

Four-dimensionalist theories of persistence

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In debates about persistence, advocates of the stage theory claim to give the best account of our intuitions about the truth conditions of many ordinary language sentences. For example, in his 1996 and 2001, Theodore Sider claims that intuitively there is just one person in my room when I am in my room alone, even in a fission case when I am about to be split into two people. Sider prefers the stage theory to the worm theory in part because the former accommodates our intuitions about simple counting sentences like these. In this paper, I argue against the theory of persistence defended in SIDER 1996 and 2001. I develop a contextualist theory as a possible recourse for Sider, and I argue that even this improved theory is bested by a simple error theory of our ordinary language judgments about counting sentences.

In §1, I present Sider's preferred theory of persistence. In §2, I present a fatal counterexample for that theory. But I continue the dialectic by developing a novel theory of persistence that is still in the spirit of the theory Sider defends. In brief, Sider may argue that we do not talk only about instantaneous temporal stages of objects, but also about proper temporal parts of objects whose length is determined by the context of utterance. In §3, I argue that a carefully elaborated version of this *perspective theory* of persistence can account for a number of otherwise intractable intuitions about ordinary counting sentences. In developing the perspective theory, I connect two previously estranged discussions: debates about the metaphysics of persistence and debates about the formal semantics of "event-related" counting sentences. In particular, the perspective theory of persistence closely resembles the theory of event-related counting defended in BARKER 1999.

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Developing the perspective theory constitutes significant progress in the persistence debate. However, I argue that there are still several reasons to prefer an error theory of ordinary counting sentences over the perspective theory of persistence. In §4, I argue that the error theory is predictively stronger, semantically simpler, and better fitted to certain ordinary language judgments than the perspective theory and other rival accounts of ordinary counting sentences. I conclude that the error theory has been prematurely dismissed, and that it is a strong position in the debate about the correct theory of persistence.

1 The stage theory and the hybrid theory

The stage theorist and worm theorist agree about many questions of fundamental ontology. Both stage theorists and worm theorists admit the existence of objects that persist through time. Both also admit the existence of *temporal parts* of objects. That is, they say that objects that persist through time have parts confined to limited temporal regions, just as objects extended in space have parts confined to limited spatial regions. For example, a putative temporal part of the Eiffel Tower might exist for exactly the latter half of the twentieth century. An instantaneous temporal part might exist exactly as the century ended.

Taking for granted the existence of both persisting objects and their instantaneous temporal parts, the worm theorist and stage theorist disagree about which sorts of objects we ordinarily refer to with names, describe with predicates, and quantify over with quantifiers. The worm theorist claims that we ordinarily talk about temporally extended objects. Sider defines the theory as follows:

On the worm view, it is spacetime worms that are continuants—the referents of ordinary terms, members of ordinary domains of quantification, subjects of ordinary predications, and so on. (60)

By contrast, the stage theorist claims that the objects we ordinarily talk about are instantaneous temporal parts of persisting objects.²

Perhaps the central argument in favor of the stage theory is that it gives a better account of our intuitions about counting than the worm theory. In particular, Sider argues that when it comes to predicting counting intuitions about fission cases, the stage theory does better than a natural worm theory of fission inspired by LEWIS 1983. Sider argues as follows: suppose that I am watching what one would ordinarily call

2. For defenses of the worm theory, see LEWIS 1983 and HELLER 1992. For defenses of the stage theory, see SIDER 1996 and HAWLEY 2001. An anonymous referee points out that the worm theorist and stage theorist may disagree about metaphysical as well as semantic questions.

“a single ship alone at sea,” and suppose that the ship is about to undergo fission, splitting symmetrically into exactly two ships. Until the ship divides, ‘one’ is the more intuitive answer to (1-a):

- (1) a. How many ships are currently at sea?
- b. One./#Two.

According to the naïve worm theorist that Sider opposes, fission does not bring a new ship into existence. Each ship that exists after fission exists before fission as well. Before fission, the distinct ships simply coincide, existing in the same place at the same time. And so according to the naïve worm theorist, at least two ships are at sea before fission occurs. By contrast, the stage theorist claims that (1-a) quantifies over instantaneous ship stages, only one of which is currently at sea. So the stage theory seems to give a better account of our intuitions about the correct answer to (1-a).

Sider claims a further advantage over the worm theorist after developing a counterpart theory of tensed predication. Sider says that a referring expression denotes a stage that exists just when the expression is uttered. According to temporal counterpart theory, these stages bear various counterpart relations to stages that exist at other times. For example, suppose you flatten a clay lump out of its statue shape. The earlier and later clay stages stand in the lump counterpart relation, but not the statue counterpart relation. These facts about counterpart relations correspond to our ordinary language judgments that a single lump existed at the earlier and later time, but that no statue existed at both times. Future tense sentences such as ‘the lump will survive squashing’ are context-sensitive. The lump counterpart relation is relevant to the truth of (2), while the statue counterpart relation is relevant to the truth of (3):

- (2) The lump will survive squashing.
- (3) The statue will not survive squashing.

Future tense sentences are made true by future counterparts of current stages. (2) is true because the current clay stage stands in the lump counterpart relation to a stage that exists after the clay is squashed, whereas (3) is true because the current stage does not stand in the statue counterpart relation to such a stage. Sider claims that the stage theory can thereby “vindicate our semantic intuition that each of the following is true: ‘the statue = the lump’ (since ‘the statue’ and ‘the lump’ refer to the same current stage), and ‘the statue will not survive the squashing, whereas the lump will survive the squashing’ (since the counterpart relations invoked by the two occurrences of ‘will’ are distinct)” (18). The naïve worm theorist, on the other hand, accounts for the truth of (2) and (3) by saying that the statue and the lump have

different persistence conditions. The naïve worm theorist holds that the statue does not persist as long as the lump does. And so by the indiscernibility of identicals, she must conclude that ‘the statue is the lump’ is not true.

In response to concerns like these, LEWIS 1983 defends a novel theory of counting. Lewis argues that sometimes we count distinct objects as one and the same:

If an infirm man wishes to know how many roads he must cross to reach his destination, I will count by identity-along-his-path rather than by identity. By crossing the Chester A. Arthur Parkway and Route 137 at the brief stretch where they have merged, he can cross both by crossing only one road. Yet these two roads are certainly not identical. (63-4)

Lewis proposes that just as we count overlapping roads as one road, we count collocated objects by a relation weaker than identity. In particular, sometimes it is as if we are counting equivalence classes of objects under the collocation relation: we count several collocated ships as one ship, and we count the collocated statue and lump as one object. Similarly, we use ‘the statue = the lump’ to say that we count the statue and the lump as one object *when counting by the collocation relation*, or in other words, to say that the statue and the lump are currently collocated. By adopting this interpretation of counting and identity sentences, Lewis aims to capture the intuitive verdicts of the stage theory mentioned above.

SIDER 2001 rejects the theory of counting defended by Lewis. Sider objects that “part of the meaning of ‘counting’ is that counting is by identity” (189). And Sider argues that the spatial analog of the stage theory is a more attractive account of the very examples that motivate the Lewisian theory of counting. For instance, in saying that the infirm man must cross just one road to reach his destination, it is attractive to suppose that you are simply counting the number of road segments that he must cross. Since it seems desirable to give a uniform theory of counting overlapping roads and counting coincident objects, Sider concludes that the stage theory is the more attractive theory of the latter.

However, SIDER 1996 acknowledges that despite these successes, ordinary language intuitions do not univocally support the stage theory. In some cases, the worm theory accounts for intuitions where the stage theory does not. Consider the dialogue:

- (4) a. How many ships have there ever been?
- b. Millions./#Infinitely many.

The worm theory has no trouble predicting (4-b). On the worm theory, (4-a) asks how many maximal extended ships there have ever been, and ‘millions’ is indeed the correct answer to this question. But on the stage theory, (4-a) asks how many instantaneous ship slices there have ever been, and ‘infinitely many’ is the correct

answer to this question. To take another example, suppose that we have watched a ship alone at sea for hours, with no impending fission. Consider the dialogue:

- (5) a. How many ships were at sea during the last hour?
- b. One./#Infinitely many.

On the worm theory, (5) asks how many extended ships were at sea during the last hour, and 'one' is indeed the correct answer to this question. But on the stage theory, (5-b) asks how many instantaneous ship slices were at sea during the last hour, and 'infinitely many' is the correct answer to this question.

"In response," Sider writes, "I propose a partial retreat" (20). Sider ultimately accepts a hybrid of the worm theory and the stage theory. Sider maintains that the stage theory typically yields the correct semantics: stages are the objects that we name, describe, and quantify over. But "in extreme cases, such as that of timeless counting," these objects are four-dimensional worms (20). Sider is not explicit about how to combine the stage theory and worm theory into one hybrid theory. In *SIDER 1996*, he says that "in certain circumstances, such as when we take the timeless perspective, reference is to worms rather than stages" (20). *SIDER 2001* adds that "a sort of indeterminacy or ambiguity should be postulated" (197). These remarks are compatible with several concrete theories. The hybrid theory may say that speakers alternate between two languages, using one to talk about worms and one to talk about stages. Or speakers may use just one language with rampant lexical ambiguity. Or context may determine whether we are talking about worms or stages. Sider does not explicitly endorse any of these plans. He does not need to choose; any of these theories could account for the intuitions canvassed above.

2 The perspective theory

However, ultimately no version of the hybrid theory can account for our intuitions about counting sentences. Suppose that a ship has been alone at sea for hours, and that it is about to divide into two ships. The worm theory predicts that 'two' is the correct answer to (6-a):

- (6) a. How many ships were at sea during the last hour?
- b. One./#Two./#Infinitely many.

Furthermore, there are infinitely many ship stages at sea during the relevant hour. So the stage theory predicts that 'infinitely many' is the correct answer to (6-a). Hence neither theory can account for our intuition that 'one' is the correct answer. Nor can any hybrid of these theories.

This example illustrates a general problem for the hybrid theory. The worm theory cannot account for our intuitions about fission cases, and the stage theory cannot account for our intuitions about timeless counting cases. So cases combining fission and timeless counting pose a problem for any combination of these theories. I conclude that Sider should reject the hybrid theory endorsed in SIDER 1996 and 2001 for the same reason he rejects the unmodified stage theory: the theory fails to account for our ordinary language intuitions about counting sentences.

As we look for viable alternatives to the hybrid theory, it helps to reflect on the original inspiration for the stage theory. Sider likes the stage theory in part because it is analogous to our best theory of other non-standard counting. For instance, the stage theorist gives a unified theory of the following sentences:

- (7) There is currently just one ship at sea.
- (8) The infirm man must cross just one road to reach his destination.

This argument suggests a good strategy for developing a theory of counting in collocation cases: extend extant theories of other non-standard counting cases.

Such cases are in fact already a familiar object of semantic study. Consider the following famous example:

- (9) Four thousand ships passed through the lock last year.

KRIFKA 1990 argues that (9) has multiple readings: an *object-related* reading which entails the existence of at least four thousand ships, and an *event-related* reading which is true just in case there were four thousand lock traversals. On its event-related reading, (9) counts ships in a non-standard way, namely by counting some ships more than once. Event-related counting sentences are common in ordinary language:

- (10) Tom Seaver struck out ten batters in a row in 1970.³
- (11) Our laundry service cleaned 9000 skirts last year.
- (12) McDonald's just served its 100 billionth customer.

These sentences seem even more useful than (8) for opponents of the worm theory. In the case of the overlapping roads, it is natural to say that speakers are counting spatial parts of objects. In event-related counting cases, it is natural to say that speakers are counting *temporal* parts of objects. For example, (10) seems to say that ten temporal segments of baseball players faced Seaver at the plate, each segment persisting just long enough to strike out. Hence opponents of the worm theory can adopt a position

3. For audiences unfamiliar with baseball: Seaver "struck out ten batters" by pitching to all nine players on the opposing team and then pitching again to the first of those players.

with advantageous breadth: their theory of ordinary counting is simply identical to the most natural theory of event-related counting. In other words, one can establish a case against the worm theory, given just two claims. The first is that the objects we ordinarily talk about are the same sort of objects we talk about with event-related counting sentences such as (9)–(12). The second is that the objects we talk about with event-related counting sentences are proper temporal parts of individuals.

Several formal semanticists have defended this second claim. BARKER 1999 introduces his theory of event-related counting as follows: “what is going on here is a form of ontological variability: the semantics allows operators to quantify either over individuals or over stages of individuals, subject to pragmatic appropriateness” (2). Here Barker uses ‘stages’ for all proper temporal parts of objects, not just instantaneous slices. Barker argues that event-related counting sentences are context-sensitive. Each context determines a set of “stage-characterizing events” (9). These events define the temporal extent of the concrete objects that we quantify over. For example, the context of (9) selects lock traversals as stage-characterizing events. For each lock traversal in the contextually determined set, we quantify over a ship stage that lasts for exactly the duration of that lock traversal. On this reading, (9) may count up distinct segments of the same ship—each corresponding to a different traversal—and thereby count ships more than once. Barker thereby predicts the intuitive truth conditions of the event-related reading of (9).⁴

In response to my objection to the hybrid theory, Sider has acknowledged that he should abandon that theory in favor of something more like Barker’s theory of event-related counting. Here is a statement of the *perspective theory* that Sider endorses:

The response employs the notion of a *perspective* from which a sentence is uttered, by which I mean an interval of time that, intuitively, the utterer thinks of as the temporal “topic” of the utterance. The perspective determines the range of (unembedded) quantifiers, referents of names, and what objects satisfy ordinary predicates. The general rule is this: the universe of discourse from a perspective consists of the restrictions of all space-time worms to that perspective. (19)⁵

There are some differences between this theory of ordinary counting and the theory of event-related counting that Barker defends. For instance, Sider suggests that all objects in the universe of discourse are confined to a single temporal interval, and Sider requires that speakers have some attitude towards that interval. But the general idea is the same: the context of a counting sentence determines the temporal boundaries of counted objects.

4. In many cases of event-related counting, a nominal such as ‘batter’ evokes an event used to individuate objects. But nominals that evoke events need not prompt event-related readings of counting sentences.

5. This suggestion was first made in personal communication. Sider states the suggestion as quoted here in SIDER 2009, though he has since abandoned that manuscript for reasons independent of our exchange.

The flexibility of a contextualist semantics can be put to good use in addressing our earlier problem for the hybrid theory. The perspective theory may say that (6-a) quantifies over just those ship stages that existed for exactly the last hour. Then ‘one’ will be the correct answer to (6-a). For opponents of the worm theory faced with explaining (6), it is extremely natural to suppose that context determines what sort of objects we are talking about. It is already widely agreed that context plays a role in determining quantifier domains. And since context could in principle restrict quantifiers to range over objects confined to any given temporal interval, the perspective theory can accommodate a wide range of intuitions about counting sentences.

3 Developing the perspective theory

The brief statement of the perspective theory quoted above leaves many important details unresolved. Some context-sensitive expressions are unacceptable models for the perspective theory of ordinary expressions. The most straightforward and least controversial examples of context-sensitive expressions are pure indexicals, expressions such as ‘I’, ‘today’, and ‘here’. The simplest version of the perspective theory would say that just as ‘here’ refers to a place that is determined by the context of utterance, ‘ship’ denotes ship stages confined to a temporal interval determined by context.

This simple perspective theory yields some counterintuitive verdicts. Suppose that colloquially speaking, yesterday there were two ships at sea. One ship split at the end of the day, so today there were three ships at sea. Say we want to compare how many ships were at sea at some point yesterday and how many were at sea at some point today. Consider the dialogue:

- (13) a. On which day were there the most ships at sea?
- b. Today, by a margin of one.

Intuitively, (13-b) is the correct answer to (13-a). It is hard to see how the simple perspective theory can account for this intuition. For instance, suppose (13-a) quantifies over longer ship segments confined to the period including yesterday and today. In this case, (13-a) would quantify over three longer ship segments, two of which coincided yesterday. Each of these three ship segments existed yesterday, and each existed today, so ‘there were three ships on both days’ would be the correct answer to (13-a).

The simplest response to (13) would be to revise the perspective theory so that context contributes a *set* of temporal intervals to the truth conditions of ordinary sentences, rather than a single temporal interval. On this response, the objects we talk about are the longest segments confined to *some* interval in the contextually determined set. For instance, in the case of (13), the contextually determined temporal

intervals may simply be the days of the week. On this account, (13-a) quantifies over the day-long ship segments that existed just yesterday, and the day-long ship segments that exist just today. There were two such segments at sea yesterday and three at sea today, so our revised pure indexical theory correctly predicts that (13-b) is the right answer to (13-a).

However, even this sophisticated version of the pure indexical theory cannot accommodate all of our counting intuitions. Suppose that colloquially speaking, exactly three ships spent the beginning of the week at sea. At the end of the day on Tuesday, multiple changes occurred: one of the ships split into two ships, while the other two ships fused into one. For every pair of adjacent days each week, some lifeguard is on a shift that lasts for just that pair of days. Each lifeguard counts the number of ships that are at sea at some point during her shift. Suppose that the lifeguards are comparing how many ships were at sea during various shifts in the past week. Consider the dialogue:

- (14) a. On which shift were there the most ships at sea?
- b. On the Tuesday and Wednesday shift, by a small margin.

It is natural to say that only three ships are at sea before Tuesday night or after Wednesday morning. It is also natural to say that at least four ships are at sea at some point on Tuesday or Wednesday. The fusion combines at least two ships that are at sea on Tuesday, and the fission produces at least two additional ships that are at sea on Wednesday. So (14-b) is the correct answer to (14-a). In other words: on Tuesday and Wednesday, there were a certain number of ship stages at sea, where those ship stages persisted for exactly those two days. On other shifts, there were other numbers of ship stages at sea that persisted for exactly those shifts. And (14-b) correctly claims that the former number slightly exceeds the latter.

The pure indexical theory cannot account for this intuition. For instance, suppose that like (13-a) above, (14-a) quantifies over just those ship segments that exist for the entire duration of some day. Exactly six such ship segments are at sea at some point on Tuesday or Wednesday: three that start existing on Tuesday morning, and three that start existing on Wednesday morning. But just the same number are at sea at some point on the previous pair of days: three starting Monday, and three starting Tuesday. And so we incorrectly predict that (14-b) is the wrong answer to (14-a). It does not help to pick a more sophisticated set of temporal intervals. Suppose that (14-a) quantifies over maximal ship segments confined to any *pair* of adjacent days. Exactly ten such ship segments are at sea at some point on Tuesday or Wednesday: three that start existing on Monday morning, four starting Tuesday, and three starting

Wednesday. But again, just the same number are at sea at some point on the previous pair of days: three starting Sunday, three starting Monday, and four starting Tuesday.

The natural way to capture the correct truth conditions for (14-b) is to posit bound variables in the logical form of (14-b). In other words, we should treat the temporal extent of the denotation of an expression as an *implicit argument* of that expression. On this version of the perspective theory, the context-sensitivity of ‘ship’ resembles the context-sensitivity of predicates such as ‘local’ and ‘enemy’.⁶ For instance, ‘local’ in (15) does not simply refer to the location of the speaker. Rather, (15) says that a certain pair of cities is such that John tried the most bars local to those cities:

(15) John tried the most local bars in the second pair of cities he visited.

The perspective theorist should compare the variable location of ‘local’ with the variable temporal extent of ordinary predicates. For instance: ‘ship’ in (16) need not simply refer to a single set of perspectives determined by the speaker:

(16) There were the most ships sailing on the second pair of days.

Rather, (16) can say that a certain pair of days is such that the greatest number of ship segments confined to that pair of days sailed on those days. The implicit argument version of the perspective theory can give a similar account of (14). Tuesday and Wednesday contain four ship segments that persist for exactly those days and are at sea on those days. Every other pair of days contains only three. To sum up: the perspective theorist should say that the context-sensitivity of ordinary expressions is like the context-sensitivity of ‘local’ and other predicates with implicit arguments exhibiting pronominal behavior. The binding phenomena in (13), (14), and (16) indicate that this sort of perspective theory is the appropriate recourse for those hoping to preserve the central insight of the hybrid theory advocated in *SIDER 2001*, namely that context may charitably determine the temporal boundaries of the referents of ordinary expressions.

The implicit argument version of the perspective theory is a viable alternative to the stage theory. Before arguing against the perspective theory, it will be instructive to address one more concern sometimes brought against perspective theories of event-related counting. Certain anaphoric expressions present a challenge for the theory of event-related counting that we have used as a model for our perspective theory of persistence. For instance, consider the following event-related counting sentence:

6. See PARTEE 1989 and CONDORAVDI & GAWRON 1996 for classic examples illustrating the distinction between pure indexicals and implicit arguments. For sake of exposition, I have followed much of the semantics literature in supposing implicit arguments are responsible for the behavior of ‘local’ and similar expressions, but see PARTEE 2009 for a survey of alternatives.

- (17) a. Four thousand ships passed through the lock last year.
- b. Half of them paid a fee at the next harbor.

Suppose that ‘four thousand ships’ in (17-a) talks about ship segments that persist only as long as any given lock traversal. (17-b) seems to talk about the same objects. But no such ship segment persists long enough to pay a fee at the next harbor. If these natural assumptions are correct, the perspective theorist has two options. He may argue that (17-a) talks about ship segments that persist long enough to pay a fee. Or he may argue that (17-b) is true even though ‘half of them’ denotes the shorter ship segments mentioned in (17-a).

BARKER 1999 defends the first approach, but he admits that it carries some uncomfortable consequences. Barker says that for dialogues like (17), “difficulties remain; for instance, it is not clear how far beyond the minimal lock traversal the component events in the ship stages may extend” (10). Consider the dialogue:

- (18) a. Four thousand ships passed through the lock last year.
- b. Half of them made their first voyage in the Pacific.

The most natural application of the first approach says that (18-a) quantifies over any ship stage that persists from a first voyage in the Pacific until some lock traversal last year. For example, suppose that some ship made its first voyage in the Pacific and then went through the lock three times last year. Then (18-a) quantifies over three ship segments: the segment lasting from the Pacific voyage through the first lock traversal, the longer segment lasting from the Pacific voyage through the second lock traversal, and the even longer segment lasting from the Pacific voyage through the third lock traversal. The shorter segments are proper temporal parts of the longer segments. This application of the first approach to (18) is sensible, but unfortunately it is not available to Barker. In response to independent concerns, BARKER 1999 prohibits contextually determined stage-characterizing events from overlapping. And so sentences like (18-a) cannot quantify over objects which are proper temporal parts of each other. It is difficult for the first approach to account for (18) given this restriction.

Furthermore, it is difficult to accept that sentences such as (17-a) and (18-a) quantify over different objects, namely that (17-a) quantifies over segments that persist only from some lock traversal until they pay a fee, while (18-a) quantifies over longer segments that persist from a Pacific voyage until some lock traversal. After all, (17-a) and (18-a) are tokens of the very same type sentence. Suppose that the second sentence of each dialogue is uttered by a second speaker. Then (17-a) and (18-a) may even be uttered by earlier speakers with the very same intrinsic properties. It would be radical to assume that the actions of a second speaker could nevertheless make

some retroactive difference to the semantic value of (17-a) or (18-a). And it is difficult for the first approach to generate correct verdicts about dialogues like (17) and (18) without such an assumption.

This is a happy instance where the metaphysician may extend a helping hand to the linguist. In particular, the counterpart theory developed in SIDER 2001 offers a simple solution to our event-related counting problem. The perspective theorist could say that (17-a) and (17-b) are both about instantaneous stages of ships and that ‘paid a fee at the next harbor’ is true of a stage just in case that stage stands in a certain counterpart relation to a stage that pays a fee at the next harbor. In particular, one could say that (17) resembles (19):

- (19) a. Some children got up during the night.
- b. Half of them turned on the light.

Here ‘turned on the light’ is true of a child just in case that child turns on the light soon after *that same child* got up during the night. Sider may claim that ‘paid a fee at the next harbor’ contains a similar implicit reference to events: it is true of a stage just in case that stage bears the ship counterpart relation to a stage that pays a fee at a harbor soon after *that former stage* passes through the lock. Giving a counterpart theory of the predication in (17-b) is an economical response, since other event-related counting sentences seem to call for a similar analysis. For example, one can say ‘four thousand centuries-old ships passed through the lock last year’ even though short-lived ship stages cannot have existed for centuries. Sider developed the counterpart theory of tensed predication in order to explain our intuitions about the persistence conditions of statues and lumps, but one might use counterpart theory to account for a number of judgments that might otherwise challenge the perspective theory.

4 An error theory of ordinary counting sentences

The perspective theory, once suitably elaborated as in §3, may accommodate our intuitions about a variety of counting sentences. But the dialectic does not end here. There is another theory in the wings that has significant advantages over even the most promising version of the perspective theory. The theory ascribes error to ordinary speakers, saying that they count extended objects and that they utter false counting sentences when objects coincide.

Both LEWIS 1983 and SIDER 2001 quickly reject this sort of error theory of ordinary counting. Lewis says that we “demand to say that on the day before the fission only *one* person entered the duplication center; that his mother did not bear twins; that until he fissions he should only have one vote; and so on” (63). Sider argues:

Even if we knew that fission was about to occur, we would not *say* that there are two persons before us. It seems wrong to *say* that there are two statue-shaped objects before us, the statue and the lump; the more natural thing is to say that there is just one. (188-9)

But the concerns of charity raised by Lewis and Sider are not unassailable. The worm theorist and perspective theorist agree that they share an enlightened perspective from which they can truly utter claims like ‘there are many voters in the voting booth’ when ordinary speakers would say that there is just one. SIDER 2011 points out that every such theorist confronts a substantive meta-semantic question, namely what it takes for ordinary claims to be true in a “hostile metaphysical environment” (11). For a more familiar example, consider the discovery that tables are composed mainly of empty space. Physicists may have falsified our ordinary claim that tables are solid objects, or they may have simply changed our minds about what solidity involves. In deciding between these options, the meta-semanticist cannot assume that charity is appropriate. Similarly, ordinary language judgments are not sufficient grounds for dismissing an error theory of metaphysically naïve counting.

Furthermore, several considerations count in favor of an error theory of ordinary counting sentences. For instance, in deciding whether to be charitable to ordinary speakers, we are deciding whether to say that they use counting sentences in the same way as card-carrying four-dimensionalists. CAPPELEN & HAWTHORNE 2009 argue that a diagnostic test for whether a sentence has the same semantic value in different contexts is whether one can say that speakers uttering that sentence and its negation in those contexts disagree with each other. For example, if Alice says ‘Naomi went to a nearby beach’ in Auckland, and Bob says ‘Naomi didn’t go to a nearby beach’ in Boston, the report ‘Alice and Bob disagreed about whether Naomi went to a nearby beach’ is infelicitous. And intuitively, that is because in order for Alice and Bob to count as disagreeing with each other, they must use ‘Naomi went to a nearby beach’ to say the same thing.

When someone comes to endorse four-dimensionalism, it is natural to say that she comes to disagree with her previous opinions about coincidence and counting. Insofar as ordinary speakers ever consider the possibility that objects could be *in the very same place at the same time*, they generally object that this sort of spatiotemporal coincidence would constitute some mysterious or unnatural event. The advocate of four-dimensionalism aims to dispel this myth by explaining that objects may share temporal parts, just as they share spatial parts. SIDER 2001 says that “coincident objects are therefore no more mysterious or objectionable than overlapping roads” (152). Just as the particle physicist could change her mind about what solidity involves, the nascent four-dimensionalist changes her mind about what coincidence involves. As

she comes to appreciate that coincidence is harmless, she comes to disregard precisely that instinct that led her to agree with Lewis that “only *one* person entered the duplication center.” SIDER & CONEE 2005 corroborate this understanding of the relationship between ordinary speakers and four-dimensionalism when they identify “the antinomy of constitution” as a collection of four claims:

Creation: the sculptor really does create the statue. . . Survival: the sculptor does not destroy the quantity of clay by forming it into a statue. Existence: there really are such objects as statues and pieces of clay. . . Absurdity: it is impossible for two different objects to share the same matter and spatial location at a single time. (136)

Confronting the antinomy intuitively forces the reader to realize that she must reject some claim that she once accepted. SIDER & CONEE 2005 explain: “we must reject Creation, Survival, Existence, or Absurdity, in order to resolve the antinomy” (136). In rejecting Absurdity and accepting four-dimensionalism, the enlightened ordinary speaker feels herself to be abandoning her prior belief that objects cannot coincide. And given the arguments in CAPPELEN & HAWTHORNE 2009, her self-ascription of disagreement with her earlier opinions constitutes evidence that her counting sentences do not in fact express different propositions before and after she accepts four-dimensionalism.

This argument points to a general strategy for adjudicating when ordinary sentences are true in a hostile metaphysical environment, namely by using tests for sameness of content developed in the context of independent meta-semantic debates. In addition, since nascent four-dimensionalists judge that they reject their previous opinions about coincidence, this argument highlights that every theory must attribute some error to ordinary speakers. If the ordinary speaker is always correct in her first-order judgments, then she incorrectly judges that she rejects her earlier opinions. The perspective theory and the Lewisian theory of counting are at odds with our intuition that eager metaphysics students simply change their minds about the number of coincident objects around when they endorse four-dimensionalism.

Lewis and Sider propose a reasonable requirement on any theory of persistence: a theory must explain why speakers assert certain counting sentences. This requirement challenges error theorists more than others, since the error theorist cannot say that certain counting sentences are assertable simply because they are true. But as long as one distinguishes various sorts of contexts in which speakers assert or refrain from asserting counting sentences, the error theory I have proposed can explain our judgments in each case. In most contexts, the possibility of coincidence is so unfamiliar that it is overlooked by speakers unless it is raised explicitly. Consider Polanski’s 1974 film *Chinatown*: Jake believes that Katherine is Evelyn’s sister, so he

wrongly accuses Evelyn of lying when she says that Katherine is her daughter. Jake never explicitly *rejects* the possibility Evelyn that has a child by incest. He simply fails to consider that possibility and so makes invalid inferences. Similarly, ordinary speakers do not explicitly reject the possibility that objects might coincide. They see one statue shape and simply infer that exactly one statue-shaped object is in a certain location. This inference is part of a predictable general pattern of reasoning. Since ordinary speakers neglect the possibility of coincidence, they undercount when objects coincide by neglecting all but one from each equivalence class of coincident objects.

The error theory also accounts for our reluctance to accept ordinary counting sentences on reflection, since raising the possibility that objects might coincide undermines the implicit inferences that support ordinary counting intuitions. Once speakers take coincidence seriously, they recognize that such inferences beg the question against anyone who accepts that objects can coincide. The error theory also predicts speaker behavior in an exceptional sort of context: that in which a speaker is aware of a possibility but believes that his audience is not. The informed speaker often utters sentences that he knows to be false, in order to cause his audience to have true beliefs about matters they care about. For instance, suppose an escaped convict runs into a nearby house only to emerge seconds later and run away. Police arrive in close pursuit and ask, "Did the convict run into any of these houses?" If you must answer in a flash, saying 'no' causes more true beliefs about the convict's current location. Similarly, suppose a government official asks you how many people are in your voting booth. Falsely saying 'one' causes more true beliefs about what matters most, namely whether the official should discard your ballot.

To sum up: ordinary speakers neglect to distinguish coincident objects as long as they fail to consider the possibility of coincidence. Reflective speakers assert false counting sentences if they believe that doing so will cause others to have true beliefs about what really matters. Thus the error theory explains our judgments about the assertability of counting sentences in various contexts. As a result, the error theory is stronger than the perspective theory defended by Sider and the novel theory of counting defended by Lewis. The perspective theory is flexible enough to accommodate an extremely wide range of counting intuitions. One concern for the perspective theory is that with no independent grasp on what context contributes to the truth conditions of counting sentences, the fact that the theory can accommodate certain judgments no longer constitutes strong evidence for the theory itself. One can register a similar complaint against the Lewisian theory of counting, which does not predict any judgments unless we can independently identify which relation we count by in a particular context.

The error theory enjoys one more advantage over the perspective theory: the counterpart theory of predication is not a simple theory. It is counterintuitive to say that speakers often apply predicates such as ‘centuries-old’ to short-lived objects, especially in cases where predicates intuitively denote intrinsic properties that cannot be instantiated in a mere instant. For instance, consider the property of believing that $35 + 33 = 68$. Sider must say that “in order to have a belief, a stage must stand in an appropriate network of counterpart relations to other stages with appropriate features” (198). Sider acknowledges that it is unintuitive to claim that having a belief is such a highly relational property. Other constructions present even more difficult challenges for temporal counterpart theory. For instance, suppose someone utters the following sentence in a context that requires ‘those three ships in the harbor yesterday’ to denote day-long ship segments rather than extended ships:

- (20) The day-long temporal segments of those three ships in the harbor yesterday have not been sailing around the world for decades.

According to the counterpart theory of predication, ‘those three ships’ denotes day-long ship segments. But ‘the day-long temporal segments of those three ships’ must also denote day-long ship segments. It is not impossible for the counterpart theorist to engineer this result: the counterpart theorist can say that ‘the day-long temporal segments of those three ships’ triggers the use of a counterpart relation which holds only between a stage and itself, and that (20) is true because no such stage counterpart has been sailing around the world. Hence ‘those three ships’ and ‘the day-long temporal segments of those three ships’ could denote the very same ship segments. But it is counterintuitive for Sider to claim that expressions like ‘the segments of those ships’ corefer with expressions such as ‘those ships’ that they embed. This claim is completely divorced from our natural understanding of (20). The counterintuitive nature of this account counts against the perspective theory.

Sider confesses that it would be better to avoid reconfiguring our understanding of tensed predication, and the same confession seems appropriate for verbs such as ‘believes’ and sentences such as (20). Regarding the former, Sider explicitly chooses to bite the bullet: “my analysis of tensed predication is unexpected, but this is not a *decisive* consideration, and is outweighed by the stage view’s benefits” (195). By contrast, the error theorist does not need to resort to any counterintuitive theory of predication in order to account for our uses of anaphoric expressions. The error theorist accepts that we talk about temporally extended objects in these cases, just as we always thought.

To sum up: the error theory is predictively stronger, semantically simpler, and

better fitted to our judgments about intrapersonal disagreement than alternative theories. Some may judge that even this combination of strength, simplicity, and fit does not outweigh the cost of attributing widespread error to speakers. But in a dialectical context in which no consideration is decisive, it is important that the error theory avoids several costs of the perspective theory of persistence. Given that several advantages of the error theory are not readily available to its competitors, my arguments constitute a challenge to recent defenses of other theories of persistence. I conclude that the error theory of persistence has been prematurely dismissed as a strong position in the debate about the correct theory of persistence.

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