

## Temporal Parts

February 12, 2001

### 1. A piece of unfinished business from last week

An object occupies a region of space  $R$  at a time  $t$  iff the intersection of the spacetime region the object traces out and the time  $t$  is the same as the intersection of  $R$  and  $t$ . (In the “Newtonian” interpretation of spacetime regions from last week, the intersection of  $R$  and  $t$  is the set of all  $\{(s, t) \mid s \text{ is a point of space contained in } R\}$ ).

Hence our old friend, the principle ‘No two objects occupy the same region of space at the same time’ can be equivalently stated as follows: ‘It never happens that the spacetime regions traced out by two objects have the same intersection with some time.’

### 2. The doctrine of temporal parts

### 3. Temporal parts and the principle of unrestricted composition

The doctrine of temporal parts, on its own, is consistent with many different views about the number of things that occupy any region of space at any time. The proponent of the doctrine could even believe that at most one thing occupied any region of space at any time, provided that she held the strange view that *nothing* lasts for more than an instant!

Things look different when someone, like Sider, combines the doctrine of temporal parts with the **principle of unrestricted composition**. According to this principle, whenever there are some things—no matter how distantly they might be related, in space or in time—there is an object which is **composed** of them, and hence has all of them as parts. (Other ways to say ‘it is composed of them’ which you might come across: ‘it is their **fusion**’; ‘it is their **mereological sum**’.)

It follows from the combination of these views that if *any* material object occupies a region of space at a time, then *lots* of material objects occupy that region at that time. (Assuming that there are lots of times at which material objects exist). The fusion of any thing which occupies that region of space at that time with any thing or things which don’t exist at that time will be another thing that occupies that region of space at that time.

### 4. The doctrine of temporal parts and the paradoxes of material constitution

If you hold the combination of these views, it is very easy explain our justification for believing the sentences which, when taken together with ‘one object to a place’ principle, led to the original paradoxes of material constitution. You *already* think, for example, that there is an object which starts to exist when the clay is shaped into a statue, and ceases to exist when it is squashed. The only remaining question is how we are justified in believing that this thing *is a statue*. But this seems to be just a matter of understanding

the concept of a statue. If our concept had worked differently, it would have picked out an object that traced out a different spatiotemporal region.

Given the doctrines of temporal parts and unrestricted composition, the only questions that remain to be answered about any of the puzzle cases are questions about which, among the many material objects that are present in any situation, are the ones picked out by our concepts and names. Compare what Sider says about the Ship of Theseus puzzle (p. 12):

Four-dimensionalism does not, on its own, answer our question, but the *metaphysical* puzzle has been dissolved. We have a perfectly clear metaphysical picture of what happens: the world contains space-time worms corresponding to both answers to our question. The only remaining question is the merely *conceptual* one of which of these spacetime worms counts a ship.



## 5. The temporal parts theorist's analysis of change

If you hold the doctrine of temporal parts, you will find the following analysis of what it is for something to *change* very appealing:

' $x$  changes [between  $t$  and  $t'$ ]' means that  $x$  has dissimilar temporal parts [at  $t$  and  $t'$ ].

Similarly you can give a very natural analysis of *temporally relativised predication*:

' $x$  is  $F$  at  $t'$ ' means that  $x$ 's temporal part at  $t'$  is  $F$ .

It follows from the temporal parts theorist's analysis of change that only something that exists at at least two times can change. It would make no sense to claim that an instantaneous thing has changed or will change. In fact this is an extremely plausible claim in its own right, quite apart from the doctrine of temporal parts!

*Instants of time* are instantaneous, so they cannot change. So you can't literally *change* what happens at any instant of time, past, present or future. (You can, however, cause things to happen at an instant of time.)

## 6. Stating the doctrine of temporal parts

The doctrine of temporal parts says: for every object, and every instant of time at which that object exists, the object has a temporal part at that time. [Alternatively: every *interval* of time *throughout* which that object exists.]

But what is it for something to be a temporal part of an object at a time? Let's confine ourselves for simplicity to instantaneous temporal parts.

Last week, in effect, I gave the following definition:  $y$  is a temporal part of  $x$  at  $t$  iff  $y$  is part of  $x$ , and  $y$  “traces out” the intersection of the spatiotemporal region traced out by  $x$  with  $t$ .

Sider gives two definitions. The first definition is the one on p. 78:

$x$  is an instantaneous temporal part of  $y$  at instant  $t =_{df}$  i)  $x$  is a part of  $y$ ; ii)  $x$  exists at, but only at,  $t$ ; and iii)  $x$  overlaps every part of  $y$  that exists at  $t$ .

(‘Overlaps’ means ‘shares a part with’.) Sider’s other definition is meant to cope with the objection that would be raised by someone who held that ‘ $x$  is part of  $y$ ’ must always be relativised to a time. In reply, he gives a definition of ‘temporal part’ that only uses this time-relative sense of ‘part’:

$x$  is an instantaneous temporal part of  $y$  at instant  $t =_{df}$  i)  $x$  exists at, but only at,  $t$ ; ii)  $x$  is part of  $y$  at  $t$ ; iii)  $x$  overlaps at  $t$  everything that is part of  $y$  at  $t$ . (p. 76-77)

## 7. Stating “Three-Dimensionalism”

Sider argues that someone (like Wiggins) who believes that the statue and the lump of clay are distinct should not deny that any object ever has a temporal part: if a lump were formed into a statue for just one instant, the statue would turn out to be a temporal part of the lump.

The argument for this claim depends on the principle (PO):

If  $x$  and  $y$  exist at  $t$ , but  $x$  is not part of  $y$  at  $t$ , then  $x$  has some part at  $t$  that does not overlap  $y$  at  $t$ .

This claim looks plausible. However, it entails that if the statue and the lump are distinct, each is a part of the other!

If you don’t think it’s possible for something to be statue-shaped for just one instant, it doesn’t matter that much: if we extended Sider’s definition of ‘instantaneous temporal part’ into a parallel definition of ‘non-instantaneous temporal part’, the statue would still turn out to be a temporal part of the clay. Most “three-dimensionalists” have wanted to deny all temporal parts, not just instantaneous ones.