

TIME TRAVEL FOR ENDURANTISTS

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ABSTRACT

Famously, David Lewis argued that we can avoid the apparent paradoxes of time travel by introducing a notion of *personal* time, which by and large follows the causal flow of the time traveler's life history. This paper argues that a related approach can be adapted for use by three-dimensionalists in response to Ted Sider's claim that three-dimensionalism is inconsistent with time travel. In contrast to Lewis (and others who follow him on this point), however, this paper argues that the order of events captured by so-called "personal time" should be thought of as *causal*, rather than temporal.

I. INTRODUCTION

The debate between three-dimensionalists and four-dimensionalists can seem to be an arcane matter of metaphysical bookkeeping; either perspective can seem to be a way of cashing out our folk ideas of objects. Yet Ted Sider (2001, pp. 101–110) has argued that what seems to be an intuitive ontology of three-dimensional continuants turns out to be inconsistent with something many of us regard as a genuine possibility: time travel.¹ We aim to show that Sider's argument fails, by providing a response that flows readily from an intuitive three-dimensionalist approach to persistence through time.

Sider alleges that endurantists face a problem with one-dimensional time travel, a problem highlighted by the possibility of self-visitation.² Suppose that on Friday, Mary travels back to 8:00 a.m. Wednesday. Suppose, further, that Mary walks out of her time machine and stands next to her younger self,³ who is sitting in an armchair. Assuming that sitting entails not standing, endurantists would seem committed to both ascribing to and withholding from Mary the very same property, namely, *standing*. Moreover, the

usual move of relativizing property ascriptions to times is not going to work here, since Mary is apparently both standing and not standing at the *same* time. How can we avoid this apparent contradiction? A four-dimensionalist distinguishes two objects, one of which is standing and the other of which is not. But this maneuver is not available to endurantists. So how should they respond to this challenge?

2. SOME RESPONSES IN THE LITERATURE

A few possible responses to Sider's challenge have been canvassed in the literature. Kristie Miller (2006) suggests relativizing property ascriptions to places as well as times. On this view, saying that Mary is sitting *over here* and standing *over there* (both at 8:00 a.m. Wednesday) entails neither that Mary is sitting *simpliciter* nor that Mary is standing *simpliciter* (at 8:00 a.m. Wednesday); thus no contradiction ensues. John Carroll (2011) suggests that time travel teaches us that, contrary to what we may have supposed, sitting does not entail not standing. We will not argue directly against either of these claims here. They are not inconsistent with our approach,

although if our approach is successful, then that might take away much of their motivation.

A different set of approaches attempts to deal with the problem by relativizing property ascriptions to *two* time indices, rather than just one—roughly, to time as measured from the perspective of the time traveler as well as to “external” time (Horwich 1975; Keller and Nelson 2001). We think there is something intuitively correct about this idea, but, as we shall argue, it ultimately misses the mark.

To see what is intuitively correct about the idea, consider a case in which, just before getting into her time machine on Friday, Mary consumes some spoiled seafood. As a result, she is sick on Wednesday. But how can seafood that you haven’t yet consumed make you sick? The answer, as David Lewis (1976/1986, pp. 73–74) points out, is that while there is a straightforward sense in which Mary’s being sick precedes her eating the seafood, there is another, equally straightforward sense in which it does not. As Mary would tell the story, she *first* eats the seafood, *then* travels back in time, and *only then* does she get sick. Although there is an “*and then*” of external time in which the effect precedes the cause, we can also make sense of an “*and then*” in which this is not the case.

This line of thought invites the introduction of an order of *personal* time that follows this “*and then*.” Personal time, in this sense, is an arrangement of temporal instants that (for the most part) respects familiar causal patterns in the life history of the time traveler: “[F]irst come infantile stages. Last come senile ones. Memories accumulate. Food digests” (Lewis 1976/1986, p. 70). And it might seem that Sider’s puzzle might be resolved by relativizing property ascriptions to such personal time (as well as to external time).

Any such suggestion, however, is liable to be confused. Personal time (so conceived) and external time are not, strictly speaking, different *times*; they are, rather, different

perspectives on the same times.⁴ The time traveler’s personal time is just a different arrangement of the very same set of temporal instants that also stand in the order of external time. The effect of Mary’s travelling back in time is simply that *a single instant* acquires *two* personal time designations.⁵ But then the question remains: How can this instant be such that Mary is both standing and sitting in it?⁶

Analogous points apply if we consider the problem in an explicitly relativistic setting (as does Horwich 1975, for example). In a relativistic setting, we can speak of the temporal location of events only relative to a frame of reference, rather than absolutely. Such relativization does not help address our problem, however. Consider the watch on Mary’s wrist. As Mary walks out of her time machine, the watch on her wrist reads 8:00 a.m. Friday (let’s say), and *Mary is both sitting and standing* at that (frame-relative) time. But how can it be coherent for a frame of reference to assign the very same temporal location to Mary’s sitting and to her standing?

Thus appeal neither to personal time nor to frame-relativized time helps the endurantist with the problem of self-visitation. Moreover, there seems to be a single underlying reason why these approaches fail. There seems to be no way in which, given time travel, we can distinguish between the *times* of Mary’s sitting and of her standing. This should not be surprising: after all, the whole point of self-visitation is that the traveler’s older and younger selves co-exist at the *same time*. We should not, therefore, expect to be able to distinguish between the events that befall them in temporal terms.

Nevertheless, as we already mentioned, there is something right about the thought that Mary’s standing occurs *after* her sitting, in some sense. On our view, the mistake of the approaches just discussed is that they attempt to explain the sense in which Mary’s standing occurs after her sitting in *temporal* terms. As

we will detail below, we believe that there is a better alternative.

3. AN ALTERNATIVE APPROACH: EVENTS AND THE CAUSAL NETWORK

Let us begin by asking *why* the endurantist wants to say that the person who steps out of the time machine is identical with the person who is sitting in the armchair. More generally, what is the point of tracking continuants across time?

According to endurantists, continuants are the subjects of causal processes and events. Such events and processes follow, by and large, predictable and intelligible patterns, determined in part by the nature of the continuant in question. Endurantists, therefore, generally require that there must be *causal relations* of an appropriate sort running through the entire period in which a continuant is around.⁷ Thus if the rotting apple on the ground today is the same fruit as the red apple hanging from the tree a week ago, then there must be a causal chain of the right sort that links the position and condition of the apple on the ground today with the position and condition of the apple on the tree a week ago. Similarly, taking the person who steps out of the time machine and the person sitting in the armchair to be one and the same implies that the right sorts of causal connections hold between them. The person who steps out of the time machine has a runny nose because of an infection that was picked up by the person sitting in the armchair; the idea for the trip was conceived while sitting in that very armchair—and so on.⁸

Notice that we do not claim that identity across time is *reducible to* a set of causal relations. Our claim requires only a more modest thesis, about the theoretical role that identity across time plays. On the view suggested here, an important aspect of that role is that statements of identity across time carry commitment to the existence of causal chains of the relevant sort. For example, recognizing

your childhood friend Bob in an unfamiliar place implies (among other things) the existence of a causal chain capable of sustaining the right sort of connections spanning the spatio-temporal gap between your present encounter with him and your previous ones.⁹ Nevertheless, as is familiar from the literature on personal identity, it might be the case that the relevant sort of continuity cannot be spelled out in terms that do not presuppose the notion of identity (Wiggins 2001, pp. 193–236). That statements of identity across time have causal implications does not mean that identity can be *analyzed* in causal terms.

For present purposes, the crucial point is that we can use the causal network that holds together the continuant's life history to introduce a sense of "before" and "after." Thus the fruit's ripening on the branch *causally precedes* its rotting on the ground, in virtue of the fact that the former process stands in the right sort of causal relations to the latter. Normally, of course, the temporal order and the causal order of events in a continuant's history will coincide. However, as the case of time travelling Mary and the spoiled seafood reminds us, this need not always be the case. Mary's being sick occurs temporally *before* she eats the spoiled seafood, but causally *after* it. Thus backward time travel involves a dissociation of the causal order of events in the time traveler's life history from their order in time. Of course, following Lewis, we can always simply define a different ordering of temporal instants, which by *fiat* follows the causal order of events in the time traveler's life history.¹⁰ This will be the time traveler's personal time. But it is clear that the order of personal time is derivative; what is fundamental is the causal order of events in the continuant's life history.¹¹

It is precisely this distinction—the distinction between the order of events in time, and the causal order of events in a continuant's life history—that helps resolve the apparent contradictions generated by the possibility of

self-visitation. As we saw above, the standard endurantist move of relativizing property instantiation to times is not going to work here, for the simple reason that, by hypothesis, Mary is both sitting and standing at the same time. Nevertheless, although there is no distinction in the *time* of Mary's sitting and her standing, there is a distinction in the location of those two events in the *causal network that constitutes Mary's life history*. Although, temporally speaking, Mary's sitting is co-located with her standing, causally speaking, Mary's sitting *precedes* her standing.¹² This, on our view, is why there is no contradiction in Mary's sitting and standing at the same time.

Let us make this idea more precise. Our suggestion is that endurantists should not think of continuants as instantiating properties *simpliciter*, or even as simply instantiating properties *at a time*. The fundamental idea is that continuants instantiate properties *at a given point in their life histories*, where the latter is conceived as a causal network of *events*. Making the reference to events explicit (in the manner familiar from the events-based semantics championed by people such as Davidson 1980; Parsons 1990; and Rothstein 1998),¹³ we can paraphrase sentences ascribing properties to objects at times, such as "Mary is sitting at *t*," in the following way:

There is an event *e* such that Mary is the subject of *e*, *e* is a sitting, and *e* takes place at *t*.

Similarly, we paraphrase "Mary is standing at *t*" as follows:

There is an event *e* such that Mary is the subject of *e*, *e* is a standing, and *e* takes place at *t*.

Our claim, now, is that there is no inconsistency between (1) and (2), precisely because they can be made true by *distinct events*. It is very hard to see how there could be a *single* event that is both Mary's sitting and her standing;¹⁴ but it is not hard to see how there could be *two* events, one of which is a

sitting by Mary and the other a standing by her. This is so, we claim, even if those events are contemporaneous, as in the case of self-visitation.

Our account makes use of the category of event, but we can afford to be relatively non-committal about what events are. The crucial point is just to focus attention on the particular occasions on which objects instantiate properties. The intuition we intend to capture with our talk of events is that a continuant's life history is a sequence of *particular instantiations* of properties, which stand in causal relations to each other.

Thus our approach is consistent with thinking of events as just particularized property instantiations. Nevertheless, it is important to emphasize that, on our view, events are *not* simply triples of objects, properties, and times (as in Goldman 1976; and Kim 1976). To see why, consider a simple variant of Sider's self-visitation case, in which Mary's younger self and her older self are both sitting. In this case, Mary instantiates the same property—the property of *sitting*—twice at one time. And yet, intuitively, these are two distinct events, not just one: the event that is Mary's younger self's sitting is distinct from the event that is Mary's older self's sitting. This would be impossible if events were just triples of objects, properties, and times. On our view, by contrast, what distinguishes those two events is *their causal relations*, or their *place in the causal network*: even though the two events are contemporaneous, the former is *causally prior* to the latter. The same holds in Sider's original case. The event that makes (1) true is causally prior to the event that makes (2) true. This is why there is no inconsistency between them.

We can further illustrate our approach by considering an elaboration of Sider's argument against three-dimensionalism. Sider (2001, pp. 102–103) suggests that three-dimensionalists have trouble distinguishing between two intuitively distinct possibilities:

one in which Mary's younger self sits while her older self stands, and one in which their roles are reversed. It is easy to see that simply relativizing property ascriptions to times cannot solve this problem: in both possibilities, Mary has the properties of sitting and standing at the same time. By contrast, our proposal has no trouble distinguishing between these possibilities. One of these cases involves a sitting by Mary that is *causally prior* to a standing by her, while the other involves a sitting by Mary that is *causally posterior* to a standing by her.¹⁵

4. CONCLUSION

The intuitive possibility of time travel depends on our being able to arrange the properties a continuant instantiates during

its career in a way that can be divorced from the objective order of time. This is where we agree with those who follow Lewis in distinguishing between personal and objective time. As we saw, however, it is a mistake to try to cash out the intuitions behind this distinction in *temporal* terms: this is what the self-visitation cases highlight. The alternative, which we endorse, is to take the relevant order to be *causal*, rather than temporal. As we explained, we can make this idea more precise by using the notion of an *event*, where events are distinguished from each other not just on the basis of the objects, properties, and times they involve, but also on the basis of their causal relations.

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NOTES

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1. For discussion of Sider's argument, see Markosian (2004); Simon (2005); Miller (2006); Carroll (2011). We will touch upon some of this literature below.
2. One way to think of the distinction between one- and two-dimensional time travel (by analogy to one- and two-dimensional modal semantics) is this: In one-dimensional time travel, there is a fact about what happens at a time *simpliciter*. If there is a time traveller at a time, say Wednesday, then the time traveller is there at the time *simpliciter*. This contrasts with two-dimensional time travel in which facts about what is true at a time hold only *from the perspective of a time*. So, as it might be, whether there is a time traveller there on Wednesday depends on whether this is considered from a time before or after the time traveller has travelled to Wednesday. Suppose the time traveller enters her machine and presses the appropriate buttons on Friday. Then if, on Saturday, we look back at Wednesday, there is a time traveller there. Looking back from Thursday, by contrast, there is not.
3. We will, throughout, use the expressions "younger self" and "older self" non-committally, simply to distinguish between the two person-like entities that are co-present in a case of seeming self-visitation. Endurantists will take these expressions to refer to the same person, while four-dimensionalists will take them to refer to distinct person-stages.
4. Sider (2001, p. 106) makes the same point. On certain conceptions of two-dimensional time travel, this might not hold; but, as mentioned earlier, we focus on the one-dimensional case only.
5. It follows that personal time is not a partial ordering, in the mathematical sense: the very same temporal instant (8:00 am Wednesday in external time) can be both *before* and *after* a different instant (say, noon on Thursday in external time) in Mary's personal time.
6. Carroll (2011, pp. 363–364) makes a similar point, though in a slightly different way.

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7. What do we have in mind when we speak of causation? What is at issue here are explanatory relations that can hold between particular contingent events, such that one term of the relation makes it intelligible why the other happened and had the characteristics that it did. We assume nothing else about causation. In particular, given that we are assuming the possibility of time travel, we cannot assume that causes must temporally precede their effects.

8. But is the entity that steps out of the time machine really a *person*? Markosian (2004, pp. 672–673) suggests that Mary’s older and younger selves are merely *proper parts* of Mary, rather than identical to her (and each other). He then goes to some lengths to argue that, despite this non-identity of Mary’s older and younger selves, the case can still be consistently described as one of *self-visitation*. Despite his efforts, however, we still find the view unsatisfying. In what sense are Mary’s younger and older selves merely proper parts of a single person? They are not connected by either biological or psychological links in the present moment. Moreover, each of them seems to be a complete person in her own right. Had Mary’s older self not suddenly appeared, we would have had no difficulty taking her younger self to just *be* Mary. Similarly, Mary’s older self just *was* Mary, up to the moment she time traveled. Why should time travel change their status in this way?

9. These connections typically involve spatio-temporal continuity, but if time travel is coherent, they may not.

10. As noted above (see endnote 5), such a relation on instants will not always be a partial ordering, since there will be instants that do not have a unique position in it.

11. What about causal loops? Suppose that Mary’s older self visits her younger self in order to tell her the secret to building a time machine, and that the older self only knows how to build a time machine because she has retained the knowledge from when she was told, in her youth, how to build a time machine by what was then *her* older self (Lewis 1976/1986, p. 74). There is here a violation of the intuitive asymmetry of causation: Mary’s telling herself the secret to building a time machine is both cause and effect of Mary’s building a time machine. This, however, need not create special problems for our approach, so long as the *preponderance* of causal processes involving Mary involves no loops. For example, the biological processes involved in Mary’s aging continue their one-directional march throughout the whole affair. Thus so long as causal loops remain relatively marginal, their possibility does not undermine the possibility of defining a causal “before” and “after.”

12. Notice that it is not necessary for there to be a *direct causal link* between Mary’s sitting and her standing in order for this to be true. We might even go along with Sider (2001, p. 103) in supposing Mary’s standing to be *uncaused*. The point is just that the totality of what’s going on with Mary at this time (which includes her standing) must stand in causal relations to what was going on with her before entering her time machine. In the absence of such relations, we believe, there would be no grounds for taking the thing that emerges from the time machine to be Mary.

13. Of course, our use of Davidson-style analyses of logical forms does not indicate that we also accept Davidson’s metaphysical commitments. In particular, while we are happy to quantify over events, we are not at all attracted to Davidson’s extensionalism.

14. There could, of course, be an event that is Mary’s *getting up* from her chair, and that has a part that involves Mary sitting down and another part that involves Mary standing. But this is not the possibility we mean to be ruling out here: what is ruled out is an event that is, throughout, a sitting by Mary and also a standing by her.

15. Notice that we can distinguish between these possibilities without having to take a stand on whether it is the *very same events* that figure in both. The topic of trans-world identity for events is a fraught one, and we are happy to leave it open here.

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