Worms, Stages, and Sometimes Neither: A Contextualist Semantics for Four-Dimensionalism

Abstract

We argue that four-dimensionalists should adopt a contextualist semantics, according to which ordinary speakers' judgments may concern person-stages, person-segments or person-worms, depending on the context. We explain how context helps select the boundaries of the temporal parts we refer to or quantify over and show that contextualism offers the best treatment of ordinary predications and ordinary counting judgments. Contextualism implies an error theory; however, we explain why this error theory is less problematic than those entailed by the worm and stage theories.

Keywords: four-dimensionalism; worm theory; stage theory; contextualism; counting.

1. Introduction

Suppose that, colloquially speaking, Tia is about to experience a potentially life-altering event such as a battle, brainwashing, brain replacement, or teleportation (Lewis 1983, p. 55). The event will likely have some significant impact on Tia's body and psychology. Will Tia survive? To answer this question, we need to provide *persistence conditions*, that is, the conditions that must obtain for Tia to continue to exist after the event. Some hold that these conditions necessarily involve bodily continuity. Others advocate for psychological continuity. Perhaps a hybrid of the two is

what persistence requires. For the purpose of this essay, it will not be necessary to settle this question. In an effort to be neutral between competing accounts of personal persistence, we will borrow a locution from (Hawley 2002) and write that Tia continues to exist after the impending event just in case the post-event individual is *suitably related* to Tia.

Now, it is natural to say that if the post-event individual is suitably related to Tia, then the post-event individual *is* Tia, that is, they are one and the same person. Most three-dimensionalist accounts of persistence endorse this commonsense view.[1] To continue to exist through time is to *endure through time*, to persist by being *wholly present* at more than one time. Four-dimensionalists reject this conception of persistence. According to the *worm theory*, persons are spacetime worms, or maximal aggregates of suitably interrelated temporal parts (Lewis 1983). Tia has temporal parts before the impending event, and if she survives that event, she also has temporal parts after it, including the post-event individual. In such a case, the post-event individual is suitably related not to Tia, but to Tia's pre-event parts. Hence, pace the commonsense view, the post-event individual is *not* identical to Tia; it is merely one of her temporal parts. According to the *stage theory*, persons are stages, which are instantaneous temporal parts of spacetime worms (Hawley 2002; Sider 1996, 2001). Tia thus exists only at one particular moment in time. Nevertheless, Tia is suitably related to past and future stages, which are her *temporal counterparts*. If Tia is a stage before the impending event and there is a post-event stage that is her counterpart, we can truly say that Tia *will* survive the impending event.[2] Like the worm theory, the stage theory

[1] Three-dimensionalist dissenters include advocates of mereological essentialism (Chisholm 1976; Zimmerman 1995). See (Sider 2001, pp. 180–8) for a critical assessment.

[2] In section 2.2, we will explain why the use of the future tense is crucial here.

rejects the commonsense view. Since they exist at different times, Tia's counterparts are numerically distinct stages, which means that the post-event individual is *not* identical to Tia.

These versions of four-dimensionalism share a common ontology. Both admit the existence of temporal parts, and both accept unrestricted composition.[3] Hence, both are committed to the existence of stages and worms, as well as segments, which are temporal parts longer than stages but shorter than worms. Nevertheless, the two theories disagree about what ordinary speakers designate with 'person' and related words, and thus on what persons are.

In this essay, we argue that four-dimensionalists should endorse a *contextualist* semantics according to which the reference of 'person' and related words varies from context to context. Contextualists agree with worm theorists that we may use 'person' to designate a worm. However, they insist that the acceptability of this use is confined to a given context and does not settle the question once and for all. In another context, it would be acceptable to use 'person' to designate a stage. As a matter of fact, there are contexts in which we may use 'person' to designate a segment. Contextualism is briefly put forward by Theodore Sider in an unpublished essay. Here, we offer a more systematic defense of this view. We argue that contextualism offers the best account of ordinary speakers' use of 'person' and related words and thus should be favored by four-dimensionalists.

In section 2, we argue that the subjects of ordinary predications are (with some exceptions) stages rather than worms. We explain why the worm theory must ascribe a widespread error to ordinary speakers. In section 3, we consider different kinds of counting judgments and show that

[3] The principle of unrestricted composition says that, for any objects, there exists a *sum*, *fusion*, or (to use the terminology we prefer in this essay) *aggregate* of those objects. Four-dimensionalists typically accept this principle, but could consistently reject it (Sider 2001, p. 7).

all things considered, these favor neither the stage theory nor the worm theory. In section 4, we argue that ordinary speakers' judgments occasionally concern segments rather than worms or stages. In light of the considerations adduced in sections 2-4, we explain why four-dimensionalists should adopt a contextualist semantics rather than the standard semantics offered by worm or stage theorists. Our case that contextualism offers the best account of ordinary speakers' use of 'person' and related words is presented in section 5. Contextualism both minimizes the attribution of error to ordinary speakers and locates the source of this error in a *metaphysical* rather than *semantic* disagreement. Moreover, contextualism offers four-dimensionalists a principled response to early critics who charged the view with positing an ontology of strange objects that are not recognized by common sense. Finally, in section 6, we propose a contextualist account of the first-person pronoun 'I' that serves as a natural amendment to the *diachronic self-making view* (DSV) recently defended by Mark David Kovacs (2016; 2020; 2022), and in section 7 we offer a contextualist treatment of fission.

2. Simple Predication

2.1 Present Tense Predications

Sider (1996, 2001) contends that in our ordinary thought and talk, it is stages rather than worms that we call 'persons,' refer to with proper names and pronouns, quantify over, and so on. As will become clear, Sider's point is not simply that the stage theory yields adequate truth conditions for ordinary claims about persons, but that it captures both what we intuitively mean by them and the beliefs they express. Stage theorists offer the following semantic analysis of *present tense predication*:

> 'Tia is sitting' is true as uttered at *t* if and only if 'Tia' refers at *t* to a stage that has the property of *sitting*.

This analysis is plausible. It yields the right truth conditions and, more importantly, it captures the thought we express in uttering 'Tia is sitting': we attribute to the individual picked out by 'Tia' the property of *sitting*.

This analysis faces a problem though. As Katherine Hawley points out, "[I]t takes time to make an utterance, and there is no unique moment of utterance" (2002, p. 58). There appears to be a domain of relevant moments at around the time of utterance, each of which could count as the present time *t*. To address this problem, Hawley notes that the stage theorist could invoke a supervaluationist reading of 'Tia is sitting,' according to which every moment in the domain of relevant moments qualifies as an admissible candidate for *t*. An utterance of 'Tia is sitting' is true just in case, for every admissible moment, the predication comes out true; false just in case, for every admissible moment, the predication comes out false; and neither true nor false otherwise.[4] Stage theorists may propose a similar supervaluationist treatment of the *problem of the many* (Unger 1980), which concerns the specific spatial boundaries of a stage.[5] The worm theory faces similar issues, since the temporal and spatial boundaries of a worm are not well defined. From now on, we will ignore the complications raised by vagueness.

Worm theorists such as David Lewis grant that they cannot offer a straightforward analysis of present tense predication: "My shapes [e.g., *being straight, being bent*] belong in the first instance to my stages, and in a derivative, relational way to the whole of me" (1988, p. 66; see also his 2002, p. 1). A worm is a maximal aggregate of suitably-interrelated stages, some straight, some bent. It is thus incorrect to say that a worm is straight or bent simpliciter. Critics of Lewis's solution

[4] See (Hawley 2002, p. 59) for two other ways to deal with this problem.

[5] See for instance (Lewis 1993). For a non-supervaluationist approach to the problem of the many amenable to four-dimensionalism, see (Hudson 2001, p. 45–71).

to the problem of temporal intrinsics were quick to point out that this solution conflicts with common sense. For instance, Mark Hinchliff remarks that the worm theory "holds that a part of the candle is straight and a part is bent, but the candle itself is neither. It thus denies our intuition that the candle itself must have the shapes" (1996, p. 120).[6] The worm theorist's semantic analysis thus implies that 'Tia is sitting' comes out false, since the individual 'Tia' refers to (viz., a worm) lacks the property of *sitting*.

More generally, since worm theorists hold that proper names and pronouns refer to worms, their semantic analysis implies a *systematic error* regarding present tense predication. Ordinary speakers attribute properties such as *sitting* or *standing* to worms but this is, strictly speaking, incorrect. The worm is neither sitting nor standing; it has sitting or standing parts. However, worm theorists can offer a *paraphrase* of 'Tia is sitting' that both mirrors our use of that sentence and explains why this error is not based on hallucination or radical misperception. As a matter of fact, ordinary folks reliably track sitting individuals; they simply misdescribe them as persons. The worm theorists' paraphrase is thus a corrective: it represents the way a meticulous worm theorist would speak. Strictly speaking, instead of saying, 'Tia is sitting,' we should say, 'The current stage of Tia is sitting.' This is because at no time is the Tia-worm sitting simpliciter. Following (Hawley 2002, pp. 37–40), the worm theorist might alternatively say, 'Tia is sitting-at-*t*.' This paraphrase should be understood as meaning not that at *t*, Tia (a whole worm) is sitting, but that Tia has the time-indexed property of *sitting-at-t*. The individual who is sitting at *t* is a part of Tia, her current stage. As Lewis puts it, this stage of Tia has the property of *sitting* "in the first instance."

The proposed paraphrases are not offered as capturing what ordinary speakers mean by 'Tia is sitting' because, as we pointed out earlier, an ordinary speaker would take *Tia herself* to

[6] See also (Haslanger 1989, p. 119–20), (Lowe 1988, p. 73–4) and (Sider 2001, p. 92–8, 215).

have the property of *sitting* and so would deny that only Tia's current temporal part is sitting. We sometimes speak loosely: the meaning of the sentence we use does not match what we mean. For example, a speaker may say, 'There are 20 candidates in this folder' or 'This animal starts with the letter 't'.' These are instances of loose, or non-literal, talk. As the speaker would readily admit, by the first utterance she means something like *there are 20 candidates' applications in this folder*, and by the second she means that *this animal's name starts with the letter 't.'* However, utterances of 'Tia is sitting' do not fall into this category. A speaker who says, 'Tia is sitting' would deny that either 'The current stage of Tia is sitting' or 'Tia is sitting-at-*t*' captures what she means.

2.2 De Re Temporal Predication

The stage theory also offers a plausible analysis of *de re* temporal predication. Although Tia is a stage and so exists only at the present moment, we can truly say, 'Tia *was* standing.' According to Sider's *temporal counterpart theory*,[7]

> 'Tia was standing' is true as uttered at *t* if and only if 'Tia' refers at *t* to a stage that has a temporal counterpart prior to *t* that is standing.

Once again, the stage theorist can claim to respect what we intuitively mean, because in uttering 'Tia was standing,' we are attributing to a specific individual the temporal property of *previously standing*. By contrast, worm theorists would claim that 'Tia was standing' is true as uttered at *t* just in case Tia has a temporal part prior to *t* that is (tenselessly) standing. At best, this provides a paraphrase that does not capture what ordinary speakers mean by 'Tia was standing.'

2.3 Predications about Past Persons

Nevertheless, worm theorists can claim to offer a better treatment of our ordinary thought and talk about past persons. For example, if we say, 'Socrates was Greek,' intuitively the sentence has a *de*

[7] Sider's inspiration is Lewis's (1968, 1971) counterpart theory of *de re* modality.

re reading: we refer to a particular past person and attribute the property of *being Greek* to them. But, as Sider acknowledges, a sentence such as 'Socrates was Greek' cannot be about a specific past Socrates-stage "for lack of a distinguished stage that the sentence concerns" (1996, p. 450). Note that this problem is very different from the problem we identified in section 2.1 concerning the specific stage a speaker is referring to when she utters 'Tia is sitting.' In the latter case, the speaker intends to pick out a presently existing individual, or a Tia-stage. The vagueness of what counts as the present time implies that which specific Tia-stage her utterance concerns is indeterminate. By contrast, a speaker who utters 'Socrates was Greek' does not intend to pick out, even roughly, any specific Socrates-stage. The speaker does not have any particular time in mind. More plausibly, her utterance concerns the Socrates-worm. Hence, unlike the stage theory, the worm theory allows for a *de re* reading of 'Socrates was Greek.'

Stage theorists like Sider can offer a *de dicto* reading of 'Socrates was wise': "Syntactically, the sentence should be taken as the result of applying a sentential operator 'WAS' to the sentence 'Socrates is wise'; the resulting sentence means that at some point in the past, there is a Socrates-stage that is wise" (1996, p. 450).[8] Oddly, on Sider's view, although a past predication about a person that currently exists has a *de re* reading, no such reading is available when the person no longer exists (Moyer 2008, pp. 114–5; Rychter 2012, pp. 372–3). But some sentences about past persons do appear to concern specific stages. Consider 'Socrates started to drink the hemlock.' An utterance of this sentence seems to be about a particular past Socrates-stage, and thus invites a *de re* reading. An analysis that allows for a *de re* reading of all three sentences ('Socrates was Greek,'

[8] The worm theory does not appear to do much better with 'Socrates was wise,' since Socrates plausibly became wise only when he reached a certain age. We will return to this issue in section 4.2.

'Socrates was wise' and 'Socrates started to drink the hemlock') would be desirable. We will explain how four-dimensionalists can deliver such a reading in section 4.

3. Counting Judgments

Stage theorists offer a plausible account of some but not all of our ordinary counting judgments. Suppose that Tia is in the waiting room, about to undergo fission. The intuitive answer to the question 'How many persons are *currently* in the waiting room?' is, as the stage theory predicts, 'One.' By contrast, according to the worm theory, (at least) two persons are in the waiting room before fission occurs. To address this problem, Lewis (1983, p. 64) claims that we count coincident persons by a relation weaker than identity: persons are *identical-at-t* if and only if their stages at *t* are identical. Hence, if we count by the relation *identity-at-t*, there is only one person in the waiting room. This paraphrase may yield the right verdicts about counting; however, it does not respect the fact that to count is to count *by identity*. As Sider insists, Lewis's proposal would be a revisionary theory of counting: "Part of the meaning of 'counting' is that counting is by identity; 'how many objects' means 'how many numerically distinct objects'" (2001, p. 189).[9]

Sarah Moss (2012, pp. 682–3) asks us to imagine a philosopher who has recently come to endorse the worm theory and thereby acknowledges that her mind has changed about pre-fission counting cases. Contrary to what she previously believed, she now holds that two persons can share temporal parts, just as they can share spatial parts. Given this, she would grant that she was wrong to count only one person in the waiting room prior to fission. As Moss notes, a nascent

[9] Lewis (1983, p. 64) contends that when giving directions, we may count two overlapping roads as one, and thus do not always count by identity. However, as Sider (2001, p. 189–90) convincingly argues, such cases are better construed as counting road *segments* rather than counting by relations other than identity.

worm theorist cannot coherently judge that she now rejects her earlier views and, at the same time, deem ordinary speakers correct in their counting judgments. This is another way of stating Sider's point that since (pace Lewis) ordinary speakers count by *identity* rather than *identity-at-t*, the worm theory implies that their pre-fission counting judgments are false. The worm theorist is thus committed to an *error theory* about counting. We conclude that Lewis's revisionary account of counting should be understood in the same way as his proposed paraphrases of simple predications in Section 2.1, that is, as a key component of an error theory.

Nevertheless, Sider concedes that the stage theory does not properly handle what Hawley (2002, p. 47) calls *diachronic counting*, or counting over time.

> Certain sentences involving 'timeless counting' are ill-handled by temporal counterpart theory, for example 'fewer than two trillion persons have set foot in North America throughout history'. The problem, of course, is that if 'person' refers to person stages, this sentence will turn out false, since more than two trillion (indeed, infinitely many if time is dense) person stages have set foot in North America throughout history. (Sider 2001, p. 197)

The stage theorist cannot respect our intuitive judgments in cases of diachronic counting if, in such cases, we count stages and that counting involves counting *by identity*. As Hawley grants, diachronic counting "highlights perhaps the least attractive feature of stage theory" (2002, p. 64).[10] By contrast, the worm theory offers an adequate treatment of cases of diachronic counting, since counting worms predicts our intuitive counting judgments (e.g., fewer than two trillion persons).

4. Contextualism

[10] Hawley (2002, p. 63–4) and Viebahn (2013, p. 323) propose some responses the stage theorist could offer. We lack the space to discuss these.

4.1 Thinking and Talking about Segments

Both the stage and worm theories entail widespread mistakes in what should be relatively straightforward predications and counting judgments. To avoid that unsavory consequence, it is tempting to infer that 'person' and related words are ambiguous (Sider 1996, p. 448; 2001, p. 197): sometimes they refer to stages and sometimes to worms. Unfortunately, instances of so-called *event-related* counting sentences show that things are more complicated (Krifka 1990). Consider the following baseball example:

(1) The pitcher faced 35 batters during the game.[11]

If we assume that there were nine players on the opposite team and none were substituted, (1) counts the same players more than once. Intuitively, in uttering (1), we are counting proper temporal parts or *segments* of worms. (1) concerns 35 temporal segments faced by the pitcher, each segment persisting just long enough for an appearance at the plate.

In section 3, we discussed the case of Tia, who is in the waiting room, about to undergo fission. The stage theory yields the intuitively correct answer to the question 'How many persons are *currently* in the waiting room?' Suppose now that Tia has been alone in the waiting room for over an hour and consider the question 'How many persons were in the waiting room *for the last hour*?' This is a case of pre-fission counting *over an interval*. Neither the stage theory nor the worm theory can account for our intuitive counting judgment that 'One' is the correct answer (Moss 2012, p. 675). Plausibly, in such cases, just like in event-related counting, we are counting segments rather than stages or worms.

[11] Other examples of event-related sentences include '12,000 persons walked through the turnstile yesterday' and 'McDonald's just served its 100 billionth customer.'

Moreover, consider temporary properties that cannot be instantiated in a mere instant, such as *completing a multi-step mental calculation*. Suppose that the calculation in question consists of dividing 40 by 1/2 and adding 19 to the result. Since completing this operation takes time, an instantaneous stage cannot be truly said to complete the whole calculation.[12] Here, it is useful to consider Lewis's alternative definition of 'stage' as a temporal part that has a brief duration. He writes that a stage "begins to exist abruptly, and it abruptly ceases to exist soon after. Hence, a stage cannot do everything that a person can do, for it cannot do those things that a person does over a longish interval" (1983, p. 76). Plausibly, only a stage in Lewis's sense, or what we have called a 'segment,' can complete the mental calculation, *40 divided by 1/2 plus 19*. The same is true of other temporary properties that take time to instantiate. This suggests that we occasionally attribute temporary properties to segments rather than instantaneous stages.

We also appear to refer to a segment when we report a person's age, as in 'Tia is 40 years old.' This sentence, as uttered at *t*, is true if and only if 'Tia' refers to an individual existing at *t* that has the property of *being 40 years old*. Neither a worm (assuming Tia will reach her 41st birthday) nor a stage (which exists only at *t*) has that property. Hence, 'Tia' plausibly refers to a segment that begins to exist at the same time as the Tia-worm and ceases to exist at *t*. Hawley considers this type of predication. She contends that stage theorists may hold that the current Tia-stage satisfies 'is 40 years old' if and only if the Tia-stage is preceded by an aggregate of suitably-interrelated stages that stretch back over 40 years (2002, p. 54). However, this proposal contradicts the stage theorist's semantic analysis of present tense predication. According to this analysis, 'Tia is 40 years old' is true as uttered at *t* if and only if 'Tia' refers at *t* to a stage that has the property of *being 40 years old*. Given that the Tia-stage exists only at *t*, it has the property of *being*

[12] See (Moss 2012, pp. 684–5) for a similar example.

instantaneous rather than the property of *being 40 years old*. However, thanks to the temporal counterpart theory, stage theorists can truly say that the current Tia-stage satisfies the predicate '*was* born 40 years ago.' This is because this stage has a temporal counterpart 40 years prior to *t* that is being born. But this does not imply that the current Tia-stage satisfies the predicate 'is 40 years old.' It is hard to see how it could, since it satisfies the predicate 'is instantaneous.' According to the stage theorist's analysis, 'Tia exists only at this moment' is true as uttered at *t*, since 'Tia' refers at *t* to a stage that has the property of *existing only at t*.

4.2 Developing Contextualism

If our goal is to respect ordinary judgments and avoid attributing widespread error to speakers, then the data we have described so far supports a *contextualist* approach according to which 'person' and related words may refer to stages, worms, or segments depending on the context. Sider reaches the same conclusion:

> 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. (Sider unpublished)

In instances of present tense predication, for example, the relevant temporal interval is the present moment and reference is thus to a currently existing stage. When talking about past persons such as Socrates, the interval varies, depending on the "topic" of the utterance. In an utterance of 'Socrates was Greek,' 'Socrates' picks out the whole worm, while in an utterance of 'Socrates

started to drink the hemlock,' 'Socrates' refers to a stage that exists at the moment the drinking begins. In 'Socrates was wise,' 'Socrates' plausibly picks out a segment whose temporal boundaries are the time wisdom was acquired and then lost (likely the end of the Socrates-worm).

Ordinary use of event-related counting sentences shows that this simple contextualist account needs some revision. An utterance of the event-related counting sentence (1) does not involve a single interval of time. To accommodate this, we should think of the topic of conversation as providing a set of *interval-characterizing events*.[13] These events impose restrictions on worms to determine which of their temporal parts we name, quantify over, and refer to. The conversational context of (1), for example, selects plate appearances, or completed "at bats," that occur during the game, as the interval-characterizing events. For each plate appearance, we quantify over a segment of the worm that lasts for exactly the duration of that plate appearance.

Moss expresses the following concern about contextualism: "[W]ith 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" (2012, p. 684). In response, contextualists can point out that in general, the predicates we use help select the interval-characterizing events. For example, if we ask, 'How many persons were in the waiting room *for the last hour*?', the events we select are presences in the waiting room during the last hour, as the predicate indicates. Each of these events determines an interval that corresponds to the duration of the event and thus marks the boundaries of the temporal part we quantify over. In some cases, the predicate we use may allow for more than one set of events and thus for more than one reading. Suppose that in the baseball example we ask, 'How many batters did the pitcher face during the game?' This question allows for two different readings, depending on which events

[13] See (Barker 1999) for a similar idea.

are selected. If the events are plate appearances occurring during the game, then for each plate appearance we should count one temporal part that lasts for the duration of that plate appearance. On this reading, we get the number '35.' However, since there were only 9 distinct players on the opposite team, '9' is also an acceptable answer to the question. On this reading, the events selected are game participations with at least one plate appearance. Since, in this case, each game participation lasted for the entirety of the game, we quantify over temporal parts with the same duration, and thus get the number '9.'

Sider writes that the stage theorist's ontology is "the same as the worm theorist's: four-dimensionalism", that is, both admit the existence of stages, segments, and worms (2001, p. 191). Moreover, given unrestricted composition, both are committed to the existence of coincident objects, that is, worms that share some but not all of their temporal parts. Hence, one cannot coherently favor one theory over the other based on qualms about temporal parts, spacetime worms, or coincident objects. The key disagreement between the two views concerns the semantic question of what the ordinary predicate 'person' designates, and whether stages or worms are in the range of our quantifiers. If our aim is to minimize the extent of error attributed to ordinary speakers, then contextualism should be preferred over the standard semantics proposed by worm and stage theorists. Contextualism shares the same ontology as the stage and worm theories but favors a context-sensitive semantics. Whether we refer to and quantify over stages, worms, or segments depends on the conversational context.

5. The Contextualist's Error Theory

Peter Geach holds that the worm theory offers an "an erroneous analysis" (1972, p. 309) of simple predication. He illustrates his criticism with an example involving McTaggart, whose beliefs about the proposition that *p* changed between 1901 and 1921. Worm theorists, Geach writes, would

describe the change as follows: 'McTaggart in 1901 was a philosopher believing that *p*' and 'McTaggart in 1921 was a philosopher believing that not-*p*.' But according to the worm theory, Geach adds, the locutions 'McTaggart in 1901' and 'McTaggart in 1921' "would not designate two philosophers, but two temporal slices of one philosopher. But just that is the trouble: for a predicate like 'philosopher believing so-and-so' can of course be true only of a philosopher, not of a temporal slice of a philosopher" (1972, p. 310). The worm theory thus fails to respect simple claims we make about McTaggart. Geach's objection is in the spirit of the remarks we made in sections 2 and 3 regarding the widespread errors the worm theory attributes to ordinary speakers.

Based on these semantic considerations, Geach rejects the four-dimensionalist ontology. He writes that "the ground for recognizing temporal slices as distinct individuals has been undercut" (1972, p. 310). Geach accuses four-dimensionalism of positing an ontology of strange objects that are not recognized by common sense.[14] This accusation is potentially damaging. If the worm theory concerns entities other than persons, then the solutions it proposes to metaphysical puzzles all miss the mark: they apply not to persons but to some four-dimensional entities and their parts that Geach describes as "dreams of our language" (1972, p. 311).

Geach's semantic objection has some merit. However, we have argued that four-dimensionalists can avoid it by invoking a contextualist semantics that respects ordinary predications while endorsing the four-dimensionalist ontology. For example, the utterance 'McTaggart believed that *p*' may be literally true in a context in which 'McTaggart' refers to a temporal stage or segment. More generally, the ordinary judgments of speakers may concern person-stages, person-segments or person-worms, depending on the context. Consider again event-related counting judgments, which are regularly made by ordinary speakers. As we showed,

[14] See also, among others, (Chisholm 1976, 138–44; Thomson 1983; van Inwagen 1981).

contextualism offers a straightforward treatment of these judgments, as involving quantification over person-segments. Hence, pace Geach and other critics of four-dimensionalism, ordinary speakers do think and talk about four-dimensional objects with various temporal boundaries, even if they do not conceive of person-stages and person-segments *as* temporal parts of spacetime worms. Our point is not that ordinary speakers explicitly embrace the four-dimensionalist ontology but rather that they refer to and quantify over the objects of this ontology.

Moss cautions against an excessive application of the principle of charity. Surely, not all judgments ordinary speakers make about persons ought to come out true. As a matter of fact, according to four-dimensionalism, some of these judgments must be false, since when one becomes a four-dimensionalist, one relinquishes central aspects of one's earlier views about persons. As Moss puts it, "If the ordinary speaker is always correct in her first-order judgments, then [the nascent four-dimensionalist] incorrectly judges that she rejects her earlier opinions" (2012, p. 683).

If the nascent four-dimensionalist is a worm theorist, then, as we showed in sections 2 and 3, she correctly holds that she disagrees with several of her earlier judgments. Specifically, she rejects her earlier judgments about temporary properties and takes many of her earlier counting judgments to be false. We have argued that this error theory is a problematic feature of the worm theory: since many of these judgments are about simple, straightforward matters, it is odd that ordinary speakers get them wrong. The stage theory suffers from a similar problem, since it conflicts with our judgments about past people and many of our counting judgments. By contrast, we have argued, contextualism avoids a problematic error theory. Given the availability of a contextualist semantics that respects both ordinary speakers' judgments and the four-

dimensionalist ontology, the semantic analyses favored by the worm and stage theorists appear unmotivated.

Nevertheless, we agree with Moss that it would be odd if contextualism predicted a perfect match in judgments. As a matter of fact, contextualism does not imply that all the judgments ordinary speakers make are true. Consider an example from Sider (1996, p. 446; see also 2001, pp. 196–7). Suppose that looking at a picture of his younger self, Ted utters (at time *t*), 'I *was* that irritating young boy.' According to the temporal counterpart theory, this utterance is true, since 'I' refers at *t* to a Ted-stage that has a temporal counterpart prior to *t* that is an irritating young boy. However, as Sider points out, tenseless cross-time identity judgments come out false on his view. The counterpart theory implies that an utterance at *t* of 'I am that irritating young boy' is false.[15] The earlier stage that has the property of *being an irritating young boy* is numerically distinct from the Ted-stage. Note that holding that 'I' refers to the Ted-worm would not help, since that worm is not identical to the earlier stage either. An error theory regarding tenseless cross-time identity judgments is thus compulsory for all four-dimensionalists, including contextualists.

Nonetheless, this error should not be a source of concern for contextualists (or other four-dimensionalists), since it is rooted in a tempting but false metaphysical assumption about persistence. Recall that in section 1, we proposed a neutral way to talk about the conditions that must be fulfilled for a person to continue to exist through time. We may say that that irritating young boy persists as Ted if and only if the two are *suitably related*. However, pace three-dimensionalism, four-dimensionalists hold that the fact that that irritating young boy and Ted are suitably related does not imply that that irritating young boy is *numerically identical to* Ted. According to what we will call the *endurantist assumption*, if an individual *a* at time t_1 continues

[15] See also (Hawley 2002, p. 63).

to exist as an individual *b* at time t_2 (because the two are suitably related), then *a* is identical to *b*. For example, if that irritating young boy continues to exist as Ted, then that boy and Ted are numerically identical, and Ted can truly say, 'I am that irritating young boy.'

According to four-dimensionalism, the endurantist assumption is false. However, four-dimensionalists should not be troubled by ordinary speakers' implicit commitment to that assumption, since it is based on a mistaken but tempting metaphysical outlook. Objections against three-dimensionalism invoke challenging scientific and philosophical considerations regarding the nature of time, complex issues about temporary intrinsics, as well as puzzles regarding coincidence and persistence (Hawley 2002; Sider 2001). Since ordinary speakers are unlikely to have been exposed to these considerations, we should not expect them to question the endurantist assumption. However, contextualists can offer paraphrases of tenseless cross-time identity judgments. If *a* at t_1 is suitably related to *b* at t_2, then a relationship similar to but distinct from identity holds between *a* and *b*. According to contextualism, there are two acceptable ways to characterize this relationship, depending on whether we take *a* and *b* to be 'persons,' as stage theorists would prescribe, or 'temporal parts of persons,' as worm theorists would recommend. If we call *a* and *b* 'persons,' then, instead of saying that they are identical, we should say that they are counterparts of each other. On this picture, ordinary speakers mischaracterize the counterpart relation as the identity relation. Contextualists can also adopt the worm theorist's perspective and characterize *a* and *b* as 'temporal parts of the same person.' Hence, what ordinary speakers take to be the identity relation is actually the co-parthood relation. Contextualists need not choose between these two paraphrases: either can be correctly used, as long as one makes clear what one means by 'person.'

We have shown that all versions of four-dimensionalism hold that cross-time identity judgments are false. Four-dimensionalists cannot take these judgments at face value, because doing

so would commit them to a problematic ontology of persons that *endure* through time. We have argued that since this error is based on complex *metaphysical* considerations, it is less problematic than those entailed by the worm and stage theories.

6. The Diachronic Self-Making View and the Reference of 'I'

Let us now turn to the indexical 'I.' Our position bears some similarities with the *Diachronic Self-Making View* (DSV) defended by David Mark Kovacs in a series of recent essays (2016; 2020; 2022). DSV concerns the reference of 'I' in an 'I'-judgment or 'I'-thought, when a host of "person-candidates" make that 'I'-judgment or entertain that 'I'-thought. For a four-dimensionalist, "person-candidates" include stages, segments, and worms. Kovacs holds that, combined with the worm theory, DSV implies that 'I' refers to a worm.[16] To illustrate, suppose that Tia is a worm and thinks, *I went to the supermarket yesterday*. A host of overlapping segments, as well as a stage, have this belief along with her. Kovacs is especially concerned with *subpeople* (or *personites*), which are segments that are long enough to exhibit developing personalities (Johnson 2016, p. 200; 2017, p. 619). Importantly, Kovacs notes, Tia and her overlapping subpeople share numerically the same thought (2020, pp. 351–2; 2022, p. 468). We thus have *one* thought and *many* thinkers.

Why hold that 'I' refers to Tia rather than one of her overlapping subpeople? According to DSV, "[T]he reference of 'I' is the best non-accidental satisfier of the 'I'-beliefs entertained by a host of person-candidates" (2022, p. 468; see also 2020, p. 351). Hence, to determine what 'I' refers to, we have to consider the totality of the person's 'I'-beliefs and opt for a reference assignment that maximizes the truth of these beliefs. As Kovacs puts it,

[16] Kovacs (2020, p. 351) remarks that DSV could also be combined with the stage theory but does not elaborate on what would follow from this combination.

> [T]he *best* candidate referent is the one that best satisfies (makes true) the total set of 'I'-beliefs that you have right now. Beliefs likely to distinguish better and worse candidate referents include past-, present-, and future-directed 'I'-beliefs (*I was once a foetus*; *I'm less than six feet tall*; *I will go on holiday next week*; etc.) and counterfactual beliefs (*I wouldn't survive total amnesia*; *I would survive the gradual replacement of my brain cells with silicon chips*; etc.). (2020, p. 352)

According to DSV, Tia's thought *I went to the supermarket yesterday* is correct because Tia indeed went to the supermarket. Moreover, the overlapping subpeople who think *I went to the supermarket yesterday* are also correct because the 'I' in their thought picks out Tia rather than themselves. As Kovacs points out, even "subpeople that were not around to go to the supermarket" (2022, p. 469) can have this true belief.

Although we agree with Kovacs that a reference assignment should, as much as possible, make true 'I'-judgments and 'I'-thoughts, we reject his conclusion about the reference of 'I' and instead favor a context-sensitive view. Before we explain our position, we need to point out that it is incorrect to hold, as Kovacs does, that the bearer of the thought *I went to the supermarket yesterday* is a worm. As we have made clear in this essay, stages (and perhaps in some cases short segments) rather than worms are the bearers of temporary properties. Worms have these properties only in a derivative sense: with respect to a temporary property *F*, we may say that the worm is *F*-at-*t*; however, this means not that at *t* the worm is *F* simpliciter, but that it has a part at *t* that is *F* simpliciter. It is thus misleading to say that many different thinkers entertain the same thought. Suppose that at time *t*, a Tia-stage has the occurrent belief *I went to the supermarket yesterday*. This Tia-stage has the belief simpliciter, while overlapping segments and the Tia-worm have the belief only in a derivative sense, that is, by having a temporal part that has the belief.

Kovacs emphasizes the role our referential intentions play in determining the reference of our 'I'-beliefs (2016, pp. 1080–3; 2022, p. 470). He draws an analogy with "impure indexicals" such as 'here' and 'now.' As he remarks, a speaker who utters 'Tia is not here,' could intend 'here' to refer to the room, the apartment, or even an entire country. Plausibly, the reference of 'here' depends on the speaker's referential intention. Similarly, "[T]he speaker's (or thinker's) intentions determine the reference of a (spoken or merely mental) token of 'I'" (2022, p. 470). But this analogy supports a context-sensitive approach, since the speaker's referential intentions target different temporal parts in different contexts.

Suppose that at time *t*, a Tia-stage thinks, *I'm sitting*. This thought is true if and only if 'I' refers at *t* to a stage that has the property of *sitting*. Hence, to make this Tia-stage's belief true, we should hold that 'I' refers to a stage. Similarly, a Tia-stage's thought (at *t*) *I went to the supermarket yesterday* is true just in case 'I' refers at *t* to a stage that has the property of *having gone to the supermarket the day before t*. According to Sider's temporal counterpart theory, this is true if and only if this Tia-stage has a temporal counterpart one day before *t* that goes to the supermarket. However, a Tia-stage may also refer to a worm or a segment with 'I.' Suppose Tia is reasoning, 'Since every human needs food to survive and I am human, I need food to survive.' Plausibly, she is using verbs tenselessly here. She is not merely talking about her current needs. If so, her reasoning concerns herself at all moments of her existence and 'I' plausibly refers to the Tia-worm. Suppose now that a Tia-stage says (at *t*), 'I'm 40 years old.' This utterance is true if and only if the individual 'I' refers to at *t* has the property of *being 40 years old*. This is the case if 'I' refers to a segment that starts at the beginning of the Tia-worm and ends at *t*.

These considerations support a contextualist view about the reference of 'I,' according to which the temporal part of a worm one refers to with 'I' varies from context to context. DSV's

interpretive principle naturally yields this context-sensitive account rather than the worm theorist's or stage theorist's preferred semantics.

7. Fission and the Endurantist Assumption

Let us now return to the case of fission. Ordinary folks' acceptance of the endurantist assumption can help explain why they are puzzled by fission. Suppose that Tia is in the waiting room about to undergo fission. In section 4.1, we saw that contextualism yields the intuitively correct answer to cases of pre-fission counting at a time and across an interval. However, judgments are more difficult to reach in cases of counting *across fission*. Suppose that, colloquially speaking, Tia divides into two post-fission persons, Sia and Dia, both of whom are suitably related to Tia. The entire procedure takes place on Tuesday and no other patients are at the medical facility that day.

Now, consider the question 'How many patients were in the medical facility on Tuesday?' It is doubtful that there is a consensus among ordinary speakers about the correct answer to this question. This is because ordinary speakers disagree about whether Tia survives the procedure. Some hold that fission ends Tia's existence. Some insist that Tia survives as both Sia and Dia, and some believe that she survives as either Sia or Dia but not both. (We have heard all of these answers from our own students.) However, most grant that they find the case puzzling and can at best offer only tentative answers. Hence, given that there is no natural, intuitive answer to the question 'How many patients were in the medical facility on Tuesday?', cases of counting across fission do not provide useful data to evaluate contextualism.[17]

Nevertheless, contextualists should provide an account of why ordinary speakers are puzzled by the question. Recall that by assumption, Tia is suitably related to both Sia and Dia. The

[17] We thus disagree with Moss (2012, pp. 678–9), who contends that there are natural, intuitive answers in cases of counting across fission.

problem is that if we make the additional, endurantist assumption that Tia's being suitably related to a future individual implies that she is one and the same as that individual, then we have to conclude that Tia is identical to Sia and that Tia is identical to Dia. Ordinary speakers who recognize that Sia and Dia are two distinct individuals will be puzzled by that conclusion. Contextualists (and other four-dimensionalists) should hold that puzzlement about fission originates with the endurantist assumption that if an individual *a* at time t_1 continues to exist as an individual *b* at time t_2, then *a* is identical to *b*.

How should contextualists describe Tia's case of fission? First, given that 'Tia' has different admissible references depending on the conversational context, contextualists should make explicit which they opt for. Alternatively, they can do what other four-dimensionalists often do, which is to use locutions such as 'the Tia-stage at *t*,' 'the Tia-worm,' and 'the Tia-segment that exists from *t* to *t*′.' Call a pre-fission stage of Tia at a time t_1, 'the Tia-stage at t_1,' and post-fission stages of Sia and Dia at a time t_2, 'the Sia-stage at t_2' and 'the Dia-stage at t_2,' respectively. By assumption, the Tia-stage at t_1 is suitably related to both the Sia-stage at t_2 and the Dia-stage at t_2, but numerically distinct from each. However, we can say that both the Sia-stage at t_2 and the Dia-stage at t_2 are temporal counterparts of the Tia-stage at t_1. This is because contextualists accept the stage theorist's claim that suitably related stages are counterparts of one another. This does not generate a puzzle, since unlike the identity relation, the counterpart relation can be one-many. But this does not preclude contextualists from also accepting the worm theorist's claim that suitably related stages are parts of the same worm. Hence, contextualists can hold that the Tia-stage at t_1 and the Sia-stage at t_2 are parts of the same worm and that the Tia-stage at t_1 and the Dia-stage at t_2 are parts of the same worm (and that these worms are numerically distinct from one another). Like the counterpart relation, the co-parthood relation can also be one-many.

Return to the question 'How many patients were in the medical facility on Tuesday?' We argued that ordinary speakers find this question puzzling because of the endurantist assumption. Four-dimensionalists who adopt a contextualist semantics can hold that the question does have an answer. Since the question concerns patients who visited the medical facility on Tuesday, it selects *facility visitations on Tuesday* as the interval-characterizing events. Each of these events determines an interval that corresponds to the duration of the visit, and for each visit, we quantify over a segment that lasts for that interval. Since there are two such segments, we get the answer 'Two.' Speakers in the grip of the endurantist assumption must first figure out whether Tia is Sia, Dia, neither, or both before answering the counting question. Once we forsake that assumption, answering the question becomes the relatively straightforward matter of figuring out how many (maximal) segments of suitably-interrelated stages there are at the facility on Tuesday. Moreover, since the same pre-fission stage may be suitably related to two post-fission stages that are not themselves suitably related, the relation of co-parthood, unlike the identity relation, can be one-many. Contextualists can thus hold without contradiction that the two (maximal) segments at the facility on Tuesday have pre-fission stages in common.

8. Conclusion

Four-dimensionalists reject the commonsense conception of persons. We have shown that despite that, they can respect most of the judgments ordinary speakers make about persons by endorsing a contextualist semantics. As we argued, the key point of disagreement between contextualists and ordinary speakers concerns a *metaphysical* question. More specifically, it concerns ordinary speakers' acceptance of the endurantist assumption. Additionally, we have argued that, by endorsing a contextualist semantics, four-dimensionalists can resist the accusation made by Geach and others that temporal parts are not recognized by common sense. As we have shown, although

ordinary speakers do not think of temporal parts *as* temporal parts, their judgments may concern person-stages, person-segments or person-worms, depending on the context. Contextualism can do justice to that fact.

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