

# Symposium on *Four-Dimensionalism*\*

THEODORE SIDER *Philosophy and Phenomenological Research* 68 (2004): 642–647, 674–687

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## 1. Précis

The spatiotemporal ontology of Russell, Smart, Quine and Lewis is a blend of separable components concerning time, persistence, mereology, and even semantics, unified by the theme that space and time are analogous:

**Eternalism:** past and future objects are just as real as current objects.

**The reducibility of tense:** tensed utterances have tenseless truth conditions; ‘now’ is an indexical. (Eternalism + The reducibility of tense is often called the “B-theory” of time.)

**Four-dimensionalism:** temporal parts exist. (Warning: ‘four-dimensionalism’ is sometimes used instead for the B-theory, or for the B-theory+the existence of temporal parts.)

**Unrestricted composition:** all objects, however scattered, have a mereological sum, or fusion.

**The worm view:** continuants, i.e., the objects we normally refer to and quantifier over, are space-time worms, that is, aggregates of temporal as well as spatial parts

My book defends each component except the last (see the discussion of the stage view below).

The main competitor to the B-theory of time is presentism, according to which “only the present is real”. This means in part that past and future objects, for instance dinosaurs and human outposts on Mars, do not exist. Hence talk of what was, and what will be, is not talk of past and future objects, but instead involves primitive sentential tense operators, e.g., ‘It WAS the case that...’, analogous to primitive modal operators (‘it is POSSIBLY the case that ...’).

Chapter two advances three arguments against presentism; each gives an old argument new form. First, the problem of cross-time relations. For me,

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\*I thank Frank Arntzenius, Dean Zimmerman, and my critics.

the core problem here is that the presentist's tensed sentences cannot capture the structure (e.g., affine and topological) of spacetime on which physical theories are based. Second, the truth-maker objection. The upshot of the truth-maker principle (and the principle that truth supervenes on being), I say, is a prohibition of primitive "hypothetical" (i.e., "non-categorical") notions, which rules out primitive tense operators. Finally, the argument from special relativity. My version of the argument consists of showing that there is no subset, *S*, of Minkowski spacetime, such that i) *S* is a natural, physically privileged subset; ii) the presentist can take *S* as the extent of reality, and capture talk of the rest of spacetime by means of tense operators; and iii) the resultant theory stays faithful to the spirit of presentism.

Taking the falsity of presentism (and indeed, the truth of the B-theory) as established, I turn in chapter three to the formulation of four-dimensionalism. This I define as the thesis that every persisting object has a temporal part at each moment of its existence. I define 'temporal part' using locutions whose intelligibility even my opponents admit: '*x* is part of *y* at *t*', and '*x* exists at (i.e., is located at) time *t*'. I show how my definitions can be converted into a tensed language, thus establishing the possibility of a rather odd combination: presentism + four-dimensionalism. I further argue that three-dimensionalism — the opposition to four-dimensionalism — is comparatively difficult to formulate as a unified, precise thesis. Three-dimensionalists say that objects are "wholly present" whenever they exist, but what does that mean? Saying that *x* is wholly present now does not mean that everything that is *now* part of *x* exists now — that is trivial. Nor does it mean that everything that is *ever* part of *x* exists now — most opponents of four-dimensionalism agree that objects can survive the destruction of some of their parts.

Chapter five gives an extended argument for four-dimensionalism: temporal parts ground the best resolution of paradoxes involving "coincident entities". In addition to paradoxes involving statues and lumps and undetached parts, Parfit's cases of fission, fusion and longevity, plus cases of vague and "conventional" identity, are also important. A fully general resolution is needed. I argue that four-dimensionalism provides a better resolution to these paradoxes than: constitution views, Michael Burke's dominance account, André Gallois's theory of temporary identity, eliminativism, and mereological essentialism.

The worm view provides a good resolution of these paradoxes, but a better resolution comes from the *stage view*. This view shares a common ontology with the worm view (namely, four-dimensionalism), but makes an alternate semantic claim: the objects we normally quantify over and name are instantaneous

stages rather than space-time worms. (According to the stage theorist, space-time worms exist; we just don't usually talk about them.) Claims about what continuants *will do* and *have done* are to be analyzed using temporal counterpart theory. I am an instantaneous stage. Nevertheless, I *once was a boy*, since I have a past temporal counterpart that is (tenselessly) a boy. The stage view is attractive because of its implications for counting in the paradoxes of coincident entities (it allows us to *identify* the statue with the lump, despite "their" future differences), and because it allows us to say, in the fission case, that a future event "matters" (in Parfit's sense) to a person only if that event will happen to that very person. (Less importantly, it allows us to say that temporary intrinsic properties are instantiated *simpliciter* by continuants themselves.) Since my critics have not focused on the stage view, from now on I will write as a defender of the worm view.

Chapter four surveys other arguments for temporal parts. Some traditional arguments I reject, for instance the argument that temporal parts are required by special relativity. Others I find inconclusive, for instance Lewis's argument from temporary intrinsics. Three new arguments seem to me to carry more weight. First, temporal parts are needed to accommodate the possibility of time travel. Second, opposition to temporal parts conflicts with both spacetime relationalism and substantivalism. The conflict with substantivalism is indirect: once spacetime points are admitted then the simplest ontology admits no continuants in addition, but rather identifies them with regions of spacetime. Such regions have temporal parts. The conflict with relationalism is more direct: relationalism requires short-lived entities to be the relata of temporal relations.<sup>1</sup> Third (and most powerfully, I think), there is an argument from vagueness, which proceeds as follows.<sup>2</sup> When do entities come into and go out of existence? Four-dimensionalists say: "always". No matter how particles are arranged, no matter what the duration of that arrangement, some object made up of the particles exists just during that duration. Opponents of four-dimensionalism typically say: "sometimes". When particles are arranged person-wise, a person comes into existence. That person persists so long as the particles are arranged person-wise, but no longer; and no shorter-lived entities come into existence from this arrangement. These opponents face the following objection. If arrangements only sometimes bring entities into existence,

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<sup>1</sup>Section three of Hawthorne and Sider (2002) strengthens the case against combining relationalism with the rejection of temporal parts.

<sup>2</sup>See the contributions by Gallois and Markosian for more careful presentations.

then for some arrangements of matter over time, it will be vague *how many things exist*. Otherwise, an arbitrarily small perturbation in the arrangement of matter could make a *definite* difference in how many objects exist; and such hypersensitivity is implausible.<sup>3</sup> But it cannot be vague how many things exist: statements of number can be phrased in pure quantificational logic, and logic is never source of vagueness.

The final chapter defends four-dimensionalism against objections. It emphasizes that one can believe that temporal parts *exist* without claiming that temporal parts are semantically or conceptually or epistemically basic. It further considers Judith Jarvis Thomson's "crazy metaphysic" objection (reply: the appearance of temporal parts is law-governed, not "ex nihilo"), the "no-change" objection (reply: change *just is* heterogeneity of temporal parts), van Inwagen's modal argument (reply: the argument would equally threaten spatial parts, and anyway can be answered assuming various views of *de re* modal predicates, for instance the view that such predicates are Abelardian). It ends with a discussion of the challenging problem of motion in homogeneous substances. The sequence of temporal parts of a homogeneous sphere is allegedly intrinsically the same whether or not the sphere rotates; hence, four-dimensionalists cannot distinguish rotating from stationary homogeneous spheres. The problem does not threaten four-dimensionalism *per se*, since one can appeal to irreducible (genidentity) relations between temporal parts of the sphere, or irreducible vector quantities, thus intrinsically distinguishing the sequences. Nevertheless, I argue that even such posits do not ground the assertion that the disk is rotating unless the irreducible relations or vectors play the right role in the laws of dynamics. Given the best-system theory of lawhood, if the world is sufficiently complex then the relations and vectors can indeed play this role. (In fact, given certain kinds of complexity, the relations and vectors are not needed.) But in very simple possible worlds, the relations and vectors cannot play this role. Thus, I am forced to deny some intuitive possibilities.

Let me close by mentioning the book's introduction, which takes up some methodological issues, especially metaontology. Many contemporary analytic metaphysicians follow W. V. O. Quine's approach to ontology. In our search for what there is we employ something like the methodology of science, seeking the "simplest" theory that accounts for the data. Most of us would horrify Quine by

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<sup>3</sup>Given the metaontology I defend in the introduction, I cannot object to hypersensitivity by claiming that our *use* of quantifiers is not hypersensitive. The rejection of hypersensitivity must stand on its own as a premise of the argument.

allowing some of “the data” to be relatively *a priori*, and by reserving a special place for strongly held ordinary beliefs (in the latter we follow David Lewis, Roderick Chisholm, and ultimately G. E. Moore).<sup>4</sup> But we are nevertheless Quinean in the following respect: we do *not* regard existence questions as questions of conceptual analysis. That is, we reject the following picture: there are a number of equally good distinct things one could mean by unrestricted quantifiers; which of these English speakers mean, and hence the English truth conditions for quantified statements, is settled by convention; and so certain statements about existence are analytic in virtue of the conventions governing the quantifiers; doing ontology consists of employing familiar tools of conceptual analysis to investigate these conventions.

Ontology not being a matter of conceptual analysis is important for a number of reasons. First, it makes best sense of the emphasis on “simple” theories, and the willingness to allow theoretical considerations to justify counterintuitive ontological posits. Genuine conceptual analysis de-emphasizes simplicity.<sup>5</sup> A first stab at the conceptual analysis of ‘bachelor’ is: unmarried male. Counterexamples then require complications: the pope, infant boys. Few would hang tough with the first stab on the grounds that it is the simplest theory. But many contemporary metaphysicians are happy to disagree with ordinary belief concerning what there is, if the gains in theoretical virtues are sufficiently great. Lewis’s (1986*a*) theory of possible worlds is only the most infamous example, and is generally not rejected on methodological grounds. Second, ontology being conceptual analysis would raise the worry that disagreeing parties in some ontological debates do not really disagree. Many ontological disputes concern terms with little impact on ordinary thought. If there exist candidate meanings vindicating each side of a dispute concerning term T, and only *theorists* use T in ways that would distinguish between the candidate meanings, then perhaps the “disagreeing” parties each speak truly in distinct idiolects. Third, and more vaguely, ontology being a matter of conceptual analysis does not square with the “heaviness” I and my cohorts associate with ontological commitment. Fourth, and more idiosyncratically, some of my book’s arguments depend on existence not being a matter of conceptual analysis; I assume that existence is neither vague (chapter 4, section 9; see also my Sider (2003)) nor parochial (pp. 156–157).

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<sup>4</sup>See the introduction to Loux and Zimmerman (2003).

<sup>5</sup>Though see Weatherson (2003).

With his rejection of analyticity, Quine himself had the cleanest reason for denying that existence-questions are questions of conceptual analysis. Most contemporary analytic metaphysicians believe in analyticity, and so need a different reason.

My reason appeals to a thesis about meaning and a metaphysics of existence. The thesis about meaning is that meaning is determined by two vectors, one dependent on *us*, call it *use*, another dependent on the world, call it the intrinsic *eligibility* of candidate meanings (reality's joints).<sup>6</sup> The metaphysics of existence is that "existence is a logical joint in reality". To illustrate: *electronhood* is a highly eligible meaning, a (natural, not logical) joint in reality. Eligibility, not use, plays the dominant role in determining the meaning of 'electron'; our conventions, beliefs, or whatever, concerning 'electron' play a comparatively small role in determining the truth conditions of statements involving that term. A wide range of alternative uses of the term 'electron' would all select one and the same highly eligible meaning for 'electron'. 'Bachelor' is different. Here, the truth conditions are largely up to us, because no natural joint in reality exists to pick out what we mean. *We* must do the semantic work.<sup>7</sup> Alternate uses for 'bachelor' would select slightly different meanings. I say that (unrestricted) quantifiers are like 'electron'; unrestricted **existence** is a highly eligible meaning — a logical joint in reality. The world comes ready-made with a domain of absolutely all the entities (as well as distinguished subclasses, e.g., the electrons); truth conditions for quantified statements concern that distinguished domain, and are largely unaffected by our beliefs or intuitions or conventions.

I do little to argue doubters into accepting this conception of existence. The conception is rather intended as a model of how ontology is possible. If **existence** is indeed a highly eligible meaning, ontology can proceed pretty much how we neo-Quineans practice it.

## 2. Replies to Gallois, Hirsch and Markosian

I thank my commentators for their kind words, and for their close reading and challenging criticisms of my book. I have chosen selective and substantive

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<sup>6</sup>This is David Lewis's (1984; 1983) conception of meaning-determination.

<sup>7</sup>Insofar as the work gets done; where it does not, there is vagueness and perhaps other semantic indeterminacy. Also, even where there is no *perfectly* eligible meaning, eligibility still must disqualify overly "bent" candidates.

replies. Those criticisms I ignore, I ignore because I have little more to say, not because they are unworthy of discussion.

## 2.1 Reply to André Gallois

**Presentism and grounding** In chapter 2 I argue that presentists' irreducibly tensed truths (for instance that "there once existed dinosaurs") violate the principle that "truth supervenes on being", which for me boils down to this: everything supervenes on what objects there are, and what "categorical" properties and relations they instantiate. Gallois objects that truths need only supervene on the categorical properties and relations that are, or *were*, or *will be* instantiated by objects; this weaker thesis he calls *presentist supervenience*, because it is friendly to presentism. The point of insisting that truth supervenes on being, I said, is to rule out brute counterfactuals, ungrounded dispositions, and so on; but, Gallois points out, presentist supervenience does just as good a job as the original principle in condemning these illicit ontological posits.

A defender of brute counterfactuals could accept *counterfactual supervenience*: truths supervene on what categorical properties and relations are, or *would have been*, instantiated by objects had the distribution of categorical properties and relations been different. A defender of brute dispositions could accept *dispositional supervenience*: truths supervene on what categorical properties and relations are, or are disposed to be, instantiated by objects. We can protect any ungrounded ontological posit we like by tinkering with supervenience.

A line must be drawn, between what can ground and what must be grounded. The most natural place to draw the line requires grounding of *all* hypothetical truths. Presentist, counterfactual and dispositional supervenience are unmotivated intermediate positions.

**Thank goodness that's over** Prior argued from the psychologically irreducible 'now' in 'thank goodness that's over *now*' to the metaphysical irreducibility of tense. I argue in Chapter 2 that the familiar cases of indexical attitudes show this argument to be misguided; otherwise the psychological irreducibility of 'here' and 'me' in 'Thank goodness that's not over *here*' and 'Thank goodness that's not *me*' would point to the metaphysical irreducibility of place and self. Against this, Gallois claims that 'Thank goodness that's not over here' *is* psychologically reducible, namely to 'Thank goodness that's not where I am located'. But my point was only that one should not introduce metaphysically privileged times, places or persons based on these sentences; instead we

should admit (as most contemporary philosophers of language do) irreducibly indexical belief, relief, and other attitudes. Gallois's proposed reduction uses the indexical 'I'; assuming he rejects a single metaphysically privileged self, he thereby agrees with me that 'Thank goodness that's not over *here*' requires no metaphysical surprises, only irreducibly indexical attitudes.

**Receding particles** Gallois's example of *Receding Particles* is supposed to show that: even if count indeterminacy — indeterminacy in the number of things — is impossible, it could still be indeterminate whether a given assignment has a minimal D-fusion. This would undermine my argument from vagueness for four-dimensionalism. I don't understand *Receding Particles*, but perhaps the following example makes the same point. Time is discrete and there are only two times,  $t_1$  and  $t_2$ . The world contains only two enduring mereological atoms,  $a$  and  $b$ , plus any further objects they may compose. At  $t_1$ ,  $a$  and  $b$  are close together; at  $t_2$  they are at a medium distance from each other. Next, define the sortal term F:

Fx iff:  $x$  is made up of two atoms at all times at which it exists, and at any moment it exists its parts are *closeish* together

'Closeish' is to be vague between *close* and *medium*. Further assume that F and 'atom' are the only sortals objects can have at this world, and that every object must fall under some sortal; thus, any composite object that exists at this world must fall under F. Finally, assume that whenever it is consistent with the aforementioned assumptions for a composite to exist, a composite does indeed exist. Gallois would, I take it, now argue as follows. The number of objects existing in this world is determinate: three. Those three objects are  $a$  and  $b$ , plus a third object,  $c$ , such that it is determinate that  $c$  exists at exactly one time, but it is indeterminate whether  $c$  exists at  $t_1$  or  $t_2$ . (If medium distance is closeish then  $c$  exists at  $t_2$ ; if close is closeish then  $c$  exists at  $t_1$ ; it's indeterminate which distance is closeish so it's indeterminate at which time  $c$  exists.) But then, it is indeterminate whether the assignment defined over just  $t_1$ , and which assigns  $\{a, b\}$  to  $t_1$ , has a minimal D-fusion.

My argument, though, was *not* that each case of indeterminacy of minimal D-fusion is *itself* a case of count indeterminacy. It was rather that if cases of indeterminacy in minimal D-fusion are possible, then we can construct cases, *perhaps other cases*, of count indeterminacy. This certainly is true of the case of the preceding paragraph: simply eliminate time  $t_2$  from the example. In this



new case it will be indeterminate whether  $a$  and  $b$  are ever closeish, and hence indeterminate whether a third object,  $c$ , exists at all.

**Fusions and constitution** The argument from vagueness assumes that anyone who rejects both four-dimensionalism and nihilism must say that some assignments have minimal D-fusions and others do not. Gallois rejects this assumption by claiming that one can reject *all* minimal D-fusions without lapsing into nihilism; one need only claim that an ordinary macro-object like a cricket ball “is not a fusion”, but rather is *constituted* by its particles. This is a misunderstanding of my technical terms. Let  $\phi$  be the assignment that assigns to any time,  $t$ , at which the cricket ball exists, the set of its particles then (and is undefined for other times). Given my definitions, the claim that the cricket ball is a “minimal D-fusion” of  $\phi$  means only that:

- i) for each time  $t$  in the domain of  $\phi$ : a) each member of  $\phi(t)$  is part of the cricket ball at  $t$ , and b) each part of the cricket ball at  $t$  overlaps some member of  $\phi(t)$  at  $t$

and

- ii) the cricket ball exists only at the times in  $\phi$ 's domain.

Clearly, the cricket ball *is* a minimal D-fusion of  $\phi$  in this sense.

Contemporary usage of the term ‘fusion’ is vexed. There is a tradition, especially in England, of using ‘fusion’ in a loaded way, as a sortal analogous to ‘person’, ‘statue’, etc. On this usage, calling something a fusion implies that it is “individuated by its parts”. Whatever that means, it at least entails that it must have those same parts permanently and essentially. I follow an alternate tradition, associated with Judith Jarvis Thomson (1983) and Peter van Inwagen (1990), on which ‘fusion’ is simply short for its definition in terms of ‘part’ from Leonard and Goodman’s Calculus of Individuals, perhaps modified to allow for temporal qualification of ‘part’. This unloaded usage says nothing about parts individuating or being essential; it says only that for  $x$  to be a fusion of some parts, each of those parts must (actually) be part of  $x$ , and each part of  $x$  must (actually) overlap at least one of the parts. Confusion results when followers of the first tradition misguidedly resist talk of “fusions” in the unloaded sense. My definition of ‘minimal D-fusion’ builds on the Calculus of Individuals sense of ‘fusion’, and is similarly unloaded. Gallois may have the loaded sense in mind when he claims that the cricket ball “is not a fusion”; but that sense is irrelevant to the argument from vagueness.

**Temporary identity and the B-theory** Gallois's interesting book *Occasions of Identity* breathed new life into the thesis that identity is a temporary relation. In my chapter 5 I argued, though, that temporary identity conflicts with the B-theory of time.

Consider one of the usual cases of fission, in which a person splits via brain bisection or Star Trek transporter beam into two persons, Fred and Ed. Gallois wants to say that Fred and Ed are identical at  $t_1$ , a time before fission, but are distinct at  $t_2$ , a time after fission. Suppose Ed is in pain at  $t_2$  but Fred is not. So only Ed has the property **being in pain at  $t_2$** . Given Leibniz's Law, how then can Fred and Ed be identical at  $t_1$ ? Gallois's answer: even though Fred is not in pain at  $t_2$ , nevertheless at  $t_1$  Fred is in pain at  $t_2$ . So Fred and Ed have the same properties at  $t_1$ , the time at which they are identical.

Gallois's core claim is that the double temporal qualification "at  $t_1$ : at  $t_2$ : Fred is in pain" makes sense, and is not equivalent to "at  $t_2$ : Fred is in pain". One of the things I said was that according to the B-theory, pain, like other temporary "properties", is a two-place relation between continuants and times, so there is no room for the third temporal relatum that double temporal qualification calls for. This was prudish; as Gallois says, pain could be multigrade. Instead, let me try a new argument.

Imagine the time is now  $t_1$ . Let us take the atemporal perspective that the B-theory says is fundamental, and speak tenselessly. According to Gallois, we can speak the following words truly:

- (1) At  $t_2$ : Ed is in pain
- (2) At  $t_2$ : Fred is not in pain

These sentences are *not* to be understood as expressing the double temporal qualifications:

- At  $t_1$ : at  $t_2$ : Ed is in pain
- At  $t_1$ : at  $t_2$ : Fred is not in pain

Rather, (1) and (2) are to be understood at face value, as expressing claims solely about time  $t_2$ . Now, Ed and Fred are allegedly identical at  $t_1$ . But how can Ed and Fred stand in any relation that deserves to be called identity, when Ed has a feature that Fred lacks: being in pain at  $t_2$ ? Identical objects are one and the same, whereas we have a difference between Ed and Fred.

Gallois will reply that *at  $t_1$* , i.e., the present time, Fred *is* in pain at  $t_2$ . But this only shows that we can *also* speak the following words truly:

(3) At  $t_1$ : at  $t_2$ : Fred is in pain

Since we can still truly utter (1) and (2), we are left with the difference between Ed and Fred.

One cannot argue that Young Teddy is not identical to Old Man Sider by citing the fact that only Young Teddy is a boy. The B-theorist blocks the argument thus: ‘is a boy’ is not a complete predicate. Strictly speaking, ‘Young Teddy is a boy’ is not truth-evaluable. ‘Is a boy’ requires temporal qualification; we must specify the time,  $t$ , at which a thing is said to be a boy. But if  $t$  is chosen early in my life, then both ‘Young Teddy is a boy at  $t$ ’ and ‘Old Man Sider is a boy at  $t$ ’ are true; if  $t$  is chosen later then each is false. Either way we find no difference between Young Teddy and Old Man Sider. The case of Ed and Fred is different. According to Gallois, (1) and (2) are *not* incomplete. ‘Is in pain’ expresses a multigrade relation, capable of holding between a person and one or two (or more?) times. This relation holds between Ed and  $t_2$ , and fails to hold between Fred and  $t_2$ . We are left with our difference between Ed and Fred.

There is a way for Gallois to deny that we can truly utter (1) and (2), thus blocking the argument, but it presupposes the A-theory of time, specifically, a version of the “moving spotlight” theory, which includes eternalism but not the reduction of tense.<sup>8</sup> According to this view, reality as a whole — the block universe — changes.<sup>9</sup> To take this into account, *all* predication requires two temporal qualifiers, as in (3). These two temporal qualifiers function very differently from each other. The inner qualifier, ‘at  $t_2$ ’, functions the way B-theorists say it does, as an argument place for ‘is in pain’. But the outer qualifier, ‘at  $t_1$ ’, indicates that we are to evaluate the component sentence, ‘at  $t_2$ : Fred is in pain’ by comparing it with the state of the entire block universe as of  $t_1$ . According to this view, our utterance of (2), when the present moment is  $t_1$ , was either false or nonsense. Predications require two temporal qualifiers, whereas (2) has only one. Thus, (2) is nonsense — unless it is taken with an implicit outer qualifier to the present time, in which case it means “At  $t_1$ : at  $t_2$ : Fred is not in pain”, and so is false. This is the only way I can see to block

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<sup>8</sup>In my book I also argued that temporary identity could be defended by a presentist.

<sup>9</sup>Talk of the entire block universe changing is often thought to be obscure, even nonsensical. My own view is that it should be interpreted using tense operators. Thus, the outer temporal qualifiers in what follows could be replaced with tense operators; when the outer qualifier is the present moment they may be omitted. But I will describe the view in the more familiar and simpler way.

the truth of utterances of (1) and (2), and it presupposes the A-theory of time. Thus, I continue to deny that temporary identity can be combined with the B-theory.

‘At  $t$ ’ is a treacherous phrase. It usually functions as a tool of opponents of temporal parts to accommodate change. Here it merely adds extra argument places to predicates. Yet ‘at  $t$ ’ can also suggest an A-theoretic picture of time, especially when used as a sentence modifier. The picture is then different: one considers reality as a whole, as it is at  $t$ , and evaluates the component sentence with respect to reality then. My worry is that temporary identity illicitly benefits from a slide between these two uses of ‘at  $t$ ’. The temporal qualifiers in sentences like (3) can look like the first sort, and so look unobjectionable from a B-theoretic point of view. But to reject the existence of genuine differences between Ed and Fred, Gallois must deny that (1) and (2) can be truly uttered, and so must slide into the second use of temporal qualifiers, and thus into the swamp of the A-theory of time.

## 2.2 Reply to Eli Hirsch

Hirsch rightly notes the centrality of meta-ontology to my project. His objections challenge the very foundations, not just of my book, but of all neo-Quinean ontology.

Hirsch imagines a language “Shmenglish”, in which the most unrestricted quantifier does not range over “strange” objects (i.e., objects foreign to common sense, what Hirsch calls “Siderian” objects). According to Hirsch, an ideal interpreter must assign to English quantifiers the same meaning as the quantifiers of Schmenglish; to assign anything else would blatantly violate the principle of charity, since speakers regard sentences asserting the existence of mereological objects as “insanely false”. Hence, in English, statements that strange objects exist are false. My book is written in English. Hence, my assertions in the book are false.

My primary reply to this challenge was given in the introduction, as described above. **Existence** is a highly eligible meaning. Suppose for the sake of argument that four-dimensionalism is true, when the quantifiers mean **existence**. (This is not built into the *concept* of **existence**; this is my *opinion* about **existence**.) Considerations of charity, at best, show that our *use* of quantifiers does not fit perfectly with **existence**; use fits better with the meanings of the quantifiers in Schmenglish. But our use fits **existence** *partially*: **existence** vindicates the core inferential role we associate with quantifiers, and it fits many of

our intuitions about particular cases. Moreover, **existence** is a highly eligible meaning, and so can be meant by English quantifiers even given significant divergence from use.

Hirsch's main objection can now be stated: "why can't considerations of use trump eligibility"? On his view, our overwhelming tendency to reject strange objects shows that the fit of **existence** with use is bad enough to outweigh its eligibility.

As Hirsch says, my choices are: i) say that eligibility *always* trumps use<sup>10</sup>, in which case Schmenglish is impossible, or ii) say that use *can* trump eligibility, in which case Schmenglish is possible. He further says that I must surely choose i); otherwise, given the reaction of his linguistics student, according to whom four-dimensionalism is "an absolutely hilarious aberration of the language", if Schmenglish is possible then it is actual. But in fact, I choose ii). Schmenglish is possible, just not actual. Hirsch and his student overstate the linguistic aberration of strange objects.

There is (almost) no question that *ordinary* uses of English quantifiers do not range over strange objects, but that is because English quantifiers are ordinarily restricted. This goes part of the way towards explaining the spontaneous negative reaction of ordinary speakers to Hirsch's sentence: "Something in the yard is a highly visible brown wooden object that contains branches during the daytime and contains no branches during the nighttime". *My* students' resistance to such sentences fades when they come to appreciate the subtleties of quantifier domain restriction. (Compare initial resistance to "there are six tables in the room" said of a room with two large tables, each made up of two smaller ones.) Resistance fades further when students master spatiotemporal thinking. Resistance (of the uninitiated — not of Hirsch!) is partially due to failure to grasp the proposed nature of strange objects. After a bit of innocent coaching, students see the analogy between strange and commonsense objects, and no longer find the former linguistically preposterous. In my experience, only philosophers put up enlightened resistance.

One can, however, imagine a language like English, but in which speakers reject 'there exist strange objects' with eyes wide open, as being linguistically deviant. (It is not enough that they merely reject the sentences, for they may simply *believe* them to be false. Given the legitimacy of something like analyticity — perhaps defeasible, perhaps coming in degrees — not all believed

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<sup>10</sup>This obviously must be restricted to languages in which quantifier expressions are used with a certain minimal inferential role.

sentences contribute equally to the use of a term.) Hence, Schmenglish is possible, though not actual.

Suppose I am wrong, and English use of quantifiers really does disallow strange objects. That is, suppose English is Shmenglish. The statements of my book would then be false if interpreted as English. But perhaps my book, and other works of ontology, should not be interpreted as English, but rather as “Ontologese”, a language distinctive to the activity of fundamental ontology, in which the quantifiers are stipulated to mean something new.<sup>11</sup>

The obvious reply: “That would render ontology uninteresting. First, because what we care about is what exists in the *ordinary* sense. Second, because no stipulation of the function of Ontologese could leave it an open question, worthy of debate, what exists. The answer to the question “what is there?”, interpreted as Ontologese, would simply follow from the stipulations governing the Ontologese quantifiers. Ontology would collapse into investigating the consequences of its own idiosyncratic (and perhaps even arbitrary) definitions.”

Eligibility answers the reply. Stipulate the quantifiers of Ontologese to be utterly unrestricted, and *not* to be governed by the (alleged) ordinary linguistic rejection of strange objects. The only stipulation on the quantifiers in Ontologese is that they have the appropriate core inferential role. Ontologese quantifiers will then mean **existence**. It will be an open question in Ontologese what exists, since no stipulation about the *extent* of **existence** has been made. Further, it is worth caring about what exists in Ontologese. Indeed, one ought to care *more* about answers to existence statements phrased in Ontologese than those phrased in English, since Ontologese quantifiers carve reality at the joints.

Imagine scientists who insist on making the truth of the current theory of electrons, T, utterly definitive of the meaning of ‘electron’. (They treat ‘electron’ like we all treat ‘sin’: it is robustly analytic to ‘sin’ that sin is transgression against God.) In fact, they explicitly disallow dependence of ‘electron’ on natural kinds: ideal interpreters must choose a meaning for their use of ‘electron’ that renders T true, even if there is no natural kind *electronhood*, and so even if the ideal interpreter must choose an extremely gerrymandered property.

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<sup>11</sup>See Dorr (2005), though he stipulates the language of ontology differently. Also: even if English is not Shmenglish, I need a bit of the Ontologese move. For English quantifiers are rarely (if ever) wholly unrestricted, and so ontologists do something a bit special with the quantifiers when they ask whether strange objects (or numbers, or properties, or ...) exist. But this special thing could be simply removing restrictions; and English as-is allows the process of removing restrictions.

Suppose it is then discovered that there *is* a natural kind in the vicinity of their theory, call it *e*, which is false of *T*, but which is true of a rival theory *T\**. An offshoot, more semantically flexible scientific community then adopts a new language, in which ‘electron’ is not stipulatively tied to theory (whether to *T* or *T\**). Since *e* is highly eligible, it is the meaning of the new language’s ‘electron’; hence, *T\** is true of ‘electron’ in the new language. *T* remains true of ‘electron’ as interpreted in the old language; ‘electron’ in this language means some rather ineligible, gerrymandered property. Everyone speaks truly in her own language, but obviously the second group is rationally superior, for the questions they raise are more important to the goal of rational inquiry. That goal is not mere maximization of truths believed; one should seek truths phrased in terms of nature’s joints. Ontologese is like the superior new language, Shmenglish like the inferior old one. Ontologese is a better language.

Hirsch has a secondary objection. The usual explication of joints in reality — Lewis’s (e.g., 1986*a*, 59–69) — appeals to similarity: natural properties are those, the sharing of which makes for similarity. As Hirsch points out, it is hard to extend this explication to **existence**.

Is **existence** a property? Let it be whatever sort of entity is an appropriate quantifier meaning (perhaps, following Montague, a property of properties.<sup>12</sup>)

Does **existence** make for similarity? Probably not in any interesting sense. When applied beyond core cases of properties of physical objects, the metaphysics of eligibility must transcend the similarity criterion. Similarity was already strained by natural mathematical functions, for instance addition as opposed to quaddition (Lewis, 1983, final section). Extending to logic, by counting identity, negation, conjunction and disjunction, as well as **existence**, as eligible, further transcends similarity. Likewise for higher-order properties and relations. Classes of quantities are structured by higher-order relations. The determinate mass properties, for instance, are structured in part by a linear order **at least as big a mass as** (the higher-order analog of **at least as massive as**).<sup>13</sup> These higher-order relations seem highly eligible, but their connection with intuitive similarity is distant at best.<sup>14</sup>

<sup>12</sup>This raises the specter of cardinality and paradox, but so does any systematic theory of unrestricted quantification. See Williamson (2003) on this topic.

<sup>13</sup>See Mundy (1987).

<sup>14</sup>Higher-order properties and relations also challenge another facet of Lewis’s conception of naturalness (eligibility). Of the natural properties and relations, Lewis says that “there are only just enough of them to characterise things completely and without redundancy” (1986*a*, 60). But higher-order natural properties like **at least as big a mass as** are (modally) redundant

The metaphysics of eligibility does not need similarity. Eligibility's root idea is: the ready-made world. Reality is not a blob, all subdivisions of which are created equal. Instead, reality has a *distinguished structure*. This idea carries over to the mathematical, logical and higher-order realms: those, too, have distinguished structures. Fundamental to all these structures is a distinguished domain of existents, since all the other eligible properties and relations presuppose the notion of objecthood and hence existence. None of this mentions similarity.

### 2.3 Reply to Ned Markosian

**Strange objects** Four-dimensionalism plus unrestricted composition do indeed imply the existence of some pretty strange objects, objects undreamt of prior to philosophy. This is not a deal-killer. (Markosian agrees.) Strange objects are linguistically unproblematic, as argued in my reply to Hirsch. Further: they have no extraordinary intrinsic properties — their intrinsic properties derive exclusively from the mundane intrinsic properties possessed by their parts, and the mundane intrinsic relations in which those parts stand. Further: strange objects are typically excluded from ordinary domains of quantification and typically do not satisfy ordinary predicates, and hence do not interfere with our day-to-day semantic business.

Strange objects like Markosian's "Tud" do indeed raise interesting questions. "Has anyone ever met Tud?", "Is Tud conscious?". I am inclined to answer such questions *no*, on the grounds that strange objects do not fall under ordinary sortals (like 'person'), and as a result are not in the extensions of ordinary predicates like 'met' and 'conscious'. Still, this answer is somewhat shallow. Markosian's claim is that four dimensionalism + unrestricted composition has "additional costs ...beyond the mere ontological commitment to diachronic fusions". I think this is correct; let me explore exactly what the additional costs are.

I am now thinking of philosophy. Tud is not, since 'think', like most predicates, applies only to objects satisfying ordinary sortal predicates. Yet Tud is doing something a lot like thinking. He has my brain as a part right now, for instance.<sup>15</sup> Tud has a lot of what it takes, intrinsically, to be thinking of philosophy. His shortcoming is merely historical: he has the wrong kind of

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because supervenient.

<sup>15</sup>Might 'part' also exclude strange objects? Surely we can suspend this restriction; otherwise I could never have stated four-dimensionalism in the first place.



history to fall under a normal sortal. Let us invent a predicate, “thinking\*”, for the thing that Tud *does* do. Thinking\* is thinking minus the restriction to things satisfying ordinary sortal concepts. Thinking\* is just as good as thinking. English ‘think’ expresses thinking rather than thinking\*, but a language that expressed thinking\* instead would be a perfectly reasonable language to speak (though counting might be difficult). Similar remarks apply to other ordinary predicates. So: I am committed to far more thinkers\*, things in pain\*, and so on, than dreamt of by Joe or Jane Sixpack.

**Brutal composition** The arguments from vagueness for unrestricted composition and four-dimensionalism can be resisted by anyone willing to posit *sharp cutoffs*: pairs of cases that differ only minutely, but which definitely differ over whether composition, or minimal D-fusion, occurs. Markosian advocates this response, and bases it on the doctrine of “brutal composition” — the view that “there is no true, non-trivial, and finitely long answer to the question, *What are the necessary and sufficient conditions for any class’s having a fusion?*”

Brutal composition does not on its own entail the possibility of sharp cutoffs. Brutal composition says that there are no truths of this sort: “objects have a fusion iff they are in contact”, “objects have a fusion whenever their activities constitute a life”, and so on. Given the vagueness in ‘contact’ and ‘life’, the truth of any such principle would rule out sharp cutoffs in whether composition occurs.<sup>16</sup> So brutal composition removes one obstacle to sharp cutoffs. Still, one could uphold brutal composition and deny sharp cutoffs. For instance, one could reject the remainder of the argument from vagueness and hold that it can be vague whether composition occurs. Nevertheless, brutal composition is a natural home for the rejection of sharp cutoffs; I agree with Markosian that it grounds an important line of resistance to the arguments from vagueness.

**Time travel** I argued (section 7.2) that the possibility of time travel requires temporal parts. Suppose I travel back in time to meet my former self, and that Young Ted sits while Old Ted stands. This case is clearly consistent with four-dimensionalism: Young Ted and Old Ted are distinct stages of a single person, Ted. But without four-dimensionalism, we have no person stages, and so must say that Young Ted and Old Ted are each identical to the person Ted. Thus, a single entity both sits and stands at the time in question.

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<sup>16</sup>Here I ignore epistemicism, though I argue on pp. 130–132 that epistemicism provides no response to the argument from vagueness.

This final claim is not yet a contradiction; a lot more was said in section 7.2 to close the deal. But we can ignore all that since Markosian challenges the argument at the very beginning; he denies that opponents of four-dimensionalism must identify Young Ted with Old Ted. They can say instead that Young Ted and Old Ted are distinct *spatial parts* of the person Ted. This is an interesting, and difficult to answer, objection. My reply will be that Markosian's scenario — in which Ted comes to have two person-like spatial parts — is not describable as a person traveling back in time to meet his former self. I will give two arguments for this.

First argument. In addition to Ted himself, Ted's parts also entered the time machine. Suppose that in the time travel world, persons do not change their matter over time (except insofar as Markosian's reply forces them to) and hence that Ted had exactly the same subatomic particles at birth as he had just prior to entering the time machine. Then, Markosian must say of Ted's particles just what he says of Ted: each such particle, P, comes to have distinct spatial parts, Young P and Old P, when Ted meets his earlier self.

That means that the entity involved in the meeting, which we have been calling "Ted", has *wholly different matter* from what Ted had at the times immediately preceding that meeting (both in external time and in personal time). If abrupt total change of matter destroys a person, then "Ted" is not Ted after all, and so Markosian's case is not a case in which Ted travels back in time and meets his former self. It is not a case of time travel at all.

Abrupt total change of matter might not be lethal for persons if the criterion of personal identity is psychological rather than physical. Still, abrupt total change of matter presumably *does* destroy non-persons, and presumably the possibility of time travel is not limited to persons.

Markosian might deny that "Ted" has wholly new matter, by claiming that each particle, P, that formerly was part of Ted, is still part of "Ted" during the meeting. Each such P does indeed have new spatial parts at the time of the meeting, he might say, but nevertheless exists and is part of "Ted" then. But the following is a plausible sufficient condition for a thing's having "wholly new matter":

If X is composed at some time of some mereological simples, *none* of which existed at immediately preceding times, then X is at that time composed of wholly new matter.

The idea is that sameness of matter involves identity of ultimate parts. Given this principle, "Ted" *does* have wholly different new matter.

The second argument assumes two premises. Premise 1: If Markosian's case really were describable as Ted traveling back in time to meet his former self, then before entering the time machine, Ted ought to be able to anticipate experiencing a meeting with his former self. Premise 2: Before entry into the time machine, Ted can anticipate  $\phi$ -ing only if he is connected to a case of  $\phi$ -ing in the past *in the way persons are normally connected to their future selves*.

Here is the argument. How are persons normally connected to their future selves, according to opponents of temporal parts? By identity: normal persistence involves no sequence of continuous temporal stages, only a single wholly present person. So by premise 2, for Ted to be able to anticipate meeting his former self, Ted himself must in the past meet his former self. But this is not true in Markosian's possibility. The only persons involved, Young Ted and Old Ted, sprang into existence; neither is Ted. At the time, Ted is not a person; he is a strange thing with two persons for parts. Presumably he experiences nothing when in this state; the experiences are had by his parts Young Ted and Old Ted. Thus, when entering the time machine, Ted cannot anticipate doing *anything* during the trip. So, by Premise 1, Markosian's case is not describable as Ted traveling back in time to experience anything at all.

According to four-dimensionalism, on the other hand, persons are normally connected to their future selves by chains of temporal stages. One can in normal cases anticipate  $\phi$ -ing because one is connected by a chain of stages to a stage that  $\phi$ s. Exactly this occurs in the time travel case. Thus, only four-dimensionalists can agree that Ted can anticipate the trip's events; only four-dimensionalists can describe the case as one of time travel.

This second argument depends on the claim that: only if four dimensionalism is true is the connection between Ted and Old Ted the same as in normal cases of persistence. As Markosian says, opponents of four-dimensionalism can point to *some* similarities. A sequence of *events* exhibiting various continuities connects Old Ted to Ted's entry into the time machine; and ordinary persistence involves similar sequences. Still, there are significant differences. Only in ordinary cases do the sequences involve single objects. At the least, then, "Ted travels to meet his earlier self" is a *more* appropriate description if four-dimensionalism is true.

My argument establishes at best that Markosian's possibility does not count as a fairly strong sort of "time travel", call it "science fiction" time travel: the time traveler herself must arrive in the past, and before departure must be able to anticipate events during the trip. Markosian's proposal might yet vindicate

“Gödelian” time “travel”.<sup>17</sup> Gödel produced models of general relativity in which spacetime contains closed timelike curves. Such spacetimes are sometimes claimed to allow a sort of time travel. But nothing in general relativity requires that this be time travel in the science fiction sense. Markosian could purge his example of talk of anticipation and identity of the traveler:

Ted is present on a closed timelike curve,  $C$ , at region  $r_1$ ; informally this is “Ted’s entry into the time machine”. Ted continues on  $C$ . Eventually, we reach another region on  $C$ ,  $r_2$ , that contains two persons, each of whom calls himself “Ted”. Informally this is when “Ted meets his earlier self”, although I do not assert that Ted himself is present at  $r_2$ . The properties of one of the persons at  $r_2$  (“Old Ted”) depend causally on Ted’s properties at  $r_1$ ; the properties of the other (“Young Ted”) depend causally on Ted’s properties at different points (points earlier in Ted’s “personal time”<sup>18</sup>).

Perhaps physics demands no more than this description. Since we arguably have better reason to believe in Gödelian than science fiction time travel, the argument from time travel is thus weakened. It would be nice to have a better reply to Markosian.

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<sup>17</sup>See Earman (1995).

<sup>18</sup>See Lewis (1976) on personal time. There is no need to assume the existence of external time in this example, in the sense of a global time order.

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