IS ENDURANTISM REALLY MORE PLAUSIBLE THAN PERDURANTISM FROM A COMMON-SENSE PERSPECTIVE?

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Abstract

I will discuss three arguments in favor of perdurantism, the thesis that objects persist by having temporal parts located at different times. Firstly, I will introduce the rival accounts of persistence of perdurantism and endurantism. Then I will discuss three arguments for perdurantism: the problem of temporary intrinsics, the argument from vagueness and the argument from Special Relativity. I will conclude that none of them represents a knock-down argument for perdurantism. However, endurantism faces important difficulties in offering its solutions to the issues at stake, and the solutions proposed are often at odds with commonsense. Therefore, if one of the main problem for perdurantism is its being at odds with commonsense, endurantism is in no better position with respect to this issue.

Keywords: *persistence; endurantism; perdurantism; temporary intrinsics; vagueness.*

¿Es realmente más plausible el endurantismo que el perdurantismo de acuerdo con el sentido común?

Resumen

En este artículo discutiré tres de los principales argumentos a favor de que los objetos persisten al tener partes temporales ubicadas en diferentes momentos. A este punto de vista se ha denominado perdurantismo. En la primera sección, presentaré dos teorías rivales de la persistencia, el perdurantismo y el endurantismo. A continuación discutiré tres argumentos a favor del perdurantismo: el argumento a partir de los intrínsecos temporales, el argumento de la vaguedad y el argumento de la relatividad especial. Concluiré que ninguno de estos argumentos es conclusivo a favor del perdurantismo, pero mostraré que el endurantismo enfrenta dificultades importantes para ofrecer sus soluciones a los problemas relevantes, y que las soluciones propuestas son a menudo en desacuerdo con el sentido común. En consecuencia, si uno de los principales problemas para el perdurantismo radica en su desacuerdo con el sentido común, el endurantismo no está en una mejor posición.

Palabras clave: *persistencia; endurantismo; perdurantismo; intrínsecos temporales; vaguedad.*

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IS ENDURANTISM REALLY MORE PLAUSIBLE THAN PERDURANTISM FROM A COMMON-SENSE PERSPECTIVE?[1]

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Introduction

There are two main rival accounts of persistence over time. Endurantism is the thesis that objects persist by being wholly present at any time of their existence. Perdurantism is the thesis that objects persist by having temporal parts dislocated among the spans of time in which they exist.

Endurantism seems to be the view most favored by commonsense, whereas perdurantism and the metaphysics of temporal parts have been criticized by many. Among these, Thomson (1983, p.210) defined it as "crazy metaphysics – obviously false", while Van Inwagen claimed of temporal parts: 'I think that no one understands what they are supposed to be, though of course plenty of philosophers think they do' (Van Inwagen 1981, p. 90). However, never mind how peculiar perdurantism and the metaphysics of temporal parts might sound, perdurantists believe that there are very good arguments supporting their view.

In this paper, I will discuss three of the main arguments in favor of perdurantism: the problem of temporary intrinsics (Lewis 1986, Sider 1997, 2001), the argument from vagueness (Sider 1997, 2001, and 2008), and the argument from Special Relativity (Putnam 1967, Dorato 2013).

I will conclude none of such arguments constitutes a knock-down argument in favor of perdurantism. Indeed, endurantists can reply to any of these arguments by proposing different solutions to the issues at stake. But what emerges from the discussion is that endurantists certainly face important difficulties in offering their own solutions, and that many of these solutions appear to be as much in conflict with commonsense as perdurantism is. Thus, if one of the main problem for perdurantism consists of its being at odds with commonsense, endurantism is in no better position with respect to this issue.

Perdurantism and Endurantism

There are two very different ways of thinking about time and the structure of reality that derives from it. Presentism is the thesis that only the present time is real. Fourdimensionalism is rather the thesis that past, present, and future are all equally real; and that time is a fourth dimension – analogous to the three dimensions of space – along which reality extends. These two different accounts of time and reality are generally associated with two contrasting accounts of persistence. Presentism is usually (but not always[2]) associated with endurantism, whereas fourdimensionalism generally (but not always[3]) goes hand in hand with perdurantism, and many philosophers define fourdimensionalism in conjunction with perdurantism[4]. A good introduction to these two different accounts of persistence can be provided by following the characterization of them provided by Lewis:

> *Something perdures iff it persists by having different temporal parts, or stages, at different times, though no one part of it is wholly present at more than one time; whereas it endures iff it persists by being wholly present at more than one time. Perdurance corresponds to the way a road persists through space; part of it is here and part of it is there, and no part of it is wholly present at two different places. Endurance corresponds to the way a universal, if there are such things, would be wholly present wherever and whenever it is instantiated. Endurance involves overlap: the content of two different times has the enduring thing as a common part. Perdurance does not* (1986, p. 201)

Let's discuss these two views in order. First, Perdurantism. Perdurantism is the thesis according to which objects persist by having temporal parts located at different times of the objects' existence. In this sense, objects can

[2] *E.g.*, Brogaard (2000) argues that presentism is compatible with perdurantism.
[3] *E.g.*, Parsons (2000) defends fourdimensionalism while rejects perdurantism.
[4] Among these, *e.g.,* Sider (1997) and Jackson (1998).

be though as "spacetime worms", which extends through space by having different spatial parts, and also through time by having different temporal parts located at different times. Following the analogy that Lewis draws with the road, all temporal parts are located along the fourth dimension of time, one at any of the times covered by the existence of a considered object. They might be more or less distant from a considered time of reference, they can be far in the past, or in the future, but this does not make them less real than all the parts that are accessible to us at any present time. In the end, we would not say that what is located at the end of a road we are on is not real only because it is far from us.

Moreover, as well as no proper part of an object coincides with the whole object to which it belongs, none of the temporal parts of an object coincides with the whole object itself. Indeed, the object is bigger than all its parts at least in its temporal dimension[5]. To clarify this, consider the following example. Consider a person along the duration of her whole life. At first sight, such person as a newborn and such person as an old woman do not share many characteristics. Despite this, we might be likely to think that she as a newborn and she as an old woman are one and the same person. Indeed, those who endorse the perdurantist account of persistence would say that the newborn and the old woman are both temporal parts of the same person, for any stage of a person's life corresponds to a temporal part of her; where the extension of a person along the fourth dimension is certainly bigger than the one of any of her temporal parts.

Furthermore, temporal parts might have spatial parts, just as spatial parts might have temporal parts (Loux 1998). A temporal part of a person at a time *t* might be a newborn. Such a newborn obviously extends through the three spatial dimensions, by having, let us say, her feet around nineteen inches distant from her head. Analogously, the spatial parts of a person also have temporal parts. A person grows and gets older over time. She grows teeth as a child, and wrinkles when she gets older. Teeth and wrinkles are not part of a person along her whole life; that is, their extension along the temporal dimension does not completely overlap with the extension of the whole person along the same dimension. Furthermore, the spatial parts of a person also change over time. For instance, wrinkles become deeper. This means, wrinkles also have temporal parts, and some of the temporal parts of them are deeper than others[6]. And, it might also be possible that just as each spatial part of a person could be divided into smaller spatial parts, each

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[5] Unless we believe in instantaneous objects.

[6] A clearer example might be provided by taking into consideration, *e.g.*, bones. Bones may survive for long time after a person's death. This means, they persist longer than the

temporal part of that person – and of her spatial parts – could be divided into smaller temporal parts[7]. The more these temporal parts are close to one another along the temporal dimension, the more they might be qualitatively similar to each other.

It might finally be possible that temporal parts could be divided as many times as to obtain instantaneous temporal parts. However, this matter is very controversial and not all perdurantists commit themselves to the existence of instantaneous temporal parts. Heller (1984), for example, remains neutral on the question. By contrast, Sider (2001, p.67) claims: 'I define temporal parts as (mereologically) large enough parts that are instantaneous, but perhaps the definition should require that temporal parts be *essentially* instantaneous'. But whether or not temporal parts can be instantaneous is of no import for most of the arguments in favor of perdurantism.

Finally, Endurantism. Roughly speaking, endurantism is the view according to which objects persist by being wholly present at any time of their existence. A person that exists at some times t_1, t_2,..., t_n exists at each of these times in all her entirety. That is, saying that she exists at t_1 simply means that she exists at that time, and not that one of her temporal parts does. Indeed, endurantists deny that objects have temporal parts. According to endurantists objects are three dimensional, extend through space, and endure through time. And at any time in an interval throughout which an object endures, such an object is numerically identical with itself. Following Loux (1998), expressions such as 'The Loux of yesterday' and 'The Loux of today' both denote a single concrete particular, for persistence is conceived as 'the numerical identity of one thing existing at one time with a thing existing at another time' (Loux 1998, p.231). That is, Loux is numerically identical with himself at any time of his existence.

Now that the two contrasting views of endurantism and perdurantism have been introduced, we can proceed by discussing some of the arguments in favor and against either view. Since the view most favored by commonsense is (at least apparently) endurantism – for it does not require any strong departure from the commonsense conception of time and parthood – I will focus on the arguments that support the more radical view of perdurantism, and I will discuss some of the counterarguments that endurantists provide against this view. I will conclude that some of these counterarguments do

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whole body of the person to which they belong, and this in virtue of the fact that they have temporal parts located even after the person's body ones along the fourth dimension.

[7] This is we consider time to be *dense* or *continuous*. However, fourdimensionalists are not necessarily committed to say that time is dense, for it might be *discrete*, i.e., that for any instant there is a next instant and an immediately preceding instant (Shoemaker 1969, p.376).

not put endurantism in a better position than perdurantism as long as the problem of being at odds with commonsense is concerned.

The Problem of Temporary Intrinsics

One of the main arguments in favor of perdurantism relies on the possibility for such an account of persistence to offer a solution to the problem of temporary intrinsics. Let us introduce the problem as presented by Lewis:

> *Persisting things change their intrinsic properties. For instance shape: when I sit, I have a bent shape; when I stand, I have a straightened shape. Both shapes are temporary intrinsic properties: I have them only some of the times. How is such change possible?* (1986, p. 203-204)

The solution favored by Lewis appeals to the existence of temporal parts. Following his reasoning, different temporary intrinsics belong to different things; namely, to different temporal parts of the same person. Accordingly, the property of being bent-shaped belongs to some of Lewis's temporal parts, just as the property of being straight-shaped belongs to other temporal parts of him. One reason for favoring this solution, also pointed out by Sider (2008) is that it seems *prima facie* to avoid entering in conflict with Leibniz's Law:

(LL) For any x and y, if x is identical to y, then x and y have all the same properties:

$$\forall x \ \forall y [x = y \rightarrow \forall P \ (Px \leftrightarrow Py)]$$

For the perdurantists might say that Lewis bent-shaped and Lewis straight-shaped are two different objects, in virtue of the fact that they have different intrinsic properties at different times.

According to a first formulation of the challenge, instead, endurantists are committed to contradict (LL) for they claim that objects are numerically identical with themselves over time, despite the fact that they change their (intrinsic) properties.

However, as Sider (2008) claims, this argument is not satisfying. The reason why it is so becomes clear if we assume a "timeless perspective" of reality. Indeed, the property of being bent-shaped and the property of being straight-shaped belong to the very same person; namely, to Lewis. What must be specified, then, is that such properties belong to Lewis at different times: Lewis is bent-shaped, *e.g.*, at t_1, and he is straight-shaped, *e.g.*, at t_2.

But by elaborating this argument, Sider notes, another argument in favor of temporal parts emerges.

If we consider, indeed, the properties that an object has from the timeless perspective, such properties can be seen as temporally indexed properties; *i.e.*, properties that an object has in relation to times. The advantage that those who endorse perdurantism have over those who deny the existence of temporal parts is that temporal parts – by existing only at a single time – can have non-indexed properties. In this sense, then, objects considered in their whole temporal existence have temporally indexed properties, but the temporal parts of which they are constituted have non-indexed properties: they have them *simpliciter*.

On the contrary, those who deny the existence of temporal parts are committed to say that properties such as 'being bent-shaped' or 'being straight-shaped' are all fundamentally indexed properties. This also means that these properties are not intrinsic properties, but are rather *relational*; they are relational in the sense that they are relations to times. The reason why we might not want to commit ourselves to the claim that all properties are relational is that there is a clear sense in which properties such as 'being bent-shaped' and 'being straight-shaped' are different from other properties that certainly are relational. Consider, for instance, the property of being-a-sister. Having the property of being a sister necessarily depends on the existence of another person; namely, on the existence of another daughter or son born from the same parents. In other words, there is no such thing as "being a sister *per se*", for a sister in necessarily a sister of another person. The problem of reducing properties as 'being bent-shaped' and 'being straight-shaped' to relational properties, then, is that this move levels the distinction between this kind of properties and all those properties that are commonly regarded as genuinely relational – such as 'being a sister' – and that are intuitively very different in their nature.

However, as I see it, an essential distinction between "genuinely relational properties" such as being-a-sister, and properties such as being straight-shaped might still hold. Indeed, whereas in the first case the property in question exists in relation both to time and to another individual, in the latter case the property would exist simply as in relation to time. Tentatively, a possible solution might be to distinguish then between different kinds of relations and to categorize the properties that an object can have on the basis of its possibility to have such properties in relation either only to times, or also to other objects or individuals. I find this solution quite appealing, although it requires the acceptance of the claim that all properties are relational, which implies itself an important departure from our way of

conceiving properties. And, as long as the plausibility from a commonsense perspective is at stake, such a departure might constitute a good reason to reject this alternative.

Another possible solution to the problem of temporary intrinsics discussed – and also discarded – by Lewis (1986)[8] is to say that the only intrinsic properties that an object has are those properties that it has at the present time, and that other times do not exist at all. That means, all existing objects would exist in the present, and past and future times would be all equally unreal.

Lewis rejects this argument because, according to him, it goes against what is commonly believed, for 'No man, unless it being the moment of his execution, believes that he has no future; still less does anyone believe that he has no past' (Lewis 1986, p. 204). This argument has not been developed in any depth by Lewis. However, the acceptability of the claim that no one would believe that he has neither future, nor past, might be more controversial. It depends, for example, on what is meant by having a past or a future, and on what it means that all times, except the present one, do not exist. Very much might depend on what is meant by the existence of other times. For, surely not many would be likely to say that their past and their future are both as real as their present is; or – generalizing – that the times of dinosaurs and future civilizations exist in the same sense in which the present time does. Plausibly, a more specific characterization of existence and reality would be required in order to provide a better evaluation of this possible solution to the problem of temporary intrinsics.

However, many arguments[9] against the unreality of past and future times – that is, against presentism – as well as replies to these arguments[10] have been discussed in the literature of the Philosophy of Time. I will partly discuss this issue in the fourth section of this paper, together with the argument from Special Relativity.

Finally, a further alternative that endurantists might embrace to solve to problem of temporary intrinsics consists of saying that properties are tensed[11]. Following this solution, properties would not be relations to time, but they could still be intrinsic. Yet, one and the same object x may once have had a property F, but no longer has it. This would not imply that only the present time exists, nor that the only properties that an object has are those that it instantiates at the present time. Going back to Lewis's example, assuming that Lewis-in-the-past is numerically identical with Lewis-in-the-present,

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[8] But supported by Merricks (1999), as we will see in the last section of this paper.
[9] See *e.g.* Sider (2001) for discussion.
[10] See *e.g.* Markosian (2004) for discussion.
[11] I wish to thank Sven Rosenkranz for pointing out this alternative.

endurantists may say that, in the past, it was the case that Lewis was bent-shaped; but, in the present, it is no longer the case that Lewis is bent-shaped, for he is straight-shaped[12]. Having been bent-shaped and being bent-shaped are not incompatible. Indeed, the fact that Lewis has been bent shaped in the past does not imply that Lewis *presently* is bent shaped in the past.

A first thing to notice regarding this solution is that, even though it allows that not only the present time exists, it seems to draw an important distinction between the way the present time exists and the way past and future times do. Indeed, following this reasoning, it becomes misleading to claim that 'past, present, and future times are all *equally* real', for only what is present can be concrete. Roughly speaking, there is no bent-shaped Lewis presently physically located in the past. Rather, the notion of existence of past and future times to which this solution appeals is a very weak one. That is, saying that objects in the past exist, simply means that it is possible to quantify over them[13].

However, this solution faces an important difficulty when considered within a relativistic framework, for it presupposes that the present time has a privileged existence with respect to past and future times. But, as we will see in more detail in the last section of this paper, one of the consequences of Special Relativity is exactly that it is no possible to determine in any absolute sense what is present, for what is present for an observer depends on the observer's frame of reference. Therefore, if only what exists in the present can be concrete, then it is not possible to determine in any absolute sense what is concrete.

The Argument from Vagueness

A second, and more recent, argument in favor of perdurantism is the argument from vagueness (Sider 1997, 2001, and 2008). I will introduce this argument by discussing first a famous case in which vagueness occurs and showing how perdurantism might help to solve this case: the case of The Ship of Theseus, discussed in Sider (2001).

Consider The Ship of Theseus, made of planks. Imagine that one starts to replace all planks, one by one, with other similar ones. Most of us would agree that The Ship of Theseus would survive the replacement of a single plank. (Let's call the ship obtained after one replacement 'Ship$_1$', Ship$_1$ after a further replacement 'Ship$_2$', and so forth.) The ship that we finally obtain by

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[12] This supposing for a moment that Lewis still exists in the present, and that he now has the property of being straight-shaped.

[13] A definition of existence that would be in accord with solution would be, e.g., $\exists x \, (x = m)$. And such definition is in no way committal to the claim that what exists is concrete.

substituting one plank per time does not share any plank in common with the original Ship of Theseus. Following Sider, let's call this ship 'Replacement'.

Despite the fact that many of us would not agree that Replacement is identical with The Ship of Theseus, this is what we would be committed to say if we were to apply the Principle of Transitivity of Identity (if $x = y$, and $y = z$, then $x = z$) and together to accept that The Ship of Theseus survives the replacement of a single plank, and so does any ship obtained at any stage of the process. To clarify this, consider the following statements of identity (Sider 2001, p.7):

The Ship of Theseus $= Ship_1$

$Ship_1 = Ship_2$

$Ship_2 = Ship_3$

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$Ship_{n-1} = Ship_n$

$Ship_n = Replacement$

Now imagine further that all planks removed from The Ship of Theseus were reassembled together into a new ship. Following Sider again, let's call this ship 'Planks'. We might want to say that The Ship of Theseus and Planks are identical with one another, for they are made of the same exact planks. The situation, indeed, seems analogous to a situation in which an object is simply disassembled and reassembled again exactly as it was before. We arguably would not say that disassembling and reassembling an object (as it was before) would create a new object. However, accepting this claim would bring about an important problem. And this is so, again, for the transitivity of identity. Following such principle, indeed, we would be committed to say that, despite the fact that they do not seem to share any relevant characteristic, Planks and Replacement are also identical with each other. In fact, if The Ship of Theseus is identical with Replacement for the transitivity of identity, and Planks is identical with The Ship of Theseus for they are made of the same exact planks, then Planks must also be identical with Replacement. But this does not seem to be the case.

Which is, then, the ship that really is identical with The Ship of Theseus? According to Sider (2001), an answer can be provided by accepting both fourdimensionalism – and the metaphysics of temporal parts – and the Principle of Unrestricted Mereological Composition, according to which every class of objects has a fusion, or mereological sum, *i.e.*, a larger object of which these objects are constitutive parts.

Before discussing Sider's solution, a clarification about the terminology employed by Sider might be needed. Indeed, Sider does not make any distinction between fourdimensionalism and perdurantism; for, as he defines it, fourdimensionalism comprises the metaphysics of temporal parts:

> *As I see it, the heart of four dimensionalism is the claim that the part-whole relation behaves analogously with respect to time as it does with respect to space: just as things have arbitrary spatial parts, they likewise have arbitrary temporal parts. When applied to space, the idea that things have arbitrary parts means, roughly, that for any way of dividing the region of space occupied by a given object, there is a corresponding way to divide the object into parts which exactly occupy those regions of space. Applied to time, the idea is that to any way of dividing up the lifetime of an object into separate intervals of time, there is a corresponding way of dividing the object into temporal parts that are connected to those intervals of time* (Sider 1997, p.7)

In this, Sider's definition of fourdimensionalism is not limited to the conception of time as a fourth dimension along which reality extends and to the claim that past and future times are as real as the present time is (that is how I defined fourdimensionalism in the beginning of this paper), but it also comprises what I defined as perdurantism: the claim that objects have temporal parts just as they have spatial parts[14].

Following his definition of fourdimensionalism together with the principle of unrestricted mereological composition, we can see the fourdimensional world as a world of stages, whereas any set of these stages has a mereological sum. Among these mereological sums there are the spacetime worms that correspond to ordinary objects according to the perdurantist picture of reality. But accepting that *any* set of stages has a mereological sum means to accept that any set of stages (no matter how scattered and apparently unrelated) is part of a larger object of which those stages are constitutive parts. And this despite the fact that we usually do not name, think of, or quantify over all of them: 'The world is therefore populated by a host of continuing spacetime worms, of which we name,

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[14] Noteworthy, if might be though that Sider's definition of fourdimensionalism simply *is* the view that I called 'perdurantism'. But when I characterized perdurantism I specified that such an account of persistence is usually, *but not necessarily*, associated with fourdimensionalism, for some philosophers (see e.g. Brogaard 2000) defend the view that perdurantism could also be consistently associated with presentism. Indeed, I would say that Sider's definition of fourdimensionalism is not the same as the one of perdurantism, but rather that it is a definition that binds together what I characterized as fourdimensionalism with what I characterized as perdurantism.

think of, and quantify over a small minority' (Sider 2001, p.8). Going back to the question of whether Planks or Replacement is identical with The Ship of Theseus, then, we could say that there is a spacetime worm corresponding to *each* answer. This can be explained as follows.

Since each set of stages constitutes a spacetime worm, there can be a spacetime worm that traces any stage of the replacement process (Sider calls this "The Replacement Worm"). But there can also be a spacetime worm that traces the planks of the original Ship of Theseus at any of their stages (Sider calls this "The Original Planks Worm"); and it is co-located with The Ship of Theseus at the beginning of the process, and with Planks at the end of the process. These two spacetime worms, then, are two spacetime worms sharing some of their temporal parts[15]. Whether Replacement or Planks is identical with The Ship of Theseus, indeed, depends on which is the spacetime worm that we intend to refer to by means of the expression 'The Ship of Theseus', which plausibly reflects our concept of 'ship'. If we are referring to the spacetime worm that traces the planks of the original ship, we might want to say that it is Planks that is identical with The Ship of Theseus. Rather, if we are referring to the spacetime worm that traces the continuity in the ship's shape, we might want to say that is Replacement that is identical with The Ship of Theseus. Perhaps our concept of 'ship' does not emphasize sameness of planks, or perhaps it is part of our concept of 'ship' that ships must retain the same planks.

However, these two are not the only spacetime worms that might be co-located at some time at which they co-exist with The Ship of Theseus. There might be, *e.g.*, a spacetime worm which traces all the planks utilized for the replacement even before they are used to fill up the empty spaces left after the removal of the original planks. Or there might be a spacetime worm which comes into existence only when the original and the replacing planks are equally mixed up. These spacetime worms are not very likely to be taken into account, but this is so because we tend to trace objects

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[15] Analogous considerations might apply to another argument in favor of temporal parts, that is, the argument from cohabitation, discussed – among others – by Heller (1984). In brief, imagine a situation in which a lump of clay is modeled into a statue. A lump of clay and a statue have very different properties. It seems, however, that the statue and the lump of clay come to coincide at the time in which the statute is created. How can two different objects, with very different properties, occupy the very same location at the very same time? The endurantists' answer that the lump of clay and the statue wholly coincide when the statue comes into existence contradicts both Leibniz's Law and the Lockean Principle of Identity, according to which two objects occupying the same location at the same time are identical with each other. Perdurantists, instead, may solve this issue by saying that the two objects simply are two distinct objects sharing some, but not all, of their temporal parts.

drawing what Sider (2008) defines as an "anthropocentric line" between those objects that we chose to recognize and to trace over time, and those that we do not. In other words, we chose to trace only the objects for which we have a name and that fit our ordinary beliefs about objects. But this represents an obstacle for us to explain away vagueness in cases such as the one of The Ship of Theseus, where it seems at least not easy to find a suitable alternative to establish the identity (or non-identity) between The Ship of Theseus and the two other ships respectively obtained by replacing and by reassembling all its planks.

Accepting fourdimensionalism (as defined by Sider) and the principle of unrestricted mereological composition, instead, we could say that whether it is Planks or Replacement the ship that is identical with The Ship of Theseus simply depends on our concept of 'ship'. And, Sider claims, even though fourdimensionalism alone does not provide a complete answer to the question regarding which ship is identical with The Ship of Theseus, the *metaphysical* puzzle would be dissolved, and the only question that would remain unanswered is the merely *conceptual* question of which of the spacetime worms counts as a ship.

However, an important fact about this argument is that it presupposes the acceptance of the principle of unrestricted mereological composition. And the argument that Sider (1997, 2001) offers in favor of such principle – that he considers both atemporally and diachronically – brings about, according to him, one of the most powerful arguments in favor of temporal parts. Before introducing Sider's argument in favor of (diachronic) unrestricted mereological composition some definitions might be required.

First, *case of composition* (or, in short, *case*). A case of composition is a possible situation involving a class of objects having certain properties and standing in certain relations.

Second, *assignment*. Here assignment is intended as a function *f* that takes times as arguments and assigns non-empty classes of objects that exist at those times as values.

Third, *diachronic fusion* (*D-fusion*, in short). An object *x* is a diachronic fusion of an assignment *f* iff for every *t* in *f*'s domain, *x* is a fusion-at-t of *f*(t).

Fourth, *minimal diachronic fusion*. A minimal diachronic fusion of an assignment is a D-fusion of that assignment that exists only at times in the assignment's domain.

With these four definitions at hand, we can now introduce Sider's argument in favor of diachronic unrestricted mereological composition and in favor of temporal parts. The argument is structured in the three following premises (Sider 1997, p.26-27):

P1: If not every assignment has a minimal D-fusion, then there must be a pair of cases connected by a "continuous series" such that in one, minimal D-fusion occurs, but in the other minimal D-fusion does not occur.

P2: In no continuous series is there an abrupt cutoff in whether minimal D- fusion occurs.

P3: In any case of minimal D-fusion, either minimal D-fusion definitely occurs, or minimal D-fusion definitely does not occur.

The defence of the argument briefly runs as follows. Sider assumes that vagueness never arises from logic. Then he argues that all assignments have a minimal D-fusion, for a restriction on the assignments that have a minimal D-fusion would require a cutoff in a continuous series between a pair of two adjacent very similar cases. But since minimal D-fusion can never be vague, such cutoff would be an abrupt cutoff, and this is implausible. Therefore, there is no restriction on the assignments that have a minimal D-fusion; and this is so because all assignments have a minimal D-fusion. Let's see now in more detail the defence of each premise.

First, Premise 1. Sider does not offer any positive argument in favor of this premise. Rather, he individuates two objections to it – as he claims, the only objections that he can think of – and proceeds by offering his counter-objections to them. First, *Nihilism*: the view that (diachronic) fusion never occurs. According to this view, there are no composite objects (objects with proper parts); and consequently there is no continuous series connecting cases in which D-fusion occurs with cases in which D-fusion does not occur. However, strictly speaking, this view relies on the assumption that all those thing that we call 'objects' – as chairs, tables, and so on – do not really exist, rather all that exists are mereological atoms, that have no proper parts. The weakness of this assumption consist of the fact that it goes against the possibility that small particles, such as electrons and quarks, might be composed themselves of smaller particles, composed these of even smaller particles, and so on. Second, the objection that not every pair of cases is connected by a continuous series. For instance, no case with finitely many objects can be connected with a case with infinitely many objects by a continuous series. Still, it would be implausible to claim that a jump from finitude to infinity makes the difference on whether D-fusion occurs or whether it does not.

Second, Premise 2. A possible objection to this premise, instead, is represented by *mereological essentialism*; that is, the thesis that every object is a mereological sum, of which each part is essential to it; and that the object exists only as long as it maintains all its parts. Accepting this

view, it would be possible to restrict minimal D-fusion not vaguely, for an assignment would have a fusion only in the case in which such assignment is the temporally longest assignment for a considered class of objects. However, this view entails that no object survives to the loss of a part. And this seems quite at odds with our ordinary conception of objects, for – considering that any object faces at least the loss of some of its microscopic parts – no object would be identical with itself over time. Thus, if one of the main problems for the metaphysics of temporal parts concerns its being at odds with commonsense, mereological essentialism does not seem to be in any better position with respect to this issue.

Third, Premise 3. The defense of this premise goes as follows. Sider assumes for reduction that P3 is false. If this were the case, then there could be vagueness on whether an assignment has or does not have a minimal D-fusion. But suppose we were counting all concrete objects in a world of finitely many objects. Then we would have to include all concrete objects in the set. Still, we would face a problem, for it would be indeterminate whether or not to include their minimal D-fusion. But this means that there would be a numerical sentence expressing the existence of a determinate finite number of concrete objects that would be neither true, nor false. For instance, consider the following numerical sentence expressing the existence of exactly two concrete objects:

(NS) $\exists x \exists y [Cx \ \& \ Cy \ \& \ x{\neq}y \ \& \ \forall z (Cz \rightarrow [x{=}z \lor y{=}z])]$

Where 'Cx' means 'x is concrete'. This sentence contains only logical terms and the predicate 'is concrete', which has determinate application conditions. If it were indeterminate what the number of concrete objects in a finitely many objects world is, then the truth value of this sentence would be indeterminate. But since numerical sentences only contain logical terms and the predicate 'concrete', and vagueness never arises from logic (Sider's assumption), then numerical sentences should be either true or false. This means, it cannot be vague whether a given assignment has or does not have a minimal D-fusion. That is, P3 is true.

Now, since it is true that, in any case of minimal D-fusion, minimal D-fusion definitely occurs or definitely it does not, and since given P2 there is no abrupt cutoff between those assignments that have a minimal D-fusion and those that do not, then, by P1, every assignment has a minimal D-fusion:

(U) Every assignment has a minimal D-fusion

And, according to Sider (1997, 2001), (U) constitutes an argument in favor of fourdimensionalism (which, as he conceives it, is indiscernible from perdurantism), for this thesis is not available to those who deny the existence of temporal parts. And this is so for, if I understand it correctly, it is possible that there are two assignments f and f', having in their domain t_1 and t_2, such that that, at $t1$, $f(t1) = f'(t1)$; but, at t_2, $f(t_2) \neq f'(t_2)$. Intuitively, this would be a case in which the two assignments f and f' would comprise the classes of objects that constitute, *e.g.*, an object x_1, at t_1. But, at t_2, f and f' would comprise the classes of objects that constitute two distinct objects, *e.g.*, x_2 and x_3. That is, the classes of objects that constitute the single object x_1, at t_1, could successively constitute two distinct objects (x_2 and x_3) at t_2. The easiest way to account for such possibility, then, would be to say that the three objects have some, but not all, of their temporal parts in common, and that they are co-located at t_1, but not at t_2.

However, there is the possibility that (U) is an option also available to those who endorse endurantism (Varzi 2005). Indeed, there are two possible alternatives that endurantists might endorse to explain a situation in which two objects are co-located at a time, *e.g.*, t_1, but not at a successive time, *e.g.*, t_2, while maintaining the idea that the two objects are wholly present at both times. Let's discuss these two alternatives in turn.

First, *contingent identity*. Following this alternative, two objects, *e.g.*, x_1 and x_2, are identical with each other at t_1, for they are composed of the exact same parts and occupy exactly the same location, but are distinct at t_2, for they are composed of different parts and occupy distinct locations. But this would mean to say that the two objects, considered in their entirety, would be identical at some times, but distinct at other times. And probably not many would be likely to endorse the view that there is such thing as "occasional identity".

Second, *massive co-location*. According to this alternative, x_1 and x_2 are distinct both at t_1 and at $t2$, even though at $t1$ their parts are fully coincident and they occupy the same exact location. But this would violate the Lockean principle of identity, according to which two objects occupying the very same place at the very same time are identical with each other. Moreover, x_1 and x_2 would not be the only two objects coinciding at t_1. For, accepting the principle of (diachronically) unrestricted mereological composition, there would be many other objects wholly coinciding at $t1$: 'one for each possible assignment f_k such that $f_k(t_1) = f(t1)$' (Varzi 2005, p.15). For, given an object x at a time t_1, it is possible that at a successive time, *e.g.*, t_2, the class of objects that constitute x at t_1 would finally be part of a great number of further objects x_1, x_2, ..., x_n. Again, if one of the main problems

for the metaphysics of temporal parts consists of its being at odds with the commonsensical picture of reality, endurantism would not be in any better position if it accepted this alternative.

In conclusion, the argument from vagueness, even though it might be useful to explain away cases in which vagueness occurs – as the one of Theseus' Ship discussed above – and the argument for unrestricted mereological composition, that is at its base, do not represent a knock-down argument in favor of perdurantism, for many other options are available that could block this argument at each of its premises. However, the main alternatives available, constituted by the acceptance of either nihilism, or mereological essentialism, or occasional identity, or massive co-location do not seem in any better position than perdurantism as far as the departure from commonsense is concerned. There might still be, of course, further reasons for favoring one of the considered available alternatives, but an analysis of such reasons goes beyond the scope of this paper.

The Argument from Special Relativity

A last argument in favor of perdurantism is the argument from Special Relativity. I will discuss this argument in two steps. Firstly, I will briefly present Merrick's (1999) thesis according to which endurantism implies presentism. Secondly, I will discuss the argument from Special Relativity against presentism (*Cf.* Putnam 1967, Sklar 1981, and Saunders 2002), which, if Merrick's argument is correct, constitutes an indirect argument against endurantism.

First, endurantism implies presentism. This argument relies on the problem of temporary intrinsics and develops further the solution discarded by Lewis (1986) that the only properties that an object has are those properties that it has at the present time, whereas past and future times are all equally unreal. Noteworthy, Merricks extends his argument not only to properties, but also to parts. In sum, Merrick's argument runs as follows.

Consider an object x existing (at least) at two times t_1 and t_2. Suppose that x has an (intrinsic) property F, or a part P, at t_1; but that it lacks such a property, or part, at t_2. Endurantists appear to fall in contradiction, for they are committed to say that x, being it wholly present both at t_1 and at t_2, both has and lacks respectively the property F and the part P. However, this apparent contradiction can be explained away by accepting presentism, for presentists would say that the only properties, or parts, that an object has are those properties, or parts, that it has at the present time. For, no other time is real. The fact that x had the property F, and the part P, at $t1$ does not imply, indeed, that it has them at the present time; therefore, no contradiction arises.

On the contrary, a non-presentist endurantist must deny that objects have intrinsic properties; which is a consequence that not everyone would want to accept for the same reasons provided in the first section of this paper. Following this reasoning, Merricks (1999, p. 5) defines endurantism as follows:

> (E) For any presently existing object O, O *endures* if and only if O persists and *all* of O's [properties or] parts *simpliciter* exist at the present time.

Indeed, he claims, the only way to make consistent the endurantist thesis that objects are wholly present at any time in which they exist with the possibility of change in parts and in properties is to endorse presentism. In fact, for the presentist, only one time is real. So, suppose that *O* is an enduring object and that it exists – and is wholly present - at a present time *t*. All parts and properties of *O* exist *simpliciter* at *t*. But suppose then that time passes and that *t* is no longer present, for *t'* is now present, and that *O* exists – and is wholly present - at *t'*. *O* has all its parts and properties simpliciter at *t'*. And the fact that *O* may have changed its part or properties from *t* to *t'*, and that it was wholly present at *t* and is wholly present at *t'* does not lead to any contradiction, for when *t'* is present *t* is no longer present. And, given that only the present time is real, then, *t'* is no longer real, so that *O* does not have those parts and properties that it had at *t* but does not have at the present time *t'*. In virtue of this, by combining endurantism with presentism, we can say that whenever an enduring object exists at a present time it has all parts and properties *simpliciter* at that time. And, given that such an object may change its parts and properties over time, which parts and properties it has simpliciter vary depending on which time is present. Thus, we might think that accepting presentism, at least one of the main problems for endurantism – the problem of temporary intrinsics – can be easily explained away. However, it is certainly true that presentism faces important difficulties itself, especially when considered within a relativistic framework[16].

One of the main consequences of Special Relativity is indeed the Relativity of Simultaneity, according to which whether or not two events are simultaneous depends on the observer's frame of reference. And, since according to Special Relativity (at least in its Minkowskian formulation), there is no privileged frame of reference, then it is not possible to determine in any absolute sense whether two events are simultaneous. This means, it is not even possible to determine which events are simultaneous with a given present time. And, since for the presentists all that is real is what exists in

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[16] See also Meyer (2005) for further objections against presentism.

the present – that is, what is *simultaneous* with the present time – then it is not possible to determine in any absolute sense what is real[17]. Presentists seem committed, then, to relativize the reality of objects and events to frames of reference, which is a consequence they might not want to accept for it is absurd. More concisely, the fourdimensionalist argument against presentism runs as follows:

> P1: Since, according to presentism, all and only those events that are pre-sent exist, then if two events e_1 and e_2 are both present for an observer O, then they co-exist for O.

> P2: If two events e_1 and e_2 are not both present for an observer O, then, for the presentists, they do not co-exist for O, for only those events that are present exist.

> P3: The notion of existence should not be relativized to frames of referen-ce. That is, if two events e_1 and e_2 co-exist for an observer O, then they should also co-exist for an observer O' moving relative to O.

But suppose that two events e_1 and e_2 are both present for an observer O, and that, whereas e_1 is also present for an observer O' moving relative to O, e_2 is actually future (or past) for O'. Then e_1 exists both for O ad for O', whereas e_2 exists for O but not for O'. And this is so because e_1 is present relative to O but not relative to O'. But this contradicts P3, for it implies that the same event does not exist for both the two observers O and O' in virtue of the fact that such an event is located in the present relative to the frame of reference of O, but it is located in the future (or in the past) relative to the frame of reference of O'. This would be absurd, thus it seems that the claim that only those events that are present exist must be rejected.

However, there might still be some alternatives that presentists could embrace to make compatible their account of existence and reality with the conception of spacetime in a relativistic framework. I will briefly discuss two of them considered by Sider (2001).

First, the so called "*here-now-ism*". They may say that only a single point of spacetime is real, and that such point coincides with the absolute present. In this sense, then, simply there are no spatiotemporally distant events. The main problem with this view, however, resides in the fact that it not only denies the existence of past and future times, but also denies the existence

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[17] This is the same problem that the last possible endurantist solution to the problem of temporary intrinsics – *i.e.*, claiming that intrinsic properties are tensed – faces. Indeed, if only what exists in the present can be concrete, while past and future things might exist in a far weaker sense, given that it is not possible to determine in any absolute sense what exists simultaneously with a considered present moment, then it is not possible to determine in any absolute sense what can exist as concrete.

of any object located outside a single point. And, since no macroscopic object can fit into a single point, it is hard to see how all objects commonly regarded as existent would fit into reality.

Second, the acceptance of *a privileged frame of reference*. Assuming the existence of a privileged frame of reference *F*, the presentist might claim that all that exists and is real coincides with what is present with respect to *F*. This would allow the presentist to accept the existence of spatially distant objects and events. However, it is also true that the postulation of a privileged frame of reference is scientifically revisionary, for accepting an absolute relationship of simultaneity between distant events contradicts what is widely considered as the main consequence of Special Relativity. I do not have the necessary scientific competences for arguing against this view. But I simply do not see any reason other than defending presentism in a relativistic framework to accept the scientifically revisionary claim that there is a privileged frame of reference. Certainly, further reasons might come in the future from science itself; but since (at least to my knowledge) such reasons are not available at the moment, I take this view to be mostly motivated by commonsense, for plausibly presentism is the view that commonsense favors. If we accept the consequences of Special Relativity as they have been presented to us by science, then, it seems plausible to claim that fourdimensionalism is the view that most straightforwardly fits in a relativistic framework[18].

Before, we have discussed Merrick's (1999) argument in favor of the claim that endurantism implies presentism. If we buy this argument, then we might say that endurantism is incompatible with Special Relativity. Therefore, assuming that perdurantism and endurantism exhaust the options, Special Relativity would seem to offer an argument in favor of perdurantism. But we have also seen that Merrick's argument does not represent a conclusive argument for the necessary association of endurantism with presentism, for such argument might still be rejected by claiming that objects have properties (or parts) in relation to time, *i.e.*, that all properties (and parts) are relational. Here much depends on whether we are disposed to take a desparture from our way of conceiving properties and reject the existence of intrinsic properties (and of parts possessed *simpliciter)* to embrace the view that they are relativized to times. Thus, as I see it, the issue concerning whether or not endurantism implies presentism remains open. And, even though we might agree that presentism is undermined by Special

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[18] For further discussion, see also Savitt (2000) against the presentist alternatives proposed by Godfrey-Smith (1979) and Weingard (1972).

relativity, Special Relativity still does not offer a conclusive argument in favor of perdurantism[19].

Conclusion

In this paper, I discussed three of the main arguments in favor of the perdurantist account of persistence over time: the problem of temporary intrinsics, the argument from vagueness, and the argument from Special Relativity. What emerges from the discussion is that none of them constitutes a conclusive argument in favor of perdurantism. Indeed, those who endorse the rival view of endurantism can reply to any of these arguments by offering different solutions to the issues at stake. However, most endurantist solutions appear to be at odds with commonsense. Commonsense might not be the primary issue with which a metaphysical theory ought to be concerned, but it is important to notice that a good part of the criticism to perdurantism relies exactly on its poor plausibility from the commonsense perspective. This considered, if one of the main problems for the perdurantist account of persistence concerns its being at odds with commonsense, endurantism does not appear to be in any better position with respect to this issue. And endurantism loses then one of its greatest advantages.

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[19] Parson (2000) proposed a further alternative, which might make fourdimensionalism compatible with endurantism. According to this alternative, temporally indexed properties - such as being bent-shaped or being straight-shaped – can be understood as intrinsic if they are understood as *distributional properties*. Parsons (2000, p.11) claims:

Wherever we have a temporally indexed property of being X-at-t, we have a number of corresponding permanent distributional properties: the X-ness distributions. X-at-t is a disjunction of some of those X-ness distributions, the ones that are compatible with being X-at-t'.

Following this reasoning, we can think of an object has having, *e.g.*, a permanent "being-straight-shaped*ness*" distribution, whose disjunctions correspond to the properties of being-straight-shaped-at-t_1/t_2/.../t_n. Where t_1, t_2, ..., t_n correspond to all times at which such an object instantiates the property of being straight-shaped. I do not have any argument against this view, if not the fact that it is a view that requires itself an important departure from our ordinary way of understanding properties. And that at least not all philosophers who endorse either endurantism or fourdimensionalism (or that might want to endorse both views together) might want to accept this view.

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