

Does Four-Dimensionalism Explain Coincidence?

Abstract

For those who think the statue and the piece of copper that compose it are distinct objects that coincide, there is a burden of explanation. After all, common sense says that different ordinary objects cannot occupy the same space at the same time. A common argument in favor of four-dimensionalism (or ‘perdurantism’ or ‘temporal parts theory’) is that it provides the resources for a superior explanation of this coincidence. This, however, is mistaken. Any explanatory work done by the four-dimensionalist notion of absolute parthood rests ultimately on notions equally available to the three-dimensionalist. Thus, a neutral explanation of coincidence is at least as good while avoiding commitment to temporal parts.

Does Four-Dimensionalism Explain Coincidence?*

Four-dimensionalism (or ‘perdurantism’ or ‘temporal parts theory’) views objects as stretched out in time as well as in space; it says objects have temporal parts much as they have spatial parts. Besides the spatial part of me that stretches from my right knee to my hip, I also have the temporal part of me that stretches from my third to my fourth birthday. Besides the extreme-most point of my nose, there is the current instantaneous stage of me. Three-dimensionalism (or ‘endurantism’) denies such parts, saying that objects exist wholly at every moment of their existence. We won’t worry about how to improve our characterization of the two views, for the present issue doesn’t trade on such niceties. The question is whether four-dimensionalism can better explain coincidence.¹

The statue and the piece of copper of which it is composed have different temporal properties: the piece of copper existed yesterday, but not the statue since the artist shaped it just this morning. Because they have different properties, the statue must, following Leibniz’s Law, be distinct from the piece of copper. But this means we have two objects occupying the same space at the same time, which common sense tells us is impossible! Many deny some step in the reasoning just given and insist that the statue and the piece of copper are identical. Those who don’t are left with a “puzzle of coincidence”. A surprising number of three- and four-dimensionalists agree that four-dimensionalism better explains this coincidence.² According to

* Many thanks to David Christensen, Matti Eklund, and an anonymous referee for helpful comments.

¹ Four-dimensionalism is *not* supposed to have a superior explanation of how distinct objects could have the exact same location (or matter) at *all* times. Because most four-dimensionalists deny this possibility, I will not discuss this related puzzle.

² The main arguments I will examine come from Heller, Sider, and Hawley, but agreement with these arguments is widespread. Gilmore, a three-dimensionalist, seems to agree with Heller’s argument in his “Time Travel, Coinciding Objects, and Persistence”. Merricks thinks that four-dimensionalism “initially seems to provide an elegant way” of explaining coincidence; the reason he thinks it only *initially* seems to explain coincidence is, it appears, not because of some lack of explanation for cases of objects that coincide at a time, but rather because the solution doesn’t generalize to explain objects that coincide at *all* times (*Objects and Persons*, p. 44). Thomson, who

Sider, e.g., the four-dimensionalist's "appealing account of coincidence is one of its most attractive features."³ I disagree. I argue that the four-dimensionalist explanations of coincidence are no better than one that does without the resources of four-dimensionalism.

A Four-Dimensionalist Argument *Against* Coincidence

Heller tries to preserve the common sense claim that distinct physical objects cannot occupy exactly the same space at the same time.⁴ He argues that either this or some other intuitively compelling claim must be denied if one takes a three-dimensional perspective. But, says Heller, from a four-dimensional perspective according to which objects are spatiotemporal hunks of matter — i.e., hunks occupying a spatiotemporal region stretched out in time as well as space — we see that everyday objects *do not* occupy the same space at a time. In short, says Heller, although four-dimensionalism embraces the distinctness of the statue and the piece of copper, it accords with the common sense denial of coincidence by showing us that this is not truly a case of coincidence.

Heller's argument relies upon an analogy. A piece of paper that is sticking out of a drawer may be said, loosely speaking, to be in the drawer. Strictly speaking, however, it is *not* inside the drawer; rather, it is only *partially* inside the drawer. That is, strictly speaking, only *part* of the piece of paper is in the drawer. By analogy, from a four-dimensional perspective we see that everyday material objects occupy an entire spatio-temporal region, and thus any talk of

considers four-dimensionalism "a crazy metaphysic", nonetheless thinks that so many philosophers are attracted to it due to "the fact that so many problems in philosophy having to do with identity across time can be so tidily solved by appeal to them" ("Parthood and Identity Across Time," pp. 213, 211). Cartwright thinks that because of the lack of alternatives to the four-dimensionalist explanation of coincidence, opponents who want to preserve certain appealing theses "had better learn to live with" four-dimensionalism ("Scattered Objects"). Hawley presents arguments similar to Sider's in her *How Things Persist*, §5.2 and in her entry on "Temporal Parts" in the *Stanford Encyclopedia of Philosophy*. Hudson considers Sider's argument "the finest of the reasons to count oneself a Four-Dimensionalist" in his review of Sider's *Four-Dimensionalism* in *Notre Dame Philosophical Reviews*, 2/6/2002.

³ *Four-Dimensionalism*, p. 152.

⁴ This argument comes from Heller's "Temporal Parts of Four Dimensional Objects" (and, in a slightly revised form, in his *The Ontology of Physical Objects*, Ch. 1, and in a more revised for in his "Temporal Overlap is Not Coincidence").

an everyday object existing at *one* particular time should be understood as loose talk: strictly speaking, only *part* of such an object exists at a particular time. A fortiori, *two* everyday objects could not occupy the same space at *a* time. By taking the four-dimensional perspective, concludes Heller, we can follow Leibniz's Law where it seems to lead us — viz., to the conclusion that the statue and the piece of copper are distinct — while preserving the common sense idea that two objects cannot occupy the same place at the same time.

Unfortunately, Heller's attempt to avoid the problem of coincidence rides on a conflation of the everyday notion of parthood and a different notion that, according to Heller himself, we understand on analogy with this everyday notion. Let us grant, for the sake of argument, the claim that if something is only partially occupying a location L then it does not, strictly speaking, exist at L since it only partially exists there. Even granting this, I argue, according to four-dimensionalism the statue and the piece of copper *do* occupy the same space at the same time.

According to four-dimensionalism, an utterance of "The statue is bent" is true at t iff the temporal slice of the statue existing at t is bent. This is the paradigm we are given for understanding tensed predications in terms of temporal parts. Without such a story, it is hard to see how we can even make sense of tensed predications of four-dimensional objects.⁵

Consider, then, the height of the statue at some time t. This, too, presumably, is to be understood in terms of the height of the temporal slice at t. So too, presumably, for the width and length and, crucially, for the volume and location of the statue. It matters not that the statue is a four-dimensional solid stretched out in time, for our everyday talk of something's volume or location is talk of its volume or location *at a time*, and predicates that are true of something at a time are to be analyzed, according to four-dimensionalism, in terms of the properties of the temporal slice of the object at that time. We can also, perhaps, employ tenseless predicates, and

⁵ Clearly, this model is only intended for predications of properties that hold in virtue of how the object is at one particular time. If we want to say that the statue *is bending*, this will have to be analyzed in terms of the different degrees of bentness had by a multitude of temporal slices that span the time of the utterance. But we needn't worry about such cases; the present argument will be made simply using temporary intrinsic properties.

in this way talk about a thing's *spatio-temporal* location; such a predicate would apply absolutely, rather than relative to a time. From this atemporal perspective we can perhaps say that the statue and the piece of copper do not occupy the same spatio-temporal location. But the problem of coincidence is a worry about satisfying the everyday intuition that two objects cannot occupy exactly the same location *at a time*. Common sense, for example, denies that a person can walk through a wall, since this would mean that at some time *t* some locations would be occupied both by the wall and by the person. Thus, according to four-dimensionalism the spatial region that the statue occupies *at t* is the same as the spatial region that the piece of copper occupies *at t*, and thus the two objects do coincide at a time, contrary to the common sense claim. In short, the four-dimensional perspective does not, pace Heller, appease common sense in the cases of concern.

It is doubtful, however, that the everyday thought that two objects cannot occupy the same location is even meant to apply to the statue and the piece of copper. What people have in mind is to rule out cases such as people walking through walls or baseballs passing through baseball bats. Yet, if Heller were right about how four-dimensionalism shows that the statue and the piece of copper do not really coincide, it would equally well show that these other cases are not cases of coincidence either. Because the spatio-temporal region of the person is different than the spatio-temporal region of the wall, Heller would say that the common sense claim that a person walking through a wall is impossible would be misplaced since there really isn't any coincidence after all. So even if Heller's argument did work, it wouldn't really deliver what common sense wants.

One moral to draw is that we must be careful with our terminology. There are tensed predications that hold at a time and, if the four-dimensionalist is correct, untensed predications that hold absolutely. An object occupies a spatial region *at a time* and occupies a spatio-temporal region *simpliciter*. (I sometimes will rely upon context to make clear which is intended.) As I will henceforth use the terms, if an object *occupies* a region *R*, whether spatial or spatio-temporal, it *occupies*, and similarly *is located at*, each of the points and sub-regions within

R. An object *exactly occupies* a region R iff it occupies every point inside R and no point outside R. Thus x and y co-occupy (or are co-located at) a point/region iff x exactly occupies some region R_x and y exactly occupies some region R_y and both R_x and R_y include that point/region. Finally, two objects *coincide* iff they exactly occupy the same region.

A Four-Dimensionalist Explanation *Of* Coincidence

Instead of trying to show that the statue and the constituting piece of copper do not coincide, a more common approach is to argue that four-dimensionalism *explains* such cases of coincidence in a way that shows that they are not problematic, for according to four-dimensionalism, goes the story, this sort of coincidence is simply a case of partial identity.⁶ The four-dimensionalist explanation employs an analogy between the temporal and the spatial dimensions.⁷ We all agree, runs the explanation, that we can explain how my arm and my body can occupy some of the same spatial locations at the same time since my arm is a *part* of my body. My arm is partially identical to my body; more explicitly, my arm and the part of my body that coincides with my arm are *identical*. In a similar way, says the four-dimensionalist, we can explain how the statue and the piece of copper coincide, for once we take the four-dimensional view we see that the statue is simply a spatio-temporal part of the piece of copper. The statue is partially identical to the piece of copper; more explicitly, the statue and the spatio-temporal part of the piece of copper that coincides with the statue are identical. Coincidence in these sorts of cases, then, is at root a case of identity, and surely there is no puzzle about how Hesperus and Phosphorus coincide.

⁶ Notice that this approach tries to show how the co-location of the statue and the piece of copper is unproblematic, but the approach does not apply to the co-location of the person and the wall. This is exactly what we want, for intuitively the former, but not the latter, is an unproblematic case of co-location that we *should* be able to explain away.

⁷ The argument to be given appears in Sider's *Four-Dimensionalism*, Ch. 5; Hawley's *How Things Persist*, §5.2; and Hawley's entry on "Temporal Parts" in the *Stanford Encyclopedia of Philosophy*.

There are difficulties, however, with this explanation. Four-dimensionalists themselves concede that these so-called spatio-temporal ‘parts’ are not parts in the usual sense.⁸ After all, we say that my car is entirely in the garage — every part of it is — but this would be wrong if we were talking about temporal parts. For example, if someone protests that the bumper Eleanor destroyed isn’t in the garage, the natural response is that *that* bumper once *was* a part, but it no longer exists, so it no longer *is* a part of the car after all. Conversely, we say the windshield *is* a part of the car, but because it existed prior to the car, it is not a ‘part’ of the car in the four-dimensionalist’s sense. It seems clear, then, that when we normally speak of a part of an object, we are speaking of what is often called a temporary part. That is, according to the usual sense of a ‘part’ of an object, x is a part of y *at some time t*. Just as an object has a weight, a shape, and a color at a time, so too does an object have parts, in the normal sense, at a time. This contrasts with the notion wielded by four-dimensionalists, which they also express with the word ‘part’, for theirs is an absolute notion of parthood, where x is a part of y *simpliciter*.

If there are two different notions of ‘part’, though, the four-dimensionalist’s explanation of coincidence needs further buttressing before it can do the trick. To keep the new notion introduced by four-dimensionalists clearly distinguished from our everyday notion of a part, let’s use the word ‘shmart’ to express the four-dimensionalist’s notion. Being a shmart is similar to, or analogous to, or an extension to, being a part, but being a shmart is *not* being a part. How, then, does the four-dimensionalist explanation of coincidence go? We agree that an explanation of why my arm and my body can be co-located is that my arm is a *part* of my body. More generally, we agree to the following principle:

⁸ Sider (*Four-Dimensionalism*, pp. 55-56) says, “Having a part at a time is familiar. . . . Familiar as this notion is, it is not the notion of parthood usually discussed by four-dimensionalists. . . . The everyday notion of parthood is temporary, rather than atemporal.” See also Lewis (1986, p. 203).

Parthood Explaining Coincidence (PEC): We have an adequate explanation of x and y both occupying (at some t) some region R whenever there is some z that is both a part of x and a part of y and z exactly occupies (at t) R.

But do shared shmarthoods explain coincidence just as shared parts do? That is, is the following principle also true?

Shmarthood Explaining Coincidence (SEC): We have an adequate explanation of x and y both occupying (absolutely) some region R whenever there is some z that is both a *shmart* of x and a *shmart* of y and z exactly occupies (absolutely) R.

Some things true of parthood are true of shmarthood yet some aren't, so something more must be said to justify SEC.⁹ In fact, when four-dimensionalists call their shmarthoods 'parts' they are inadvertently gaining mileage from the conflation of shmarthoods and parts, leading us to think that they are merely employing the uncontroversial PEC rather than the so far unsubstantiated SEC.

To press the point, let's set aside worries about the richer four-dimensionalist ontology and *grant* the four-dimensionalist that besides the statue and the piece of copper that coincide at some t, there's some other object O that exists only at t and that coincides with the statue (and hence with the piece of copper) at t. If O were a part of x and a part of y then we would have an explanation of why x and y co-occupy some locations, for they would have parts that were identical and it would be a case of partial identity. But in the case of the statue and the coinciding piece of copper, all we're assuming so far is that O is a shmart of x and of y rather

⁹ I say that because the notion of a part is different than the notion of a shmart, we cannot be sure that an inference that works for the one will work for the other. Importantly, this reasoning requires only the weakest possible reading of 'different notion', and thus it is impervious to a variety of objections insisting that both expressions are employing *the very same notion of part*. For example, one might argue that there is only one notion at play, although the everyday usage of 'part' restricts our quantifiers to current parts, whereas the four-dimensionalist usage of 'part' leaves quantifiers wide open. However, even if such a view were correct (which it isn't, as has been pointed out — the windshield is a part of the car, but because it existed prior to the car it can't be a shmart of the car), it would not undermine the current line of reasoning, for as soon as one admits almost any difference in (semantic or pragmatic) function between the everyday use of 'part' and the four-dimensionalist use of 'part', that opens up the possibility that the explanation of coincidence works only when 'part' is functioning in the one way rather than the other. For example, it could be *current* parthood that explains coincidence rather than parthood simpliciter.

than a part of x and of y. So something additional must be said about shmarthood to make clear why O being a shmart of both x and of y would explain the coincidence of x and y.

I think the four-dimensionalist *can* say something more and thus *can* explain coincidence, for shmarthood is similar to parthood in just the way that is essential for explaining co-location. Let's first examine why *part*-sharing between two objects explains their co-location. Or, more exactly, let's see why x and y sharing a part z (at some time t) explains how x and y can both occupy (at t) the region R that is exactly occupied by z (at t).

The non-philosopher's idea that two objects cannot occupy the same location at a time is a worry about over-crowding. One object occupying a location precludes another object from occupying that location because the matter of the first object resists the interpenetration of the matter of the second object. But when we have a case of partial identity, the two objects do not compete for space because the part of x that is in the region of co-occupation is the very same as the part of y that is in the region of co-occupation. Thus, there aren't two quantities of matter competing for space; instead there is one quantity of matter that is part of both x and y.

This explanation of x and y co-occupying a region R rests on a claim of identity: the part of x that is in R is identical to the part of y that is in R. One might think that the objects having identical parts in region R makes it hard to see how they could be distinct. That is, perhaps in addition to a problem of how distinct objects can share a location (at a time) there is a problem of how objects sharing parts (at a time) can be distinct. But although x and y consist of the same parts within R and thus are the same in all ways intrinsic to R, they differ in ways extrinsic to R; in particular, they have different extensions external to that region. What we *mean* by 'arm' is something that extends up to the shoulder but doesn't include the torso; what we *mean* by 'body', in contrast, includes the torso. Ipso facto 'arm' picks out something that extends only so far and 'body' picks out something that, dismemberment aside, extends further. In this way we can explain both how x and y can co-occupy a region and yet how they can nonetheless be distinct material objects.

So far, then, we have an explanation of *co-occupation* in terms of shared *parts*. But the same underlying idea also provides an explanation of *coincidence* in terms of shared *shwarts* — at least assuming that there *are* shwarts. For simplicity I will consider only instantaneous shwarts that are spatially maximal, i.e., objects that exist only at one time *t* and occupy the same spatial region at *t* as the object of which they are a shwart (though the argument generalizes to shwarts that are not spatially maximal and that exist throughout an interval). So let's see why *x* and *y* both having the same shwart *z* (not *at t* but *simpliciter*) that exists at *t* explains how *x* and *y* can coincide at *t*. When there is some object *z* that is a shwart of *x* and also of *y*, and that exists at *t*, what this means is not merely that it exists at *t* and coincides with *x* and with *y*. An instantaneous object made up of some *different* matter that doesn't resist our familiar kind of matter could by chance have a location coinciding with *x* and *y* at *t*. Being a shwart, however, requires more. If *z* exists at *t* and is an instantaneous shwart of *x*, this also requires that the matter of which the shwart is composed at *t* be the matter of which *x* is composed at *t*. And thus if *z* exists at *t* and is an instantaneous shwart both of *x* and of *y*, then *x*, *y*, and *z* are all composed of exactly the same matter at *t*. So if *z* is a shwart of both *x* and *y*, then the coincidence of *x* and *y* is not a case of two different quantities of matter competing for space but is instead a case of the very same matter composing both objects.¹⁰

Again, this may seem to pose a related problem, for the dissolution of worries about coincidence rests upon a claim of identity: the matter composing *x* at *t* is identical to the matter

¹⁰ Since the putative problem of how two objects can coincide is a problem of how the matter making up one object can occupy the same space as the matter making up the other, the four-dimensionalist explanation of coincidence must show that there is only one collection of matter making up both objects. The four-dimensionalist can perhaps show this in various ways. For example, Sider defines the four-dimensionalist notion of parthood in terms of the ordinary notion of parthood (see *Four-Dimensionalism*, p. 59), and from this one can derive that two objects that share an instantaneous temporal part must be composed of the same matter at that time. Alternatively, one might argue that the four-dimensionalist notion of a part is the same as the everyday notion of a part that applies to events. And perhaps from this one can show that two objects sharing a temporal part at a time must be composed of the same matter at that time. The argument being presented relies solely on the fact that the four-dimensionalist explanation of coincidence must show that the coinciding objects are composed of the same matter at that time, not on how the four-dimensionalist shows this.

composing y at t . One might think that them being composed of identical matter at a time makes it hard to see how they could be distinct. That is, perhaps in addition to a problem of how distinct objects can share their entire location at a time there is a problem of how objects sharing their entire matter at a time can be distinct. But x and y differ in ways extrinsic to the time of coincidence. What we *mean* by ‘statue’, at least roughly, is something that extends in time for as long as it has the form given to it by its creator; what we *mean* by ‘piece of copper’, in contrast, is something that extends in time for as long as it is composed of copper and has all contiguous parts. Ipso facto ‘statue’ picks out something that extends only so far back in time and ‘piece of copper’ picks out something that, in the cases of concern, extends further back. Thus, just as there is no problem in explaining the distinctness of my arm and my body by their difference in spatial extents, so too can we explain the distinctness of the statue and the piece of copper by their difference in temporal extent.

Talk of parts helps restrict our consideration to the space co-occupied by the two objects and allows us to see that within that region the matter of the one object is simply the matter of the other. Similarly, talk of shparts helps restrict our consideration to the time at which the two objects coincide, and allows us to see that at that time of coincidence the matter of the one object is simply the matter of the other. In either case, we see that there are not two quantities of matter competing for one space; rather, one quantity of matter makes up both objects. Likewise, in both cases we see that the distinctness of the two objects obtains in virtue of facts extrinsic to the space or time of co-occupation. In short, just as part-sharing explains co-occupation, so too does shpart-sharing explain coincidence.

The Neutral Explanation of Coincidence

There is, however, an equally good, if not better, explanation of coincidence. The four-dimensionalist explanation of coincidence in terms of shparts succeeds because shparts are to be understood in such a way that an object and a shpart of it that exists at some time t *must both be composed of the same matter at t* . Given this understanding, when two coinciding objects

share a smart that exists at t , they will be composed of the same matter at t and, thus, there is no problem of overcrowding at t . In this way, using untensed facts about which objects have which smarts, we can explain coincidence, but what explains why the two objects coincide at t is ultimately not the untensed facts about what smarts there are or the untensed facts about which objects are smarts of which, but instead simply the tensed fact that the same matter composes both objects at t . This tensed fact about which matter composes which object at t , however, is equally available to the three-dimensionalist. And this alone provides a full explanation, without any need to appeal to smarts.

The point isn't that instead of parthood our explanation relies upon composition. In fact, it is plausible that the everyday notion of composition — according to which something can be composed of one *or* more things — is to be analyzed, at least in part, in terms of parthood. The point is that the four-dimensionalist explanation of coincidence at some time t rests upon facts about composition — or parthood — that obtain *at t*, and these are the everyday tensed notions that three-dimensionalists already have at their disposal. A neutral explanation will therefore skip straight to these *tensed* facts about matter and composition. My arm, which occupies region R , is currently composed of one quantity of matter A and my body is currently composed of a quantity of matter that includes A and includes no other matter inside of R . Thus, the objects presently co-occupy R without there being two different quantities of matter competing for the same space. Similarly, the statue is currently composed of one quantity of matter and the piece of copper is currently composed of that very same quantity of matter. Because of this, both objects currently occupy exactly the same spatial region without any over-crowding.

Do these explanations raise a related puzzle of how the co-located objects can be distinct? If so, we can again appeal to facts of composition at various times to explain their distinctness. Although my arm and my body share a certain quantity of matter — viz., that located at the region that my body and arm co-occupy — my body, unlike my arm, is also composed of additional matter that lies outside the spatial region of co-occupation. Simply put, my body is larger than my arm. How could my body be larger than my arm? Well, by 'body' we *just mean*

that spatially maximal thing that is composed of a torso and any appropriately attached head, legs and arms, whereas by ‘arm’ we *just mean* that spatially maximal thing which does *not* include the torso, head, or legs. Thus, because there is a head, torso, and legs attached to my arm, any talk of my body will, ipso facto, refer to something that is larger than, and hence distinct from, what we refer to by talking of my arm.

In a like manner, although the statue and the piece of copper are *currently* composed of exactly the same quantity of matter, the piece of copper, unlike the statue, was also *yesterday* composed of some matter, whereas the statue was not, for it was not yet formed. Simply put, the piece of copper is longer lived than the statue. How could the piece of copper be longer lived than the statue? Well, by ‘piece of copper’ we *just mean* that temporally maximal thing which at all times is composed of all contiguous portions of copper, whereas by ‘statue’ we *just mean*, very roughly, that temporally maximal thing which at all times has an artistically given shape. Thus, because the piece of copper was only given its current shape by the artist this morning, any talk of the piece of copper will, ipso facto, refer to something that is longer lived, and hence distinct from, what we refer to by talking of the statue.

This neutral explanation of coincidence is, at root, the same explanation the four-dimensionalist gives. The four-dimensionalist gives his explanation in terms of shmarts, but these only explain coincidence insofar as one understands which matter composes which objects or shmarts at a time. The neutral explanation, in contrast, skips straight to facts about which matter composes which objects at the various times; these are facts available to three-dimensionalists and four-dimensionalists alike. Both ways explain coincidence, although in giving the explanation by way of shmarts the four-dimensionalist explanation isn’t quite as straightforward. Perhaps worse, the four-dimensional explanation incurs a commitment to a panoply of shmarts which the neutral explanation avoids.

Cited Works

- Cartwright, Richard. "Scattered Objects," in Keith Lehrer, ed., *Analysis and Metaphysics*. Dordrecht: Reidel, 1975.
- Gilmore, Cody. "Time Travel, Coinciding Objects, and Persistence" in *Oxford Studies in Metaphysics*, vol. III (forthcoming).
- Hawley, Katherine. *How Things Persist*. Oxford: Oxford University Press, 2001.
- Hawley, Katherine, "Temporal Parts", *The Stanford Encyclopedia of Philosophy (Winter 2004 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/win2004/entries/temporal-parts/>.
- Heller, Mark. *The Ontology of Physical Objects: Four-Dimensional Hunks of Matter*, Cambridge: Cambridge University Press, 1990.
- Heller, Mark. "Temporal Overlap is Not Coincidence," *The Monist* 83 (1990), pp. 362-380.
- Heller, Mark. "Temporal Parts of Four Dimensional Objects," *Philosophical Studies* 46 (1984), pp. 323-334.
- Hudson, Hud. "Review of: Theodore Sider, *Four-Dimensionalism*," *Notre Dame Philosophical Reviews*, 2/6/2002.
- Lewis, David. *On the Plurality of Worlds*. Oxford: Basil Blackwell, 1986.
- Merricks, Trenton. *Objects and Persons*. Oxford: Oxford University Press, 2001.
- Sider, Theodore. *Four-Dimensionalism: An Ontology of Persistence and Time*. Oxford: Clarendon Press, 2001.
- Thomson, Judith Jarvis. "Parthood and Identity Across Time," *Journal of Philosophy* 80 (1983), pp. 201-220.