

Critical Study of Four-Dimensionalism, by Theodore Sider, Oxford University Press 2001, ISBN 0 19 924443 X, hardback.

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Four-Dimensionalism is a thorough, lively and forceful defence of the claim that “necessarily, every spatiotemporal object has a temporal part at every moment at which it exists” (59). The standard four-dimensionalist view is perdurance theory, according to which everyday things like boats are temporally extended. But Sider rejects perdurance theory, nicely disparaging it as the “worm view”, and he argues for the “stage view” version of four-dimensionalism instead. According to the stage view, everyday things like boats are instantaneous, and claims about the history of the Anstruther lifeboat are made true or false by the boat’s past counterparts. Sider reserves the term “four-dimensionalism” for these two views of persistence; he also defends a tenseless B-theory of time. The book develops, extends and systematises work which Sider has published over the last few years, and it makes a compelling and readable whole. I am sympathetic with many of the conclusions, but I will take issue with some of the arguments.

## 1. Overview

In the Introduction, Sider sets out his presuppositions, and provides a spirited defence of the very possibility of “speculative ontology” (xiv). Presuppositions include classical logic, an ontology of things not just stuff, the assumption that “there is a single, objective, correct account of what things there are” (xvi), and a best-candidate theory of meaning, according to which referring terms and predicates attach themselves to naturally-delineated objects and extensions in the world beyond us. Though it does not crop up in the Introduction, the

presupposition that there can be no metaphysical vagueness will also be important. So far, so David Lewis (the star of the index), and indeed Sider places himself squarely in the Lewis tradition, ending the book with a defence of Humean Supervenience.

The vindication of speculative ontology relies on the best-candidate theory of meaning. A common insinuation about metaphysical disputes is that they are merely verbal. Concerned about whether some objects compose anything? No need for sleepless nights: in one sense of ‘compose’ they do, and in another sense they don’t. The best-candidate theory blocks this move: not all candidates for the meaning of ‘compose’ are equally good, and in ontology we try to answer questions expressed in terms whose content is the best candidate content.

In Chapter One, instantaneous temporal parts of material objects are introduced informally, by comparison with the temporal parts of a story or process, and by comparison with the spatial parts of material objects. Belief in temporal parts is motivated by their explanatory, puzzle-solving power. If objects have different temporal parts at different times, this explains how they can have different properties at different times. And if objects are extended four-dimensionally, this explains how they can coincide for a while without being identical.

Chapter Two gets stuck into a defence of the B-theory of time. B-theorists believe both that the past and future are as real as the present, and that seemingly-tensed facts, like the fact that the lifeboat went out yesterday, are reducible to eternal, tenseless facts. Sider rejects as unmotivated the mixed view that past and future are real but tensed facts are irreducible. So the main challenger to the B-theory is presentism, the view that only the present is real and tensed facts are irreducible to tenseless ones. Sider challenges presentists with arguments

about cross-time spatial relations, about truth-makers for claims about past and future, and about the special theory of relativity. The STR can seem to show that there is no one time which is the present, since whether some event across the Atlantic is present (simultaneous with my typing this sentence) depends upon the frame of reference from which we compare my typing with that transAtlantic event. With presentism rejected, the B-theory is presupposed throughout the rest of the book.

In Chapter Three, Sider makes the unusual move of arguing that endurance theorists (the opponents of four-dimensionalism) have difficulty formulating their own view. How so? Endurance theory is typically characterised as the view that persisting objects are “wholly present” at every moment of their existence, just as an immanent universal is supposed to be wholly present at its every instantiation. “The lifeboat is wholly present” presumably means “all of the lifeboat is present”, which presumably means “all of the lifeboat’s parts are present”. Sider argues that this claim is either trivial or false. Trivially, all the parts which an object has at a time are present at that time. But it is usually false that all the parts which the object ever had or will have are parts of it at any given time - most objects gain and lose parts. Four-dimensionalists seem to be in a stronger position, defining an instantaneous temporal part of an object to be a part which exists only for a moment but overlaps all the parts the object has at that moment. Then four-dimensionalism is the view that necessarily, every spatiotemporal object has a temporal part at every moment at which it exists. Three-dimensionalists seem to be united only by their opposition to four-dimensionalism: they lack a “core, positive thesis” (68). In consequence, the remainder of the book is structured around arguments for and against four-dimensionalism.

Chapters Four and Five examine arguments in favour. Sider dismisses some weak arguments for four-dimensionalism - for example, special relativity apparently leaves three-dimensionalism unscathed (despite its destructive effect on presentism) and the power of space-time analogies seems limited. Sider depends little on Lewis's argument from temporary intrinsics, although he does discuss timeless worlds in order to argue that temporary properties cannot be relations to times. There is an argument from the possibility of time-travel to the truth of four-dimensionalism, and an argument from the impossibility of metaphysical vagueness to a trilemma: there are no composite objects, or composite objects never change their parts, or objects have temporal parts.

Chapter Five is dedicated to puzzles of coincidence, like that of the statue and the lump of clay from which it is made. Here Sider turns to the stage view, arguing that although standard perdurance theory gives a reasonable account of coincidence, the stage view does better. For example, standard perdurance theory must have it that before personal fission there are two people occupying the same place at the same time, whereas the stage view, which identifies people with stages, has it that there is just the one, as intuition suggests. There is plenty of interesting material here about modal counterpart theory and about the temporal counterpart theory which backs up the stage view.

Finally, in Chapter Six, Sider turns to arguments against four-dimensionalism and is rather unimpressed. Four-dimensionalists are not committed to the epistemic or ontic priority of temporal parts over four-dimensional things. Nor do four-dimensionalists abandon change, any more than modal counterpart theorists abandon contingency. And four-dimensionalists do not espouse a "crazy metaphysic", positing constant creation *ex nihilo* and instantaneous

passing away. Sider spends a little more time on van Inwagen's argument that four-dimensional objects have the wrong modal features to be the objects of ordinary life: four-dimensional things allegedly have their temporal spans essentially, unlike human beings or butterflies. But, first, if this argument rules out temporal parts, then an analogous argument rules out spatial parts, which is absurd. And second, a counterpart theory of modality dissolves the problem: van Inwagen believes this is a poor exchange, but Sider defends the deal.

## 2: Distinctions without Differences?

The book is crammed with interesting arguments, and some of the most interesting have a common feature: Sider argues in several contexts that three-dimensionalists (or in some places presentists) must collapse possibilities which are apparently distinct, whereas four-dimensionalists (or B-theorists) have the resources to make the relevant distinctions. This strategy works well in some contexts, but less well in others: I will take up four cases.

### 2.1 Motion in simple worlds

In section 2.2. of the book, an argument of this type is deployed against presentism. According to presentists, only presently existing objects exist. "Sensible" (14) presentists will want to retain some truths about the past and future, though these cannot involve quantification over non-present objects, because there aren't any. Instead, presentists need operators like  $WAS\Phi$  and  $WILL\Phi$ ; these are primitive but can be understood to mean 'at some past time,  $\Phi$ ' and 'at some future time,  $\Phi$ ' respectively. Crucially, claims involving such operators must be evaluated 'one time at a time', since it is never permissible to treat two times as real together. But this means trouble.

In particular, Sider makes trouble with his discussion of cross-time spatial relations. We must compare objects' locations at different times if we are to understand velocity and acceleration. According to the Russellian account of velocity, which Sider endorses, an object's instantaneous velocity is not just a matter of how the object is at a particular time: it is defined in terms of the object's change of position over time. And the same goes for instantaneous acceleration. Physics does not require us to compare absolute locations (because we don't need absolute velocities in order to make sense of absolute acceleration). But we *are* required to compare relative locations. Sider lists three ways in which we can make the required cross-time spatial comparisons; he argues that the first is unavailable to presentists, the second is scientifically disreputable and the third fails to distinguish situations which are, it seems, distinct.

The first strategy is to rely upon irreducible relations between points existing at different times. This is fine for eternalists, who accept the reality of past and future points, but of course presentists don't believe that there are any such points. The second strategy is to posit enduring spatial locations. Presentists could thereby make cross-time comparisons, relating events at one time to a particular location, then relating events at a different time to that very same location. But this is scientifically disreputable, because modern physics finds no need to posit enduring spatial locations: "...absolute comparisons of position...go far beyond the relative comparisons of position that are required for science..." (28).

Unlike Sider, I'm not sure that this suffices for disreputability. There seems to be a significant difference between positing entities whose existence is explicitly ruled out by a

scientific theory, and positing entities which merely go beyond those required by science. Modern spacetime physics is expressed in non-presentist terms but we should, as usual, be wary of reading off our metaphysics from the surface grammar of scientific theories. Presentists propose to banish non-present times and accept enduring locations instead: this might seem like a good ontological bargain, even to physicists who take an interest in such matters. (Presentists might try a similar response to the claim that positing an absolute present and thereby a privileged frame of reference is “scientifically revisionary” (47). However in this case the choice of any particular frame seems to be arbitrary, not just superfluous to physics.)

If presentists forswear enduring locations, and if they accept the reductive Russellian account of velocity, their only remaining option is to insist that the one-time facts determine facts about cross-time relations. For example, we might re-identify locations across times in a way which maximises unaccelerated motion in the universe as a whole. This may give the right results if the universe is sufficiently complex, but what about a very simple world containing a single persisting particle? Intuitively, various possibilities are available for this particle - it could move continuously without acceleration, move continuously with acceleration of some kind, or move discontinuously. The current strategy, however, dictates that the lone particle *must* be moving continuously without acceleration. “The presentist must deny these possible differences. The eternalist, of course, can accept them. Pre-analytically the possibilities exist; the case of cross-time spatial relations therefore favors eternalism.” (33)

I find this argument problematic for two reasons. First, it is notoriously hard to think clearly about simple universes. Imagining the particle stuck in one spot seems very different from

imagining it zipping about, and so pre-analytically these seem like different possibilities. But the reliability of this intuition is undermined by the fact that visualisation is apparently from a standpoint within the same the universe as the “lone” particle. This point is not too serious: Sider’s argument is not intended to be knock-down, and even a shaky intuition carries some weight. But - ad hominem - the intuition relied upon here is remarkably similar to an intuition which Sider is willing to sacrifice when defending Humean Supervenience in section 6.5.

Consider a uniform disk made out of homogeneous matter. Pre-analytically, it seems that such a disk might be rotating at some rate, that it might be stationary, and that these are distinct possibilities. Consider a particular wedge-shaped spatial segment of the disk - if the disk is rotating, then this spatial segment will trace out a four-dimensional spiral, while if the disk is stationary, the spatial segment will stay put. To distinguish these scenarios, we need to be able to trace a particular segment over time, but the moment-by-moment facts do not seem to permit this. Three-dimensionalists have no problem: they accept facts about the identity and distinctness of segments existing at different times. Can four-dimensionalists determine whether a later segment-slice is a temporal part of the same segment as an earlier segment-slice? Without such facts (epistemically accessible or not), the distinction between rotating and stationary homogeneous disks is lost.

Four-dimensionalists could posit non-supervenient cross-time relations between different temporal parts of the same persisting disk segment. But four-dimensionalists typically have reductionist tastes. After all, one of the unappealing features of three-dimensionalism is the way it litters the world with ugly cross-time identities as well as clean qualitative facts.

Many four-dimensionalists, including Sider, are committed to defending the honour of Humean Supervenience against philosophical challenges. (Humean Supervenience is the doctrine that all the facts about the world supervene upon piecemeal, point-by-point, moment-by-moment facts.) Supporters of Humean Supervenience must reject the proposed non-supervenient relations, and they need another way of accounting for facts about which segment slices are successors of which.

Sider wheels in the Humean big guns, in particular the 'best-systems' account of laws (see also Callender 2001). Momentary facts about the disk in isolation do not distinguish different states of rotation, nor determine which segment-slices are successors of which. But the best-systems view reminds us of the wider world: does a rotating disk or a stationary disk fit better into a simple, strong picture of the entire universe? Whichever fits best is real. Facts about rotation and persistence are thus determined by Humean facts about the universe as a whole.

This is a powerful strategy. Opponents may object that rotation or persistence are not extrinsic in this way. But the extrinsicness has been deduced from an elegant and fruitful metaphysical theory, not posited ad hoc. Opponents may also object that in a world containing only a homogeneous disk the subvenient facts are too sparse to determine whether the disk is rotating, and thus there are no facts about rotation in such a world. Again, this peculiar consequence might be acceptable, given the apparent allure of Humean Supervenience.

But the intuition sacrificed here - that even a lone object may have a variety of dynamical states - is almost identical to that used earlier against presentists. Sider makes the connection

explicit: "...I have complained that rival theories have implausible consequences with respect to certain distant possible worlds. Some of these worlds have been 'simple' worlds, as in discussion of the problem of cross-time relations for presentism...Now I myself must 'bite the bullet', and admit that four-dimensionalism has implausible consequences with respect to certain possible worlds. Some may suspect an unscrupulous accounting of theoretical costs and benefits, but I don't agree. It would be inconsistent to claim that four-dimensionalism's counterintuitive consequences in distant worlds represents no cost at all to accepting four-dimensionalism while at the same time upholding arguments based on distant worlds against my rivals. I do not claim this; I admit four-dimensionalism's weaknesses, hoping for victory in the final reckoning." (235)

Despite clear evidence of scruples, this is a dialectical oddity. Humean four-dimensionalism conflicts with the intuition that dynamical states must be determinate, and this counts against the theory. But if Sider judges the Humean picture to be the best available, and thus accepts it, then he should take himself to have discovered that the intuition is false. Can presentism's conflict with that same intuition still count as a weakness? Maybe, but only if we adopt the stance of the careful shopper, who has not yet adopted either Humean four-dimensionalism or presentism. Moreover, perhaps the fact that two radically different metaphysical theories both clash with the intuition is a good indication that the intuition is misleading and shouldn't count against either theory.

Curiously, the clash of both Humean four-dimensionalism and presentism with this intuition brings out some parallels between the views. Both attempt to account for the world using limited resources, and both face accusations of having missed something out. Presentist

resources are restricted to moment-by-moment facts plus, typically, transtemporal facts about object identity. Humean resources are restricted to moment-by-moment facts plus transtemporal facts about spatial relations. What motivates these self-imposed restrictions? Presentists don't accept transtemporal relations because they don't accept the necessary relata, except in the special case of the identity relation. But Humeans accept the existence of other-timely relata, so why do they restrict themselves to spatiotemporal relations between those relata? Parsimony holds the Humean back, but this raises the question of why spatiotemporal relations are acceptable: what is the rationale for admitting some, but only some, nonsupervenient relations into the supervenience base? Why put up with indeterminate dynamical states?

## 2.2 Time-travel

In section 4.7.2, Sider argues that if backwards time travel is a coherent notion then there are genuinely distinct possibilities which three-dimensionalists cannot distinguish. Since physicists apparently treat time travel as a coherent notion, this is one more black mark against three-dimensionalism. This absolutely intriguing argument runs as follows. Suppose that Ted travels back in time, and confronts his earlier self: t(he)y is/are alone in a room (together). The four-dimensionalist account of this seems straightforward: two of Ted's temporal parts exist simultaneously. This is a bit peculiar, but you'd expect time travel to be a bit peculiar.

Three-dimensionalists have more trouble. According to them, Ted is wholly present whenever he exists; in general, Ted's changing features present no problem, since they are possessed at different times. But in the time travel case, both young Ted and old Ted are

wholly present at the same time. How can one and the same entity be in different parts of the room with different postures (standing, sitting) at the same time? Well, you'd expect time travel to be a bit peculiar: perhaps we can just accept that under such unusual circumstances a thing may have apparently conflicting features simultaneously.

According to Sider, however, what's worse is that three-dimensionalists cannot distinguish a situation in which young Ted stands at the window while old Ted sits by the fire, from a situation in which the positions are reversed: "...I am standing while my former self is sitting. But our roles might have been reversed - I might have sat where he sits while he stood where I actually stand. We have here what appear to be two distinct possibilities...The problem is that the three-dimensionalist cannot distinguish these possibilities." (102-3)

Why not? The problem is that, in each of the two distinct possibilities, one and the same thing (Ted) both stands and sits: at this level of description the possibilities look identical. To make this bite, we must stipulate that old Ted and young Ted are qualitatively indiscernible, except for the qualities (position, posture) which they swap in the envisaged scenarios. They must even share all their parts (each part bi-located), otherwise the three-dimensionalist will be able to distinguish between a scenario in which this molecule (part of old Ted) is located in a standing-person-shaped biology-filled region and a scenario in which the very same molecule is located in a sitting-person-shaped biology-filled region.

The case is thus not plausible for human beings or other complex systems, but the problem could be posed for a rudimentary object which does not change its parts or properties too quickly. I'll continue to discuss the problem as if it concerned people, so as to match Sider's

own discussion. (But Sider should desist from using the first-person perspective to bolster the intuition that the possibilities are genuinely distinct.)

Perhaps three-dimensionalists can cite differences at other times in order to distinguish the two possibilities. Age has not ravaged old Ted, and he has forgotten his colourful past, but surely we can distinguish a situation in which experienced Ted stands at the window from one in which inexperienced Ted stands there? No: all those exciting episodes belong just as much to young Ted as to old Ted, and at the time of the meeting they lie in the future of each. What about causal differences between old Ted and young Ted? Old Ted's posture is causally determined by Ted's state on entering the time machine, and young Ted's is not, so we might try to distinguish a situation in which Ted is standing and sitting but only the standing is caused by the future from a situation in which Ted is standing and sitting but only the sitting is caused by the future. But Sider points out that there might be no such causal determination. The time machine might introduce an element of indeterminism, in which case there would be a causal connection between the pre-time-travel state and old Ted's present state (as indeed there must be, if personal identity is to be preserved), without causal determination of old Ted's posture.

Can these vestiges of causal connection be used by three-dimensionalists to make the relevant distinction, even in the absence of causal determination? We can't just distinguish between a case in which someone causally connected to the future stands, and a case in which someone with those connections sits, because in three-dimensionalist terms someone (Ted) with those connections both stands and sits in both scenarios. But if the causal connection grounds counterfactuals these may do the work: if future Ted had grown a beard, then either there

would have been a beard near the window, or there would have been a beard by the fire. (These counterfactuals may be true even when the 'two' Teds are made of exactly the same parts.) If the causal connection required for personal identity supports anything at all, this will permit the three-dimensionalist to distinguish the two scenarios Sider takes to be distinct.

If, on the other hand, these causal connections cannot do the work for the three-dimensionalist, then four-dimensionalists will also encounter difficulties. Intuitively, the four-dimensionalist, whether stage or perdurance theorist, can distinguish between a situation in which this stage sits while that stage stands, and a scenario in which that stage sits while this stage stands: unlike three-dimensionalists, four-dimensionalists believe that there are two distinct particulars involved in this story. But, given that we must suppose the two stages to be qualitatively identical except in their position and posture, the only difference between the two situations - the two possible worlds - is a difference regarding which individuals instantiate which sets of properties. Such non-qualitative differences between worlds are known as haecceistic differences, and they do not sit easily within Sider's reductionist, Lewisian, Humean framework.

In short, then, time travel only looks like a problem for three-dimensionalists if it involves an object which has not changed its parts or properties over time. Even then, either causal differences can come to the rescue, or, if they cannot, then three-dimensionalists are on an equal footing with four-dimensionalists, unless four-dimensionalists can bring themselves to accept that purely haecceistic differences between worlds.

### 2.3: Cyclic Time

A more persuasive argument of this “collapsing differences” type is articulated in section 4.8. Having argued that presentism is false, Sider produces a dilemma for three-dimensionalists. Either spacetime is a substance, or it is not. If it is, economy bids us identify material objects with regions, and thus accept four-dimensionalism. If, on the other hand, all there is to spacetime is spatiotemporal relations between material things and events, then the limited ontology of three-dimensionalism will not discriminate between seemingly different possibilities. (In fact, Sider places more weight on his other arguments against the three-dimensionalist relationalist, but I shall not discuss these here.)

For example, consider a world containing a single unchanging particle. It seems that such a world might have infinite linear time, or might have circular time. Four-dimensionalists can distinguish these possibilities: in the first, there is an infinitely-extended linear succession of particle stages, while in the second there’s a loop of stages each of which exists both before itself and after itself. According to three-dimensionalists, it’s just the same old (wholly present) particle at every moment in both scenarios, and these scenarios do not represent genuinely different possibilities.

In the time travel case, three-dimensionalists were accused not of collapsing the two Teds within a world (we granted that Ted could be bi-located), but of collapsing two different possibilities for the two Teds. Here, three-dimensionalists are accused of collapsing different temporal eras within a world, although the collapse is brought out by considering different worlds. I responded in the time travel case by arguing that four-dimensionalists would need haecceistic differences between worlds in order to avoid collapsing the two possibilities. Do

four-dimensionalists need anything equally peculiar in this case, in order to avoid collapsing different temporal eras?

Oddly, no. In order to hold apart the different eras, four-dimensionalists must abandon the principle of identity of indiscernibles (they can of course retain the more plausible principle of indiscernibility of identicals): indiscernible particle-slices in different eras are distinct objects. But accepting haecceistic differences between possible worlds is a much bigger step than just giving up the principle of identity of indiscernibles, as David Lewis makes clear (1986, section 4.4). To handle the time travel case, four-dimensionalists must argue not just that indiscernible worlds can be distinct, but that qualitatively indiscernible worlds can represent different de re possibilities; this represents a much larger commitment.

Sider's various arguments about collapsed possibilities have varying degrees of success. And some may be suspicious of all such arguments, which rely upon intuitions about simple, distant possible worlds. Reader, rest assured: in no instance does Sider's whole case against presentism or three-dimensionalism rest upon these individual arguments. Rather, his strategy is to pile one consideration on top of another, hoping to establish his own views by sheer weight of argument. But one particular argument for four-dimensionalism does play an especially important role, and I turn now to that argument.

### 3: The Argument from Vagueness

At the end of chapter 4, Sider discusses "one of the most powerful" arguments in favour of four-dimensionalism. He assumes that there can be no metaphysical vagueness, and argues that the terms involved in general claims about how many entities there are in the world do

not suffer from linguistic vagueness (the ‘best-candidate’ theory of content is key here).

Thus there can be no vagueness of any kind when it comes to the question of how many things there are. Armed with this lemma, Sider argues that we must either posit implausibly sharp distinctions between cases in which there is an object in a region and cases in which there is not, or else accept four-dimensionalism.

In its general shape, this argument is like Lewis’s argument that composition is unrestricted and thus any old objects have a sum. But the twists are interestingly different, and the use of this type of argument against three-dimensionalism is new. To avoid begging the question against three-dimensionalism, Sider uses only the notion of parthood-at-a-time, and proceeds as follows (but rather more carefully than I do in this gloss). Take some objects which exist at a certain time, and think of the pair which is that time paired with the class of those objects. Now take some objects which exist at another time, and think of the pair of this second time and this second class of objects. The object (if there is one) which has just the first objects as its parts at the first time, which has just the second objects as its parts at the second time, and which doesn’t exist at any other time, is the minimal D(iachronic)-fusion of those two pairs. We can generalise the notion to any number of pairs. Take your parts at each moment you exist, and pair each moment-by-moment class of parts with the relevant time: you yourself are the minimal D-fusion of that series of pairs. Thus far, the machinery of D-fusions is compatible both with three-dimensionalism and with four-dimensionalism.

Now, which series of pairs have minimal D-fusions? Intuitively, three-dimensionalists will want to maintain that only those series of time-objects pairs that correspond to the career and changing parts of a persisting object have minimal D-fusions. But which are these

respectable series? Sider argues that there must be a determinate answer to this question, and that there are only three determinate non-arbitrary answers available: every series has a minimal D-fusion; no series has a minimal D-fusion; only those series which involve exactly the same objects at each moment have minimal D-fusions. The third of these is mereological essentialism: composite objects never change their parts. The second is nihilism: there are no composite objects. And the first entails that even a series which consists of just a single time-objects pair has a minimal D-fusion. If we reject essentialism and nihilism, what follows?

Think of the Anstruther lifeboat. There is an object which has the lifeboat and the lifeboat's current spatial parts as its only parts right now, and which doesn't exist at any other time. In other words, the lifeboat has an instantaneous temporal part right now, and four-dimensionalism is the one true ontology of persistence. At first sight, it seems that a large rabbit has been pulled from a rather small hat. A second look suggests instead that a sledgehammer has been used to crack a nut: Sider argues for extraordinary liberality about composition in order to secure the existence of temporal parts of ordinary persistents. That said, this is a powerful and ingenious argument, built on premises which command relatively widespread assent, and framed in terms of parthood-at-a-time, a three-dimensionalism-friendly notion.

Has Sider's definition of temporal parthood made life a little too easy for him? The argument from vagueness, granted its premises, establishes that there is a momentary object which has the Anstruther lifeboat and the lifeboat's current parts as its only parts. Now, what makes this momentary thing a temporal part of the Anstruther lifeboat? Sider relies upon principle PO (58): "If x and y exist at t, but x is not a part of y at t, then x has some part at t that does

not overlap  $y$  at  $t$ " (where two objects overlap iff they have a part in common). Roughly speaking, if the momentary thing is to avoid being a part of the Anstruther lifeboat, it must have a part of its own which is entirely distinct from any part of the Anstruther lifeboat.

But every one of its proper parts is either a proper or an improper part of the Anstruther lifeboat. So by PO the momentary thing is a part of the Anstruther lifeboat, and because it is the largest part existing at that time it is a temporal part of the boat. The argument doesn't rely upon any special feature of either the present moment or the Anstruther lifeboat, so we can generalise, concluding that every persisting thing has a temporal part at every moment. (Notice that the lifeboat is, reciprocally, a part-at- $t$  of the temporal part it has at  $t$ .)

Once three-dimensionalists concede that there is a momentary boat-sized thing which is part of the Anstruther lifeboat, all is lost, so there is reason to look more closely at PO. PO captures the idea that if an object is to avoid being part of another object, it must retain its independence by having some part which is entirely distinct from that second object. But many three-dimensionalists will want to recognise a further way in which one object can retain its independence from a second, even if the two objects share all their (proper) parts. In order to explain how two things, like a statue and a lump of clay, can coincide without being identical, some three-dimensionalists have argued that objects can be distinguished merely by their principle of composition (e.g. Levey (1997)), or by their persistence conditions or modal properties (e.g. Lowe (1995), Wiggins (1980)).

These three-dimensionalist claims have problems of their own: Sider provides a clear critique of such views in his Chapter Five. And strictly they are compatible with PO: indeed Sider

argues (155) that coincidence-without-identity views should be combined with PO, so that the statue and the lump are parts of one another for a while. But coincidence-without-identity views undermine the motivation for PO: if an object can avoid being identical with a second even though they share all their proper parts, why shouldn't the object avoid being a part of the second in just the same way? Dropping PO also helps three-dimensionalists formulate their position: in the absence of PO, they can rule out the very possibility of momentary temporal parts, even if momentary objects occasionally coincide with persistents (64-5).

Three-dimensionalists have good reason to give up PO, and if they do so they can accept the momentary things whose existence is established by the argument for vagueness, whilst denying that persisting things have temporal parts. However, it must be said that this would not constitute a great leap forward for three-dimensionalism: if the world is full of momentary objects which coincide with the more familiar persisting things of everyday ontology, why also insist on the existence of those three-dimensional persistents? The argument from vagueness does not quite establish four-dimensionalism if we reject PO, but nevertheless it makes four-dimensionalism look very tempting.

So three-dimensionalists should resist the argument from vagueness at an earlier point, and indeed this is what they do. Chisholm (1976), for example, accepts mereological essentialism. Van Inwagen (1990) accepts that there can be metaphysical vagueness - there is no determinate answer to the question of which series of pairs have minimal D-fusions (although many series determinately do not have such fusions). More recently, Trenton Merricks (2001) has argued that very small differences between series of pairs can make all the difference as to whether a series has a minimal D-fusion, especially where that fusion would

have features which seem very different from the features of its parts (for example, where the fusion would be a conscious thing).

So the argument from vagueness is not knock-down. But three-dimensionalists must make some response or other to this argument. Moreover, three-dimensionalists will need to restrict composition-at-a-time in any case, even abstracting from the issue about temporal parts. If three-dimensionalists accept unrestricted composition at a time - belief in scattered objects and the like - they will face very awkward questions about what happens to those peculiar objects next. Either the objects are momentary, in which case four-dimensionalism threatens, or else they are three-dimensional enduring things, and must have persistence conditions of their own, despite the fact that they fall under no known sortals, and do not have natural boundaries.

#### 4. Conclusion

As these considerations suggest, and as Sider's rich and complex book demonstrates, the dispute between three-dimensionalists and four-dimensionalists cannot easily be restricted to a difference of opinion about how many parts material things have, and whether they are temporally extended. Four-dimensionalists are often motivated by a generally reductionist, nominalist, scientific metaphysical framework, and the hope that, by positing lots of plain and boring instantaneous objects, they will be able to account for the world we see around us. Three-dimensionalists, in contrast, are driven (willingly or unwillingly) to accept some or all of the following: metaphysical vagueness, brute facts about composition, non-qualitative facts about trans-temporal identity, irreducible facts about instantaneous velocity, irreducibly tensed facts, and differences in identity without differences in composition. In compensation,

the three-dimensionalists' world is populated by far fewer, and more interesting, material objects. To choose between these two world pictures, we will need to find a principled way of balancing economy in sheer quantity of things with economy of different types of facts and entities: a challenge for us all.

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