

Presentist Four-Dimensionalism

Berit Brogaard

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§ 1 Four-Dimensionalism

Four-dimensionalism is the thesis that everyday objects, such as you and me, are space-time worms that persist through time by having temporal parts none of which is identical to the object itself. Objects are aggregates or sums of such temporal parts. The main virtue of four-dimensionalism is that it solves—or does away with—the problem of identity through change.¹ The main charge raised against it is that it is inconsistent with the thesis according to which there is change in the world.² If this charge could be sustained, then we would need compelling arguments in support of the view that things are four-dimensional, since the view that there is no change in the world conflicts with so many of our most well-supported common-sense beliefs. In what follows, however, I want to show that, contrary to what is usually believed, four-dimensionalism does not entail a changeless world.

§ 2 Cambridge Change

In the narrow sense, change takes place when a single entity has two incompatible states at different times. This consideration appears to have been behind the so-called Cambridge criterion of change (Geach 1969, p. 71), which Russell put forth in his *Principles of Mathematics*:

change is the difference, in respect of truth and falsehood, between a proposition concerning an entity at a time T and a proposition concerning the

same entity at another time T', provided that the two propositions differ only by the fact that T occurs in the one where T' occurs in the other. (1903, § 422)

This definition refers to a difference in truth-value of two propositions. The propositions themselves are to be understood as eternal or timeless in two senses: first, they do not change their truth-value; second, they are not tensed but rather time-indexed, which is to say that they involve a timeless reference to a specific calendar-date and clock-time, as for example in: 'John is running at 2 P.M. on June 9, 1999'.

Note that Russell's definition does not make any restriction as to the nature of the entity which changes. It does, however, lay down that the two propositions under consideration must be concerned with the *same* entity, and thus it presupposes that the entity which changes must be an entity that persists through change.

Consider the true statement (A) 'Aristotle is a teacher at 2 p.m. on the 15th of March, 347 B.C.' and the false statement (B) 'Aristotle is a teacher at 2 p.m. on the 15th of March, 390 B.C.' Is there a problem with the Cambridge criterion if the entity referred to is a four-dimensional object? Only if the term 'Aristotle' as it appears in (A) and (B) must refer to two distinct person-stages of Aristotle. Here, however, we shall assume that, since the two person-stages are stages of the same object, nothing stands in the way of our conceiving the two statements as being about this very object.³ Hence if Geach is right to claim that the Cambridge definition is the 'only clear, sharp conception of change we have' (1979, p. 91), then the construal of objects four-dimensionally ought not to entail that objects do not change.

But there is still something odd about the combination of change and four-dimensional objects.⁴ Intuitively, the difference in truth-value of statements that otherwise differ only by the fact that they have different time-indices indicates that a gain or loss of a property (broadly understood) has taken place between the two times. This talk of the gain or loss of a property, on the other hand, seems to suggest that a property belongs to an object at one time but not at

another. But if objects are four-dimensional entities, then they surely do not gain or lose properties in this sense. Rather, they have (tenselessly) all the properties that they ever have in that these different properties are assigned (tenselessly) to their respective temporal parts. One of Aristotle's instantaneous temporal parts has a certain size and shape which a different temporal part does not have. And now, as has been argued by various thinkers, the fact that an object has temporal parts with different properties ought most properly to be interpreted as signifying not that a change has taken place, but rather that there is a mere tenseless alternation of properties. Aristotle has temporal parts with different properties, just as a multicolored strip of paper has spatial parts with different properties, and neither case involves change in the sense in which this word is commonly understood. As Sider points out, 'we can think of the four-dimensionalist's notions of atemporal parthood, and atemporal exemplification generally, as being those we employ when we take an "atemporal perspective" and contemplate the whole of time' (1997, p. 198). Alternation among the properties of the temporal parts which appear when we adopt such a perspective is not real change, even though one can talk about it as if it were a change, just as one can say that one's house is located one mile after the road changes from paved to dirt without implying that the road itself is really changing.

§ 3 Presentism

The elimination of change in favor of the mere alternation of properties can be overcome if we can somehow find a way to bring time—the passage of time—back into the four-dimensional picture, and this is what presentist four-dimensionalism allows. Presentism is the view that the only things that exist are the things that presently exist.⁵ Four-dimensionalism and presentism are usually considered incompatible. Heller, for example, argues that four-dimensionalism cannot accept the tensed sense of existence that is presupposed by three-dimensionalism: 'if there are four dimensional objects that extend beyond the present moment, the sense in which

there *are* such things must be temporally neutral' (1992, p. 701). How could we possibly hold the view that objects are four-dimensional and at the same time claim that things exist only if and to the extent that they presently exist? The solution to this puzzle is to insist that only temporal stages of objects exist, but that objects have four dimensions in the sense that they have an unfolding temporal dimension in addition to the three spatial ones. I take a stage to be an infinitely thin slice of an object along this temporal dimension. No stage is wholly present at more than one time; every stage is wholly present at exactly one time. There is a new stage for every moment at which a given thing exists. Given this (surely non-contentious) conception of stages, we can take presentist four-dimensionalism to be the view according to which (i) objects have stages (their smallest temporal parts); and (ii) at any given time, only presently existing stages of objects exist.

According to presentist four-dimensionalism, then, to say that W. V. O. Quine exists (with tensed 'exists') must be characterized as loose talk. What we really mean is that an instantaneous stage of W. V. O. Quine exists. One might feel uneasy about the idea of restricting the inhabitants of the actual world in this fashion to their instantaneous stages. But there is nothing strange here. We also speak of time as if it existed, although strictly speaking, at any given moment, only one of its instants (presently) exists.

What speaks in favor of presentism? First of all, presentism can account for various phenomena which cannot be accounted for on alternative views. For example, classical four-dimensionalism holds that future, present and past stages of objects and events exist on equal terms: what is in the future does not *come into* existence, but is (with tenseless 'is') already in existence. The fact that we only directly perceive things in the present is for such a four-dimensionalist due to our limited cognitive abilities: the difference with respect to the past, the present or the future is not a feature of what is perceived or believed, but only of the way we have of perceiving or believing it.

This, however, entails that nothing could ever have come into existence in a gradual fashion. For consider Stapp's distinction between process time and Einstein time: 'Process time is the time associated with a cumulative process whereby things gradually become fixed and settled. Einstein time is the time part of the space-time continuum of contemporary physics' (1986, p. 264). In contemporary physics, time is taken to be Einstein time. Whenever an observation is made it acquires a place in the space-time continuum. But, as Stapp points out,

whether the data represented in one observation become fixed and settled before or after the data represented in some other observation is not determined by contemporary physics: one can equally well imagine *either* that everything becomes fixed and settled all at once, in some single act of creation, and hence that neither process nor process time exists, *or*, alternatively, that things become fixed and settled in some definite order. (1986, p. 264)

Given a four-dimensional, timeless universe, the space-time geometry must have been fixed and settled all at once in some single act of creation; for if it were settled in some definite order, this would involve a fifth dimension of Stapp-like process time. Accordingly, if we reject presentism, then you and I did not come into existence at a time later than Napoleon or the Big Bang. Rather, if the universe were created at all, then you and me and all its parts, and all the associated events in which these parts are involved, were all created together in some single act of creation.

But if we were all created thus in some single act of creation, that is, if everything is in existence (in some sense of 'is' that is both tenseless and timeless),⁶ then the advocate of the tenseless theory is faced with the problem of accounting for the mundane fact that new perceptions enter and exit our minds in successive fashion at what appear to be always later and later times. What is it that confines our cognitive abilities in such a way that we have no access to the past and the future if there is no present that is different from the past and the future? And why is it that the times at which we can perceive the world appear to be ordered successively?

While the advocate of the tenseless view cannot account for these facts, the defender of presentism can. For, to use Stapp's terminology again, presentism entails that everything exists successively in accordance with process time.

A common objection to presentism is that the thesis that time is Stapp-like process time entails that there must be a rate at which time passes. This again entails that there must be a second kind of time that is static, otherwise the same problem arises for this second kind of time as for the first. This Rate of Passage Argument, which is due to McTaggart, is based on the idea that time is a substance-like something which exists independently of things and events. If time is a substance and time passes, then it makes sense to say that time changes in the same way that other objects such as human beings, trees and planets change. And if time changes, then it must change with some rate.⁷

The view that time is a substance, however, is not the only option we have. Another option is to argue, with Brentano, that time is a mere feature of the successively occurring events in which thing-stages come into and go out of existence.⁸ Time is then inseparable from such events in much the same way that spatial extension is inseparable from each specific patch of color. In other words, it is necessarily the case that if a temporal moment x exists, then there is an entity y which is coming into or going out of existence. The existential dependence here is mutual or reciprocal: a thing-stage's coming into or going out of existence is itself inseparable from time. Given this mutual dependence between time and thing-stages, and given that at any given time the totality of the then existing thing-stages exhausts the totality of what exists, it follows that to say that time passes or flows with some rate must be absurd; for the idea of rate presupposes the existence of something against which that rate is being measured. Time cannot change with any rate for the same reason that a thing-stage's coming into and going out of existence cannot occur more slowly or more quickly than it does in fact occur.

§ 4 Tensed Existential Dependence

One obvious objection to presentist four-dimensionalism might read as follows. If we defend presentism, then we can be realists about only one moment, the actual moment. But this means that we smuggle three-dimensionalism in through the back door. In other words: objects are four-dimensional if they have temporal parts, and in order for an object to have temporal parts, these parts must (surely) exist. On the presentist view, only entities that are *now* wholly present exist. So if Quine is four-dimensional, then it would seem that, on this view, he does not exist. If, on the other hand, he does exist, but only stagewise, then he has no more than three dimensions.

This objection too, I shall claim, rests on the idea that objects must have their temporal parts in the same way that they have their spatial parts. That is: temporal part, like spatial parts, must exist in their entirety. This does indeed hold of those smallest temporal parts which are our successive stages. But it does not hold of temporal parts in general. That this need not be a problem is seen in the fact that events are commonly understood as having temporally extended parts even though these never exist as a whole but only through their successive stages. Similarly, objects, such as you and me, may have extended temporal parts even though these are parts which exist always only in the sense that they unfold themselves, incrementally, through their successive stages.

As Brentano (1976, p. 209) has argued, the temporal stages of an object are dependent for their existence on what just was and what is just about to be. Brentano is here appealing to a more general thesis according to which boundaries are as a matter of necessity dependent entities: they can exist only as parts of larger wholes of higher dimension which they serve to bound. Instantaneous temporal entities, like unextended spatial entities such as points or lines, can exist for Brentano only as parts of higher-dimensional entities. Consider the boundary of a table. The boundary separates the table from its environment, but it does so without having any thickness and without being separable from the table in such a way that it could exist on its own.

If this particular boundary exists, then necessarily the table, or some suitable part of the table, exists. If the table were partially eaten away from the inside by woodworm, then the boundary might well be unaffected thereby. Some finite neighborhood of the boundary must however survive. If the worm ate the entire table from the inside, then there would never be a time when the boundary would stand by itself.

The boundary is thus specifically dependent on this very table or on some suitably extended part. The table itself, on the other hand, is only generically dependent on its boundary. Whenever the table obtains a scratch, or has its surface painted or sanded down, then it obtains a new boundary. In every case, however, it must have *some* boundary that separates it from its surroundings.

The successively existing stages of an object, too, stand in such relations of dependence, and this allows the presentist to make sense of our common-sense intuition to the effect that objects persist through time. The thin temporal slice of you which now exists is a specific boundary of a temporal sort. This, like every other boundary, cannot exist by itself, but only *as* the boundary of that which it bounds – in this case of what just was and of what is about to be. The past, on this view, is connected to the future via the thin boundary which is the present moment, and the latter cannot exist independently of an extended past stage for the same reason that the end of a horserace cannot exist independently of the race of which it is a part. Each present temporal slice is simultaneously both a coming into existence of a future stage and a going out of existence of a past stage; it is thus not temporally extended in the way that it is spatially extended. To see how this can be, imagine a cone in space. Suppose that God destroys this cone, slice by slice, until he approaches ever closer to its apex. Then, however, when he reaches the apex he continues his journey by slowly creating a second, exactly symmetrical cone in a slice-by-slice fashion that is the mirror-image of his earlier process of destruction. There would then be an instant at which only one point exists. This is, intuitively, the point at which the

two cones meet, even though there is never a time when the two cones enjoy a simultaneous existence. For the presentist, it is as if the world as a whole is in this manner simultaneously destroyed and recreated anew with each successive passing instant.

§ 5 The Problem of Change and Persistence

How does presentist four-dimensionalism offer a solution to the problem of change? Consider the true statement ‘Aristotle was a teacher at 2 p.m. on the 15th of March, 347 B.C.’ and the false statement ‘Aristotle was a teacher at 2 p.m. on the 15th of March, 390 B.C.’ To say that a change has here taken place is to say that there was a time at which Aristotle had the property of being a teacher and there was a time at which Aristotle did not have the property of being a teacher. On the classical four-dimensionalist view, an object does not gain or lose properties; rather, different properties are possessed by different temporal stages. This is so on the presentist account, too, but with the added proviso that the only stages that exist are present stages. This then allows us to acknowledge that the coming into existence of a new stage with a different non-relational property is a real change—and this in a way that captures our most basic intuitions according to which a change has taken place if the object stage that presently exists has different properties from those that existed previously. We can define this more precisely as follows:

a change of x has taken place =: (i) there is an entity z which is a present stage of x ; and (ii) there was an entity y which was a previous stage of x ; and (iii) z has a different set of non-relational properties than y had.

The verbs here are in every case tensed and the properties in question must in every case be non-relational. The mere coming into existence of a temporal stage is not sufficient for a change to have taken place: it must involve further the coming into or going out of existence of a non-

relational property, a property such as being black, having ten fingers, being square, being bent or straight (as contrasted with relational properties such as being such that Clinton is President, being identical to Quine, being located at a given time).⁹

§ 6 Persistence Through Time

I will now offer an argument why both presentist and classical four-dimensionalism are to be preferred to three-dimensionalism. It is an embarrassment for a theory if it cannot provide acceptable identity conditions for the entities whose existence it asserts. It is the identity of an object that makes sense of our applications to it of the same name on different occasions. This is the main problem facing three-dimensionalism: how to provide an answer to the question of what secures identity through time given that objects can gain and lose (perhaps all) their parts.

Suppose the three-dimensionalist argues that objects are identical if and only if they have the same parts. She must then accept that objects cease to exist if they gain or lose parts. This view—which is a consequence of classical extensional mereology—has come to be associated with Chisholm under the heading of ‘mereological essentialism’. Chisholm defends the thesis that all parts of an object are essential to that object. As he puts it:

for any whole x , if x has y as one of its parts then y is part of x in every possible world in which x exists (1973, pp. 581 f.)

Mereological essentialism requires in effect, that all parts of an object are essential parts; that is, it implies the principle that if y is ever a part of x , then y is a part of x at every time at which x exists. If an object loses a part, however small, it ceases to exist. A particular table ceases to exist if it loses a single molecule. Mereological essentialism has thus been criticized for being in conflict with our ordinary intuitions.¹⁰

If the three-dimensionalist accepts Chisholm’s principle of mereological essentialism, then she cannot account for the fact that common-sense objects persist through change, save,

perhaps, by arguing that persistent objects are something like logical constructions out of momentary objects. It might seem that we can solve the problem of persistence through change by formulating mereological essentialism differently. Consider, to this end, the principle of mereological *extensionalism*, which underlies Chisholm's thesis. This states that two objects are identical just in case they have the same parts. There are, when it is transtemporal identity which is at issue, different readings of this principle depending on how we read the tenses. On one reading, mereological extensionalism as applied to objects existing at different times states that x and y are identical just in case x now has the same parts as y once had. This, of course, would make Quine today and Quine as child non-identical. On a second reading mereological extensionalism states that x and y are identical just in case x once had the same parts as y and y will have the same parts as x . On this reading Quine preserves his identity, since Quine as child was already such that he would go on to have the same parts as Quine as adult. Mereological extensionalism then states that x and y are identical iff at each time at which x and y exist, x has the parts y has and *vice versa*. Note that this principle can only account for the self-identity of objects at a given time; it is not applicable to objects across time; about these it provides us with no information.¹¹ Quine as child might for all we know go on to become Chisholm as adult.

The three-dimensionalist is now confronted with a dilemma. If she accepts the first reading of mereological extensionalism, then she cannot do justice to the fact that the three-dimensional objects in which she believes can gain and lose parts over time. If, on the other hand, she embraces the second reading, then she is left with no criterion for the identity of three-dimensional objects from one time to the next. Spatio-temporal continuity, it is now widely accepted, will not serve to provide the needed criterion (thus it faces problems, for example, in the case of fission as this occurs in cell mitosis).¹² Haecceitism, too, is fraught with difficulties, since it proposes to explain the identity through time of concrete particulars by positing further items in such particulars which must themselves be identical through time. Castañeda (1975, pp.

136-137) has argued that individuation by means of an unknowable individuator that makes two entities identical or distinct requires not only an account of the individuator, but also an account of the way in which the individuator is related to the individual it individuates. Haecceitism fails this task also, since it provides no answer to the question of how haecceities are related to the general properties of the particulars whose individual essences they are. Simons (1994) has defended what he calls the ‘nuclear theory’—an alternative to haecceitism which meets Castañeda’s challenge. Substances, on this view, have an inner bundle of essential tropes tied by strong ontological dependence and an outer bundle of tropes some of which have to be of a certain type and some of which are optional. The inner nucleus of essential tropes can, then, serve as the individuator of the bundle in light of the fact that no two exactly similar tropes are identical. But what, then, explains *their* persistence over time? And what, if not haecceities, can do the job of ensuring that two exactly similar tropes or trope-bundles are distinct?

Fortunately, however, there is in fact no need to adopt any of these various solutions to the problem of persistence. For with the four-dimensionalist approach to objects, on both its classical and its presentist readings, the problem of persistence disappears. This is because the four-dimensionalist can accept the view that, for any objects, there is a mereological fusion of those objects. And if this fusion principle is accepted, then it follows, as Sider has it, that

any set of stages has a sum, even sets of stages that aren’t unified in any particularly interesting way. The world is therefore populated by a host of continuing space-time worms, of which we name, think of, and quantify over a small minority. The predicate ‘person’ applies perhaps to worms that are psychologically united in a certain way. (1999b, p. 9)

A fusion of stages is unlike Chisholm’s logical construction of objects as *entia successiva*. For on Chisholm’s account, objects can endure through small amounts of time provided only that they do not gain or lose parts. On the view that objects are fusions of stages, in contrast, objects

can survive the gain and loss of myriad parts, but their stages do not endure from one moment to the next, and this is so even if no change takes place at all.

There is still the problem of explaining what makes good worms better than bad. What makes the worm that is Quine, or my kitchen table, a better worm than the one that consists of the morning stages of Quine and the evening stages of my table? Intuitively, bad worms are gerrymandered entities, good worms are spatio-temporally connected entities that are bounded by genuine or bona fide boundaries. The good worms track just the three-dimensional objects in which the three-dimensionalist believes.

Unlike the three-dimensionalist, however, the four-dimensionalist escapes the problem of needing to explain how objects can gain and lose parts without thereby ceasing to exist. The presentist four-dimensionalist can then go still further by reformulating the principles of mereology in their tensed versions. She then has at her disposal an identity criterion for four-dimensional objects, which can be formulated very simply as follows:

x is identical to y := x has, had and will have the temporal stages y has, had and will have.

The fact that the parts of everyday objects are not simultaneously in existence and that some of these parts are never in existence in their entirety poses no threat to the identity criterion as thus formulated. One might here object that the given identity criterion does not hold if two objects might have switched around their stages in such a way that a stage that is part of x at t becomes part of y at t' and a stage that is part of y at t becomes part of x at t' . This, however, is impossible, since (as already mentioned) a stage cannot exist at more than one time. It is as if each stage comes ready stamped with its own specific temporal label or mark.

Our thus taking tense seriously brings with it a further advantage of the presentist account. If the principle of mereological extensionalism is applied to four-dimensional objects classically conceived, then it entails that they could not have failed to have the parts they in fact have. For on the assumption that Quine is a certain sum of temporal parts, it seems to be impossible for him to die before or after the date of his actual death: the occurrence of his death at some definite yet unknown time in the future exists tenselessly.¹³ On the presentist version of four-dimensionalism, in contrast, while persons could not have had parts different from those they in fact had and now have, it is not already now determined what stages a person will have in the future. This is because the future stages of four-dimensional objects are not already now (or in any other sense) in existence. For example, it is not already now determined whether or not Gloria will cut her hair on June 15, 2005 and so will obtain a property which she will not obtain if she does not cut her hair. This is clearly an advantage compared to the view that all future stages of an object exist tenselessly.

One final advantage of the presentist version of four-dimensionalism turns on its account of persistence. A thing can undergo real change, in the commonly accepted sense, only if there is underlying real persistence. No real change occurs at noon in a gerrymandered four-dimensional whole—call it Quinetable—which consists of the morning stages of my table fused together with the afternoon stages of Quine. But such a change does occur when my table changes temperature at noon, for there is here (as we commonly conceive matters) a single object which underlies the alternation of properties unfolding in time. The noon-stage of Quinetable is in fact two noon-stages, one the last morning stage of my table, the other the first afternoon stage of Quine. The two are not linked together at all, except as a result of our fiat. The noon-stage of my table, in contrast, stands in relations of existential dependence to the table as it exists in the adjacent times. It is this feature of the stages of enduring objects which allows the presentist to recognize a category of genuine change in objects of this sort, change which is not merely such as to occur

in time, as a phenomenon of temporal unfolding, but also such as to occur against a background of persistence.

§ 7 The Objection from Special Relativity

I should like to conclude by considering an objection frequently raised against presentism, namely that it is incompatible with the special theory of relativity.¹⁴ The argument begins with the observation that the notion of simultaneity, and thus of the present moment, is not a notion with any univocal application, since what is simultaneous depends on the motion of the relevant observer. Consider an event E that is past relative to our spatio-temporal location—or in other words, to our Here-Now. According to presentism, E is not present and therefore it does not (now) exist. However, there could be some observer who is in motion relative to us. In the inertial frame in which this observer is at rest, E *is* simultaneous with us in the Here-Now. The moving observer presently exists in our frame of reference, but not E. E does, on the other hand, presently exist in the frame of reference of that other observer. Since we and the other observer co-exist, and the event E and the other observer co-exist, it must follow (so the objection goes) that we and the event E co-exist. Thus, the event E both exists and does not exist in our Here-Now, which shows that presentism cannot be reconciled with the relativity of simultaneity.¹⁵ Given special relativity, the opponent might argue, the very notion of the present is incoherent. All things co-exist.

This argument rests, however, on the thesis that co-existence or co-presence is transitive,¹⁶ but it is just this that is denied by the special theory. The special theory rests on the principles that no signal is faster than light and that light travels with a finite velocity which is independent of the velocity of its source. Thus, there are spatio-temporal locations from which no signal can reach our spatio-temporal location, and to which no signal can be transmitted. In special relativity, events at these distant locations are said to have a spacelike separation from a

given spatio-temporal location. When two events have a spacelike separation, then there is no longer any meaning to the question of whether or not they are simultaneous. So the notion of a single present when all things would co-exist is incoherent. This last point seems to imply that we need to reformulate what presentism says. Since the notion of a single present is meaningful only if two events do not have a spacelike separation, let us then restrict presentism to frames of reference, or in other words to world-stages in which no two events have spacelike separation. Presentism then says that in any frame of reference, only the presently existing instantaneous stages of objects exist. On this view, there is no absolute frame of reference and no four-dimensional space-time geometry which would exist in its entirety when viewed from some 'atemporal perspective'. There is then also, to use Stapp's terminology, no Einstein time. Rather, the world-stages, the successive totalities of all what exists, are relative to frames of reference. And each constitutes its own process time, the scene of real change in an ultimate reality which consists in a succession of passing stages.

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NOTES

1. See e.g. Oderberg (1993, p. 106), Quine (1960, pp. 171ff), Lewis (1983, vol. 1, Ch. 5), Heller (1990) and Casati and Varzi (1999, p. 184).

2. Lombard (1986, p. 128), for example, argues that accepting four-dimensionalism entails that objects do not change. He takes this to be a *reductio ad absurdum* against the thesis that objects have temporal parts.

3. One objection to four-dimensionalism is that a property turns out to be possessed, not by the object itself, but by one of its stages. As Hinchliff puts it, in discussion of a changing candle, 'If

the candle never has the shapes itself, it cannot change *its* shape' (1996, p. 120). I will not here be concerned with these criticisms of four-dimensionalism. See Sider 1997, 2000.

4. See e.g. Zemach (1970, p. 231 f.).

5. For a recent defense of presentism, see Sider (1999a).

6. If a temporally extended object exists tenselessly, then it has temporal parts which are temporally ordered by being located at different times (times which need not include the present). If a temporally extended object exists timelessly, then it exists by having temporal parts that are not temporally ordered (its temporal parts have no particular temporal location). See Sider (1997).

7. See Markosian (1993).

8. See Brentano (1976, pp. 101, 215).

9. In general, we can define a non-relational property as follows: P is a non-relational or intrinsic property if it satisfies: (1) it is possible for P to be possessed by a given object even if that object were the one and only object in the world; and (2) it is possible for P to be possessed by two disjoint objects at the same time. The property of being such that Clinton is President violates the first condition. The property of being identical to Quine violates the second condition. See Vallyentyne 1997.

10. See e.g. Plantinga (1975) and Wiggins (1979).

11. Something similar holds for Leibniz's law. On one reading, Leibniz's law states that objects are identical if, at each time, they have all the same properties. But this does not provide a criterion of identity *through* time in a way which does justice to the fact that objects change.

12. On the problem of fission, see e.g. Hirsch (1982) and Lewis (1983, p. 61).

13. See van Inwagen (1990).

14. See e.g. Sklar (1981) and Putnam (1967).

15. See e.g. Sklar (1981).

16. □apek has on several occasions provided arguments against the thesis that the special theory rebuts presentism. See e.g. his (1975). See also Hinchliff (1996, pp. 129ff.) and Rea (1998, pp. 226ff.).