

Four Dimensionalism—Reading group 7

In the previous two weeks, 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. In this final chapter of the book, Sider turns his attention to some objections to four-dimensionalism.

Chapter 6: Arguments against four-dimensionalism

The no-change objection

In *Principles of Mathematics* (1903), Russell presents a particular view on the nature of change:

Russell has in mind propositions like these:

The poker is hot on Monday.

The poker is hot on Tuesday.

If these propositions differ in truth value, then according to Russell the poker changes.

The poker changes because it is hot at one time, but not hot at another. (Sider p. 212)

As Sider writes, this account of change can be accommodated by the perdurantist:

Four-dimensionalists typically accept the B-theory and this account of change, and add an account of what it is for a poker to be hot at a particular time: it is for the poker's temporal part at the time to be hot simpliciter. The poker thus changes from hot to cold by first having a hot temporal part, then a cold one. Change is qualitative variation between the distinct temporal parts of an object. (Sider p. 212)

(Recall that this perdurantist approach to change avoids the 'problem of temporary intrinsics' faced by the endurantist.) Sider finds in McTaggart's *The Nature of Existence* (1927) two objections to the above conception of change, which he labels respectively 'the argument from unchanging facts' and 'the argument from spatial analogy'. Here's the first:

The argument from unchanging facts is that things cannot change unless the facts change; but if the poker is hot at a particular time then it is always true that it is hot at that time; therefore, B-facts like that expressed by the sentence 'The poker is hot on Monday' do not change, and so neither does the poker. If the B-theory of time is true, the same is true for all facts about the poker, and so the poker would not change; nor would anything else. (Sider p. 213)

And here's the second:

McTaggart's second argument is that the Russellian theory of change makes genuine change too much like spatial variation. No one says that the relative locations of the Greenwich meridian and the United Kingdom change, and no one says that a poker that is hot at one end but cold at another is thereby changing. But on the Russellian theory, change is the instantiation of different properties at different times, and is thus analogous to these cases of the instantiation of different properties at different places. (Sider p. 214)

Sider's response to both of these arguments is blunt:

These McTaggartian arguments contain no subtle fallacy, no hidden technical mistake, and there is no reply making use of elaborate distinctions or theory. The objections may simply be met head-on. Change is analogous to spatial variation. Change does occur in virtue of unchanging facts about temporal parts. There are no good arguments to the contrary. (Sider p. 214)

A crazy metaphysic

Judith Jarvis Thomson presents the following objection to perdurantism:

... this seems to me a crazy metaphysic. It seems that its full craziness comes out only when we take the [analogy between spatial parts and temporal parts] seriously. The metaphysic yields that if I have had exactly one bit of chalk in my hand for the last hour, then there is something in my hand which is white, roughly cylindrical in shape, and dusty, something which also has a weight, something which is chalk, which was not in my hand three minutes ago, and indeed, such that no part of it was in my hand three minutes ago.

As I hold the bit of chalk in my hand, new stuff, new chalk keeps constantly coming into existence ex nihilo. That strikes me as obviously false. (Jarvis Thomson p. 1983)

Jarvis Thomson is essentially saying that it would be miraculous for new temporal parts to come into existence every instant. But Sider responds that this isn't so:

The sensible four-dimensionalist will claim that current temporal parts are caused to exist by previous temporal parts. The laws that govern this process are none other than the familiar laws of motion. A law of motion just is a law which guarantees the future existence of temporal parts given previous temporal parts ...

Thomson's argument, moreover, is subject to the following tu quoque. Why don't enduring particles just stop existing? Thomson ought to respond that the laws of motion ensure continued existence. But if this explanation is acceptable, so should be the response of the four-dimensionalist. (Sider p. 217)

Question: In his first response here, is Sider assuming a governing conception of laws of nature? Would the response still work if one were a Lewisian about laws?¹

The modal argument

This objection points to some supposedly odd modal properties of sums of temporal parts. Following van Inwagen (1990), call an object *modally inductile* just in case it could not possibly have existed longer than it in fact did. Then the objection to perdurantism is this:

The [worm-theorist] will want to say that it would make no sense to say of the temporal part of Descartes that occupied the year 1620 that it might have had an extent of a year and a half. ... We may summarize this point by saying that the [worm-theorist] will want to maintain that temporal parts are 'modally inductile' ...

But then the argument against [the worm theory] is almost embarrassingly simple. If [the worm theory] is correct, then Descartes is composed of temporal parts, and all temporal parts are modally inductile. But Descartes himself is one of his temporal parts—the largest one, the sum of all of them. But then Descartes is himself modally inductile, which means

¹I can explain in the session Lewis' conception of laws of nature, for those who are unfamiliar. This conception of laws will also play quite a significant role in the final section of this chapter.

he could not have had a temporal extent greater than fifty-four years. But this is obviously false, and [the worm theory] is therefore wrong. (Van Inwagen p. 253)

Sider first responds to this argument by calling into question whether the move from the modal inductility of (some of) an object's parts to the modal inductility of an object is too fast (p. 220). He then goes on to argue that (modal) counterpart theory provides a good way of responding to this problem.

Motion in homogeneous substances

This subsection addresses what Sider regards as being one of the most powerful extant objections to four-dimensionalism. The objection is related to questions which were raised by some of us (e.g. Jamie) right back in the first session. Here's how Sider introduces the issue:

For the temporal parts theorist, the world is a four-dimensional manifold of stages. The career of any persisting object is a sequence of instantaneous objects in this manifold—a path through spacetime. But it is only a small minority of paths through spacetime that correspond to careers of persisting objects. This point will be put differently by worm and stage theorists. The worm theorist will say that only a small minority of all the mereological sums of instantaneous stages count as continuants (objects of our ordinary ontology)—namely, those sums whose temporal parts stand in some 'unity' or 'genidentity' relation. The stage theorist will say that of all the paths through spacetime intersecting a given continuant (stage), only some of these paths include all and only that continuant's counterparts, where the relevant counterpart relation is just the worm theorist's genidentity relation.

Thus an integral part of any four-dimensionalist view is the genidentity relation. The question of the nature of that relation is generally separable from the question of whether temporal parts exist, but one objection to four-dimensionalism threatens to rule out the possibility of any criterion of genidentity. (Sider pp. 224-5)

Just to be clear: here's how Sider characterises the genidentity relation: "By 'genidentity' let us here understand just the genidentity relation for matter: that relation that holds between stages iff they are parts of some continuing portion of matter" (p. 225). But now we turn to the infamous *rotating disks argument* against perdurantism (from Kripke):

[I]magine two duplicate, homogeneous, continuous, perfectly circular disks of uniform depth: one stationary, the other rotating. The genidentity relation must hold in different patterns among the temporal parts of the bits of the two disks: it must hold in straight lines through spacetime in the case of the stationary disk, and in a helical pattern in the case of the rotating disk. But this is impossible if genidentity is identified with spatiotemporal continuity, for the disks occupy duplicate, perfectly smoothly filled regions of spacetime that contain both straight and helical continuous sequences of stages. (Sider p. 225)

Note, by contrast, that the endurantist is able to meet the rotating disks argument head-on: “The enduring parts of the disk will be locating at different places depending on whether the disk rotates” (p. 226). Moreover, this account—*pace* Robinson (1989, p. 400)—does not imply a ‘haecceitistic’ commitment to impure properties,² for, as Sider explains,

The endurantist merely appeals to differing facts of occupation between enduring objects and spacetime points; no non-qualitative, haecceitistic identifying properties are needed. The four-dimensionalist cannot accept this story, and so faces the challenge of grounding the differences in the holding of the genidentity relation. (Sider p. 226)

Question: What do you make of this response from Sider?

How is the perdurantist to meet the force of the rotating disks argument? Sider considers three main options:³

1. Distinguish a rotating from non-rotating homogeneous disc “by means of a *sui generis* relation of ‘immanent causation’, whose holding does not depend in any way on other states of affairs, not even the laws of nature” (p. 227). However, this would be to give up on the Lewisian doctrine of Humean Supervenience (I can explain..!), “since immanent causation thus conceived would not supervene on the spatiotemporal arrangement of local qualities” (p. 227).

²Forrest (SEP 2010) explains nicely the difference between pure and impure properties:

Another useful distinction is between the pure and the impure. A property is said to be impure if it is analysed in terms of a relation with some particular substance (e.g., being within a light year of the Sun). Otherwise it is pure (e.g., being within a light year of a star). Those two examples are both of extrinsic properties, but some intrinsic properties are impure, (e.g., being composed of the Earth and the Moon).

For the purposes of today, we can take *haecceitism* to be the view that impure properties exist.

³For a discussion of the rotating disks argument from the perspective of physics, see Butterfield, ‘The Rotating Discs Argument Defeated’, *British Journal for the Philosophy of Science* 57(1), 2006.

2. State that these two disks are distinguished by their parts having different primitive vectorial velocity quantities. However, such velocity quantities “clearly do not supervene on the distribution of local quantities throughout spacetime” (p. 229).
3. Be a *super-Humean* (NB: Sider doesn’t use this term, but it’s reasonably standard in the wider literature): that is, extract both the laws (via a Lewisian account) and the genidentity relation *simultaneously* from a subvening Humean mosaic.⁴ This works because, as Sider explains,

To see how stages are grouped into physical continuants at a given possible world, we must look globally, across the entire world, to find what assignment yields the best candidate laws of dynamics. Thus, although the states of a spinning disk may qualitatively match those of a stationary disk, what is going on elsewhere in the world may result in differences in rotation. (Sider p. 231)

Sider mentions two possible objections to his super-Humean proposal. The first is that the view cannot “distinguish states of rotation in cases where there is not enough else going on in the world to give candidate pairs of genidentity and laws a foothold” (p. 233). *Possible response*: bite the bullet. The second objection is that, on this view, “persistence becomes an extrinsic matter: whether a disk rotates depends on what goes on in parts of spacetime external to that occupied by the disk” (p. 234). *Possible response*: bite the bullet again (note in particular that this is no worse than Lewis’ already-popular approach to laws of nature).

⁴Super-Humeanism is an increasingly popular view in metaphysics and the philosophy of physics: the term refers to any extension of the Lewisian ‘best systems account’ of laws which argues that some elements of one’s ontology supervene on a given more fundamental ontology (the ‘mosaic’). For example, Huggett (Mind 2006) uses super-Humeanism as a novel way of being a relationalist about spacetime. (For those who care: cf. Brown’s ‘dynamical approach’ to spacetime: Pooley (*The Reality of Spacetime*, 2015) maintains that Huggett’s approach provides the metaphysics to undergird Brown’s spacetime philosophy; interestingly, he also compares Huggett with Sider on pp. 198ff.). As a second example, Esfeld and Deckert appeal to super-Humeanism as a way of excising commitment to the (otherwise mysterious) quantum mechanical wavefunction: see Esfeld and Deckert, *A Minimalist Ontology of the Natural World*, Routledge, 2018.