Four Dimensionalism—Reading group 5

Last time, we looked at various arguments in favour of four-dimensionalism, starting with (what Sider considered to be) some bad ones, and ending with (in Sider's view) some better ones. This week, we'll consider the final two such arguments which Sider discusses in chapter 4. These are: (i) the argument from spacetime, and (ii) the argument from vagueness.

Chapter 4: In favour of four-dimensionalism, part I (continued)

The argument from spacetime

There are two main views regarding the ontological status of spacetime: *substantivalism* and *relationalism* (this distinction will be familiar to PhysPhils!). For the purposes of our discussion, we can define these as follows:

Substantivalism: Space and time are independent elements of the ontology of the world.

Relationalism: Space and time are not independent elements of the ontology of the world; rather, they are reducible to (relations between) material bodies.

(Historically, Newton was a major proponent of substantivalism; Leibniz was a major proponent of relationalism—see *The Leibniz-Clarke Correspondence* for debates on this.)

On this debate, Sider writes, "Either substantivalism or relationalism is true; I will argue in each case that the four-dimensional ontology is favored" (p. 110). So, his thought goes that assuming that substantivalism and relationalism are mutually exclusive and exhaustive views in the ontology of space and time, any way one cuts it, one should be a four-dimensionalist.

Sider starts off by thinking about substantivalism; he notes that there is a sub-distinction between different kinds of substantivalism:

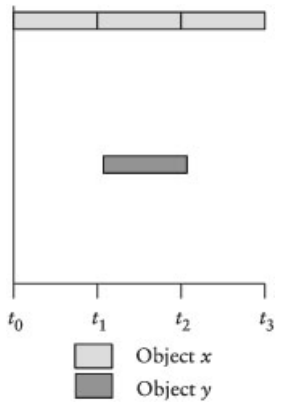
> *First, assume that substantivalism is true, then there are such things as points and regions of spacetime. There is then the question of whether there is anything else, wheher spatiotemporal objects* occupy*, but are distinct from, regions of spacetime, or whether they simply* are *regions of spacetime.* (Sider p. 110)

The view according to which objects occupy spacetime points is 'classic substantivalism' (and is, arguably, the more intuitive view); the view according to which spacetime points *constitute* objects sometimes goes by the name of *supersubstantivalism* (see Lehmkuhl, Noûs, 2018, for more).

On supersubstantivalism, Sider writes that "Given the identification [of objects with spacetime points], perdurance follows, since spacetime perdures" (p. 110). **Questions:**

1. Is this correct? Can Sider say more about why he takes spacetime to perdure?
2. Sider doesn't discuss 'classic substantivalism'. Assuming that we don't buy into supersubstantivalism, doesn't that leave a hole in his argument for perdurantism?

Next, Sider moves on to consider relationalism. The claim here is that relationalism does not sit easily with endurantism, so perdurantism is to be preferred. *Per* relationalism, temporal relations obtain between objects, and all claims about time can be reduced to such relations. With this in mind, consider the following image, from Sider (p. 115).



Here, we have two objects, x and y. Let the light grey indicate having the property F, and let the dark grey indicate having the property G. On the substantivalist-endurantist model, we can say that x is F at t_0, t_1, t_2, t_3, and y is G at t_1 and t_2. From this, we can reconstruct that, say, there is some point in time (e.g. t_0) such that x is F one unit of time earlier than y is G, and so forth. We can say everything that we think there is to say about the relations between these objects on a substantivalist-endurantist picture.

Now consider a relationalist-perdurantist model. x (now a four-dimensional worm) has three-dimensional temporal parts, call then x_0, x_1, x_2, x_3; y (also now a four-dimensional worm) has three-dimensional temporal parts, call them y_1 and y_2. On this model, we can say that x_0 is F, x_1 is F, y_1 is G, and so forth. We can also introduce the primitive temporal relations (the surrogate for the substantivalist's primitive times) that x_0 is one unit of time earlier than y_1, x_0 is one unit of time earlier than x_1, and so forth. Using these relations, we can say everything that the substantivalist-endurantist can say about this situation.

Finally, consider a relationalist-endurantist model. In this case, objects do not have temporal parts, so it is not clear how on this approach one can say everything that, say, the substantivalist-endurantist could say. At least, the approach is going to have to be different to the relationalist-perdurantist model discussed above. Sider contends, however, that there is a way forward here. Here is his proposal:

> *The endurantist relationalist should say that all facts about persisting objects are captured by statements of the form: ⌜x is F n units of time after y is G⌝, which is officially primitive but explained informally as meaning that at* some *pair of times n units apart, x is F at the earlier time and y is G at the later.* (Sider p. 115)

And here's how his proposal pans out in our example (I've suppressed parenthetical comments in this quote):

> *In this situation the following facts holds:* x is F one unit after x is F*;* x is F two units after x is F*;* x is F three units after x is F*;* y is G one unit after y is G*;* x is F one unit after y is G*; and so on;* it is not the case that x is F four units after x is F*; and so on.* (Sider p. 115)

Although these relations might sound slightly odd initially, there's nothing problematic about introducing them into a relationalist-endurantist ontology; in this way, the proponent of this view can say everything that can be said in the other two approaches.[1]

Ultimately, though, Sider doesn't like this proposal, for a couple of reasons. One is that it doesn't seem to be able to distinguish between linear and circular time. He writes:

[1] Aside: Famously, Quine in his 1951 paper 'Ontology and Ideology', distinguished between the ontology of a theory—its basic metaphyiscal commitments—from the ideology of a theory—what can be said in that theory.

> *... the view cannot distinguish a world with an infinite linear time line containing only a single unchanging electron from an otherwise similar world in which time is circular. Call the electron e, and let C be the property* having a negative charge. *Presumably, in the circular world, for any n, e is C n units after e is C, since one can begin at any point and traverse the circle repeatedly until n units of time have elapsed. Since it is also true in the infinite linear world that e is C n units of time after e is C, for all n, the endurantist-relationalist cannot distinguish these possibilities.* (Sider p. 116)

Questions: What's the upshot of this supposed to be? Why *should* an endurantist-relationalist account of change along the lines that Sider suggests be able to distinguish different temporal topologies? Doesn't it just issue the correct verdict that the electron hasn't changed, in both cases? Or is the concern that, if there is nothing more to time than the obtaining of these relations, then one cannot settle certain questions about the topology of time? Perhaps this kind of relationalist could simply bite the bullet on this? (And: is it a particular problem for the endurantist-relationalist, or just a general problem for relationalism?)

The argument from vagueness

Sider calls this "one of the most powerful" arguments for four-dimensionalism (p. 120). Here's how he summarises the structure of this section and the arguments within it:

> *Under what conditions do objects come into and go out of existence? As a believer in temporal parts and unrestricted composition, I say this* always *occurs. Any filled region of spacetime is the total career of some object. Others say that objects come into and go out of existence only under certain conditions. When bits of matter are arranged in certain ways, an object—say, a person—comes into existence; and that thing goes out of existence when the bits cease to be arranged in the appropriate way. But what sorts of arrangements are suitable? If one arrangement is suitable, then a very slightly different arrangement would seem to be as well. Iterate this procedure, and we have the conclusion that objects* always *come into and go out of existence, no matter how bits of matter are arranged. But this, it will be seen, is tantamount to admitting that four-dimensionalism is true. The obvious problem with 'slippery slope' arguments of this sort is that they neglect vagueness. But there cannot be vagueness of the sort needed to block the argument.* (Sider p. 120)

Put very simply, the idea is this: for the perdurantist, there are various different temporal

parts, which can be assembled into various different four-dimensional objects; there's according no issue about when one object comes into or goes out of existence. By contrast, the endurantist needs to commit to the same object either being present or not being present at a particular time. But how to do this? Either one goes for sharp cutoffs, which is implausible, or one invokes vagueness and lands in a sorites-paradox-like predicament (see my notes from last year's reading group for more on the sorites paradox!).