

The Paradox of Fission: Common Sense vs. Logic?

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Abstract

The fission of a person involves what common sense describes as a single person surviving as two different people. Thus, say most metaphysicians, this paradox shows us that common sense is inconsistent with the transitivity of identity. Those attempting to resolve the paradox deny common sense and argue that the resolution rests upon embracing a particular metaphysics. I disagree on both counts. First, we must recognize that natural language quantifiers are in fact temporally relativized. Second, we must get straight on the semantics of talk of persons, for in cases of fission, we think a single person will exist at two different places after the fission. Properly understood, this does not bring the undesirable consequences one would expect. Thus, with the correct semantics in hand, we can save common sense. Moreover, because this dissolution relies solely on semantics, we can remain neutral with respect to the metaphysics.

1. The Paradox

Tomorrow Adam will undergo fission. His fission will be like that of an amoeba's, with the two resulting people, call them Cain and Abel, both bodily and psychologically continuous with Adam.

Since the fission will not take place until tomorrow, it seems that today Adam is still one person. Once the fission is complete, Cain and Abel will, it seems, be two different people. Both of these conclusions are supported by the concept of a person: if there is an embodied mind that is independent of other bodies and minds, then it constitutes a single person. If Adam is two people right now, how could we explain the fact that both are standing in the exact same spot having exactly the same thoughts? Wouldn't this identity of mental and bodily properties *constitute* their being the same person? If next week at this time Cain and Abel are identical, how could we explain the one's being in Cairo wondering if he paid the month's rent while at that same moment the other is in Dallas envying his neighbor's new kayak? Again, doesn't this difference *constitute* their being different people?

Yet it also seems that Adam will not cease to exist once he undergoes fission tomorrow. The mental and physical changes that will lead from Adam to Cain are of a piece with the changes that we all undergo every day — except, of course, for the fact that some great mass of flesh will separate from him, much as a newborn baby separates from its mother. Similarly, *mutatis mutandis*, for the changes that will lead from Adam to Abel. Intuitively, Adam does not die but survives. The puzzle is that what results from his survival are *two* people. Focusing on Adam and Cain and the series of changes between them, it seems they are the same person, yet similar reasoning suggests that Adam and Abel are also the same person. But how can this be,

for, as we've said, surely Cain and Abel are *not* the same person? Common sense seems to have led us to deny the transitivity of identity.¹

The paradox of fission pits our concept of a person — both what it is to be one versus two persons *at a time* and what it is to continue to be the same person *over time* — against the transitivity of identity. Because the logic of identity is part of the mother's milk of most philosophers, the paradox has been taken to show that we should reject our common sense intuitions, and the puzzle has therefore been to determine *which* piece we are to reject. Parfit takes the puzzle to show that Adam's life does in fact end.² Chisholm insists that, despite the apparent symmetry, Adam survives as one of the two later people, though we simply don't know which of the two he is.³ Lewis argues that Adam is in fact two people, while Ehring takes the opposite tack and claims Cain and Abel are one person.⁴ Johnston concludes that in cases of fission, "there is no fact of the matter about personal identity," for our concept of a person doesn't apply in such bizarre cases.⁵

We must deny common sense, say so many metaphysicians. I disagree. I say our concept of a person and the intuitions that come with it do *not* contradict logic. We simply need to figure out *which* logic our concepts obey. That is, we need to examine the semantics of the putatively contradictory statements of common sense and we'll find that, properly understood, the statements do not conflict after all. My view takes its cue from Lewis's, so in the second section I begin with his solution appealing to temporal parts. In the third section I explore and defend Lewis's distinction between identity and tensed identity, or 'sameness' as I shall call it,

¹ I speak of what 'common sense' says about such cases. Some might object that I am unfairly stretching the meaning of this expression since there is nothing common about the fission of persons. However, the expression does not mean that *what is being judged* is common; rather, it means that the judgment is the unreflective opinion of the common *person*. It is not at all unusual to ask what common sense says about whether it is right or wrong to do act A, where A is something never encountered.

² *Reasons and Persons*, Part III.

³ Chisholm, *Person and Object*, Ch. 3.

⁴ Lewis, "Survival and Identity"; Ehring, "Personal Identity and Time Travel."

⁵ "Fission and the Facts," p. 393.

which leads to my departure from Lewis in the fourth section, primarily in recognizing branching persons. I consider a line of objection in the fifth section that will help clarify the view. After briefly stepping back to consider this semantic approach to metaphysics in the sixth section, finally, in the seventh section I argue that the resolution is purely semantic and, therefore, that we can kick away the commitment to temporal parts as we please.

2. Lewis, Temporal Parts Theory, and Fission

Lewis advocates temporal parts theory. Impressed by the analogy between space and time, temporal parts theorists say that just as objects have spatial parts, so too do they have temporal parts. Me from my left foot to my knee is a spatial part of me; me from birth to my tenth birthday is a temporal part of me. A temporal slice is a momentary temporal part of an object.

Wielding the notion of a temporal part, Lewis explains what is going on in cases of fission.⁶ He employs the notion of the I-relation, that relation that holds between the slices of a single person. According to Lewis, a person is a maximal sum of I-interrelated slices. We need not bicker over the details of the I-relation. You might think what underlies me being the same person as the youth I once was is that the youth and I have mental states that are similar or that are connected by a chain of gradual changes; or perhaps *bodily* continuity is required instead of or in addition to the appropriate sort of mental continuity. The paradox of fission is largely independent of the details of the I-relation, so I leave these for others.

The notion of temporal parts, then, gives us one perspective from which to understand cases of fission. There is one series of temporal slices up to the point of fission and two series of slices that result from the fission. Importantly, the I-relation is not a transitive relation. It holds between any ‘Adam’ slice and any ‘Cain’ slice, and it holds between any ‘Adam’ slice and any ‘Abel’ slice, but it does not hold between a ‘Cain’ slice and an ‘Abel’ slice. Thus, there are two

⁶ See Lewis, “Survival and Identity.”

maximal sums of I-interrelated person slices. One consists of the slices up to the point of fission — the ‘Adam’ slices — together with the slices forming one future branch — e.g., the ‘Cain’ slices. The other consists of the ‘Adam’ slices together with the ‘Abel’ slices. In short, Lewis claims that ‘Cain’ and ‘Abel’ refer to two people that are now spatially coincident but tomorrow, at the time of fission, will diverge, and ‘Adam’ is an ambiguous term since it applies equally well to either of these two people.

3. Identity vs. Sameness

One may object, for it surely *seems* that there is only a single person standing in front of us! But Lewis has a story to tell.⁷ When we count objects, he claims, in many contexts we count not by identity but by *tensed identity*, or *identity-at-t*, where A and B are identical-at-t iff they share the same temporal slice at t.

How many persons entered the duplication center yesterday? We may reply: [Cain] entered and [Abel] entered, and no one else; although [Cain] and [Abel] are not identical today, and are not identical simpliciter, they were identical yesterday. So counting by identity-yesterday, there was only one. Counting by identity-today, there were two; but it is inappropriate to count by identity-today when we are talking solely about the events of yesterday. Counting by identity simpliciter there were two; but in talking about the events of yesterday it is as unnatural to count by identity as it is to count by identity-today.⁸

In this way Lewis tries to reconcile temporal parts theory with the everyday claim that there is only one person entering the chamber.

One may doubt that we count in such a way. For example, one might think that the competing hypothesis, that we count by identity, is simpler and therefore preferable to the hypothesis that we count by tensed identity. However, given that most of our everyday predicates apply just in virtue of how things are at the relevant time, and almost all, if not all apply relative to a time, if anything it seems more likely that our counts are similarly relativized. Predicates such as ‘is tall’, ‘has a gold tooth’, ‘is green’, and so forth apply in virtue of properties intrinsic to the current time. Predicates such as ‘is ten years old’, ‘is growing’, and ‘is an ex-

⁷ See Lewis, “Survival and Identity”. Cf. Robinson, “Can Amoebae Divide Without Multiplying?”

⁸“Survival and Identity,” p. 63.

marine' are extrinsic to the current time, yet even these are not tenseless but instead apply in virtue of how the subject is in some way that indexes the current time. It seems rather strange, then, to say that predicates like "... is a single person' and '... are two people' apply in virtue of features not relative to the current time, counting the single contiguous human-shaped arrangement of atoms that currently exists as 'two' in virtue of being spatio-temporally contiguous with what are, in the future, *two* human-shaped arrangements of atoms. If anything, simplicity suggests that we don't have special counting predicates that operate in some different, tenseless manner.

One might instead use conceptual analysis to argue that we count by identity. It seems this is Sider's thought when he protests that "it is part of the meaning of 'counting' that counting is by identity."⁹ But the relation of absolute identity differs from tensed identity only in that the latter allows the relata to differ temporally and modally while the former doesn't. We certainly do have the intuition that *x* and *y* can be 'one' thing only if they don't differ. But our use of 'differ' in this sentence is most plausibly also temporally relativized, so this intuition does not help to resolve the issue. Instead, we need to determine whether we intend our counts to discriminate *x* and *y* in all cases where *x* and *y* were, will be, or could be different. And, in fact, everyday language suggests we often think such differences *do not* matter. Consider whether the statue and the lump of clay of which it is made are 'one' and 'the same', a question that raises the issue of temporary identity while abstracting away from concerns peculiar to personal identity and to the unusual circumstances involved with fission. When told that the statue was created today from a lump of clay that had been sitting on the workbench for a week, the untutored are not at all moved to doubt that the lump of clay *is* a statue or that there is only *one* object on the mantle or that when we discuss the statue and when we later discuss the lump of clay we are discussing *the same* object. But when told that the lump of clay is painted entirely

⁹"All the World's a Stage," p. 440.

white while the statue is unpainted, they think there must, after all, be two different objects at hand. Why when presented with clear differences in temporal properties does common sense not see this as conflicting with the objects being 'one' and 'the same', yet when presented with differences in current properties it does see this as contradictory? The simplest and most charitable answer is that what we mean by saying x and y are 'the same' in such contexts requires only that x and y be *currently* the same, i.e., that x and y share all properties intrinsic to the current moment. Thus, if anything the evidence suggests that we *do* mean our counts to be temporally relativized.

It seems, then, that at least in some contexts we count x and y as 'two' things only if they differ in their properties intrinsic to the relevant time (and world) rather than in their properties simpliciter. Moreover, since we're fully aware of the temporal and modal differences between the statue and the lump of clay, we apparently *intend* to count this way. Of course, this leaves open whether we intend to count this way because this is what we literally mean by 'one', 'two', etc. or if instead we count this way because we thereby convey useful information despite these counts being literally false. That is, we haven't settled whether counting by tensed identity is part of the semantics of our counting predicates or part of some pragmatic story. In fact, since Lewis says that it is 'appropriate' to say Adam is one person even though he is 'really' two people, it appears that Lewis is suggesting a pragmatic account. I'm not sure why we should see it this way. Lewis doesn't explain *why* people would be saying something that is false. The claim that Adam is one person doesn't fit the mold of a Gricean implicature, and it is not a case of restricted quantifiers.¹⁰ Moreover, common sense insists that, literally speaking, Adam is *not* two people. So I don't see what motivates a pragmatic account. Lacking such a motivation, it makes more sense to interpret Lewis's tensed identity relation as giving the semantics of our counts and, more generally, of our quantifiers. That is, I would prefer to say Lewis spells out not

¹⁰ For the former point, it fails Grice's test of cancelability. For the latter point, because of the symmetry we can't say that our restricted quantifiers are omitting Cain but not Abel or vice versa.

merely the conditions under which we *say* there is one thing present, but rather the conditions under which there *really is* one thing present.

Whether it is a pragmatic or a semantic account, though, matters little for my purposes. What is important is that tensed identity gives us the rules of how we count, and that this thereby explains away any putative conflict between the metaphysician's claim that Adam is two people (counting by identity) and the common sense intuition that Adam is one person (counting by tensed identity).

Many other philosophers, driven by somewhat different concerns, have also argued — though they have not put it this way — that a relation weaker than identity plays a central role in our natural language quantifying expressions. For example, according to both White and Rea, Aristotle distinguished identity, or sameness in being or in substance, from accidental sameness, where things are identical only if they share *all* properties, including temporal and modal properties, and things are accidentally the same merely by sharing those properties intrinsic to the time and world in question.¹¹ The lump of clay is accidentally the same thing as the statue that was formed from it this morning since they share all properties intrinsic to the current time. But they are not strictly identical since they differ temporally and modally: the clay existed yesterday but the statue did not; the clay could have survived being squashed but the statue could not.

Once we concede that things differing temporally and modally are not strictly identical, we can easily recognize a weaker relation holding between coincident objects. As Yablo says, “that the bust and the wax are in *some* sense the same thing is perfectly obvious.”¹² Similarly, Wiggins, and many following in his path, have distinguished the ‘is’ of identity from the ‘is’ of composition, thereby explaining why we say that the lump of clay *is* a statue.¹³ The ‘is’ of

¹¹ See Nicholas White, “Identity, Modal Individuation, and Matter”; and Michael Rea, “Sameness without Identity.”

¹² “Identity, Essence, and Indiscernibility,” p. 295.

¹³ See Wiggins, *Sameness and Substance*; Yablo, “Identity, Essence, and Indiscernibility”; Johnston, “Constitution is not Identity”; Baker, “Why Constitution is not Identity”; Thomson, “The Statue and the Clay”. Besides those

composition is a temporally relative, or tensed, relation, just like Lewis's. What these authors are suggesting, each in somewhat different ways, is that the semantics of many occurrences of our English quantifying expressions — e.g., 'is', 'one', and 'the same' — are relativized to times and worlds while the semantics of the philosopher's notion of identity is not. Identity-at-t, or 'sameness' as I will call it, is not identity.¹⁴ The paradox of fission, however, only gets a grip if we conflate the two.

4. Are Two Heads Better Than One?

Even if we construe Lewis's account as specifying the conditions under which sentences containing English quantifiers are *really* true, it still doesn't quite match linguistic intuition. Consider first what I take to be a bad line of objection. One might complain that according to Lewis we can say that there is exactly one person standing before us despite the fact that if we talk about 'him' or about 'Adam', our sentences are ambiguous. Shouldn't an ambiguity be possible iff there are multiple possible referents? Furthermore, if *before* the fission I say "Adam still has a headache", intuition tells us the referent is not at all ambiguous. Thus, it seems we have even more evidence that statements about Adam are *not* ambiguous, that such statements are quite different than true ambiguities such as "Bush was my favorite president" as spoken by someone who has heard about 'Bush' during both the Bush presidencies but not realizing the stories were about two people.

This line of objection, however, rides on a failure to distinguish identity and sameness. First, Lewis can respond that while according to our everyday counting by tensed identity there is 'one' person prior to the fission, there nonetheless are two people as individuated by their temporal properties, and this is all that is necessary for there to be an ambiguity. Second, a temporal part theorist would say that the ambiguity of 'Adam' and the ambiguity of 'Bush' are

following in Wiggins' footsteps, a similar conclusion is found with Perry's "The Same F". At least for Wiggins, the 'is' of constitution is a symmetric relation. See *Sameness and Substance*, p. 197f1.19.

¹⁴ See my [edited for blind review] for a more thorough exposition of sameness.

not analogous since the two referents of ‘Adam’, unlike those of ‘Bush’, are partially identical or, in our new terminology, are related by sameness. An ambiguity that provides a closer parallel, a temporal part theorist would insist, is that of a statue and the piece of bronze of which it is made since these *are* partially identical. If I say, “This weighs five stone,” while pointing at the statue/piece, intuition suggests there is only a single object that might serve as the referent and, much like the sentence saying “Adam has a headache,” intuition sees the sentence as unambiguous. Of course, with the statue and piece, one reason for saying there are, at least in some sense, multiple objects and that the reference is therefore ambiguous is because there are other sentences concerning this ‘one’ object that *are* ambiguous. If I claim, “I created this myself,” while pointing at the statue/piece, we must rely upon context to disambiguate whether I mean that I, as artist, crafted *this statue* from the pre-existing piece of bronze or that I, as metallurgist, combined the copper and tin to form *this piece of bronze*. Thus, it seems Lewis has a parallel motivation in saying that ‘Adam’ is ambiguous since when we talk about what Adam *will* do, it’s unclear whether we’re talking about the one branch or the other.

The crux of the issue, however, is whether this parallel in fact holds. I’m not so concerned that with Adam the two referents are of the same sort while with the statue/piece they are not. I, for one, *do* buy arguments that two things of a sort can coincide, such as Fine’s two letters written using the same piece of paper.¹⁵ In the case of the two letters, however, we can pre-theoretically distinguish them even when they coincide, whereas there is nothing intrinsic to the time prior to fission that makes it the case that there are two Adams. Of course, we can distinguish them by the properties they *will* have. Because of this, I think our ‘person’ talk *could have* developed as Lewis suggests. Just as the fact that highway 27 and highway 138 diverge north of town constitutes a difference between highway 27 and highway 138 even though right here they are ‘the same’ road, so too could we intend that the future differences between the

¹⁵ See Fine’s “A Counter-example to Locke’s Thesis”.

people resulting from the fission constitutes the multiplicity of people prior to the fission. But *do* we talk this way about persons? I think not.

Consider the statement, “I will visit Rome tomorrow,” uttered by Adam an hour before the fission. Lewis claims the name ‘Adam’ is ambiguous or improper, which means that sentences containing the name will likewise be ambiguous or improper. The same holds for demonstratives and indexicals.¹⁶ Thus we should say that if Cain visits Rome tomorrow but Abel doesn’t the sentence is, at best, partly true and partly false. However, linguistic intuitions — or at least *my* linguistic intuitions — suggest this claim is simply true in such a case. Adam *does* succeed in visiting Rome.

Linguistic intuitions are rather murky in this case, so one might well object that my theory is driving my intuitions. To testify on my behalf, I call my opponent, David Lewis, for he himself inadvertently endorses my case. In his defense of the claim that what matters in survival is identity, Lewis considers how we should best construe a person’s “commonsensical desire that he himself ... survive” when had by a person about to undergo fission. Or, as I would paraphrase the project, we are trying to determine the semantics for the everyday imperative “Let me survive!” or, simpler yet, for the indicative “I will survive.” Beginning with the claim that any thought had by one person at a time must be shared by any coincident persons at that time, Lewis follows a chain of reasoning that leads to the conclusion that this desire is satisfied if *either* of the continuants survives.¹⁷ Although Lewis is concerned with “I will survive”, it seems his chain of reasoning applies equally well to “I will feed the dog”, “I will visit Rome tomorrow”, or any other future tense claims made prior to fission: if we are to follow Lewis’s reasoning, the statement is true if *either* branch satisfies the predicate. But this is contrary to Lewis’s thesis

¹⁶ See “Postscripts to ‘Survival and Identity’”, p. 75.

¹⁷ “Postscripts to ‘Survival and Identity’”, pp. 74-75.

that our talk of ‘Adam’ or Adam’s talk using ‘I’ is ambiguous, that such terms have “the status of an improper description.”¹⁸

The alternative I propose is to say that the name ‘Adam’ refers to a branching, or two-headed, time worm — in the temporal part theorist’s argot, it refers to the sum of pre-fission slices called ‘Adam’, the post-fission slices called ‘Abel’, *and* the post-fission slices called ‘Cain’. Thus, Lewis’s conclusion that Adam’s utterance of “I will survive” prior to fission is true iff either branch survives conflicts with his own account yet agrees with the branching view I am endorsing. Philosophers have traditionally eschewed such solutions, assuming that countenancing such referents would mean sacrificing either common sense or the transitivity of identity. “If Adam is a two-headed worm, that explains our intuition that Adam survives,” goes the thinking, “but this means that when we speak of the two future branches, we are talking about *one* person. And yet clearly what we have after the fission are *two* people.” However, once we distinguish identity and sameness, we see that no such untoward consequences result. Just as there is only ‘one’ person prior to the fission, as counted by tensed identity, even if there are, as Lewis claims, two people as individuated by their spatio-temporal extensions, so too are there ‘two’ people after the fission, even if there is only a single, two-headed worm. If there are two person slices at the time we’re discussing, then as with Lewis’s story the proper count to give is ‘two’.

The alternative I am proposing, though, need not say that we are only dealing with a single two-headed worm. In fact, this is clearly wrong when considering what the referent of ‘Cain’ is after the fission. If the ‘Cain’ slices are in Rome and the ‘Abel’ slices are in London, we don’t want to count “Cain is currently in London” as true. So instead it seems that there are three worms. ‘Adam’ refers to the two-headed worm, ‘Cain’ refers to the worm consisting of the ‘Adam’ slices and the ‘Cain’ slices, and ‘Abel’ refers to the worm consisting of the ‘Adam’

¹⁸ See “Postscripts to ‘Survival and Identity’”, p. 75.

slices and the ‘Abel’ slices. Thus, rather than saying that a person is a maximal sum of I-interrelated person slices, as Lewis favors, we can say more simply and naturally that a person is the sum of all slices I-related to *a* slice, or, more specifically, the sum of all slices I-related to the slice in virtue of which we pick out that person.¹⁹ If I talk about the woman whose photograph I found in my grandfather’s trunk, I am talking about the sum of all slices I-related to the slice that was photographed. If I talk about the murderer of my grandfather, I am talking about the sum of all slices I-related to the slice that murdered my grandfather.²⁰ Whether our references succeed

¹⁹ Perry also advocates two-headed worms in “Can the Self Divide?” and, I believe, anticipates much that later appears in the literature on fission. Yet his (rather complex) account doesn’t work. According to Perry (pp. 482-3), names are assigned to person slices. The *primary referent* of (a name) *N* is the sum of slices I-related to the slice assigned to *N*. The *secondary referent* of *N* at *t* is the unique sum of slices I-related to the slice existing at *t* which includes the slice assigned to *N*. If there is not a unique sum, then *N* is improper at *t*. The sentence “*N* has *F* at *t*” is then true iff the secondary referent of *N* at the time of utterance contains a person slice at *t* that has *F*.

There are various problems with this account. First, Perry’s specification of when names are improper does not match linguistic intuitions. According to his semantics, “Adam fears his fission” is proper when uttered before the fission, but “Adam feared his fission” is improper if uttered after the fission. Why make the referent of a name vary with the time of utterance?

Second, Perry gives a rather strange analysis of temporal adverbs. “At *t*, *N* has *F*” contains a proper reference to *N* iff the secondary referent of *N* at *t* is proper. “*N* has *F* at *t*,” in contrast, contains a proper reference to *N* iff the secondary referent of *N* at the time of utterance is proper. “Adam will be in Rome after the fission” is true, when uttered before the fission, since the two-headed worm has a stage that will be in Rome, though “After the fission, Adam will be in Rome” is false, since ‘Adam’ has no secondary referent after the fission.

Third, consider the case in which the Cain slices visit Rome and the Abel slices visit London. Although Perry’s semantics makes both “Adam will be in Rome” and “Adam will be in London” true if uttered before the fission, correctly in my opinion, it also makes “Cain will be in London” true when uttered before the fission since the secondary reference of ‘Cain’ prior to the fission is the two-headed worm which does have a future slice in London.

Fourth, according to Perry “*N* is identical with *M*” is “true at *t* iff the secondary referent of *N* at *t* is identical with the secondary referent of *M* at *t*.” (pp. 482-3) Thus, before the fission it is correct to say that Cain and Abel are identical and hence that there was only one person present, since both names will refer to the two-headed worm. Intuitively, however, there is one sense in which it is proper to say, even prior to the fission, that the person who will be in Rome and the person who will be in London are *not* the same person. I think we must recognize two senses of our quantifiers, one temporally relativized, which I call ‘sameness’, and the other non-relativized, which I call ‘identity’. While the person who will visit Rome and the person who will visit London are *currently* the same, they differ in the sense that one visits Rome while the other does not.

²⁰ Of course, often when we refer it is not a single slice in virtue of which we refer. If I refer to the man I just met, my concept of that man is formed through a causal connection with the many slices that span the five minutes I talked with him. Worse yet, my reference to my mother succeeds in virtue of slices spread throughout my entire lifetime. But this is no problem, for in these cases the sum of all slices I-related to one of these slices picks out the same worm as the sum of all slices I-related to another. We have an ambiguity, but an ambiguity hidden to us below the level of the referent or the sentence. The only ambiguities that surface at the sentence level are those we would want to surface, for example if I were ignorant of the fission and associated the name ‘Adam’ with the person

in virtue of fitting some description or in virtue of some causal chain, we can say that it is most directly slices to which we are thereby connected and only derivatively do we refer to persisting things.

Why do I say that it is more natural to think of a person as the sum of all slices I-related to a slice? First, notice why it would be more natural for Lewis. Lewis's central thesis in "Survival and Identity" is that what matters in survival is identity *and* is mental continuity. That is, what I want when I desire to survive is that the person who will persist be identical to me and have mental states continuous with mine. Lewis thinks these are both true since the stages that are related by mental continuity just are the stages of identical persons. But it is odd, then, that Lewis recognizes two individuals, Cain and Abel, overlapping prior to the fission. For if Lewis is right in saying that what matters is identity and mental continuity, then what matters to Cain prior to the fission should be that the surviving person be identical to him. Likewise for Abel. But according to Lewis what Cain desires is instead that *either* he or Abel survive. This accords with the claim that what matters is mental continuity, but it doesn't jibe at all with the thought that what matters is identity.²¹ Lewis can maintain his thesis that what matters in survival is identity *and* is mental continuity, but only by recognizing two-headed worms.²²

I met before fission we're calling 'Adam' and also with the person after the fission others call 'Cain'. In this case the referent is ambiguous and sentences such as "Adam has never been to Tokyo" reflect this with an ambiguous truth value.

²¹ Similar arguments are given by Sider (*Four-Dimensionalism*, pp. 202-204) and Parfit ("Lewis, Perry, and What Matters").

²² I have argued that a person is the sum of slices I-related to one particular stage, rather than, as Lewis has it, a person is a maximal sum of I-interrelated person slices. Lewis himself gives no argument for this view. Consider how Lewis motivates an appeal to mental continuity and connectedness:

"I find that what I mostly want in wanting survival is that my mental life should flow on. My present experiences, thoughts, beliefs, desires, and traits of character should have appropriate future successors. My total present mental state should be but one momentary stage in a continuing succession of mental states. These successive states should be interconnected in two ways," i.e., these states should differ only gradually from those they succeed and they should be caused by those they succeed ("Survival and Identity," p. 55).

In my opinion, Lewis lays out common sense rather nicely, saying that what one wants in wanting survival is that their current mental state 'flows on', which, he explains, means that the succession of their future mental states "should conform, for the most part, to lawful regularities concerning the succession of mental states—regularities, moreover, that are exemplified in everyday cases of survival." It sounds like all stages that flow from one's present

Would such a notion of a person wreak havoc with our theories of reference? Quite the contrary. If you thought a singular term refers to the persisting *object* which fits the description (or most of the descriptions) which the speaker associates with the term, you can now say instead that a term refers to the sum of all slices I-related to the *time slice* which fits the description. If you thought a term refers to the *object* bearing the appropriate causal or historical relation to the speaker's use of the term, you can instead say the term refers to the sum of all slices I-related to the *slice* bearing the appropriate relations to the speaker's use of the term. If we focus on any slice prior to the fission, or, in other words, if we focus on the person as he was prior to fission, we thereby refer to Adam; if we focus on a slice after fission, we refer to Cain or to Abel. This, say I, preserves common sense.²³ If, as Lewis says, it is natural to talk about there being *one* person who entered the duplication chamber, so too is it natural to *refer* to *him*, i.e. to the sum of slices I-related to the slice we are focusing on at the time in question.

I have given one reason for countenancing two-headed worms, viz., that when we speak of a person who will undergo fission we say that she will do those things that *either* future branch does. I think we can support this semantic hypothesis by examining our concept of a person. Lewis, like others, has appealed to the analogy between splitting roads and splitting people. But there are other ways we could, and in fact do, individuate objects. The logic of talk of rivers seems to be quite different, for at the confluence of two rivers, one of them necessarily

stage, and, presumably, all those which flow into their present stage, where this notion of 'flow' is cashed out in terms of psychological succession in the right way, constitutes that person. But what he has so far described is the account I favor and not his own! In the final quoted sentence, Lewis adds the requirement that stages *all* be *interconnected* by the right sort of relation. This, when understood as Lewis's account requires, specifies that any future stage of a person must flow from or flow into any other future stage of her. In so doing, he amends the nice-sounding description he has so far given and *stipulates* without argument that multiple branches are not allowed within a single person's future.

²³ A note on methodology: I say the theory *preserves* common sense but not that the theory itself *is* common sense. Unlike many metaphysicians, I see the goal to be theories which preserve the claims of common sense, not theories whose theoretical posits are themselves fitting with common sense. For like-minded voices, compare Stalnaker's "Counterparts and Identity," p. 127: "The semantic thesis, and the contrasting one from the standard theory, should be judged on how well they account for the use of ordinary modal language, and not on alleged intuitions about how theoretical terms of the theory relate to the modal language they are being used to explain." Similarly, see Hazen, "Counterpart-Theoretic Semantics for Modal Logic", pp. 320-324.

ends. For those who, like me, believe psychological continuity underlies personal identity while physical continuity underlies the identity of most other physical objects, we can perhaps explain why we treat persons differently in cases of fission. For when a non-thinking object splits, as with the fission of an amoeba, *half* of the matter goes to form one of the resulting amoebae while the *other half* goes to form the other. In contrast, with the fission of people *all* of the beliefs, desires, etc. persist unaltered in both resulting streams of consciousness. Perhaps, then, it is the large sudden change in the essential make-up of physical objects and the lack of a change in the essential make-up of thinking things that explains why we treat cases of fission so differently. Thus, if one believes it is the physical make-up that is key for the persistence of most objects and the psychological make-up that is key for the persistence of thinking objects, it is very natural to say that Adam is a single person who will survive as two different people.

As a comparison, let's consider an even clearer case of fission, the splitting of a wave. Imagine that a tidal wave, generated by an earthquake, approaches a small island from the south, the wave splitting when it hits the southern point of the island such that the western part of the wave travels up the west side of the island and the eastern part travels up the east side. But let's say the wave traveling up the eastern side reaches the northern tip of the island first, whether because the western shore of the island juts out more and is longer than the eastern shore or because the water is deeper on the western side of the island making the wave on that side slower. The result is that the eastern wave leaves the northern tip of the island first, and some thirty seconds later the western wave hits the northern tip and continues north *following* the wave that came from the eastern side. Thus, after the waves have passed the island we would see what all would describe as *two* waves traveling north, one behind the other. Yet we would also say of each of the two waves that it originated at the site of the earthquake and, paradoxically, that at the site of the earthquake there was only one wave that was spawned, a wave that continued past the island.

Waves are patently not individuated by the matter composing them since, like rivers, the matter composing them is replaced continuously. Instead, what makes a wave we see at t the

same as a wave we see at t' is, roughly, that the energy from the former has been passed to the energy of the latter by means of a spatio-temporally continuous hill of water. What makes two parts of waves parts of the same wave at a time is, roughly, that there is a spatially continuous hill of water at that time leading from one to the other.²⁴ Like the conditions for being the same person over time or at a time, these conditions allow that what are now two waves once were one and the same wave. It is the fact that the conditions for waves and persons do allow this, along with the distinction between sameness and identity, that explains why there can be cases of fission.

A final consideration in favor of branching persons pursues the counter-intuitiveness of saying that Adam's thoughts about himself are about *two* people.²⁵ If when Adam says "I will survive" he in fact is thinking the thought "One of us will survive", that means that despite the fact that Adam and I are currently physically identical, have identical histories, have identical contexts, and even have everything appearing identically in introspection, if unbeknownst to us he will someday undergo fission and I won't, then he and I must be thinking different sorts of thoughts about ourselves. Taken together with the other two reasons, I think there is a strong case in favor of branching persons.

5. Sosa's Objection

Sosa contends that Lewis's account does not explain away the paradox of fission, that common sense conflicts with the story Lewis tells. He considers a case of fission that occurs at t_1 , where according to Lewis two people, P1 and P2, spatially coincide prior to t_1 and diverge thereafter, P1 then traveling to London and P2 to Tokyo.

Suppose at time $t(0.5)$ the stream of consciousness contains the thought T_a : [I will be in London at t_2]. At $t(0.5)$ each of P1 and P2 thus self-attributes the property of being in London at t_2 . It might now be thought

²⁴ Since two intersecting waves can either add or cancel each other out, leaving a gap in each, a more accurate account might employ counterfactuals, speaking of the spatially continuous hill that exists relative to what would exist were this wave not present.

²⁵ Martin Montminy brought worries of this sort to my attention (in correspondence).

that Ta itself must then turn out both true and false. But this is open to a reply: “It is not Ta that can be true or false, just as the sentence ‘I will be in Tokyo at t2’ can be neither true nor false on its own. What is true or false is rather the thought Ta *relative* to a time/person context such as t(0.5)/P1 or t(0.5)/P2.” This seems a promising reply, but there is still trouble ahead.

Suppose that at t(0.5) the stream of consciousness also contains the thought Tb: [I will be in Tokyo at t2]. At t(0.5) each of P1 and P2 thus self-attributes the property of being in Tokyo at t2. But surely at t(0.5) the following thought Tc might also occur: [Noone is both in London and in Tokyo at t2]. Simple logic then leads from Ta and Tc to Tb’: [I will *not* be in Tokyo at t2]; and from Tb and Tc to Ta’: [I will *not* be in London at t2]. But it seems absurd to suppose that anyone could at any time fully assent to both Ta and Ta’ or to both Tb and Tb’.²⁶

And why is it that I can reasonably believe at t(0.5) *both* that I’ll be in London at t2 *and* that I’ll be in Tokyo at t2? According to Sosa,

... Ta and Tb both deserve a place in that stream of consciousness, on the following basis: If one will be in a certain city C at some future time t’, later than t, it is then logically, metaphysically possible for one to believe correctly at t that one will be in C at t’, and compossible with anyone else’s doing otherwise.²⁷

However, notice that this principle which Sosa endorses states that one can correctly believe certain things compossible with *anyone else’s* doing otherwise. In general this principle seems quite reasonable, but in Sosa’s argument the force of this is that when we’re considering what it is possible for P1 to believe, this is independent of what P2 believes at that time, and in this case it seems intuitively wrong. The problem is that we are not distinguishing between things being *wholly distinct* and things being only *partially distinct*. It is possible for one piece of metal to be in one city while *any other* piece of metal is in another city, but only if ‘any other’ means something wholly distinct from the first. The upper two-thirds of the Eiffel Tower cannot be in London while the lower two-thirds is in Tokyo, for the two are partially identical. Similarly, Lewis would claim, P1 and P2 overlap, sharing many temporal parts, and therefore the beliefs of P1 at t(0.5) are *not* metaphysically independent of the beliefs of P2 at t(0.5). Prior to fission, P1 can only reasonably believe something if P2 can also reasonably believe it since, after all, in all ways intrinsic to that time P1 *just is* P2. According to Lewis, ‘Adam’ is ambiguous, referring to two partially overlapping people, and thus if Adam is thinking about his impending

²⁶ “Surviving Matters,” p. 300.

²⁷ “Surviving Matters,” pp. 300-1.

fission, he/they could believe “*One of us* will be in Tokyo at t_2 ” consistent with believing “*One of us* will be in London at t_2 ”, but he/they could not entertain the inconsistent first-person singular beliefs required for Sosa’s argument. Lewis’s account is thus immune to Sosa’s objection, for the thoughts Sosa considers are not, after all, compossible.

I, on the other hand, still have some explaining to go. Because Adam is a single individual that consists of two future branches, it seems it *is* reasonable for him to believe both that he’ll be in Tokyo at t_2 and that he’ll be in London at t_2 . And this, it seems, leads me back into Sosa’s trap. But this problem rests on a simple scope ambiguity. Because we are analyzing tensed predications as quantifiers over slices, and because we are now countenancing two-headed time worms, ordinary tensed statements will not be ambiguous, but those involving logical operations will be. “I will be in Tokyo” is true iff *any* future slice of the speaker is in Tokyo. The statement “I will not be in Tokyo at t_2 ,” though, has two readings which in ordinary cases are equivalent but in cases of fission are not. Giving the negation wide scope, the statement is true iff it is not the case that a slice of the speaker at t_2 is in Tokyo — i.e., iff *neither* branch is in Tokyo at t_2 . Giving the quantifier wide scope, the statement is true iff a slice of the person at t_2 is not in Tokyo — i.e., iff *one* of the branches isn’t in Tokyo at t_2 .²⁸ This explains away the puzzle that Sosa presents, for not only can someone believe “I will be in Tokyo at t_2 ” and “I will not be in Tokyo at t_2 ”, but, giving the quantifier wide scope, one can even believe both of these *correctly*!

Going further, the claim “Nobody is both in London and in Tokyo at t_2 ,” presents two ambiguities. One ambiguity rests upon whether the conjunction or the quantifier is given wide

²⁸ Is it odd to say that the sentence “I will not be in Tokyo at t_1 ” is ambiguous? We can expect talk of fission to bring some oddities, but this ambiguity is of a piece with what we already have in English. Consider a rich man saying, “I will not be rich tomorrow.” Is this true if the next day at noon the man loses everything he owns, i.e. if at 8:00 am the next day he is rich but at 2:00 pm he is not? It seems so, suggesting that one valid reading of this statement takes the quantifier over times as having wide scope. I am not committed to there being a valid reading on which the negation has narrow scope in this case, just as I am not with cases of fission, but I want to point out the ambiguity that arises *if* it is legitimate.

scope. If a person undergoes fission, perhaps he will be in London at t_2 (by having a slice of one branch there) *and* he will be in Tokyo at t_2 (by having a slice of the other branch there), and so if we interpret “I will be in London and in Tokyo at t_2 ” as equivalent to “I will be in London at t_2 and I will be in Tokyo at t_2 ”, the statement could easily be true. But giving the quantifier wide scope the statement is true iff he has a slice that at t_2 is in London *and* in Tokyo, something quite unlikely given current day geography and human physiology.

The second ambiguity lies in the tense of “Nobody is both in London and in Tokyo”. If we focus on a person at a time, I have suggested that we thereby pick out all slices I-related to that person slice. Thus, no matter which person slice we focus on to pick out a person, we thereby have picked out a person that *at that time* can only be in one place.²⁹ In this sense the claim that nobody is in two places at one time, and likewise the claim that nobody can have two streams of consciousness at a time, is guaranteed by our concept of a person.³⁰ However, when we focus on a person slice to pick out a person, that person *can* be at two places and *can* have two streams of consciousness (properly understood) at *some other* time.

Since we ordinarily deal only with people that do not undergo fission, it is no wonder that we conflate different interpretations that pull apart with science fiction. But if we do consider science fiction cases, it is natural, I suggest, to think that claims such as “Spock will be on the

²⁹ Time travel provides a counter-example. But there is intuitive pull that if traveling back in time is possible then one person can be at two places at one time. What our concept of a person guarantees, it seems, is that no matter which person we pick out by focusing on a slice of that person, that person can only be at one place at that point in *personal* time.

³⁰ Sosa has suggested (in conversation) that the account I am endorsing violates the requirement of the unity of consciousness. I take this section to show that the requirement needs to be disambiguated but, properly construed, it is in fact an essential part of the account. Any person we pick out at any time can only have at that time one stream of consciousness. Nonetheless, it is possible that at some later time that person *will have* two streams of consciousness. As soon as we think of her at that later time and thus think of her two bodies or streams of consciousness, we are then thinking of two persons. Thus, using our everyday way of thinking of a person we can never conceive of a person who ‘has’ two streams of consciousness. It is only when we step outside of time and adopt tenseless predications that, when considering fission cases, we can say that a person ‘has’ two streams.

planet at t_2 and he will be on the Enterprise at t_2 ” are, as science fiction stories have it, quite reasonable after all.³¹

6. Avoiding Conflicts with Logic Using a Semantic Approach

The correct semantics for talk about the fission of persons is an empirical issue. Perhaps Lewis is right that our references to Adam are ambiguous. Or, perhaps the alternative I’m suggesting is correct. In either case the original paradox can be dissolved by recognizing the temporal relativity of our natural language quantifiers. Thus, my primary goal is merely to convince the reader that, contrary to the predominant view, the possibility of fission *does not* show — and certainly does not *easily* show — that the naive claims of the non-philosopher are inconsistent. Given an apparent conflict between logic and common sense, charity demands that we at least try to find a semantics that reconciles these putatively conflicting claims *before* any metaphysical conclusions are drawn. And yet the debates on personal identity have typically skipped any such investigation and have instead presupposed a semantics on which common sense is blatantly inconsistent.³²

There are certainly cases where people do err when speaking; in some cases they later discover some new fact and so *they* realize they were previously wrong, and in other cases we are privy to some fact they don’t know and so *we* realize they are wrong. For example, it seems

³¹ Fine has raised an objection (in conversation) similar to Sosa’s. On the usual temporal parts semantics, for a subject S and a temporally intrinsic property Φ , “ S will Φ ” is true when uttered at t iff a temporal slice of S existing after t Φ ’s. But consider the sentence “I will think (correctly) that I am in Rome,” as uttered by Adam prior to his fission. Intuitively this should count as true in the imagined circumstance since, on the semantics I am advocating, Adam *will* be in Rome. The difficulty is in specifying the referent of the second ‘I’. Presumably this should refer to the same thing as the ‘I’ occurring in Adam’s statement when he eventually exclaims “I *am* in Rome!” But *that* ‘I’ refers to Cain, i.e., to all slices I-related to the slice that utters this sentence. Thus, there appears to be a reference shift when singular terms are within the scope of a tense operator.

I therefore suggest that a singular term attaches most directly to a slice, and each tense operator in which the term is embedded shifts the target slice, the ‘referent’ being the sum of slices I-related to the resulting slice.

³² Note that debates on personal identity are not unique in this respect. Van Inwagen speaks generally of “a recent tendency of some philosophers to think that there is an at least *prima facie* conflict between logic and common sense.” (“Forward” to *Material Constitution*, ed. Michael Rea, p. x.)

quite reasonable to say that ancient people who called whales ‘fish’ were in error since they were not aware of the underlying physiological similarities between whales and other mammals and the underlying physiological dissimilarities between whales and other swimming creatures. With many metaphysical disputes, in contrast, such as debates over material constitution, it is often claimed that the non-philosopher knows all the facts — or rather all of the *empirical* facts — and yet is still wrong. A better analogy, therefore, is to imagine us coming across a people who learn all physiological information about whales and fish but are still unrepentant in calling them by the same name. In this case it seems reasonable to say that they *are* using their term correctly, that their term does *not* refer to fish but to swimming creatures living in water. Often in metaphysics all microphysical facts are known or stipulated, yet the macrophysical facts which supervene on them — how many people entered the duplication chamber and the like — are nonetheless at issue. What could determine these supervenience relations? On one picture, there are some hidden necessary truths that the philosopher brings to light, and it is ignorance of *these* that explains the layman’s error. A burden for this approach, of course, is explaining these necessary truths. On an alternative picture, however, the supervenience relations are underwritten by our semantics: learn the language, perhaps together with some empirical facts, and you thereby learn how the microphysical determines the macrophysical. There are only simple conceptual necessities.

I will not attempt a general argument for a semantic approach to metaphysics. Certainly, if one can avoid imputing error to the folk, one thereby brings charity of interpretation and avoids the need to explain both how and why the folk err. This general preference for charity, however, does little to show that the multitude of particular metaphysical puzzles *can* be resolved in this way or that there are not incumbent overriding costs. But I am hoping to illustrate how fruitful a semantic approach might be in dealing with the paradox of fission. We *can* consistently claim that Adam survives, that Adam is only one person, and that the products of the fission are two different people, never violating the transitivity of identity. In fact, we can do this in various ways, and what remains is the empirical question of which best captures our

linguistic usage. That is, we can avoid the charge that common sense is incompatible with logic by instead exploring *what* the logic of common sense claims is.

Before proceeding, though, notice that we need not commit to there being a single correct semantics for such statements, at least if sentence meaning is in part determined by speaker intentions. Instead we can leave open the possibility that the semantics of English are indeterminate. Perhaps some people intend their talk of ‘persons’ to have the semantics Lewis sketches, and others intend such talk to have the semantics I have sketched, in which case sentence meaning is indeterminate. Or perhaps each person is drawn in both directions, so that even speaker meaning is indeterminate. Thus, as long as this is merely a semantic issue, we need not commit to there being a single determinate answer to questions about fission cases.

7. Abstracting Away from Commitments to Temporal Parts

We have examined Lewis’s resolution to the paradox of fission and my own alternative to his story. Both employ a particular understanding of our quantifying expressions, one that recognizes that our counts and, even more generally, our quantifiers, are often temporally relative, and, thus, both resolutions understand our terms as referring to what in one sense are multiple things that without any mysterious interpenetration of one by the other can be located at the same place at the same time.³³ But while I have presented these resolutions to the paradox within the framework of temporal parts theory, the work in resolving the paradox is being done solely by the semantics, and this is *independent* of the underlying ontology. Hence, I will now abstract away from the commitments of the formulations we have been employing to convince those who eschew temporal parts that the argument I have given up to this point should be equally palatable to them.

³³ I say ‘in one sense’ because when we are counting by tensed identity, as we usually do, we never have colocation. At times when Cain and Abel were colocated, there was only *one* person present. However, assuming we also count by identity, then in *this* sense there were two — or, if I am correct, three — people located at the same place at the same time.

To illustrate this abstraction from metaphysical commitments, let's examine temporal parts theory and one of the metaphysical views competing with it, the theory saying that instead of temporal parts of perduring objects bearing temporary intrinsic properties there are simply enduring objects bearing relations to times.³⁴ Thus, while Lewis presents the following sort of truth conditions for tensed sentences:

“X will be Φ ” uttered at t is true iff the temporal slice of X at some $t' > t$ bears the (temporally intrinsic) property, Φ ,

Lewis's opponent, call her a relationist, provides somewhat different conditions:

“X will be Φ ” uttered at t is true iff X bears the (temporally intrinsic) relation Φ to some $t' > t$.

These two contrasting specifications are in fact each accomplishing two independent tasks. First, they are spelling out the semantics for future tensed predications, and, second, they are spelling out the ontology underlying change. The first task is carried out simply by stating the truth conditions for our future tensed language in an untensed meta-language.³⁵ This can be accomplished with a rather trivial statement as part of a purely *semantic* theory as follows:

“X will be Φ ” uttered at t is true iff X is Φ at $t' > t$,

where the ‘is’ in ‘is Φ ’ is a tenseless copula. Corresponding statements handle other tenses.

The second task is to state the underlying ontology *in virtue of which* X is Φ at t . For the temporal part theorist, a single statement in one's *metaphysical* theory will suffice:³⁶

³⁴ Lewis lays out these two views in *On the Plurality of Worlds*, pp. 202-205. A third position that has emerged is that objects instantiate intrinsic properties yet it is the instantiation relation which is temporally relative. I will not discuss this view, though the arguments I am presenting apply equally well, *mutatis mutandis*, to this position as well.

³⁵ As Lepore and Ludwig have argued, because a context insensitive metalanguage is essential for the generality of the analysis, an untensed metalanguage is necessary to capture the indexical nature of our tensed language. (“Outline of a Truth Conditional Semantics for Tense,” §2)

³⁶ These statements hold only for those properties (or relations, according to the relationist) that are intrinsic to a time. Properties that *are not* intrinsic to a time can be analyzed into other properties that *are* intrinsic to a time. For example, something is *growing* at t iff the *size* it has throughout some interval about t increases as t increases. What I call temporally intrinsic properties, or properties intrinsic to a time, Peter Simons calls “time-blinkered properties”

X is Φ at t in virtue of a temporal slice of X at t being Φ .³⁷

For the relationist, the corresponding statement is:

X is Φ at t in virtue of X bearing the Φ relation to t.

Those subscribing to yet other metaphysical views will endorse yet other statements.

Now that we see in outline how to separate the semantics from the metaphysics, we can sketch the semantics for tensed identity, or sameness, in an ontologically neutral way. First, for comparison, here is the temporal part theorist's statement of tensed identity:

“X and Y are the same” uttered at t is true iff the temporal slice of X at t is identical to the temporal slice of Y at t.³⁸

To remain neutral with respect to the underlying ontology, we can simply say:

“X and Y are the same” uttered at t is true iff the set of X's properties intrinsic to t is identical to the set of Y's properties intrinsic to t.³⁹

(*Parts*, p. 229) and Chisholm (*Person and Object*, ch. 3) calls properties that are not “rooted outside the times at which they are had.”

³⁷ As Sally Haslanger has helpfully impressed upon me (in correspondence), the two occurrences of ‘ Φ ’ mean slightly different things. The first picks out a relation to a time while the latter picks out a property corresponding to the relation. For ease of exposition, I ignore this here, though this becomes critical in evaluating Lewis's argument from temporary intrinsics.

³⁸ First: Notice a worry on this account: Fine has argued (“A Counter-example to Locke's Thesis”) that two messages scrawled on the same piece of paper constitute two coincident letters. It seems they are ‘two’ as counting by tensed identity, since it is in virtue of features intrinsic to a time that we count them as two. If this is right, it suggests that we need to alter Lewis's account such that x and y are the same F at t iff they have identical temporal parts at t *and* the features that make x an F and the way in which those features make it an F are identical to the features that make y an F and the way they do so. It is the one pattern of ink stains that make this piece of paper letter x and another that makes it letter y. Or, in the case of one pattern of ink stains constituting two different messages in different languages, it is the fact that the ink stains mean Mx in language Lx, that makes the piece of letter containing them letter x, and it is the fact that the ink stains mean My in language Ly, that makes the piece of letter containing them letter y. I ignore such worries, for the same problem occurs, and the same problem can be fixed just as easily, whether we're spelling out sameness using temporal part talk or ontology-neutral talk.

Second: The standard temporal parts view is that two objects, b and c, that are constituted of the same things at t will share a temporal slice at t. One might have a competing view, however, that the temporal slice of b at t and the temporal slice of c at t might not be identical since they might differ modally. Thus, a more general way to express the temporal parts truth conditions would be:

“X and Y are the same” uttered at t is true iff the non-modal properties of the temporal slice of X at t are identical to the non-modal properties of the temporal slice of Y at t.

³⁹ An alternative way of spelling out sameness that we might consider is:

This statement remains neutral with respect to metaphysics while allowing for ‘one’ thing to become ‘two’, with nary a conflict with logic. Whichever metaphysical theory might turn out to be true, or even if there is no deeper metaphysical truth about what it is for something to change, we can dissolve our paradox with just semantics.

Of course, not only can we remain neutral in spelling out sameness. We can also spell out various theories of personal identity with purely semantic theories. And again our semantic theory can look much like the temporal part theorist’s statements about personal identity. In fact, we can mimic the temporal part theorist. The temporal part theorist that I have envisioned says persons are sums of all person slices I-related to a particular slice. Person slices are, in turn, sums of simultaneous particle slices that bear the S-relation to each other, let us say.⁴⁰ Note that

“X and Y are the same” uttered at t is true iff anything that constitutes X at t constitutes Y at t and vice versa.

Consider a worry one might have. It is possible that there are fundamental particles, call them transions, that don’t repel one another but instead often pass right through each other. It seems that two transions that are coincident at some time t would have identical properties intrinsic to t. Being the same sort of particle, they would have the same charge, spin, charm, wit, or any other basic properties physicists come up with. Yet ex hypothesi their locations are also identical. By the account given these transions are related by sameness. But we clearly don’t want to say this since as I have described them they are entirely independent of each other at all times, whereas things related by sameness are identical in all respects up to their fission and are to be considered ‘two’ only in that a multiplicity is introduced after this point. Thus, one might question whether the proffered accounts of sameness are adequate. However, notice that as I’ve described these transions, they independently persist through time. Thus, at every point in time t there must be something at t about one of the transions, say b, that makes it identical to b and not the other at some other time. In other words, its identity across time must be grounded. (Though some deny this in the case of trans-world identity, none that I know deny it for trans-temporal or trans-spatial identity. Even arbitrary sums have grounded identities. The collection of marbles m, n, and o is identical across space because each spatial part of it is a part of the collection m, n, and o.) Thus, there must be some property of these transions intrinsic to each time that distinguishes them, and, therefore, they will not be counted as ‘the same’ after all.

A similar concern is with the possibility that there are fundamental particles which don’t have identities across time. Perhaps electrons are like this: if an atom gains an electron and later loses one, perhaps there is no fact of the matter about whether the one it lost was the one it gained. Perhaps the only facts are that the atom gained and lost such properties as electrical charge. This would mean that the atom currently contains six electrons but each of the six electrons has the same properties intrinsic to the present time as the others. According to the account given, this would mean that these electrons are related by sameness and there is only ‘one’ at t, despite the fact that the atom has a much greater negative charge than it would if it had only one electron; this conflicts with the idea that there is only ‘one’ thing at a time, counting by sameness, iff it is no different at t than as if there were only ‘one’ thing as counted by identity. To avoid an extended digression, let’s simply say that we’re here concerned with quantifiers over things that have identities across time.

⁴⁰ Cf. Lewis, “Rearrangement of Particles,” p. 71.

the temporal part theorist we are considering helps herself to the I-relation, i.e., the general conditions for constituting a person *over time*, as well as to the S-relation, i.e. the general conditions for constituting a person *at a time*. In fact, all the temporal part theorist *does* provide is the underlying ontological basis for persons, i.e., that persons are sums of person slices that are sums of particle slices.

Keeping to a neutral framework we can instead say that a person is constituted of, as common sense has it, a collection of atoms, or particles.⁴¹ Which particles? For any time *t*, a collection of particles constitutes a person at *t* iff it satisfies the same conditions, though relativized to a time, that the temporal part theorist presupposes in her conditions for being a person slice. Thus, whereas the temporal part theorist specifies when the *constitution* relation holds between *particle slices* and *person slices*, we can remain ontologically neutral by specifying when the *constitution at a time* relation holds between *particles* and *persons*. For example, perhaps the temporal part theorist says particle slices constitute a person slice only if they are all contiguous; parroting this, we can say that a collection of particles constitutes a person *at t* only if they are all contiguous *at t*. For any property or relation mentioned by the temporal part theorist, we can use the time-relative correlates to translate out of the temporal part theorist's four-dimensional jargon.

In a similar way we can handle the conditions for being a person *over time*: we can say that a collection *c* of particles that constitutes a person at time *t*, and a collection *c'* of particles that constitutes a person at *t'* constitute identical persons just in case *c* at *t* and *c'* at *t'* satisfy the conditions specified in the I-relation. For example, perhaps the temporal part theorist requires persons to be made up of person slices bearing certain causal relations between them. Similarly,

⁴¹ Speaking of 'quantity of matter' would be more accurate, rather than 'atoms'. First, we do not wish to commit to persons being constituted by a plurality or atoms. Perhaps science could have discovered that each person is a single, malleable atom. More importantly, we do not wish to commit to these 'atoms' being atoms in the literal sense of having no proper parts, since atomless gunk is certainly possible. Stating conditions in terms of quantities of matter, though, is more cumbersome, so for ease of exposition I retain the misleading talk of atoms.

we can require that those same causal relations obtain between *c* at *t* and *c'* at *t'* (or between the properties instantiated by *c* at *t* and the properties instantiated by *c'* at *t'*). Thus, we can specify the conditions for being a person that are parallel to those offered by the temporal part theorist but without committing to any momentary objects such as person slices or particle slices.

Summary

Having sketched the semantics for our natural language quantifiers, we have seen that there is an interpretation of our words upon which the paradox of fission dissolves. We can, as it were, say what we like. Only one person entered the duplication chamber, viz., Adam;⁴² Adam survived the fission; and yet Cain and Abel, both of whom *were* Adam, now *are* two different people. The semantics of our quantifiers and of our talk of persons shows that such pre-theoretic claims can be consistent after all. Best of all, contrary to standard solutions appealing to some preferred ontology, the resolution we have been exploring is independent of one's metaphysic, for we can spell out the semantics of our quantifiers and even spell out the identity conditions for persons, all the while remaining neutral on any questions concerning underlying ontology.⁴³

⁴² Imagine Cain saying, "I was the only person to enter the duplication center," to which Abel responds, "No, because I too was there!" Cain's statement is ambiguous as intuition requires. On one reading he is truly saying that there *was* only one person who entered the center, and that person *is* he. On the other reading, to which Abel may appropriately object, he is falsely saying that there *is* only one person who entered the center, and that person is he. That is, we have a simple scope ambiguity, with either the quantifier over times or the quantifier over people (at a time) taking wide scope.

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