



LUND UNIVERSITY

Endurance Per Se in B-time

Hansson Wahlberg, Tobias

Published in:
Metaphysica

DOI:
[10.1007/s12133-009-0049-z](https://doi.org/10.1007/s12133-009-0049-z)

2009

[Link to publication](#)

Citation for published version (APA):
Hansson Wahlberg, T. (2009). Endurance Per Se in B-time. *Metaphysica*, 10(2), 175-183.
<https://doi.org/10.1007/s12133-009-0049-z>

Total number of authors:
1

General rights

Unless other specific re-use rights are stated the following general rights apply:
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Endurance *per se* in B-time

Tobias Hansson Wahlberg

Lund University

Abstract:

Three arguments for the conclusion that objects cannot endure in B-time even if they remain intrinsically unchanged are examined: Carter and Hestevold's enduring-objects-as-universals argument (1994) and Barker and Dowe's Paradox 1 and Paradox 2 (2003; 2005). All three are shown to fail.

1. Introduction

Discussions of endurance in B-time (the kind of time posited in the B-theory of time) have tended to focus on the problem of temporary intrinsics, i.e. the question whether objects can endure through intrinsic change.¹ However, that question is arguably subordinate to the question whether an object can endure in B-time *without* intrinsically changing. If objects cannot even endure in B-time without intrinsic change, discussion of temporary intrinsics is surely idle. Carter and Hestevold (1994) and Barker and Dowe (2003; 2005) have addressed the more fundamental question. They argue that objects *cannot* endure in B-time, irrespective of intrinsic change. In this paper, I shall take a close look at these arguments and see if they stand up to scrutiny. I shall argue they do not.

2. The enduring-objects-as-universals argument

The first argument goes like this.² In the B-theory of time, all times – times which, from our current location in time, appear to be either past, present or future – and their contents, are ontologically on a par and interrelated by the B-relations *earlier than*, *later than* and *simultaneous with*. (So-called A-properties, such as *being past*, *present*, and *future*, are

¹ See e.g. Lewis (1986, pp. 202-204; 1988; 2002), Lowe (1988), Merricks (1995), Armstrong (1997, pp. 100-102), Mellor (1998, Ch. 8), Sider (2001, Ch. 4.6), Haslanger (2003), Wasserman (2003), and my (xxxx).

² See Carter and Hestevold (1994, pp. 278-279); see also Lewis (2002, p. 3) and Ingthorsson (2002, p. 135). The argument was also pressed by an anonymous reviewer of my (xxxx). In the paper, I said that I aimed to deal with the objection in a later paper. This is that paper.

rejected.)³ Since all times and their contents are equally real, if an object *O* (e.g. a stone, tree, car or person) persists through time by *enduring*, i.e. by being wholly present at distinct times as numerically the same entity, *O* will have to be *multiply located* in time. In other words, *O* will have to be wholly present earlier and later than itself. But an object – a concrete particular – can only be repeated in this way, the argument goes, on pain of becoming a *universal*! A concrete particular can persist through B-time only by either *perduring* (i.e. being a four-dimensional entity with distinct temporal parts at distinct times) or *exduring* (i.e. being a three-dimensional entity with distinct temporal counterparts at distinct times).⁴

This is a weak argument. Why would an object, multiply located in B-time, have to be a universal? Universals – in the Aristotelian/Armstrongian tradition (e.g. Armstrong, 1989), which, unlike the Platonic tradition, allows them to be spatiotemporally located – are characteristically entities which are repeatable in time *and in space* (at a single time). However, an object enduring in a normal manner in B-time is multiply located only in time, not space (at a single time). Hence, by simply enduring in B-time such an object is quite far from behaving like a classical immanent universal.

An advocate of the argument may retort that proponents of endurance in B-time who endorse the possibility of backward time travel (e.g. Miller, 2006) are committed to the notion that objects are, or at least can be, wholly present at distinct places at a single time, apart from being wholly present at distinct times: if an enduring object ‘doubles back’ in B-time to an earlier time where it is already located, it will be multiply located in space at the relevant time; and such an object would be universal-like indeed!

However, even the B-theorist endurantists who regard time travel as a genuine possibility⁵ (as many emphatically do not: e.g. Mellor 1998, Ch. 12) can almost certainly resist the imputation that objects, on their view of time and persistence, turn out to be universals.⁶ For even if they are committed to the idea that both objects and universals are repeatables in space-time, they can still point to major differences between the two categories of being, and hence maintain that being a repeatable is not *sufficient* for being a universal.

³ For an introduction to, and a defense of, the B-theory of time (also known as ‘the tenseless theory of time’ and ‘the static conception of time’), see Mellor (1998).

⁴ For the ‘endurance’/‘perdurantism’ terminology, see Lewis (1986, p. 202); for ‘exdurantism’, see Haslinger (2003, p. 319).

⁵ Persuaded by reasoning like that in Smith (1997).

⁶ It is often assumed that time travel is sensible only on the B-theory of time: it is thought that in order for time travel to take place there must *be* other times than the present one to travel to (the so-called destination requirement). Keller and Nelson (2001) have challenged this line of thought. If they are right, then the argument from time travel can be invoked against presentist endurantists as well. (Presentists hold that only the present moment exists.)

To begin with, they can point out that for an object to be multiply located in space at a single time, that object has to enter a time machine, or a wormhole in space-time, and *travel backwards in time*. A classical, immanent universal need do no such a thing. For a universal to be repeated in space at a certain time it is enough that it be multiply *instantiated* at the time in question. This difference in the way the relevant items are multiply located in space, they may further point out, is a by-product of the more fundamental and substantial metaphysical difference between immanent universals and objects, at least as traditionally understood: *universals are entities which exist in space-time in virtue of being instantiated by some further entity (i.e. an object), but objects do not have to be instantiated in order to exist in space-time – they are independent entities, in this respect*. This crucial and classical difference between universals and objects has not been shown to collapse within the metaphysics we are considering. I conclude, therefore, that B-theorist endurantists are not obliged to concede that putative objects in fact are “universals in drag” (Carter and Hestevold, 1994, p. 279).⁷

3. The argument from Paradox 1

Barker and Dowe (2003) do not press the enduring-objects-as-universals argument into service. Instead they argue that if objects (and, equally, immanent universals) were to endure in B-time they would be both three-dimensional and four-dimensional. Since no entity can be like this, endurance in B-time is impossible. (They consequently hold that not even universals can endure in B-time. Their argument therefore has wider scope than the enduring-objects-as-universals argument.)

Barker and Dowe reason as follows:

Take a multi-located entity *O*, be it enduring entity or universal. Say that *O* is multi-located throughout a 4D space-time region *R*. Thus there is a division of *R* into sub-regions *r*, such that *O* is wholly located at each *r*. [...] At each *r* that is a sub-region of *R*, there is an entity – a universal, or enduring entity – of a certain

⁷ I should mention that Carter and Hestevold (1994, pp. 278-279) back up their allegation by comparing endurance in B-time with ‘endurance’ over possible worlds, assuming Modal Parity (i.e. the thesis that all possible worlds are ontologically on a par). They hold that only universals can be multiply located in different worlds given Modal Parity. They subsequently ask: why should the situation be any different for times given Temporal Parity (i.e. the thesis that all times are ontologically on a par)? It is not the purpose of this paper to discuss the modal case. However, I have two things to say about this analogy. First, Carter and Hestevold have not shown that only universals can be multiply located in different worlds given Modal Parity – they merely intuit that it is so. Secondly, the temporal case differs from the modal one in that times belong to a *single, unified world*: the contents of distinct times – in contrast with the contents of distinct possible worlds – are interrelated by earlier-/later-than relations and causal/nomological relations. Hence, the cases are significantly different.

kind. Call it O_r . Take the fusion, or mereological sum, of all such O_r s. Call the fusion $F(O_r)$:

(i) Each such O_r is a 3D entity, since it is located at a 3D sub-region r . O_r is an entity with non-zero spatial extent and zero temporal extent. Each O_r is identical to every other. So each O_r is identical with $F(O_r)$. So, $F(O_r)$ is a 3D entity.

(ii) $F(O_r)$ has parts at every sub-region of R . So it has non-zero spatial and temporal extent. $F(O_r)$ is a 4D entity.

Conclusion: $F(O_r)$ is both 3D and 4D, but that is a contradiction since being 3D means having no temporal extent, and being 4D means having temporal extent. (Barker and Dowe, 2003, p. 107)

This argument is flawed. If O is an enduring entity, it is 3D in the sense that it is extended in three spatial dimensions⁸ but not extended in the temporal dimension.⁹ In other words, it is 3D in the sense that it has spatial proper parts (at times) but no temporal proper parts – it is wholly present at each of the distinct times (instants) it is located. Given that O endures, each O_r is identical with O . Supposing that it makes sense to mereologically fuse an entity with itself, the resulting fusion is simply the original entity. Thus, the mereological sum of the O_r s, $F(O_r)$, is the old O . Since O (and each and every O_r , i.e. O) is 3D, $F(O_r)$ is 3D. We can therefore agree with the conclusion arrived at in (i). However, in (ii) it is concluded that $F(O_r)$ is 4D because it has parts at every r . This is mistaken: it simply does not follow that $F(O_r)$ is 4D just because it has parts at every r . This would only follow if $F(O_r)$, i.e. O , had distinct *temporal proper parts* at the respective r s; but since, *ex hypothesi*, O endures, it has not. The parts of O at the respective r s are either spatial parts or else the single temporal part that O has (if it has any), namely O itself, which is wholly located at the distinct r s and is not a temporal proper part. Consequently, $O/F(O_r)$, is 3D, and 3D only – it is not 4D. Notice, moreover, that this last fact does not entail that O is *instantaneous*. It just means that O has no temporal *extent* in the sense of having temporal proper parts. O may still persist – endure – for a certain positive duration, as indeed was presumed in the very argument.

I have not seen this response in print (other than in what can be discerned in the short quote below), but it seems that Barker and Dowe may have encountered some version of it verbally. In a follow-up paper (2005), where they respond to criticisms of their original paper, they write, after presenting an argument that is essentially the same as the one given above (but uses the example of Eric the enduring cat):

⁸ That is, if it is extended in *all* spatial dimensions (neglecting the curled dimensions of string theory); otherwise it is 2D or less. I suppose an immanent universal would not have to be 3D.

⁹ Here I disagree with Bebee and Rush (2003, p. 313), who claim: “No sensible endurantist is going to equate being a 3D object and having zero temporal extent.” I think sensible endurantists should do just this.

Some people produce the following dismissive response to the first paradox: $F(\text{Eric}_r)$ has parts at every sub-region r of the 4-dimensional space R . But $F(\text{Eric}_r)$ is not 4-dimensional because these parts are not *proper parts* – they are all Eric!

We reply that there is a single thing at every sub-region r of R . Eric is eternally at r_1 , at r_2 , at r_3 , etc. The region R is filled up! In terms of occupation there is no difference between this situation and that where each occupier of a 4-D space is non-identical to every other occupier. The fact of identity does not affect the matter of occupation and the whole space being occupied. If the space is fully occupied, how can the fusion of the occupiers not be a 4-dimensional object? (2005, p. 70)

Answer: the fusion will fail to be 4D if the occupiers of the filled 4D space happen to be, not several, but a single enduring 3D object that is multiply located within the relevant region.

Is this answer tenable? In their original paper, Barker and Dowe use a spatial analogy to show that it is absurd to deny that the fusion of the O_r s (Eric_r s) is 4D .

Take a spatial analogy. Say a person time travels 10 times, and 10 time travelling individuals appear in the same room. Say they squash together on a bench. Then the bench is a ruler. Its parts are in a one-to-one correspondence, in the relevant sense, to human parts. The fusion of the human parts is an object. That 3D object is one-bench length. But we are told that the ten humans are identical. Their fusion then is simply a human. But a human is not one bench in width. Ergo, there can be no spatially multi-located individual. It seems to us nonsensical to attempt to rebut this argument by claiming that the fusion of individuals is not a bench-long thing. We think the response to the 4D case is in exactly the same boat. There is no relevant difference between the spatial case and the 4D case. (2003, pp. 109-110)

Let us grant the possibility of time travel, for the sake of the argument. Does the thought experiment establish that the fusion of the ‘ten’ time-travelling humans located at the relevant time is one bench in width at the time in question? I think not. Given endurantism, the allegedly nonsensical answer must be correct. If the time-travelling person keeps a constant width of, say, 0.4 m (because he does not lose/gain weight) during his travels, the width of the fusion of the ‘ten’ humans located at the relevant time, who are really just one and the same enduring human, is 0.4 m at the time in question.¹⁰ However, as the fusion, i.e. human, is multiply located in space at the relevant time, owing to repeated time travel, the fusion/human fills up a spatial region that is *larger* than 0.4 m in width: a region one bench in width. The situation may be described as one in which a fusion/human with a width of 0.4 m – *extending* in space for 0.4 m – *s-endures* (‘endures’ spatially – as a result of time travel)

¹⁰ If the time-travelling human gains/loses weight and swells/shrinks during his time-travelling, it cannot be said that the fusion/human simply has a width of 0.4 m at the time in question: hence we must say that the fusion/human has distinct weights/widths *at distinct places* at the time in question (see Miller, 2006). In this paper, however, we are concerned with objects that do not change intrinsically.

over a bench-long stretch at the time in question. Thus the spatial case does not establish the impossibility of endurance in B-time, even granting that time travel is possible and that the spatial case and the 4D case are analogous.¹¹ The spatial case is susceptible to the same kind of analysis as the original 4D case.

In their follow-up paper (2005), Barker and Dowe do not mention the spatial analogy. (Perhaps at this point they no longer found the spatial scenario more compelling than the ordinary 4D case.) Instead they try to strengthen Paradox 1 (in its Eric guise) by putting it in terms of plural reference:

We note that there is a form of the paradox that completely defuses the dismissive response anyway [the kind of response I offered above]. ‘The Eric,*s*’ is a plural referring term. One can assert ‘The Eric,*s* occupy (fill up) *R*’, since the Eric,*s* are scattered throughout *R*. The predication here is not distributed – each Eric,*r* does not occupy or fill up *R* – but collective. How do we analyze collective predication? One analysis is through mereology: the mereological fusion of the Eric,*s* occupies *R*. Thus, we must admit that F(Eric,*r*) is a 4-dimensional object, and the paradox remains. The other analysis is to treat plurals as plurally referring and collective predication as an irreducible form of predication. But this just means the paradox takes on the following plural form:

The Eric,*s* occupy *R* (they fill up *R*).

Eric does not occupy *R* (by Endurantism – he is multi-located throughout *R*).

The Eric,*s* are one and the same; they are Eric (by Endurantism).

Therefore, the Eric,*s* occupy and don’t occupy *R*. (2005, p. 70)

Here Barker and Dowe claim that if Eric endures, he does not occupy *R* – he is just multi-located throughout *R*. This seems false, however. If Eric is multi-located throughout *R*, he surely occupies *R* – *R* is filled up by Eric. Barker and Dowe concede this when discussing the original form of the paradox on the very same page: “[According to endurantism] Eric is eternally at *r*1, at *r*2, at *r*3, etc. The region is filled up! *In terms of occupation there is no difference between this situation and that where each occupier of a 4-D space is non-identical to every other occupier. The fact of identity does not affect the matter of occupation and the whole space being occupied*” (p. 70, my emphasis). Moreover, in the new form of the argument it is claimed that “each Eric,*r* does not occupy or fill up *R*”. But given that each Eric,*r* is identical with Eric, as endurantists have it, this claim is false. Finally, the fact that Barker and Dowe choose to use the plural *expression* ‘the Eric,*s*’ shows little. When we say things such

¹¹ Notice, though, that *s*-endurance for concrete objects is due to ordinary endurance plus time travel. Ordinary endurance, i.e. endurance in time, does not require some kind of ‘meta-endurance’ to take place in a further dimension.

as ‘*a* and *b* are identical’, the plural ‘are’ and the use of the two names ‘*a*’ and ‘*b*’ do not reveal that we are in fact referring to two entities as opposed to a single entity denoted by two distinct names. Similarly, if the Eric_s are in fact identical, the plural expression refers to a single object that is multiply located in time.

I conclude, then, that Paradox 1, in its various guises, fails to generate a contradiction. Why do Barker and Dowe think it does (2003, p. 106)? They believe the following “part/whole location” principle “underpins” (2003, p. 109) their argument:

WLP: If an entity *W* and a space-time region *R* are such that for some division of *R* into sub-regions *r*, *W* has a part *p* located at each sub-region *r*, then *W* is located at *R* and is a 3 or 4D entity according to the dimension of *R* itself. (Ibid.)

Notice, however, that if the endurance theory of persistence and the B-theory of time are true (or even if the combination is merely possible), **WLP** is false. In such a case *W* is 3D, supposing at any rate that entity *W* is an object and not a process, although *W* has a part located at each sub-region *r* and *R* is 4D. The principle, then, is question-begging. If it indeed underpins the argument, the argument presupposes what it seeks to establish: that objects cannot endure in B-time.

4. The argument from Paradox 2

Paradox 1 is no paradox. What about Barker and Dowe’s Paradox 2?

Here is how it is formulated:

Say that *O* is multi-located throughout a 4D space-time region *R*. Intimately connected with *O* and *R*, there is, we submit, a 4D entity which we call *the life of O*, or **L(O)**. [...] Lives are part of common sense ontology; we speak of entities – be they people, animate entities or inanimate – having long, interesting, varied, good, etc. lives. Lives are 4D things; they have beginnings, middles, and ends. **L(O)** is just like an event occurring at a region *R*; it is located at *R* with proper parts located at each sub-region *r* in *R*.

Assuming doctrines of multi-location, lives are paradoxical entities. Where there is a persisting thing, material object or universal, there is a life **L(O)**. There is a necessary connection between a persisting thing and its life. We should accept the principle, call it *Independence*, that there are no logically or metaphysically necessary connections between distinct existences. Thus if there is a necessary connection between *O*’s persisting and **L(O)**’s existing, *O* and **L(O)** can’t be distinct things. That means, we think, that *O* is part of **L(O)** [...] But if *O* is part of **L(O)** then there is the following contradictory reasoning. [...] Split **L(O)** into two proper parts. Call them **L(O)1** and **L(O)2**, which are located at distinct regions *R1* and *R2*. In which case:

Paradox 2:

- (i) $L(O)1$ and $L(O)2$ are entities bounded by distinct regions $R1$ and $R2$. Qua event-like entities they occur or are located at $R1$ and $R2$ respectively, and nowhere else.
- (ii) $L(O)1$ and $L(O)2$ have as parts the entity O . O is located at rs in $R2$, so, as O is part of $L(O)1$, $L(O)1$, is not confined to $R1$; it is partly located in $R2$. O is located at rs in $R1$, so $L(O)2$ is not confined to $R2$; it is partly located in $R1$.

Conclusion: $L(O)1$ and $L(O)2$ are and are not bounded by $R1$ and $R2$. (2003, pp. 110-111)

Given the supposition that O is a part of its life, it is tempting to respond to this alleged paradox by saying that what happens in the scenario is simply that O is part of $L(O)1$ as long, and only as long, as $L(O)1$ exists or perdures through time, and is part of $L(O)2$ as long, and only as long, as $L(O)2$ exists or perdures through time. After all, that parts can predate and outlive wholes of which they are parts – *temporary* parts – is a commonplace: my daughter stacks some building blocks on top of each other, creating a tower, but eventually she tears it down, the blocks being spread out on the floor, still existing but no longer parts of the destroyed tower.

Tempting as this response may be, it is not the one I will defend (but see Beebe and Rush, 2005, for this kind of response). The temporary parthood relation is most naturally wedded to an ontology of three-dimensional, enduring entities, i.e. an ontology where both the whole and its parts are three-dimensional (see Simons, 1987); but in the case at hand, the wholes in question are four-dimensional, perduring entities, and it is generally thought that the mereological apparatus most suitable for four-dimensional entities is the one developed by Leonard and Goodman (1940). That mereology is ‘timeless’ in the sense that mereological relations are borne, not relative to times, but *simpliciter*. Thus it is doubtful that temporary parthood can be sensibly invoked here if we allow that $L(O)$, $L(O)1$ and $L(O)2$ are four-dimensional entities (cf. Barker and Dowe’s 2005 reply to Beebe and Rush).

My complaint, rather, is that Barker and Dowe have not established that an enduring object must indeed be a part of its life. (The relation might be non-mereological.) In particular, I will argue that the thesis underlying the claim – i.e. that “there is a necessary connection between a persisting thing and its life” – is simply not credible once it is agreed that a persisting thing/object is a 3D entity and that a life is a 4D entity.

It would generally be accepted persisting, living objects might have had shorter or longer lives than they actually have. Descartes lived to fifty-four but he could have died at three (we think). If persisting objects are three-dimensional and persist by enduring, such modal beliefs appear fairly unproblematic and straightforward: we simply imagine a possible world¹² where the object of our concern fails for some reason to be wholly present at times (times later than a certain time t) at which it is located in the actual world (or vice versa). However, in such a situation the life of the object would have been shorter. If lives are indeed four-dimensional, perduring entities, they have to be understood as four-dimensional *aggregates* of temporal parts (think of the standard perdurantism found in Lewis, 1983, and Armstrong, 1997, p. 102). Aggregates, however, have their parts essentially (see my yyyy); and from this it follows that a 3D object which, counterfactually, led a shorter life would lead a 4D life that is numerically distinct from its actual life, since its counterfactual life would lack some of the temporal parts its actual life has.¹³ Hence, since the object in question exists in a possible world in which (with ‘its life’ being understood rigidly) its life does not, there is no necessary connection between the enduring object and its life. (Descartes could thus truly have entertained the following pseudo-contradictory thought: ‘I could have led a different life, but my life could not have been different!’) It may be that an enduring object has to have *a* life – i.e. one life or another – but it does not appear necessary for the enduring object to have the particular life it has. If I am right about this, an endurantist who accepts Barker and Dowe’s Independence principle can consistently maintain that an enduring object and its life are *distinct* entities, as there is no necessary connection between them.

Notice, by the way, that if there were a necessary connection between a persisting thing and its life, then, given the Independence principle, we would have to conclude that the thing and its life are *numerically identical* (the natural position given perdurantism). To conclude, with Barker and Dowe, that they must be related by a part-whole relation would be a very weak way of expressing their relationship, as proper parts, although not parts, are necessarily *distinct* from the wholes of which they are parts (although they certainly overlap).

¹² I take it that possible worlds can be invoked here even if we do not conceive of them realistically.

¹³ In my (yyyy) I argue in detail that the 4D aggregate in the non-actual world is not even a *counterpart* of the actual 4D aggregate, *pace* van Inwagen (1990).

5. Conclusion

I conclude that all three arguments against endurance *per se* in B-time fail: they do not establish what they aim to establish. Although I would concede that endurance *per se* in B-time is counterintuitive to an extent, I do not think that this widespread intuition is sufficiently strong or reliable to render discussions about endurance through intrinsic change in B-time futile.

References

Armstrong D. M., 1989, *Universals: An Opinionated Introduction*, London: Westview Press.

Armstrong D. M. 1997, *A World of States of Affairs*, Cambridge: Cambridge University Press.

Barker S. and Dowe P., 2003, "Paradoxes of Multi-location", *Analysis*, vol. 63, no. 2, pp. 106-114.

Barker S. and Dowe P., 2005, "Endurance is Paradoxical", *Analysis*, vol. 65, no. 1, pp. 69-74.

Beebe H. and Rush M., 2003, "Non-paradoxical Multi-location", *Analysis*, vol. 63, no. 4, pp. 311-317.

Carter W. R. and Hestevold H. S., 1994, "On Passage and Persistence", *American Philosophical Quarterly*, vol. 31, no. 4, pp. 269-283.

Hansson T., 2007, "The Problem(s) of Change Revisited", *Dialectica*, vol. 61, no. 2, pp. 265-274.

Hansson Wahlberg, 2009, "4-D Objects and Disposition Ascriptions", *Philosophical Papers*, vol. 38, no. 1, pp. 35-72.

Haslanger S, 2003, "Persistence through Time", in *The Oxford Handbook of Metaphysics*, eds. Loux M. J. and Zimmerman D. W., 2003, Oxford: Oxford University Press.

Ingthorsson R. D., 2002, *Time, Persistence and Causality: Towards a Dynamic View of Temporal Reality*, Umeå: Solfjädern Offset.

Keller S and Nelson M, 2001, "Presentists should Believe in Time Travel", *Australasian Journal of Philosophy*, vol. 79, no. 3, pp. 333-345.

Leonard H. S. and Goodman N., 1940, "The Calculus of Individuals and Its Uses", *The Journal of Symbolic Logic*, vol. 5, no. 2, pp. 45-55.

Lewis D. K., 1983, "Survival and Identity", in *Philosophical Papers vol. I*, 1983, Oxford: Oxford University Press. Originally published 1976.

Lewis D. K., 1986, *On the Plurality of Worlds*, Oxford: Blackwell Publishing.

Lewis D. K., 1988, "Rearrangement of Particles: Reply to Lowe", *Analysis*, vol. 48, no. 2, pp. 65-72.

Lewis D. K., 2002, "Tensing the Copula", *Mind*, vol. 111, no. 441, pp. 1-13.

Lowe, E. J., 1988, "The Problems of Intrinsic Change: Rejoinder to Lewis", *Analysis*, vol. 48, no. 2, pp. 72-77.

Mellor D. H., 1998, *Real Time II*, London: Routledge.

Merricks T., 1995, "On the Incompatibility of Enduring and Perduring Entities", *Mind*, vol. 104, no. 415, pp. 523-531.

Miller K., 2006, "Travelling in Time: How to wholly Exist in Two Places at the same Time", *Canadian Journal of Philosophy*, vol. 36, no. 3, pp. 309-334.

Sider T., 2001, *Four-dimensionalism: An Ontology of Persistence and Time*, Oxford: Oxford University Press.

Simons P., 1987, *Parts: A Study in Ontology*, Oxford: Oxford University Press.

Smith N. J. J., 1997, "Bananas Enough for Time Travel?", *British Journal for the Philosophy of Science*, vol. 48, pp. 363-389.

Van Inwagen P., 1990, "Four-dimensional Objects", *Noûs*, vol. 24, no. 2, pp. 245-255.

Wasserman R., 2003, "The Argument from Temporary Intrinsic", *Australasian Journal of Philosophy*, vol. 81, no. 3, pp. 413-419.