

How sitting in a café might be metaphysically as problematic as time travel

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This is an abandoned draft. As I explain toward the end of §5, I think that the argument falls apart. Nevertheless, comments are welcome.
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Abstract

Theodore Sider argues that the possibility of time travel gives us a reason to prefer four-dimensionalist metaphysics (according to which things have temporal parts) over three-dimensionalist metaphysics (according to which things are wholly present at each moment of their careers). This paper considers scenarios in which, although there is no time travel, an individual is simultaneous with its past and future selves. We can use such scenarios to make the same metaphysical point that Sider gleans from time travel. Yet for all we know, we may be living in such a scenario. As such, any mundane moment of our lives might have the same metaphysical upshot as traveling through time.

1 Introduction

There is something disorienting about thinking that there might now be another me. Science fiction scenarios are simple enough to describe: Imagine that next week I step into a time machine and travel back to this morning. I hang around until this moment. There would be a sense in which I was now out there, because ‘I’ as we usually use it doesn’t distinguish between the me who got to this moment in the ordinary way and the me who got to this moment by time travel.

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Theodore Sider [Sid01, pp. 101–109] suggests that the metaphysical possibility of time travel scenarios like this provides an argument in favor of four-dimensionalism, the view that individuals *perdure* rather than *endure*. Below, I discuss Sider’s argument and defend it against criticisms leveled by Ned Markosian [Mar04]. I will then argue that the same problems that arise in this time travel scenario may arise without time travel if space is multiply-connected. As such, Sider’s argument can go through without an appeal to time travel. Since space might be multiply-connected for all we know, we would do well to adopt a metaphysics compatible with that possibility.

2 Three- and four-dimensionalism

Three-dimensionalism is the view that objects are ‘wholly present’ *whenever* they exist. Take me, for instance. I am here *now*. In five minutes, this same person will be wholly present *then*. I am entirely present in each single moment, and I have no proper temporal parts.

Four-dimensionalism is the view that “every persisting object has a temporal part at each moment of its existence” [Sid04a, p. 643]. Corresponding to me, there is a four-dimensional object that is an aggregate of me at all the moments of my life— a so-called spacetime worm. At each particular time, there is a temporal stage— a time slice of the spacetime worm. Compatible with four-dimensionalism, we might say that references to me typically pick out the worm or the stage. (Sider himself advocates the stage view [Sid01, pp. 188–208].)

3 The argument from time travel

Return to the time travel scenario broached in the introduction: Let’s use the label ‘young-me’ for the me who has not yet travelled through time and the label ‘old-me’ for the me who has come back from the future. Imagine it is noon, and young-me is sitting quietly in a coffee shop. Old-me enters the coffee shop and walks up to the counter. At this moment, young-me is seated; old-me is standing. (See fig 1a.) The puzzle is whether I simpliciter am seated or standing.

How does the four-dimensionalist resolve this? Strictly speaking, the temporal stage of me at noon includes both young-me and old-me; the temporal stage has two heads, four eyes, and so on for twice the usual human complement of organs. Sider distinguishes young-me from old-me as distinct ‘person stages’ [Sid01, p. 101], each with the usual number of organs. For ordinary cases, a person at a time and place (a person stage) is part of that person’s spacetime worm. We can say the same thing about young-me and old-me: they are both me because they are part of the same spacetime worm. Ordinary people have one person stage per temporal stage, but in the time travel scenario there are two person stages of me in the café at noon. This dissolves the puzzle by denying that it makes sense to ask about me simpliciter in the café at noon.

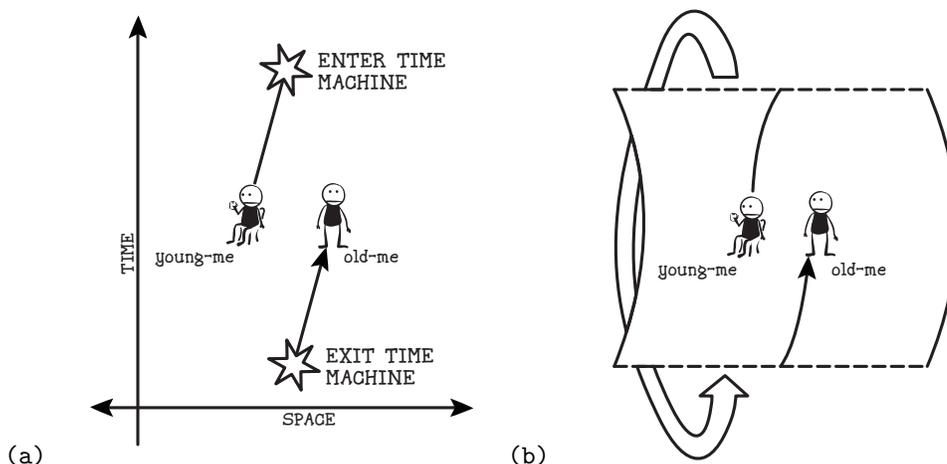


Figure 1: (a) At noon, I am seated. In the future, I climb into a time machine, return to the past, and am standing nearby at noon. (b) The same situation might arise if I followed a suitable trajectory through multiply-connected space-time.

Sider prefers to say that we normally refer to stages of things. Since young-me and old-me are distinct person stages, there is no more difficulty dealing with how they relate in the time travel case than there would be if old-me stayed in the future. (On Sider’s account, young-me and old-me are counterparts.)

The scenario is less manageable for the three-dimensionalist. If I am wholly present *as* seated and wholly present *as* standing, then I am both seated and standing. Worse: there is no principled way of sorting out which me is seated and which is standing, since each of young-me and old-me is wholly present as me. (Sider [Sid01, esp. pp. 102–106] argues this point at greater length.)

As Markosian [Mar04, pp. 670–673] suggests, the three-dimensionalist may resolve this paradox by saying that neither young-me nor old-me is fully me at noon in the café. Rather, me-at-noon is the aggregate of young-me and old-me. Given three-dimensionalism, this aggregate is wholly present in the coffee shop and has no proper temporal parts. Like Sider’s temporal stage at noon, me-at-noon on Markosian’s analysis has two heads, etc.

Assuming that this is the only time travel we have to worry about, infant-me was wholly present in the crib and had only one head. Markosian’s analysis seems to miss the sense in which young-me and old-me are both the same person as infant-me, since they are recorded in different columns of the metaphysical ledger. Young-me and old-me are proper spatial parts of me, whereas infant-me was me tout court. (See fig 2.)

Markosian tries to resolve this problem by considering my entire life as an event. My life can be divided into temporal parts: infancy, adolescence, and so

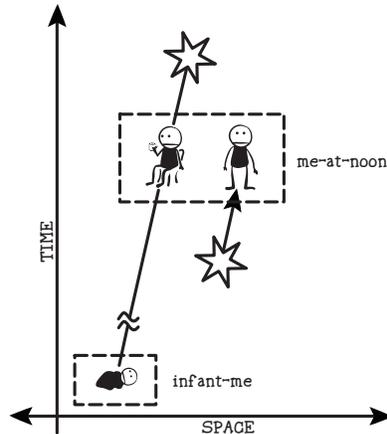


Figure 2: On Markosian’s analysis, infant-me had one head, two eyes, etc. Because of time travel, me-at-noon is a different sort of thing; it has two heads, four eyes, etc.

on up through today.¹ The event of my life at noon has two discrete spatial parts. These separate ‘person events’ are what I’ve been calling young-me and old-me. The three-dimensionalist can give the same story about person events that Sider gives about person stages: Young-me, old-me, and infant-me *qua* person events are all parts of my life.

This reply is coherent, I think, but it gives the game away to the four-dimensionalist. The intuition behind three-dimensionalism is that I am wholly present here and now— even if I will travel back through time such that even now my future self is lurking around out there. The only way that the three-dimensionalist can do justice to the distinction between young-me and old-me is to appeal to person events. Since person events are tantamount to person stages, the four-dimensionalist wins. That is: Person events have temporal parts and young-me can only be understood as a person event, so there is no room left to deny the four-dimensionalist claim that young-me is best understood as having temporal parts.

The three-dimensionalist may attempt to block this conclusion by showing that time travel of this kind is metaphysically impossible. Sider [Sid01, p. 109] defends the metaphysical possibility of time travel on the ground that physicists take the possibility seriously. More recently [Sid04b, p. 686], he writes that the argument may only go through for science fiction time travel in which the traveller follows a discontinuous trajectory through spacetime. Notice, however, that the argument as I have presented it does not rely on any details about my future trajectory. The outcome would be the same if I were to follow a closed

¹Three-dimensionalism denies that objects have temporal parts, but can agree that *events* have temporal parts[Mar04, pp. 672–673, fn. 13].

time-like curve. (See fig 1b.)

Perhaps it would be sufficient for the three-dimensionalist if time travel were metaphysically extraordinary. Me-now can be wholly present here and now, provided that no later-me travels to this time. Perhaps the ‘me’ that I usually am is wholly present now, even if the concept would break down were old-me to enter the coffee shop. If time travel never or only rarely actually occurs, then it would be possible to insist on three-dimensionalism for the objects we usually refer to.

In what follows, I will argue that the problem for three-dimensionalism can be posed without time travel or closed time-like curves. For all we know, I am now and always have been simultaneous with older person stages of myself.

4 Multiply connected space

In this section, I explain a situation that might arise in trying to discover the topological structure of space. In the next section, I will argue that a variant of this situation creates problems for three-dimensionalism.

Suppose that space is multiply connected. Considering only one dimension of space, identify the point x with the point $x + k$ for some constant k . Call this possibility T_1 . Reichenbach [Rei58, pp. 58–81] argues that any evidence consistent with the hypothesis that space is multiply-connected in this way would also be consistent with the hypothesis that things repeat themselves every k units in simply-connected space. Call this possibility T_ω .

For the sake of cartoon illustration, suppose that k is the length of one city block. According to T_1 , there is a street one block long such that each end of the block connected to the other end. I stand on the sidewalk and can look down the street to see myself one block away, as in fig 3a. According to T_ω , there is an indistinguishable street that repeats itself every block. I stand on the sidewalk and can look down the street to see someone who looks exactly like me, as in fig 3b. In T_1 , my observation is explained by the topology of space. In T_ω , it is explained by duplication of everything on the block.

The choice between T_1 and T_ω may seem underdetermined, but there is a significant reason to prefer T_1 . The theories agree that what happens at one location tells us what is happening n blocks away, for all integers n . In T_1 , this is hardly puzzling: The event n blocks away is the same, numerically-identical event, reached by following a closed curve around multiply-connected space. In T_ω , however, each event n blocks apart is distinct. The distribution of matter is repeated periodically with lawlike regularity. In 3b, if I scratch my nose, then infinitely many qualitatively-identical people scratch their noses at the same moment.

As Magnus [Mag05] argues, the non-local, law-like regularity posited by T_ω can be exploited to send messages instantaneously across arbitrarily long distances. Roughly, sending a message involves an intention and an action that produces a recognizable mark or signal. Suppose I know that T_ω is true and want to send a message to the guy three million blocks to his left. I have the

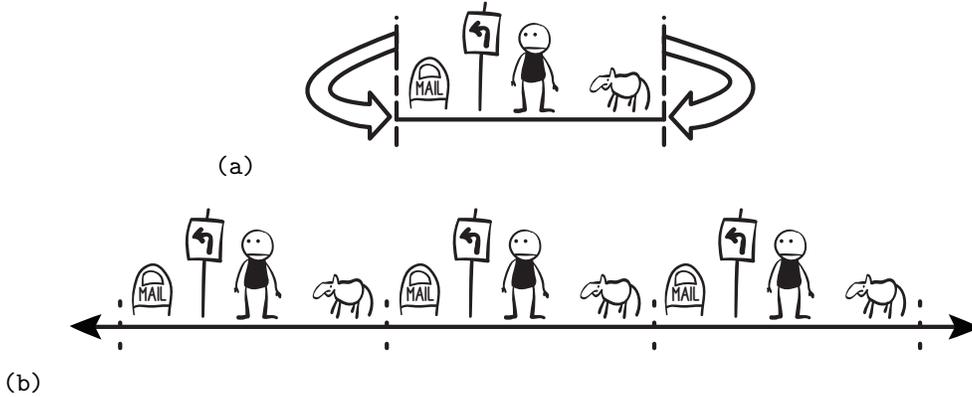


Figure 3: (a) Theory T_1 : The universe is finite but unbounded. (b) Theory T_ω : The universe is infinite. All of its contents are repeated at regular intervals, down to the last detail.

intention; all I need to do is produce the mark. Using a piece of chalk, I inscribe my message on the curb in front of me. Due to the law of repetition, the same message is inscribed on the curb three million blocks to his left. Message sent!

Presuming that intentions supervene on the physical (either broadly or narrowly), each of the infinitely many guys forms a similar intention to send a message. Each makes a similar mark. As such, each sends a message three million blocks to the left. So just when a guy in fig 3b sends his message, he *receives* a message from three million blocks to his *right*. The message he receives is spelled out in the very same chalk that he laid down in sending his message. I receive a message, and so do all of my indistinguishable fellows.

If there is a finite upper bound on the speed of causal signals— as we believe there is— then it is impossible to send messages in this way and T_ω is false.² Yet our belief that there is upper bound on the speed of causal signals is motivated by relativity, and we have so far formulated T_1 and T_ω in terms of classical space.

5 Temporally-offset self-simultaneity scenarios

Given classical mechanics, neither T_1 nor T_ω presents a problem for three-dimensionalism. The three-dimensionalist says that the guy is wholly present here now, and this is compatible with either theory. If T_1 were true, then he would be wholly present here and n blocks away (for all integers n); no problem, since a location n blocks away is (ex hypothesi) the same location as *here*. If

²As Reichenbach remarks, “the topological properties of space are closely related to the problem of causality; *we assume a topology of space that leads to normal causal laws*” [Rei58, p. 80, emphasis in original].

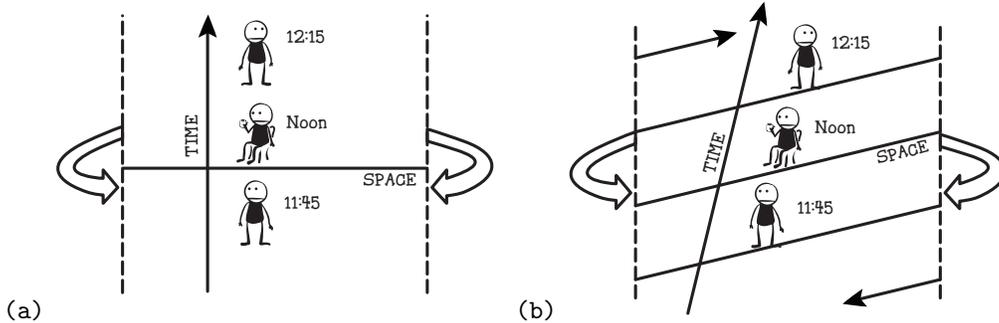


Figure 4: Relativistic corrections to theory T_1 . (a) If the coffee shop is stationary on the page, then it looks just like the classical case. (b) If the coffee shop is in a different reference frame than the page, I am simultaneous with my past and future selves. Am I sitting or standing at noon?

T_ω were true, then there would be an indistinguishable duplicate of the guy n blocks away; no problem, since the duplicate is wholly present there now just as the guy is wholly present here now.

This reliance on ‘there now’ and ‘here now’ will create problems as we shift from classical mechanics to special relativity. Suppose that I am in a multiply-connected spacetime, like the guy in fig 3a. I am standing in line at the coffee shop, I sit down with a cup of coffee, and then I stand up again. Consider me-at-noon. Using the usual definition for simultaneity, we can draw a line through all the points that I would count as simultaneous to me seated and drinking coffee; that is, we can draw a hyperplane of simultaneity relative to the inertial reference frame of the coffee shop. If the reference frame of the coffee shop is the same as the reference frame of the drawing, this line will be horizontal; see fig 4a. The three-dimensionalist should have no problem with this, since this is just the outcome in the classical case. Yet suppose that the coffee shop is moving to the right, relative to the drawing’s reference frame. The hyperplane of simultaneity relative to the reference frame of the coffee shop is then a diagonal line; the diagonal line continues around multiply-connected spacetime to intersect my past and future selves, as in fig 4b. At noon, I would be simultaneous with younger and older time slices of myself; me-at-noon would include both seated and standing person stages. Differentiating between these different person stages would require the same metaphysical machinery as differentiating between young-me and old-me in the time travel scenario. In the time travel scenario, I travel back in time and see my younger self. In this scenario, I arrive at the coffee shop and take a seat in the usual way—but because of features of spacetime far removed from the coffeeshop, I am simultaneous with my past and future selves. For lack of a better phrase, let’s call this a *temporally-offset self-simultaneity* scenario.

The three-dimensionalist has no reason to expect that the reference frame of the coffee shop will be like fig 4a. Even if it were, I would be in a different

reference frame if I were to walk across the room.³

Four-dimensionalism, on the other hand, has no problem with these scenarios. There are three separate person stages depicted in fig 4. The separate person stages are temporal parts of my spacetime worm, and they are also spatial parts. Since four-dimensionalism allows for both spatial and temporal parts, there is no contradiction in this. The fact that something can be *both* a temporal and a spatial part is perhaps odd, but the oddity arises from relativity rather than from four-dimensionalism.

As we saw, four-dimensionalism is the better way to understand cases of time travel; three-dimensionalism can be defended by insisting that time travel is either impossible or very rare. Since such a scenario is like a time travel scenario in the relevant respects, four-dimensionalism is the better way to understand it; three-dimensionalism could be defended either by denying that such a scenario is possible or by denying that any such scenario is actual.

Of course the universe is larger than a block across, but surely that is metaphysically contingent. The scenario described above is metaphysically possible, so a fortiori scenarios like it are possible. Moreover, no observations of our immediate surroundings could show that we are not actually in a such a scenario. For all we know, spacetime may have a multiply-connected geometry. Analysis of the cosmic microwave background might settle the matter in the next few years, but for now it is an open question. (See [LSW99], [LWR⁺03], and further citations in [Mag05].)

The last refuge for the three-dimensionalist is to deny that individuals are genuinely *simultaneous* with past or future stages of themselves in these scenarios. I can see two ways that this objection might go:

First, one might object to the way in which the hyperplane of simultaneity is drawn in fig 4. Reichenbach and Grünbaum famously argue that simultaneity is conventional in special relativity, but none of the conventions they consider will suit a three-dimensionalist any better than this one. The three-dimensionalist could argue that the correct notion of simultaneity is one that makes me simultaneous with myself now rather than with earlier stages or later stages of myself. Here the suggestion is not that simultaneity is conventional, but rather that the usual definition is *wrong* and should be replaced with one that excludes temporally-offset self-simultaneity. This is unpromising. Although the usual definition applies in any spacetime— whether simply or multiply-connected—the new constraint says nothing about how we should construe simultaneity in simply-connected spacetime. Further differences might be elaborated, but I think that if any definition is to be privileged it should be the usual one and not one cooked up to save three-dimensionalism.

Second, one might object the notion of simultaneity actually becomes *mean-*

³There is no consolation for the three-dimensionalist if my reference frame is *close* to the one in fig 4a. On the contrary, matters are easiest for the three-dimensionalist if my frame is moving very quickly relative to the reference frame of the figure. I might not be simultaneous with any distant moments of my own life at all— the hyperplane of simultaneity would come around before my birth and after my death. This would not save three-dimensionalism, however, since we could still construct self-simultaneity scenarios for things with longer lifespans.

ingless in relativity. This claim is most plausible in general relativity, where my reference frame might fail to define a global time coordinate. Even in special relativity, though, one might argue that there is no sense in thinking of events more than a few light-minutes away as occurring *now*. I have no answer to this argument, but I begin to lose track of the dialectic. Three-dimensionalism presupposes a sharp distinction between *space* and *time*. The objection undoes that distinction. There are objects in spacetime which I am precluded from situating in my past, present, or future—I cannot situate them in time at all. Are they thereby not in space, either? Hell if I know.

6 Postscript

In §4, we saw that a multiply-connected spacetime (T_1) can result in similar predictions to a simply-connected spacetime along with a law-like repetition of the contents of space (T_ω). The possibility of instantaneous messaging in T_ω provided a reason to prefer T_1 . In §5, we saw that T_1 would allow for scenarios in which individuals are simultaneous with their past and future selves. Since these scenarios sit better with four-dimensionalism than with three-dimensionalism, we have an argument for four-dimensionalism. (Here I ignore the final caveat.) This is effectively Sider’s argument from time travel, given without appealing to time travel or closed time-like curves.

The three-dimensionalist might reply that we have principled reasons to deny that such a scenario obtains, so T_ω would be preferable to T_1 after all. I have no decisive argument here: Perhaps I have merely uncovered a reason to think that laws of infinite repetition like the one in T_ω are not so distasteful as we might otherwise have thought.

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