



ON THE RELATIONSHIP BETWEEN FOUR-DIMENSIONALISM AND PERDURANCE

Michele Luchetti

ABSTRACT. A relevant part of the literature around the metaphysical problem of the persistence of concrete particulars has been charged of being too liberal on the following respect: despite the fact that Four-Dimensionalism and Perdurantism are often treated as theories equivalent in content, they actually seem to be different metaphysical doctrines. Parsons (2000) attempts to clarify the content of these doctrines: his clarification is based on the postulation of a difference between temporal parts and temporal extension and it aims at demonstrating that Four-Dimensionalism and Perdurantism are not tied by any *a priori* connection and are not underpinned by the same ontological footing. In this work I endorse Parsons' clarification as legitimate from a logical and semantic point of view, but I maintain that, in spite of his distinction between Perdurantism as a theory of persistence and Four-Dimensionalism as a theory of extension, these doctrines are ultimately equivalent, when it comes to formulating a general view about material objects. Indeed, I argue that material objects extended four-dimensionally persist by perduring, and perduring objects extend four-dimensionally in space-time.

KEYWORDS. Metaphysics, Ontology, Temporal Parts, Four-Dimensionalism, Perdurantism.

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AUTHOR. Michele Luchetti. michele.luchetti@studenti.unimi.it.

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1 Introduction

Four-Dimensionalism and Perdurantism are normally conceived as inseparable if not even equivalent. In fact, they are often both taken to require that objects extend four-dimensionally by having temporal parts. For instance, Trenton Merricks (1995) uses *perduring* and *four-dimensional* interchangeably and Ted Sider (2001, p. 68)¹, in his influential treatise on Four-Dimensionalism states: “I use the term [Four-Dimensionalism] in the sense of perdurance”.

However, the identity of Four-Dimensionalism and Perdurance Theory has been challenged by Josh Parsons (2000), who claims not only that Four-Dimensionalism and Perdurantism are not equivalent, but also that no a-priori connection holds between them. With reference to Jackson’s formulation of Four-Dimensionalism², Parsons (2000, p. 399) states that, in respect to the debate about temporal parts, “four-dimensionalism is a broader programme that (allegedly) entails a certain specific theory of persistence, namely perdurantism”. Furthermore, as he argues, theoretically Four-Dimensionalism is not in disagreement with Endurantism, according to which objects do not persist by having temporal parts but by being wholly present at every moment at which they exist. Therefore, conceiving objects four-dimensionally does not necessarily imply conceiving them as being made of temporal parts.

Firstly, this work is aimed at delving into Parsons’ strategy, which is based on an attempt to strengthen the distinction between Four-Dimensionalism and Perdurantism, inasmuch as they constitute two theories different in kind and content, in order to make room for a plausible combination of Four-Dimensionalism and Endurantism. Secondly, I will criticise some of the weak points of Parsons’ metaphysical picture in order to show that, despite the fact that Four-Dimensionalism and Perdurantism do not necessarily imply the very same theses, there are valuable reasons to assert that these two theories must go together to provide an effective account of reality.

2 Parsons’ Four-Dimensionalism without Temporal Parts

While Four-Dimensionalism is usually known as the doctrine whose core states that entities in space-time have four dimensions since they extend in time as well as in space, Parsons distinguishes between two different theses constituting Four-Dimensionalism: the Dimensionality Thesis and the Analogy Thesis. The Dimensionality Thesis claims that the universe is a four-dimensional manifold of which one of the dimensions is time. This is, according to Parsons, the central claim of Four-Dimensionalism, whereas the content of the Analogy Thesis is merely “that time is somehow, strongly or weakly, analogous to space” (Parsons, 2000, p. 401). This latter thesis is not implied by the former, but it grants a solution to many puzzles about time through the analogy with space. Parsons believes that these relevant philosophical implications have led some philosophers, for example Heller (1990), to consider the Analogy Thesis, erroneously, as the only relevant content of Four-Dimensionalism. In particular, Heller’s mistake consisted in taking the Dimensionality Thesis for granted, and making of the Analogy Thesis the only claim of his ‘minimal Four-Dimensionalism’.

¹The term “Perdurantism” goes back to Lewis (1986).

²See (Jackson, 1998, p. 138).

Many versions of the Analogy Thesis are possible, some stronger than others, but ultimately all of them state that time is in some way similar to space. For instance, “a weaker form of the Analogy Thesis could assert that time is just like space, *except* that objects fill time by enduring, while they fill space by having spatial parts” (Parsons, 2000, p. 403). However, Parsons does not provide any criterion which we might base our choice of the degree of ‘weakness’ of the Analogy Thesis upon, and his argument makes use of the Analogy Thesis in its strongest possible version. According to this version, time and space seem to be alike *tout court*. Parsons’ purpose is to demonstrate that the fundamental theses defining Four-Dimensionalism do not necessarily involve recourse to Perdurantism and to temporal parts, since they can also be perfectly efficient in an ‘endurantist’ frame.

Parsons’ reasoning runs as follows: if we did not take the fact that things extend in space by having spatial parts³ for granted, a position analogue to ‘Endurance Theory’ would be available: call it ‘Entension Theory’. Whereas the former asserts that every material object is wholly present at every time at which it exists, the latter states that material objects fill space by being wholly located in each of several places. Parsons believes that if we had enough empirical evidence to claim that some, if not all objects, *entend*, we would be bound to embrace Endurance Theory as well, since the spatial analogy compels us to do so. Still, this picture would be perfectly compatible with Four-Dimensionalism, conceived as the combination of Dimensionality Thesis and Analogy Thesis, since none of these would be contradicted.

For an object to ‘entend’, it is necessary that it is wholly located in each of several places; that means it has to extend in space without having parts. If we argued that extended objects were composed of extensionless parts, we would run into a paradox, since extended objects themselves would be extensionless. Therefore, we must admit the existence of ‘mereologically simple’ objects which will correspond to the *entending* objects we are looking for. “What are these *entending* simples? I think that it is most likely that they are the most fundamental objects of physics, leptons and quarks” (Parsons, 2000, p. 404).

According to current physics these subatomic particles are ‘mereologically simple’ objects and they correspond to the extreme limit which matter can be subdivided into. From these premises, Parsons draws the conclusion that these objects have an extension while lacking parts, and assumes that, even in case we might find even smaller particles, the questions whether there are ‘mereologically simple’ objects and what they are like, should have empirical answers.

Parsons does not explicitly consider these ‘mereologically simple’ objects to be the fundamental constituents of the ontology of material objects, although it is plausible that he believes these objects to be somehow more fundamental than non-*entending* – or ‘*pertending*’ – objects. Nevertheless, his argument only aims at demonstrating “that some material objects, not regions of space, *entend*” (Parsons, 2000, p. 405).

A common objection raised against the *endurantist* view is that its account of change leads to the problem of temporary intrinsics, which is often brought up to support the ontology of temporal parts. According to Lewis (1986, p. 202), “endurance involves overlap: the content of two different times has the enduring thing as a common part”: therefore *enduring* objects necessitate the coexistence of mutually exclusive properties, if we are not to deny the possibility for an object to change. For instance, a window glass can be intact at T_1 and broken at T_2 : hence, if we are to consider the window glass as an object wholly present at every time at

³This position, according to which material objects extend in space by being divided into parts, is called by Parsons ‘*Pertension Theory*’, which is nothing but the analogue of *Perdurantism* as far as extension of material objects in space is concerned.

which it exists, it will instantiate both the intrinsic properties⁴ of being intact and of being broken. The very same problem may affect Parsons objects, which are intended as extending in time by being wholly present at every time at which they exist.

How to account for change without running into the problem of temporary intrinsics, if temporal parts are to be rejected? Parsons' solution resorts to temporally indexed properties⁵, which are intrinsic, non-relational and "should be understood in a way that makes it possible for objects located at two different times to share such a property. If two pokers, created at different times, were to have the same history of cooling down, and being destroyed, they would share all their temporal indexed heat properties" (Parsons, 2000, p. 408).

These properties are distributional, since each of them accounts for certain distributions of a characteristic of an object in time and space. They are also disjunctive, that is: "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, the ones that are compatible with being X-at-t" (Parsons, 2000, p. 409). According to these claims, change is to have a distribution that is non-uniform over time and does not compel us to admit the existence of any sort of temporal part whatsoever.

Therefore Parsons attempts to open the way for a four-dimensional picture that does not need the controversial concept of 'temporal part' and can account for change in an endurantist perspective, apparently without running into the usual objections raised against the three-dimensional endurantist picture, since distributional properties avoid the problem of temporary intrinsics by integrating the temporal dimension. Indeed, a distributional property is not exemplified or non-exemplified by an object with reference to a single instant t , but it is exemplified for more or less uniform temporal intervals, with reference to the whole "life-span" of the object considered. Just like the colour red in a chequered white and red tablecloth is exemplified on several and different occurrences along the whole extension of the tablecloth, the same reasoning applies, roughly, to a poker which exemplifies the property of being hot. The distributional property of being hot is not taken into account by considering the poker at a fixed moment t_1 , in which, let's say, the property is exemplified, and at another moment t_2 , in which the property is not exemplified, but with reference to the irregular distribution of the property along the whole "life-span" of the poker.

3 Objections against Parsons' View and Minimal Four-Dimensionalism

Parsons tells apart two assertions usually accepted as constituting the central nucleus of Perdurant Theory, and very often believed to be fundamental to Four-Dimensionalism as well:

- 1) The claim that ordinary objects have temporal *parts*;
- 2) The claim that ordinary objects have temporal *extent*.

As Hawley (2008, p. 202) points out, "the distinction is useful because it seems at least conceivable that an object could be temporally extended without having temporal parts".

⁴A thing has its intrinsic properties in virtue of the way that thing itself, and nothing else, is [...] The intrinsic properties of something depend only on that thing" (Lewis, 1983, p. 197).

⁵See (Van Inwagen, 1990).

Parsons regards 1) as the chief content of Perdurantism, but not as a necessary entailment of a four-dimensionalist position, whereas he considers 2) to be a central claim of Four-Dimensionalism.

Similarly to the spatial case, in which those who believe in the possibility of spatially-extended simples may also believe that an object can extend through a spatial region without having a proper part in every proper sub-region of that region⁶, Parsons postulates temporally-extended simples: objects extended over time but without temporal parts. In this way, he opens the path for a plausible association of Four-Dimensionalism and Endurantism and challenges the traditional picture, which combines of Perdurantism and Four-Dimensionalism.

In this paragraph some objections against Parsons' view will be formulated and examined in order to answer the following question: is it necessary for a four-dimensional object to have temporal parts? Despite Parsons' attempt, I hold that the most plausible answer is still 'yes'. In order to analyze Parsons' strategy in more detail, I believe his reasoning may be deconstructed into the following steps:

- a) Decomposition of the nucleus of Four-Dimensionalism into two theses, Dimensionality Thesis and Analogy Thesis, and attribution of the 'guilt' of making seemingly necessary the recourse to temporal parts to the latter.
- b) Choice of the strongest version of the Analogy Thesis and demonstration of its compatibility with Endurantism.
- c) Postulation of the existence of 'mereologically simple' objects that have temporal extension by lacking parts, underpinned by the analogy of how objects extend in space and how we have enough empirical evidence to regard the existence of 'mereologically simple' objects that have spatial extension by lacking parts as plausible.

As far as a) is concerned, Parsons (2000, pp. 399–400) draws a sharp separation between the Dimensionality Thesis and the Analogy Thesis. This separation reflects and supports the distinction made between 1) and 2): the claim that material objects have a temporal extent (2) is as fundamental to Four-Dimensionalism as the Dimensionality Thesis is. On the other hand, the claim that material objects are made of temporal parts (1) is not constitutive of Four-Dimensionalism, while it is essential to Perdurantism. Parsons asserts that the origins of the Dimensionality Thesis lie in the set of consequences of relativity theory, the Analogy Thesis being possibly justified only inasmuch as it is a useful philosophical addition, since it provides a solution to paradoxes about time and change.

However, a justification for the Analogy Thesis may also be rooted in the very same field as the Dimensionality Thesis. Since one of the results of relativity theory is, roughly, that space and time relations cannot be analysed separately if they are not considered within the same frame of reference, a single unified representation of the spatiotemporal extension of objects is necessary. Moreover, both the possibility of a graphic representation of spatiotemporal extension on a spatiotemporal diagram, and the principle that objects extend in time in the same way as they extend in space, do not necessarily require the annihilation of the differences between spatial relations and temporal relations. They can be regarded, instead, as consequences of the treatment of time on a par with space and of the loss of meaning of

⁶See also (Markosian, 1983).

the notions of absolute time and space. If we consider the second part of a), it must also be noted that the Analogy Thesis is not always used as an *argument* for temporal parts, but rather to *illustrate* what they are: “though I appeal to the analogy between spatial parts and temporal parts in explaining the concept of temporal parts, I do not appeal to any analogy as an *argument* for temporal parts” (Heller, 1992, p. 696)⁷.

Now let us turn our attention to b). Parsons believes that the strongest version of the Analogy Thesis is the most difficult to combine with Endurantism. If it can be demonstrated that this combination is possible, it follows that any incompatibility between Endurantism and weaker versions of the Analogy Thesis is ruled out. However, the fact that weaker versions of the Analogy Thesis, as it will be shown, may be more problematic for Endurantism than the strongest version, is taken for granted. Furthermore, no criterion is provided by Parsons, on which we should base our choice of the degree of weakness of the Analogy Thesis, when characterizing a particular four-dimensionalist theory. For instance, Heller (1992, p. 696) claims that his version of the ontology of temporal parts accords better to weaker versions of the Analogy Thesis: “it will prove important to my defence of the temporal parts ontology to reject a complete analogy between space and time”. Parsons may therefore have underestimated weaker versions of the Analogy Thesis as less forbidding enemies than the strongest version.

Step c) consists of a postulation of ‘mereologically simple’ temporal objects, which extend in time by lacking parts. The legitimacy of these entities derives from the analogy with space, from the strongest version of the Analogy Thesis, in particular. Since the existence of these entities does not contradict either of the two fundamental theses of Four-Dimensionalism, they allow a combination of Four-Dimensionalism and Endurantism to be a plausible basis for our ‘true’ ontology of material objects⁸. However, two main kinds of objections can be formulated against the legitimacy of the reasoning that might lead us to introduce these entities in our ontology:

- 1) Objections from empirical premises;
- 2) Objections from non-empirical premises.

1) Parsons argues that, since ‘mereologically simple’ spatial objects exist, and time is exactly like space, ‘mereologically simple’ temporal objects may exist. The first problem that stands out is of empirical nature. According to Parsons, the fact that some things ‘entend’, i.e. have spatial extension by lacking parts, has many empirical premises and “whether some things entend (as I have argued), or whether, on the contrary, everything pertends⁹ is an empirical matter” (Parsons, 2000, p. 404). But if empirical evidence is our measure, we are not bound to accept the thesis that time is exactly like space, since the possibility that at least some differences between the spatial dimensions and the temporal dimension subsist has not been ruled out yet¹⁰. For instance, we might mistakenly wind up believing that space and time have the same density: in fact, since space is not dense, ‘mereologically simple’ spatial

⁷Hawley (2001) also points out that the soundness of the argument that goes from the unified treatment inferred by Special Relativity to temporal parts is very debatable. However, as Heller points out, an argument is not needed to introduce temporal parts in our ontology, as long as they are able to guarantee consistency and a stronger explanatory capacity to an ontological theory.

⁸A structured and in depth exposition of Parsons’ ontology can be found in (Parsons, 2007, pp. 201–232).

⁹For a definition of “Pertension” see note 2.

¹⁰One among many examples consists in the commonsensical belief that, differently from the spatial dimensions, the temporal dimension has a direction. The question whether covering the temporal dimension along both direc-

objects must therefore exist, if we do not want to incur the Argument from Avogadro¹¹. On the grounds of the strongest version of the Analogy Thesis, according to which time is exactly like space (i.e., not dense), ‘mereologically simple’ temporal objects must exist too. However, we have no decisive empirical evidence that time is not dense¹², therefore we have no decisive empirical evidence to legitimate the introduction of ‘mereologically simple’ temporal objects on an empirical basis.

2) Parsons’ argument is based, as we have seen, on the premise that there are some things that entend. Setting aside the empirical presuppositions, I would like to reflect upon the meaning of the theory of ‘Entension’ coined by Parsons to legitimate his ‘mereologically simple’ temporal objects through the analogy with space.

Since Endurance Theory states that objects are wholly present at every moment at which they exist, Entension Theory, which is defined by Parsons as the equivalent for space of Endurance Theory, entails that there are objects wholly located in each of several places. What does this mean? If we attempt to explain how a world populated by mereologically simple entending objects could be, I believe two possible scenarios can be given:

- a) Each of these entending objects must fill exactly one unit only of space which is not any further divisible, one *place*, and therefore these objects are wholly located, but in just one place (at a time), in accord with the axiom that every ‘mereological simple’ occupies one and only one point of space-time;
- b) Entension is based on the assumption that mereological simple objects are the most fundamental objects of physics (i.e., leptons and quarks). These particles are not practically decomposable any further. This derives from the fact that physical divisibility is assumed as the privileged criterion to establish what is a ‘mereological simple’. However, the fact that the most fundamental objects of physics cannot be subdivided into smaller parts, might nevertheless be insufficient to rule out the possibility that our physical space is composed by units even smaller than the particles by which these spatial units are occupied. If this was the case, i.e. if every lepton or quark occupied more than one place at a time, our mereologically simple spatial objects would be only *partially* located in each of several places.

Option a) fails the requirements of Entension, according to which ‘mereologically simple’ spatial objects are multiply located at the same moment of time; option b) fails to meet the requirement that entending objects are wholly located in all of the places in which they exist.

Since Parsons’ defines Entension Theory in analogy with Endurance Theory, it follows that the same problem occurs when his ‘mereologically simple’ temporal objects are defined. For instance, Hawley challenges the strict connection between Endurantism and Parsons’ view, drawn by Parsons himself. She suggests that both enduring objects and Parsons’ objects lack temporal parts, but while an enduring object is wholly present at each of several times, a Parsonian object occupies a temporally extended region without being wholly present at any single time.

tions, just like they were spatial dimensions, is (logically and/or empirically) possible or not roused the philosophical debate concerning the possibility of time travels and the discussion of the consequential paradoxes (see Torrenco, 2011). Another example, which is below taken into account, concerns the problem of space and time density.

¹¹See (Parsons, 2000, pp. 403–404)

¹²Many views in philosophy of time are based on the ancient principle that time is continuous (See for example Aristotle, *Physics* VI, 2). For a recent example of a theory of time based on that principle, see Skow (2012, pp. 223–242)’s version of the spotlight view. Indeed, the question whether or not time is dense is still open.

The distinction between enduring objects and Parsons objects depends upon a non-mereological distinction between occupying a spatiotemporal region by being multiply-located at various of its subregions, and occupying it by extending through it, a distinction between two ways in which a simple object might conceivably occupy a region. (Hawley, 2008, p. 7)

Hawley believes that Parsons' objects are different from enduring objects, since the former fail to be wholly present at any single time. From this reasoning, it follows that Parsons does not manage to provide a solid endurantist frame for Four-Dimensionalism, and his system tends to collapse onto a view not very different from a three-dimensional picture¹³.

In fact, if we apply the two scenarios depicted for extending objects to enduring objects, it results that these objects cannot subsist in a four-dimensional frame. Standard three-dimensional continuants are objects with spatial parts and no temporal parts, which are conceptualized in our experience as occupying space but not time, and as persisting wholes *through* time. They exist entirely at every time at which they exist: they do not have temporal parts through which they extend over time, but they endure over time. On the other hand, Parsons' four-dimensional enduring objects would occupy only one spatio-temporal region (the smallest possible) and would be composed neither of spatial nor of temporal parts. These objects would be spatio-temporally extended without having parts. However, as we have seen, this claim is justified, as far as the temporal dimension is concerned, only on the basis of an absolute analogy between space and time.

By applying scenario a) to the temporal dimension of Parsons' objects, it follows that these objects, even though they would not fail to meet the requirement of being four-dimensional, since they would have a temporal extension, would fail to meet the requirement of being enduring objects, since they couldn't have a temporal extension without having temporal parts. For an object to be four-dimensional, an extension along the temporal dimension is needed, but we do not have enough empirical evidence to support an absolute analogy between spatial and temporal dimensions, and therefore to accept the fact that objects can have a minimal temporal extension that cannot be subdivided into further parts. If Parsons' objects were to preserve a duration over time, they would need at least to 'sweep' over time, like three-dimensional objects do.

According to scenario b), Parsons' objects would occupy more than one spatio-temporal unit, therefore they would extend in spacetime by having parts. As far as their extension along the temporal dimension is concerned, they would be nothing but four-dimensional enduring objects.

4 Do we need Parsons' distinction? A proposal of "Minimal Four-Dimensionalism"

I believe Parsons' distinction between temporal extent and temporal parts should be taken into account when formulating a definition of Four-Dimensionalism, since it allows a logical distinction between two expressions which do not designate the same concept. Nevertheless, from an ontological point of view – and for as much empirical groundings as we want our ontology to be underpinned by – Endurance Theory fails to provide an appropriate frame for Four-Dimensionalism, and the recourse to temporal parts seems to remain inevitable.

¹³This point has been discussed with Katherine Hawley, whom I thank for the significant prompts.

Therefore, I believe the main requirements of a minimal Four-Dimensionalism boil down to the following claims:

- 1) The universe is a four-dimensional manifold of which one of the dimensions is time¹⁴;
- 2) Material objects extend four-dimensionally in space-time. They have a spatial as well as a temporal extension.

The assertion that four-dimensional objects extend in time in the same way that they extend in space does not entail that time and space must have the same kind of ‘simples’ or the same way of being divided into parts. The fact that it is not possible to consider spatial relations and time relations as being absolute outwith a frame of reference, simply does not allow us to consider absolute spatial and temporal parts. If we follow Parsons, building the concept of ‘temporal part’ into the definition of minimal Four-Dimensionalism brings implications that derive from a combination of Four-Dimensionalism and Perdurantism. The principle that objects ‘extend’ in time, instead of ‘moving or sweeping in time’, or ‘being wholly present at every instant’ guarantees in itself the analogy with space, since in both the temporal and the spatial case we are considering a relative extension in one (or more) of the four dimensions of the manifold.

Nevertheless, I believe a fundamental reason stands out, which requires an effective definition of ‘minimal Four-Dimensionalism’ to include also the principle that four-dimensional objects extend in time by having temporal parts. This reason has to do with the fact that Four-Dimensionalism in combination with Endurantism tends, as we have seen, to flatten to a sort of three-dimensionalist view. Although Four-Dimensionalism itself does not logically entail Perdurantism – as much as ‘temporal extension’ might not logically imply ‘temporal part’, if we believe in temporally-extended simples – as Parsons clearly pointed out, as a matter of fact Four-Dimensionalism is not in a condition to provide an effective account of material objects persisting over time if not recurring to temporal parts, which are ontologically necessary to make sense of Four-Dimensionalism. Therefore, I believe that 1) and 2) need to be supplemented by the following principle:

- 3) Four-dimensional objects extend in time by having temporal parts.

5 Conclusions

I attempted to show that Parsons’ combination of Four-Dimensionalism and Endurantism has some weak points. In the first place, I argue against the empirical and non-empirical premises on which Parsons grounds the strongest version of spatial analogy that he endorses. In the second place, I claim that, even if it were the case that this analogy was justified enough, Parsons’ four-dimensional enduring objects would nonetheless fail to be contemporarily four-dimensional *and* enduring.

In conclusion, I maintain that, despite Parsons’ distinction between Perdurantism as a theory of persistence and Four-Dimensionalism as a theory of extension, from an ontological point of view these doctrines are inextricably entangled, when it comes to formulating a general metaphysical theory on material objects. Indeed, I argue that objects extended four-dimensionally – persist by perduring, and perduring objects extend four-dimensionally in space-time¹⁵.

¹⁴This corresponds to Parsons’ Dimensionality Thesis.

¹⁵I thank Giuliano Torrenco and Paolo Valore for their priceless help and support during the revision of the paper.

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