) terminology, events can be subdivided into *static* and *dynamic*. The former do not involve change and are perhaps more appropriately called states (of affairs). The latter in contrast typically involve change and are more usually called events. As an example of the former we could consider a snapshot of a ball sitting still at a certain specific place. By presupposing instantism we may say that this state occurs at a certain instant; the durationist may say something similar after reconstructing instants in terms of intervals. As an example of the latter, we could consider a ball rapidly moving from a place to another. Intuitively, this movement occupies an interval of time.

Dynamic events pose a problem for presentism. We observe them, they can occupy our specious present, and thus their existence can hardly be denied. And yet, once we admit this, it seems that we must also admit past events, in contrast with presentism. Suppose for example that August *now* sees a ball running from p_1 to p_4 in the interval from t_1 to t_4 . Thus August sees a certain dynamic event; call it *ED*. The perception is veridical, let us assume, and thus *ED* presently exists. However, *ED* is made up, one could say, of static events following one another, e.g., event e_1 consisting of the ball's being in p_1 , then event e_2 consisting of the ball's being in p_2 , then event e_3 consisting of the ball's being in p_3 and finally event e_4 consisting of the ball's being in p_4 . And thus we should admit that there are events, such as p_1 , p_2 , and p_3 , that are earlier than other events. By being earlier than other events, these events can hardly be considered present. They must be past, one could urge. Moreover, there is a conscious state of mind of August's, which lasts from t_1 to t_4 , his specious present, which, one could suspect, involves conscious states some of which are earlier than others and must then be past, e.g., the vision of e_2 and the vision of e_3 . Hence, there exist past events, both physical and mental, and presentism, one could then suspect, is false (Orilia 2012a).

What can the presentist reply? The problem is due to the fact that the dynamic event is taken to really occur at an extended interval of time, and once this is admitted it seems it can be subdivided into slices, some of which must be past. And if we accept durations as primitive and fundamental, it seems we are forced to view things precisely in this way. To be sure, a certain interval can be taken to be present. This is the choice proposed by Hestevold (2008), who calls such an extended present a "thick" present, and thus speaks of "Thick Presentism." The opposite choice is, in his terminology, "Thin Presentism", according to which the present is «thin», that is instantaneous or durationless. Hestevold argues that the duration of the thick present that presentists should allow for had better be that of "an 'extraordinarily brief' event; e.g. *a butterfly's flapping its wings exactly twice*" (Hestevold 2008, 334). For otherwise presentists would be committed to a host of past objects that they do not want to acknowledge. But even with such brief presents, there would be past objects that the presentist should not acknowledge, even simply the butterfly's first flapping of its wing within one thick present, when the second flapping is taking place. And moreover, what would precisely determine the length of the present? Why not that of a faster movement, occupying simply the time of the second flapping of wings, or that of a slightly faster movement, taking also the time of a third flapping? I think the

presentist is better off without having to answer these questions and without past events as subparts of events that occur at an interval. That is, the presentist had better take the present to be a durationless instant, at which events occur, and in fact I think presentists typically take the present in this way. And thus instantism rather than durationism seems to be a better choice for the presentist.

But then how should the presentist account for dynamic events? With the resources offered by substantival presentism, i.e., with instants as primitive entities and the appeal to tense granted by an A-theory, it can be done as follows. First of all, one could accept past-tensed and future-tensed properties of the sort *having been F at instant t* or *being potentially F at time t*. One could then reconstruct a dynamic event as an event that occurs at an instant, but involves the exemplification of such past-tensed properties. To illustrate, consider again the ball moving from p_1 to p_4 in the interval from t_1 to t_4 . At time t_3 there occurs a static event which is the ball's being at p_3 , but there also occur events involving past-tensed and future-tensed properties such as those consisting of the ball's exemplifying the following properties: having been in p_1 at t_1 , having been in p_2 at t_2 , being potentially in p_4 at t_4 . By virtue of this, we may say, there also occur at t_3 the dynamic event which is the ball's moving from p_1 to p_4 . There are dynamic events, in other words, insofar as there are objects having such past-tensed and future-tensed properties, in addition to present-tensed properties.

A natural further step is to associate this approach to a Husserlian retentive model of the specious present, which certainly is presentist-friendly, in contrast with other models of the specious present (see Dainton 2018). According to it, the specious present involves *retentions*, *impressions* and *protentions*. The idea here is that these three items represent exemplifications of past-tensed, present-tensed, and future-tensed properties, respectively. Thus, in perceiving the dynamic event consisting of the ball's moving, August has at t_3 an instantaneous conscious state with retentions, impressions and protentions within it, so that the perception of a succession is not a succession of perceptions but one perception with a “before” (retentions), a “now” (impressions) and an “after” (protentions) within it: retentions corresponding to the events consisting of the ball's having been in p_1 at t_1 and having been in p_2 at t_2 ; an impression corresponding to the event consisting of the ball's being in p_3 ; a protention corresponding to the event of the ball's potentially being in p_4 at t_4 (see Orilia 2012, for further details).

VI. Concluding Remarks

In sum, the presentist has no problems with instantism, at least after accepting the substantivalist option. By endorsing it, the presentist can also nicely account for dynamic events. And, on the other hand, dynamic events suggest that the presentist had better avoid durationism. But is instant-continuism really the best choice for the presentist (or more generally for whoever embraces instantism)?

The problem is that, despite our Cantorean wisdom, a continuous, or even simply dense, progression in time remains baffling for Zenonian reasons, with “a puzzling character ... [that] may be ineliminable” (Danto 2010, 284). The specifically temporal aspect of the perplexity is well explained by Findlay (1941, p. 156; insertions into brackets are mine):

[W]hen we strip Zeno's problem of its spatial and other wrappings, its significance becomes clearer. For it is not, essentially, a problem of space or quantity, but solely of time It is

therefore foolish to think that we can meet Zeno's puzzles by the modern theory of the continuum or by the facts of infinite convergent numerical series ... And the problem assumes its most vexing form if we allow that ordinary happenings have ultimate parts that take no time [in my terminology, static events occupying durationless instants]. For of such parts it seems most natural to say [given Instant-Densitism or –Continuism] that none can be next to any other, and once this is said it is hard to understand how any ultimate part can ever pass away or be replaced by any other. For before such part can be replaced by any other similar part, it must have first been replaced by an infinity of other similar parts. Our admission seems to leave us with a world immobilized and paralyzed, in which every object and process, like the arrow of Zeno, stands still in the instant, for the simple reason that it has no way of passing on to other instants.

Thus, perhaps, one may be tempted to say that one should favour instant-discretism, which grants that any instant has a next instant. After all, it is more digestible for common sense, which the presentist is supposed to honour. On the other hand, the math used in modern physics seems to presuppose continuity. To see it, it is sufficient to notice this: if a physical square has a 1 meter long side, we must say that its diagonal is $\sqrt{2}$ meter long. Consider then a body moving at the uniform speed of 1 meter per second. It will take, it seems we should say, seconds to move along the diagonal. The example suggests that we need reals to measure time, which in turn suggests that time is continuous (Salmon 1970, 35). And fortunately, after setting aside Findlay's perplexity, Zeno's arguments against continuity (the *Achilles*, *Dichotomy*, and *Plurality* paradoxes) can be answered by the Cantorean conception of continuity (See Grünbaum 1968, Salmon 1970). Finally, Zeno does not only have arguments against continuity. Its *Stadium* paradox can be viewed as a nasty argument against discreteness (Salmon 1970).

There are possible replies to these arguments in favour of continuity, though. Modern physics could be done with discrete math after all: the experts tell us that there are systems of discrete mathematics that could be employed, and that we could in principle view the use of reals as an approximation of what we should really do (Caratheodory 1963; Penrose 2004, ch. 16). And the Stadium can somehow be digested by the Instant-Discretist (Dainton, 2010, 296). Finally, one could add, Quantum Mechanics may be taken to suggest discrete time (Dainton, 2010, 299). In conclusion, ... I don't really know.

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