A Survival Guide to Fission

Draft Date: July 19, 2007

Mark Moyer

Abstract

The fission of a person involves what common sense describes as a single person surviving as two distinct people. Thus, say most metaphysicians, this paradox shows us that common sense is inconsistent with the transitivity of identity. Lewis's theory of overlapping persons, buttressed with tensed identity, gives us one way to reconcile the common sense claims. Lewis's account, however, implausibly says that reference to a person about to undergo fission is ambiguous. A better way to reconcile the claims of common sense, one that avoids this ambiguity, is to recognize branching persons, persons who have multiple pasts or futures.

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 — or, more properly, if 'Adam' ambiguously refers to two people — 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? Similarly, 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 child support for the month while at that same moment the other is in Dallas envying his neighbor's new kayak? 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. 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]

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[1] I speak of what 'common sense' says about such cases. 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 whether, according to common sense, it would be wrong to do act A, where A is something never encountered.

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. Thus, 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. 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.[2] Lewis argues that Adam is in fact two people, while Ehring takes the opposite tack and claims Cain and Abel are one person.[3] Parfit takes the puzzle to show that the best description is that Adam ceases to exist, so he will later be neither Cain nor Abel.[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 are *not* inconsistent. My view takes its cue from Lewis's, so in section 1 I begin with his solution appealing to temporal parts. I explore and defend Lewis's distinction between identity and tensed identity, since this distinction is a major plank of my view. This bit of semantics allows us to understand the sense in which Lewis's two overlapping people are 'two' and yet reconcile this with the common intuition that prior to fission there is only 'one' person present; with minor adjustments, this semantic story provides one account on which everyday claims about fission are in fact consistent. In section 2, however, I depart from Lewis to develop a competing account that also reconciles the seemingly inconsistent claims of common sense. Like Lewis's story, mine also employs temporal parts, but mine differs in recognizing branching persons, that is, persons who will be, or who once were,

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[2] Chisholm, *Person and Object*, Ch. 3.

[3] Lewis, "Survival and Identity"; Ehring, "Personal Identity and Time Travel."

[4] *Reasons and Persons*, Part III.

[5] "Fission and the Facts," p. 393.

two people. Once we deploy the distinction between identity and tensed identity we see that the raft of problems thought to beset such a position rest upon confusion.

1. Lewis's Solution

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, or stage, is a spatially maximal momentary temporal part of an object.[6] For example, the current stage of me is that which extends in space exactly as far as I currently do but, unlike me, exists only at the current moment. Furthermore, objects satisfy predicates in virtue of the temporal parts of the object instantiating associated properties.

"Eleanor was tall" is true at t iff a stage of Eleanor before t is tall.

"Eleanor is tall" is true at t iff a stage of Eleanor at t is tall.

"Eleanor will be tall" is true at t iff a stage of Eleanor after t is tall.

Many predicates require a more complex analysis involving more than just a single slice existing at the time indicated by the tense. For example,

"Eleanor is growing" is true at t iff throughout some interval surrounding t, each of the stages of Eleanor is larger than all previous stages of her during that interval.

To address issues of personal identity, Lewis employs the notion of the I-relation, that relation that holds between any two stages of a single person.[7] According to Lewis, a person is a maximal sum of I-interrelated stages. That is, for any collection of person stages that (a) are all I-related to one another, and for which (b) no other stage is I-related to them all, the sum of that

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[6] Sider gives a more rigorous definition: "x is an instantaneous temporal part of y at instant t =df (1) x exists at, but only at, t; (2) x is part of y at t; and (3) x overlaps at t everything that is part of y at t" (*Four-Dimensionalism*, p. 59). We need not worry about niceties at this point, though, for in section 2 I will argue that this notion of a time *slice* must be supplemented by a different notion of a temporal *stage*.

[7] See Lewis, "Survival and Identity."

collection is itself a person. 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.

Against this background, Lewis accounts for fission as follows: There is one series of stages up to the point of fission and two series of stages that result from the fission. Importantly, the I-relation is not a transitive relation. It holds between any 'Cain' stage and any 'Adam' stage, and it holds between any 'Adam' stage and any 'Abel' stage, but it does not hold between a 'Cain' stage and an 'Abel' stage. Thus, there are two maximal sums of I-interrelated person stages. One consists of the stages up to the point of fission — the 'Adam' stages — together with the stages forming one future branch — e.g., the 'Cain' stages. The other consists of the 'Adam' stages together with the 'Abel' stages. In short, Lewis claims that 'Cain' and 'Abel' refer to two people that are now spatially coincident but will diverge at the time of fission, and 'Adam' is an ambiguous term since it applies equally well to either of these two people.

1.1. Identity vs. Tensed Identity

Lewis has spelled out what he takes to be the metaphysical underpinnings of material objects in general and persons undergoing fission in particular. But nothing said so far reconciles the seemingly conflicting claims about fission held by common sense. If anything, the story so far has simply denied the common intuition that with fission there is *one* person who then becomes two; the account instead says there were two all along. But Lewis has a story to tell.[8] In many contexts, he claims, we count objects not by identity but by *tensed identity*, or *identity-at-t*, where A and B are identical-at-t iff they share a stage at t.

[8] See Lewis, "Survival and Identity". Cf. Robinson, "Can Amoebae Divide Without Multiplying?"

> 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.[9]

What Lewis is adding to his metaphysical story about temporal parts is a linguistic story about how we count. I want to explore and develop the linguistic story, since this is, in my view, crucial to resolving the paradox.

One putative problem with Lewis's linguistic story is that it conflicts with intuition. We say there is one person prior to fission because we *think* there is one person prior to fission. Thus, Lewis faces the burden of explaining why we would, incorrectly, think there is one if there are, in his words, "really" or "strictly speaking" two.[10] One explanation Lewis offers appeals to how unusual such cases of stage sharing are: "after all, we're talking about something that doesn't really ever happen to people except in science fiction stories and philosophy examples, so is it really so very bad that peculiar cases have to get described in peculiar ways?"[11] Although it is true that people don't actually share stages, his explanation neglects the fact that for the temporal parts theorist stage sharing among other kinds of objects is ubiquitous. For example, if asked how many objects there are on the mantle, common sense says 'one' even though the statue and the piece of clay are, according to temporal parts theory, distinct objects that share a stage. Similarly, the person and the mass of flesh are, according to temporal parts theory, two distinct objects, yet intuition says this mass of flesh and the person are *one* and the same. Because stage sharing among distinct objects of different types is the norm, and because in these cases we also have the intuition that there is only a single object present, it is hard to see how an explanation appealing to the rarity of stage sharing between people would go.

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[9] "Survival and Identity," p. 63.

[10] "Survival and Identity," p. 64; *On the Plurality of Worlds*, p. 218.

[11] *On the Plurality of Worlds*, p. 219.

Lewis's troubles come, I believe, when he claims that there are "really", or "strictly speaking", two people prior to fission. This thought comes, it seems, from taking a four-dimensional perspective from which we can see that there are *two* time worms, each to be identified with a person. They share their earlier stages, but they are nonetheless distinct since they do not share all of their stages. The problem with this line of thought, though, is that we cannot simply take at face value the observations we make from this four-dimensional perspective. Much confusion ensued when temporal parts theorists and their opponents read off facts about parthood from their four-dimensional perspective. The 'temporal parts' that one speaks about from this perspective are *not*, as four-dimensionalists themselves concede, parts in the ordinary sense. The ordinary notion of parthood is the notion of a *temporary part*, a part something has *at a time*, in contrast with the four-dimensionalist's notion of parthood which holds absolutely. Similarly, the 'location' of an object of which a four-dimensionalist speaks is not the ordinary notion of location, for the ordinary notion is of a *spatial location* that an object occupies *at a time*, whereas the four-dimensional location of an object is the spatio-temporal location an object occupies absolutely. The untensed claims about parthood and location that the four-dimensionalist makes are all too easily conflated with the everyday tensed claims.

This raises the specter that Lewis's claims that there are two people prior to fission, like other four-dimensionalist claims such as those about parthood and location, mean something different than homonymous claims of everyday English. The difference in meaning between the two claims stems from the fact that the four-dimensionalist claim is an untensed claim counting the number of people absolutely, whereas the everyday claim is a tensed claim counting the number of people *at a time*. I therefore propose that we alter Lewis's story a bit and say that there really is only one person prior to fission, but this is because in English we count by tensed identity.

Lewis presents the problem as concerning how we count, yet our counts are but one way in which the phenomenon surfaces, for our counts are tied to what Quine calls the "cluster of interrelated devices in which quantification becomes central."[12] If x and y are counted as *one* thing, we also say that they are *the same* thing, that x *is* y, that there is *a* thing rather than *some* thing*s*, etc. If we do count by tensed identity, then this is but a special case of the more general phenomenon in which these 'natural language quantifiers', as I will call them, are relativized to times and worlds; that is, their semantic values index a time, typically that specified by the tense, as well as a world. If this is correct, then the statement "Bob is Mr. Kohl", for example, can be used to claim not that a simple two-place relation (viz., absolute identity) holds between Bob and Mr. Kohl but instead that a four-place relation holds between Bob, Mr. Kohl, the time of utterance, and the world of utterance. (The relativization to a world is unimportant for fission cases and will henceforth be ignored). The resolution of the paradox of fission only requires that our natural language quantifiers *sometimes* are so relativized. I suspect they in fact *always* are, despite apparent counter-examples, but I will not defend that claim here.

What we need to determine, then, is whether our natural language quantifiers distinguish x and y whenever x and y were, will be, or could be different or, instead, if sometimes all that is relevant is whether x and y *currently* differ. That is, we need to see whether x and y are always counted as two objects if they differ merely in their temporal and modal properties or if instead sometimes counting them as two requires that they differ in their properties rooted in the relevant time — typically, that specified by the tense.[13]

Notice, first, that if x and y are constituted of the same matter for some portion of their careers, we should *expect* our everyday language to treat them as the same object during that period. If some current person will at some point in the future undergo fission, e.g., the futurity

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[12] "Ontological Relativity," p. 32.

[13] I follow Chisholm (*Person and Object*, ch. 3) in speaking of properties 'rooted' inside the times they are had. Perry calls these "basic" properties ("Can the Self Divide?" p. 470). Peter Simons calls them "time-blinkered properties" (*Parts*, p. 229).

of fission makes the multiplicity of persons beyond our ken as well as beyond our practical interests. Both Cain and Abel occupy a single seat on the bus, they eat what one person eats, they use one toothbrush, etc. Thinking of these as 'two' people, even *if* we could know there were two, would not help with any of our practical aims. Similarly, even if the statue is not identical to the clay composing the statue, the 'two' of them occupy one spot on the mantle, they require one box for shipping, and we need only find one object if 'they' are lost. It simply wouldn't make sense to have a language that discriminated objects that differ merely in their temporal or modal properties.

Second, we can see that our everyday identifications of objects *do not* treat temporal and modal differences in a parallel fashion. 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 white while the statue is unpainted, they think there must, after all, be two different objects under consideration. 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 sees this as necessitating that we have multiple objects? The simplest and most charitable answer is that what we mean by saying x is 'the same' as y in such contexts requires only that x and y be *currently* the same, or, in other words, that they be identical-at-t,

that the predicate 'is the same as ...' obtains solely in virtue of how the world is at the contextually specified time.[14]

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 rooted in the time and world in question.[15] The lump of clay is accidentally the same thing as the statue that was formed from it this morning since they share all properties rooted in 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."[16] 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.[17] The 'is' of composition is a temporally relative, or tensed, relation, just like Lewis's. What these authors are advocating, each in somewhat different ways, is that the semantics of many occurrences of

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[14] Consider an additional piece of evidence, albeit one with other possible explanations. We say things like, "Unbeknownst to those who were living in the peaceful North End, Druitt *was* Jack the Ripper — they were one and the same person!" If this is asserting identity and not a relation indexed to a time, why doesn't it sound strange when marked in this way with the past tense?

[15] See Nicholas White, "Identity, Modal Individuation, and Matter"; and Michael Rea, "Sameness without Identity."

[16] "Identity, Essence, and Indiscernibility," p. 295.

[17] 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 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.

our English quantifying expressions — e.g., 'is', 'one', and 'the same' — index times and worlds while the semantics of the philosopher's notion of identity does not. Identity-at-t, or tensed identity, is not identity. The paradox of fission, however, gets a grip only if we conflate the two.

2. A Problem for Lewis: Is 'Adam' Ambiguous?

If our natural language quantifiers hold relative to times, and if fission does involve two overlapping persons, then the claims of common sense are fully consistent. Because we count by tensed identity, there really was one person prior to fission, fission did not end that person's life, and yet the result of the fission were two people, each of whom once was the original person. We therefore have a way to reconcile the central claims of common sense about fission. But is this the correct way? In this section I will argue that it conflicts with other claims of common sense. In the following section I argue that these worries are resolved by recognizing branching persons.

The Lewisian story we've told so far has a metaphysical component that says that people are four-dimensional time worms (and in particular that fission involves overlapping time worms) and a linguistic component that says that our natural language quantifiers are temporally relativized. The problem, however, is that on this story the name 'Adam' is ambiguous, and this doesn't quite match linguistic intuition. To understand the objection, consider first what I take to be a bad line of attack:

> 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. But this just sounds confused. How can we reconcile the claim that there is only one thing here with the claim that terms purporting to refer to it are ambiguous? Furthermore, if *before* the fission I say, 'Adam 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 heard about 'Bush' during both the Bush presidencies, not realizing she was hearing about two distinct presidents.

This line of objection, however, trades on a failure to distinguish identity and tensed identity. 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 the sense in which there is an ambiguity. Second, a temporal part theorist would say that the ambiguity of 'Adam' and the ambiguity of 'Bush' are not analogous since the two referents of 'Adam', unlike those of 'Bush', overlap and, thus, are related by tensed identity. 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 *do* overlap. If I say, "This weighs fifteen pounds," 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 pre-theoretically *do* strike us as 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 pre-existing copper and tin to form this *piece of bronze*. Thus, it seems Lewis has a parallel motivation for 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. We can distinguish the two referents of 'Adam' 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 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. That is, I don't think 'Adam' is ambiguous.

Consider the statement, "I will visit London tomorrow," uttered by Adam an hour before the fission. Lewis claims the name 'Adam' is either ambiguous or improper, failing to refer, and that sentences containing the name cannot be satisfied. Likewise, says Lewis, for demonstratives

and indexicals.[18] Thus we should say that if Cain visits London tomorrow but Abel doesn't the sentence cannot be satisfied or, at best, is 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 London. We can focus on Abel, and say that *he* won't visit London, but if we focus on Adam, that person entering the duplication chamber, the claim that *he* won't visit London is simply false.[19]

Both Sider and Perry, whose theories deliver the same results, agree.[20] However, linguistic intuitions are rather murky in this case, so one might well object that our theories are driving our intuitions.[21] To garner additional support let's examine my opponents, Parfit and Lewis. Both have accounts with serious problems, problems that are easily, and most naturally, resolved by saying that 'Adam' refers, unambiguously, to an individual who will have two distinct futures.

Parfit distinguishes the traditional issue of personal identity across time from the issue of "what matters" regarding survival. The former concerns what is required for person p existing at time t to be identical to person p' existing at time t'. The latter concerns, roughly, what is required for person p existing at time t to have that which one ought to value in surviving to t'.[22]

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[18] See "Postscripts to 'Survival and Identity'", p. 75.

[19] Thus I take it that 'Adam' also does not doubly refer, a possibility raised by an anonymous referee. That is, Adam's utterance of "I will visit London" is not wholly true *and* wholly false.

[20] See Sider's *Four-Dimensionalism*, p. 201 and Perry's "Can the Self Divide?"

[21] Perhaps our murky intuitions reflect an indeterminate notion of a person, such as might be the case if we are drawn in part to the notion captured by Lewis's account and in part to the notion captured by the account involving branching persons. In this case *both* Lewis's *and* my accounts will be part of a larger, more complex account of what it is to be a person.

Both accounts preserve what is much clearer, viz. that Cain once entered the duplication chamber. Science fiction is rife with examples. Star Trek: The Next Generation episode #150 ("Second Chances") is one such example.

[22] Parfit does not spell out the notion of 'what matters'. I find the notion opaque. He cannot be talking about our *self*-concern, for then what matters would trivially align with personal identity. Nor can he be talking about our concerns driven by our own various interests and projects, for then what matters would trivially diverge, in many cases, from personal identity (e.g., those who value their children enough would, in this sense, maximize what matters by sacrificing their own lives to save their children's).

Parfit himself agrees that it is intuitively compelling that a person has what matters just in case they survive or, in other words, if they continue to exist. Parfit, however, thinks this intuition is wrong, arguing that with cases of fission personal identity pulls apart from what matters. Like most, Parfit thinks psychological continuity is a key ingredient for personal identity. However, because a person undergoing fission is psychologically continuous with the two *different* people resulting from their fission, Parfit, again like many others, argues that personal identity must instead consist in psychological continuity that takes a *non-branching* form. One can't be identical with the *two* products of fission, he urges, since personal identity would then "not fit the logic of identity."[23] Hence, the best description is that one ceases to exist with fission. Nonetheless, he reasons, if I undergo fission, I do have what matters with survival since "my relation to each of the resulting people . . . contains everything that would be needed for me to survive as that person," namely, psychological continuity.[24]

Nonetheless, Parfit's conclusion is difficult to swallow. When I write a book, I may desire the advancement of the field, and when I kayak a river, I perhaps enjoy the impersonal fact that the river is being enjoyed in its natural state, but the main thing I value is *my* doing those things, selfish as it may be. It simply can't be rational for me to value having someone *else* write my book, love my wife, and care for my children just as much as I value my doing it, no matter how closely related that other person is to me. As Lewis says, the idea that what matters is identity is "a commonsense ... platitude that cannot credibly be denied."[25] Point one: in separating what matters from personal identity, Parfit embraces a quite dubious conclusion.

Instead, if we accept Parfit's thesis that what matters is simply psychological continuity but eschew Parfit's dubious conclusion and instead maintain the 'commonsense platitude' that personal identity is what matters, then we have a view on which the claim "Adam will be in

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[23] *Reasons and Persons*, p. 262.

[24] *Reasons and Persons*, p. 261.

[25] "Survival and Identity," p. 56.

London" is true iff Cain *or* Abel visits London. Thus, point two: the semantics I am advocating are the natural consequence of Parfit's central thesis that psychological continuity is what matters. In this way, I think Parfit's own account gives some support to the account I am endorsing. Of course, I have said nothing yet to counter Parfit's claim that branching persons conflict with the logic of identity; that is yet to come.

Let's, then, move on to our third point: Lewis says that one cannot credibly deny that what matters is identity, yet his metaphysic does not deliver this. What matters to Cain before the fission is, if identity is what matters, that *he* survive, and yet Lewis himself thinks that Cain has what matters even if after his fission he doesn't survive.[26]

Lewis focuses in his "Postscripts to 'Survival and Identity'" on the commonsense desire to survive, or something as commonsensical as possible. The net result is that Lewis tells us that we all actually have two desires, one expressed by "Let me survive" and the other, which can be satisfied in cases of fission, expressed by "Let at least one of us survive." The reason Lewis gives for thinking we all have this other desire is, briefly, that we have a desire that is satisfied in cases of fission and yet the singular first person desire is not.[27] Thus, we must have the plural desire. This reasoning, however, seems to apply much more broadly than to a) first person b) desires for c) survival. It seems Lewis's reasoning equally well justifies the claim that there is an additional propositional attitude, one involving a plurality rather than a single subject, in cases where a) *I* desire that Adam survive, where b) either Adam or I desire that he *visit London*, and even where c) we *believe* that he will visit London. Hence, point four: it looks as though on Lewis's account we must swallow the idea that *for each* propositional attitude we have concerning a person, we also have a second one of which we're unaware — a quite extraordinary commitment!

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[26] Similar arguments are given by Sider (*Four-Dimensionalism*, pp. 202-204) and Parfit ("Lewis, Perry, and What Matters", §1).

[27] "Postscrips to 'Survival and Identity'", pp. 74-75.

Parfit argues that what matters is psychological continuity. Lewis argues that what matters is both psychological continuity and identity. The natural result of these commitments is a view on which Adam will visit London iff either Cain or Abel does. But both Parfit and Lewis avoid this conclusion with drastic costs, Parfit saying that what matters is not identity, and Lewis delivering a metaphysic on which identity is not what matters and on which he commits to a widespread duplication of propositional attitudes. If possible, surely it is better to avoid these consequences. And this is easily done.

3. The Alternative: Branching Persons

The alternative I propose is to say that besides Cain and Abel, there is also Adam, a branching person, i.e., a person who has two distinct series of events composing his life after his fission. In terms of temporal parts, 'Adam' refers to the sum of pre-fission stages called 'Adam', the post-fission stages called 'Abel', *and* the post-fission stages called 'Cain' — in short, to a two-headed time worm. The synchronic identity conditions for persons define what it is to be a person stage. That is, a person stage at t is a momentary piece of matter arranged person-wise at t, where what it is to be 'arranged person-wise' at a time is given by our concept of a person. The diachronic identity conditions for persons in turn define, given the notion of a person stage, what it is to continue to be that very person, or, in other words, they tell us under what conditions a person stage at t and a person stage at t' are stages of the same person, again as dictated by the concept of a person. If the diachronic identity conditions for persons consist in psychological continuity, then a person can be composed of one stage at one time and multiple stages at some other time.

One might complain that this would mean that Adam will have all sorts of counter-intuitive properties after his fission, such as having two left feet. But this line of thought neglects the fact that tensed predications are analyzed using quantifiers *over stages*. Since Adam has two stages at each time following the fission, it can be true that Adam will be in London at t and true that Adam will be in Tokyo at t, but false that Adam will be bi-located at t, have two left

feet at t, or double in weight suddenly at the time of fission, for there is a stage of Adam that is in London at t, a stage that is in Tokyo at t, but there is no stage that is located at both places, no stage that has two left feet, and no stage that weighs 340 pounds.

Philosophers disagree whether a singular term — whether a name, a pronoun, a demonstrative, etc. — refers to an object in virtue of the object fitting descriptions associated with the term or in virtue of an appropriate sort of causal chain originating with the object and terminating with the use of the term or with the associated concept. But it is what a persisting object is like *at a particular time* that fits our descriptions and it is an object's having certain properties *at a particular time* that is the causal source of our ideas about that object. Thus, though we refer to the persisting object, we do so in virtue of it being a certain way at a certain time or times. A persisting object satisfies a predicate at a time, say temporal parts theorists, in virtue of a stage having the corresponding property. Reference to a persisting object therefore obtains in virtue of this sort of 'connection', let us call it, to one or more stages of that temporally extended worm. The suggestion, then, is simply that when we refer to an object of kind K, we are connected to a K-stage s and the object we thereby refer to is the sum of all K-stages I_K-related to s.[28] Adam, that person who is standing before us awaiting his fission, is the sum of all person stages I_{person}-related to that stage currently before us. Cain, the one who will first leave the duplication center, is the sum of all person stages I_{person}-related to that stage that first leaves the duplication center first. Likewise, Abel is the sum of all person stages I_{person}-

[28] Of course, often when we refer we are 'connected' in the appropriate way with *multiple* slices. If I refer to the man I just met, my concept of that man is formed through a causal connection with the many stages that span the five minutes I talked with him. Worse yet, my reference to my mother succeeds in virtue of stages spread throughout my entire lifetime. But this is no problem, for in these cases the sum of all stages I-related to one of these stages picks out the same worm as the sum of all stages I-related to another. We have an ambiguity, but an ambiguity hidden 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, such as when my concept of a person is caused by, or fits, two different people. Cases of fission presernt additional sources of ambiguity, for example if I were ignorant of the fission and associated the name 'Adam' with the person 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 been to Tokyo" reflect this with an ambiguous truth value (assuming Abel has visited Tokyo but Cain has not).

related to that stage that leaves the duplication center second. Depending upon which stage you focus on, you thereby refer to Adam, Cain, or Abel. Adam is a branching, or two-headed, worm; the other two are single-headed worms.[29] If it is natural, as Lewis says, to talk about there being *one* person who entered the duplication chamber, so too is it natural, say I, to *refer* to *him*, i.e. to the sum of stages I-related to the stage we are focusing on at the time in question.

What may not be obvious is that an account of branching persons requires a departure from Lewis regarding the form of the I-relation. The I-relation — or more exactly the I_K-relation, for each different sort K — is that relation between stages in virtue of which different stages are stages of a single object of kind K. There are two reasonable forms this relation can take. According to Lewis, the I_{person}-relation is a relation that holds between any two stages of a single person. A person is then a maximal sum of stages all of which are inter-related by the I_{person}-relation. According to the present proposal reference involves a connection to one or more stages, so the I_{person}-relation is a relation that holds between a particular stage s and all other

[29] Perry advocates an alternative account employing 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 stages. The *primary referent of* (a name) *N* is the sum of stages I-related to the stage assigned to N. The *secondary referent of N at t* is the unique sum of stages I-related to the stage existing at t which includes the stage 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 stage 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 London after the fission" is true, when uttered before the fission, since the two-headed worm has a stage that will be in London, though "After the fission, Adam will be in London" is false, since 'Adam' has no secondary referent after the fission.

Third, consider the case in which the Cain stages visit London and the Abel stages visit Tokyo. Although Perry's semantics makes both "Adam will be in London" and "Adam will be in Tokyo" true if uttered before the fission, correctly in my opinion, it also makes "Cain will be in Tokyo" 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 stage in Tokyo.

stages of the person one would refer to if one referred to a person by focusing on s. A person is then the sum of all stages I_{person}-related to any stage s.

To illustrate this difference, let's contrast spatial fission with temporal fission. First consider spatial fission, i.e., cases where what appears to be one person at one location is spatially connected to what appears to be two people at other locations. Imagine we see only a hand, but the hand we see is in fact shared by a pair of congenitally joined twins. Notice that this seems to be exactly the right description to give: there are *two* people and we have seen a part that is shared by them. What we might first have thought was one person, when looking at the hand, is in fact two. Thus, the relation between parts that determines which collections of parts form a person at a time cannot be a relation that holds between that part we see and each of the other parts of a person, for any relation between the shared hand and the head of one of the twins would, by symmetry, also relate the hand to the head of the other twin. Thus, what distinguishes a person at a time must instead be some relation, P, that holds between *all* of the parts of a person. A person, then, will be a maximal sum of parts inter-related by P.

Let's now consider temporal fission, i.e., cases where what appears to be one person at one time is temporally connected to what appears to be two people at another time. In this case we see what we would call 'one' person at some particular time, but after fission there are intuitively 'two' people that result. In this case let's again ask what sort of relation we need to distinguish a person. We could, following Lewis, say that a person is a maximal sum of slices inter-related by some relation, I. This would mean that there are, as with congenitally joined twins, two overlapping persons. But our intuitions in this case differ. When apprised of the fact that the one hand is spatially connected to two bodies, we retract our previous judgment that there is only one person. In contrast, when apprised of the fact that the one stage is temporally connected to two different stages at a future time, we retain our judgment that what we have prior to fission is a single person. With the case of spatial fission, we seem to be equivocating if we point at the hand and say that *that* person has long red hair and that *the very same* person has a shaven head, assuming these descriptions fit the two twins. With the case of temporal fission,

in contrast, it seems we're not equivocating when we say that this person before us will tomorrow be in London and that this person before us will tomorrow be in Tokyo. The person tomorrow in London may be a different person from the person tomorrow in Tokyo, but there is one person here now who both a) will be in London, and b) will be in Tokyo. If we are to let ordinary language guide us, we have two people in the case of spatial fission yet one person in the case of temporal fission. And this means that while we need to distinguish a person in the spatial case using some relation that inter-relates all spatial parts of a person, we need to distinguish a person in the temporal case using some relation that holds between a particular stage and all other stages of the person, for that is the relation that allows for branching persons in cases of fission.[30]

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[30] I have argued that a person is the sum of stages I-related to one particular stage, rather than, as Lewis has it, that a person is a maximal sum of I-interrelated person stages. Lewis himself gives no argument for his 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 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 sentence quoted above, 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.

In fact, Lewis himself appears to slip into the more natural way of seeing the I-relation as a relation between a particular focal stage of a person and all other stages of that person. Consider the following passage: "In wondering whether you will survive the battle … you wonder whether the continuant person that includes your present stage is identical with any of the continuant persons that continue beyond the battle. In other words: whether it is identical with any of the continuant persons that include stages after the battle. In other words: you wonder whether any of the stages that will exist afterward is I-related to—belongs to the same person as—your present stage." ("Survival and Identity", p. 59) Whether or not an individual will survive the battle is *not*, given Lewis's view of the I-relation, equivalent to whether or not the current stage of the individual is I-related to some stage after the battle. Cain could die shortly after fission, but his present, pre-fission stage is nonetheless I-related to stages of Abel after the battle.

One reason I have given for countenancing two-headed worms is 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 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 the fission of persons so differently. Thus, if one believes it is the physical make-up that is key for the persistence of most objects but 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, even though we wouldn't say something similar for chairs or amoebae.[31]

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[31] Other sorts of physical objects also undergo fission. Waves are not individuated by their matter so much as by the energy they carry. For example, when waves pass through each other, there is no fact of the matter about which bits of water belong to which. It is perhaps because of this that we countenance cases of fission in waves. When a northbound wave and a southbound wave pass through each other, the result is a larger wave. Even though aware that there were two approaching waves and that afterwards their will be two departing waves, we would say that right now there is a *single* large wave. The two waves became one wave at the moment of constructive interference.

Similarly, a single wave passing in one direction can undergo fission. 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

Another respect in which the present account differs from others is that it is usually assumed that a stage of an object at t is a cross-sectional 'slice' of the object at t, so an object will, *by definition*, have only one stage at any time. In contrast, I claim that an object can have multiple stages at a time. If I am correct that 'Adam will visit London' is true and therefore that it quantifies over multiple stages existing at the same time, then this shows that the usual analysis must be wrong. But cases of time travel provide independent evidence, for even if when I'm sixty years old I will travel back to the present moment, we don't want my current utterances of "I weigh 346 pounds" or "I have four hands" to come out true in virtue of the sum of my younger and older stages weighing 346 pounds and having four hands.[32] Thus, we need to distinguish a temporal *slice* of an object, a part existing entirely at one time that is the sum of all parts that exist entirely at that time, from a *stage* of an object of kind K, a part existing entirely at one time that is arranged K-wise.

Philosophers have traditionally eschewed two-headed worms, 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, or, with Cain and Abel, *three* persons. And yet clearly what we have after the fission are *two* people." However, once we distinguish identity and tensed identity, we see that no such untoward consequences result. Counting by tensed identity is a form of counting where we restrict our attention solely to a particular time, so counting people by tensed identity comes down to simply counting the number of person stages that exist at that time. As a result, if there is one series of person stages prior to fission and two diverging series of person stages following

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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 only one wave was spawned, a wave that continued past the island.

[32] Cf. Lewis, who says that the time traveler "has two different complete stages located at the same time at different places" ("The Paradoxes of Time Travel", p. 162).

fission, there is one person prior to fission and two people afterwards. This holds independently of one's story about which people those series of person stages compose. That is, this holds whether you say, as Lewis does, that those person stages compose two people (as individuated by their spatio-temporal extensions) or you say, as I do, that those person stages also compose a third, branching person. Lewis's story of two overlapping people is one way to reconcile the seemingly contradictory intuitions involved in thinking that with fission one person survives to become two. By countenancing branching persons, we have another way to reconcile the seemingly contradictory intuitions, but one on which 'Adam' is, as intuition demands, unambiguous.

The tie between tensed identity and the proposed account of reference whereby we refer to someone by 'connecting' (via descriptions or causal connections) to a stage of an object is an intimate one. When we count objects by tensed identity, we count *each and every* — counting by tensed identity — object at the relevant time. After fission, the only two people who exist are Cain and Abel, so the proper count is 'two'. One might protest: "What about Adam? Doesn't he exist at that time?" Yes, he does, but he is not *a* person then; instead, he is two, viz. Cain and Abel! And prior to fission there is only one person, viz. Adam. "What about Cain and Abel? Aren't they *different* people, and don't they exist prior to fission? They do exist prior to fission, but they aren't different people prior to fission; rather, prior to fission they just are Adam. Of course, when we say Adam *is* Cain and *is* Abel after the fission, and when we say Cain and Abel *are* Adam prior to fission, these are not claims of identity but of tensed identity. What this means, though, is that on the present account when we count people at a time, there are particular individuals we are counting. Prior to fission we count one, viz. Adam. After fission we count two, Cain and Abel. Without branching persons we can't say this. Prior to fission Lewis can *say* there is one person, but there would be no particular individual who is that one.

4. Considering Objections

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 t1, where according to Lewis two people, P1 and P2, spatially coincide prior to t1 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 Ta: [I will be in London at t2]. At t(0.5) each of P1 and P2 thus self-attributes the property of being in London at t2. It might now be thought 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□.[33]

And why exactly is it that I can 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.[34]

However, notice that this principle that 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 object to be in one city while *any other* object 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

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[33] "Surviving Matters," p. 300.

[34] "Surviving Matters," pp. 300-1.

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 believe something if P2 also believes it since, after all, in all respects rooted in such times 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 fission, each of the overlapping people could believe "*One of us* will be in Tokyo at t2" consistent with believing "*One of us* will be in London at t2", but 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 do. Because Adam is a single individual with two future branches, it seems it *is* possible and, moreover, reasonable (if he knows of his fission) for him to believe both that he'll be in Tokyo at t2 and that he'll be in London at t2. And this, it seems, leads me back into Sosa's trap. But this puzzle rests on a simple scope ambiguity. Because as temporal parts theorists we are analyzing tensed predications as quantifiers over stages, and because we are now countenancing two-headed time worms, tensed statements involving logical operations will be ambiguous. "I will be in Tokyo" is true iff *any* future stage of the speaker is in Tokyo. The statement "I will not be in Tokyo at t2," though, has two readings that 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 there exists some stage of the speaker at t2 that is in Tokyo — i.e., iff *neither* branch is in Tokyo at t2. Giving the quantifier wide scope, the statement is true iff there exists some stage of the person at t2 that is not in Tokyo — i.e., iff *one* of the branches isn't in Tokyo at t2.[35] This explains away the puzzle

[35] It may seem odd to say that the sentence "I will not be in Tokyo at t1" is ambiguous. Although we can expect talk of fission to introduce oddities, this ambiguity is of a piece with what we already find in English. Consider a rich woman saying, "I will not be rich tomorrow." Does this mean there *is* a time the following day at which she *is not* rich, or that there *is not* a time the following day at which she *is* rich? That is, if she loses her fortune at noon

that Sosa presents, for not only can someone believe "I will be in Tokyo at t2" and "I will not be in Tokyo at t2", 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 t2," presents two ambiguities. One ambiguity rests upon whether the conjunction or the quantifier is given wide scope. If a person undergoes fission, perhaps he will be in London at t2 (by having a stage of one branch there) *and* he will be in Tokyo at t2 (by having a stage of the other branch there), and so if we interpret "I will be in London and in Tokyo at t2" as equivalent to "I will be in London at t2 and I will be in Tokyo at t2", the statement could easily be true. But giving the quantifier wide scope the statement is true iff he has a *stage* that at t2 is both in London *and* in Tokyo, something precluded by current day geography and human physiology.

The second ambiguity lies with the interaction of the tense of 'is' and the range of the quantifier 'Nobody'. If 'Nobody' ranges over all people of all times, and 'is' is tenseless, then the statement is false since Adam, the person who entered the duplication chamber at t(0.5), is in London at t2 and is in Tokyo at t2. Of course, it may be technologically, or even physically, impossible for such a thing to happen, but if we're asking whether fission is metaphyiscally possible, intuitively it is. A more natural way to read the statement, however, is with 'Nobody' ranging over the people *at t2*, and 'is' being a present tensed claim of what is *then* possible for those people. But if we pick out any person existing at t2 by focusing on a slice at t2, we find that the person thereby picked out cannot be in two different locations at t2.[36] Thus, on its more natural reading the statement is a truth that does not conflict with fission.

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the following day, is the statement true or false? One plausible account is that this is ambiguous in just the way that Adam saying "I will not be in Tokyo at t2" is ambiguous, since both statements involve a scope ambiguity between a quantifier (over times/stages) and a negation.

[36] This and the following discussion on the unity of consciousness *assumes* a single direction in time of causation. A more complex requirement would be necessary to relax this assumption. The idea, though, is that a person can have only one location and only one stream of consciousness at any point in their *personal time*. (See Lewis's "The Paradoxes of Time Travel" for the notion of personal time.)

Sosa has further suggested that the account I am endorsing violates the requirement of the unity of consciousness.[37] I take the foregoing discussion 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 have at that time only one stream of consciousness. Nonetheless, it is possible that at some later or earlier time that person *will have* or *did have* two streams of consciousness — or, more properly, since on the most natural reading even this will be necessarily false since a person can't have a future or past stage that has two streams of consciousness, that person can at some other time t have a certain stream of consciousness s_1 and that same person can, at t, have stream of consciousness s_2, even though $s_1 \neq s_2$. As soon as we think of her at that other time and thus think of her two bodies or streams of consciousness, we are then thinking of two persons. Thus, if we conceive a person *at a time* we can never conjure up an image of someone who 'has' two streams of consciousness. It is only when we conceive a branching person using a conception that involves their life stretching out across time that we can truly say, using tenseless predications, that such a person 'has' two streams.

Kit Fine raises a related worry.[38] Consider the sentence "I will think that I am in London," as uttered by Adam prior to his fission. We're concerned with the reading on which Adam will at some later time think that he is *then* in London, not the reading on which he will later think that he was in London at the time of his original utterance. Intuitively the utterance should count as true in the imagined circumstance since, on the semantics I am advocating, Adam *will be* in London and — let's assume he'll be aware of his whereabouts — he *will* think he's there. The difficulty is in specifying the referent of the second 'I', the 'I' in the embedded clause.

To see the worry, here are various considerations that pull in opposite directions. 1) On the traditional story, a propositional attitude verb like 'think' expresses a relation between a

[37] In conversation.

[38] In conversation.

subject and a proposition, and the 'that'-clause following the propositional attitude verb names the proposition so related. So if we say the second 'I' refers to Adam, we have Adam later thinking that *Adam* is in London, which would be true if either branch were, at that time, in London. Intuitively, this is not at all what we want. 2) I have suggested that 'I' refers to the sum of all stages I-related to the stage that does the uttering, which would mean that both the first and second 'I' refer to Adam. 3) However, similar reasoning suggests that when Adam later thinks, "I am in London", that 'I' must refer to Cain. But since it is this later thinking of "I am in London" that makes true Adam's original statement, the proposition expressed by the sentence "I am in London" must, it seems, be the same proposition that Adam's original statement says will be thought by Adam. So it looks like the second 'I' refers to Cain. 4) On the other hand, if Cain and Abel both visit London and both think "I am in London", then the same reasoning we have just gone through can be used to conclude both that the second 'I' refers to Cain *and* that it refers to Abel. Since 'I' only refers to one individual, the symmetry of the case precludes both that it refers to Cain and that it refers to Abel. In short, it looks like we get into quite a mess once we countenance branching persons.

The problem, however, lies not with branching persons but with the naive semantics we've presupposed. One might think the 'that'-clause, "that I am in London", names the particular proposition to be thought, a proposition containing the subject, the property the subject instantiates, and the time at which the subject instantiates that property.[39] But this can't be so. One way to see this in our case is to concentrate not on the role of 'I' in Adam's statement but on 'am'. Just as the simple story for 'I' holds that the word refers to the speaker, so too does the simple story for 'am' say that it refers to the time of utterance. But when Adam says "I will think that I am in London" this means (on the intended reading) that he will have a thought at some

[39] We often ignore the time in question since our concerns lie elsewhere, but there's a long tradition going back at least to Frege insisting that the time is also to be included. "If a time-indication is conveyed by the present tense one must know when the sentence was uttered in order to grasp the thought correctly. Therefore the time of utterance is part of the expression of the thought." ("Thought", p. 332; see also, p. 343)

future time t and what he will think is that he is in London *at t*, i.e. at the time the thought occurs. In fact, speaking of *the* time is misleading since Adam's statement is true iff there is *at least* one time t such that he thinks at t that he is in London at t. Thus, either 'that I am in London' doesn't name a proposition or propositions don't contain particular times. This is hardly news, of course.[40] Instead, the correct story will have to say something about 'am' lying within the scope of the future tense of the main clause and therefore being 'shifted by' or 'indexed to' a time satisfying that tense.[41]

If the tense of an embedded clause does not refer to a determinate time but instead is shifted by, or indexed to, the tense of the embedding clause, it seems a similar story can be told for the first person pronoun. The view previously set out was that singular terms refer to some object in virtue of the speaker being 'connected' to a particular stage of the object, the object being the sum of all slices I-related to that focal stage. But we can adjust our story to take into account more complex cases of embedded tenses, just as we must alter the naïve story for 'am'. Just as 'am' picks out the time of utterance, which then gets shifted by each tense having scope over it, 'I' focuses on the current stage of the speaker, which then gets shifted by each tense having scope over it.[42] So in this case, 'I' focuses on the stage of the speaker at the time of the utterance, which is then shifted by the future tense having scope over it. Shifting a time is straightforward: 'am' picks out the time of utterance but, because it is within the scope of the future tense of the main clause, the time it picks out is shifted to be some time after this. Similarly, shifting a stage is straightforward: 'I' focuses on the stage of the speaker at the time of the utterance but, because it is within the scope of the future tense of the main clause, the focus is

[40] As Salmon notes, "It has become well known since the middle of the 1970s that the phenomenon of tense cannot be fully assimilated to temporal indexicality, and that the presence of indexical temporal operators necessitates 'double indexing'. ("Tense and Singular Propositions," p. 356.)

[41] I am purposely steering clear of current controversies about the mechanisms of 'shifting' or 'indexing', since the current issue rides only on there being something of this sort.

[42] Of course, while I discuss the shifting of the time and the shifting of the stage separately, they both must shift together, so these two shifts are not independent.

shifted to a stage that exists after the time of utterance and that is I-related to the pre-shifted stage.[43]

Is this shifting ad hoc, and should this count against a theory countenancing two-headed worms? I think not. First, I have tried to motivate it by considering the independently established shifting of tenses. Second, this shifting is in fact nothing new but is exactly what was already taking place with the treatment of tense in more usual contexts. "David was bent" is true when uttered at t iff 'David' focuses on a stage s and some stage *shifted* from s, i.e. some stage that exists prior to t and is I-related to s, is bent. So we've been shifting stages based upon the tense from the start. Finally, *if* we are to countenance branching persons, then it seems this sort of reference shifting is what we should expect. That is, *if* what happens to Cain and what happens to Abel are things that *will* happen to Adam, and, extending this idea, *if* what currently happens to Bob, who later fuses with Cain, are things that *will have* happened to Adam, then the natural way to capture this is by means of a stage which can shift forward in time along the Adam/Cain worm and backward along the Bob worm. Thus, the notion of shifting stages is not ad hoc but part and parcel of the underlying idea of branching persons.

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[43] This can explain intuitively ambiguous sentences involving anaphora. Consider, e.g., the time traveler who says she went back in time and looked at *herself*. Intuitively, there are two ways to interpret this, one involving her traveling back and looking at that very person who has traveled back in time, and the other allowing her to go back and look at her *younger* self. Similarly, if before his fission Adam says he will look at himself after the fission, intuitively on one reading this is true if Cain looks at Abel, whereas on the other reading this is true only if Cain looks at *him*self or Abel looks at *him*self. This sort of ambiguity is to be expected since there is a scope ambiguity. The anaphora requires a binding to some already established slice, and the tense involves shifting the slice upon which we focus. Thus, if the tense takes wide scope, we begin with the slice uttering the sentence, shift to focus on some later slice I-related to it, and the sentence is true iff that slice talks to itself. If the binding takes wide scope, we begin with the slice uttering the sentence, we settle that we are discussing that slice and that same slice, and then both the slice doing the looking and the slice being looked at are the products of shifting the original slice forward in time, allowing us to end up focusing on two distinct slices at the future time.

Shifting of the focal slice also allows shifting forward along one branch and backward along another. Thus, if I will some day fuse with someone who once was in the army, then my utterance of "I've never been in the army and never will be, but I will one day have been in the army" is true. It may seem odd that this sentence could every be true, but once we envision the case we're dealing with, it seems this is nonetheless intuitively the correct thing to say.

One might protest that rejecting branching persons allows us to keep our traditional semantic picture according to which 'that'-clauses name propositions that contain subjects and properties, as long as we don't require propositions to contain times as well; for example, some think that propositions are not timeless but are true or false relative to a time. In this way, we could retain the attractive view on which pronouns are connected to referents by means of a simple reference relation. Remember, though, that we already need to explain constructions such as "Each girl will think that *she* is in London" (with the quantifier having wide scope), where pronouns clearly aren't connected by a simple reference relation to an individual. Thus, we already think some pronoun uses are to be treated as bound variables and thus 'that'-clauses can't name a proposition as traditionally conceived.

Perhaps, though, the real reason we hesitate at the thought of extending indexing to the first-person pronoun and to names is simply because we think that there is no ambiguity about what such terms refer to. Similarly, perhaps we balk at the idea that a person could have two futures or two future streams of consciousness because this strikes us as so fantastic. But this is to be expected since we live in a world in which people *don't* undergo fission or fusion. Since we ordinarily do not deal with fission, it should come as no surprise that we see 'I' as in no sense ambiguous and that we conflate different interpretations that pull apart with science fiction. But if we do consider science fiction cases, I suggest, it is natural to think that even though Spock will be on the planet at t, this shouldn't stop us from thinking that, because of his fission, it is also the case that he will be on the Enterprise at t, just as science fiction so commonly has it.

By separating what we find fantastic from what we consider metaphysically impossible, we can address another line of objection. “You claim to preserve common sense and linguistic intuition,” runs the objection, “and yet there are many claims and inferences quite contrary to common sense that this account will endorse. So at best your account is like all others, preserving some intuitions while sacrificing some. As one example, common sense judges the following inference as valid:

Adam will visit London.

<u>Abel won't visit London.</u>

Therefore, Adam is not the same person as Abel.

The proposed account, however, will endorse the premises and reject the conclusion!"[44]

I claim that common sense recoils at such an inference because fission is so fantastic, not because the inference requires something that is metaphysically impossible. But how can we know which of these reasons explains our resistance to this and other claims and inferences? The answer, I believe, is simple. We begin by imagining the fantastic fission case, described neutrally, of course. Only *then* do we probe intuitions and ask whether it would make sense to say that Adam will visit London, that Abel won't, and that Adam and Abel are the same person. The answer, I've suggested, is that common sense then finds no contradiction. The apparent contradiction is felt only when not envisioning the fantastic scenario, for *in everyday cases* it is certainly the case that if X will □ and Y won't, then X and Y are not the same.

Some will insist that an account endorsing overlapping persons is wildly counter-intuitive. If the foregoing account is correct, they are misinterpreting their intuitions in one of two ways. First, it is easy to forget that we are talking about *metaphysical* possibility, so the impossibility of overlapping persons is not being denied as long as we are discussing nomological possibility or what is possible given human physiology. Second, it is easy for someone to make claims about identity even though they are in fact thinking about tensed identity. Since the two relations differ only subtly, the only way we can know which we are countenancing is to focus on how they differ. Identity differs from tensed identity in that identity is governed by the indiscernibility of identicals whereas tensed identity is governed by a similar law that holds only relative to a time. If x and y differ in any properties, ipso facto they are not identical, whereas non-identicals *can* be related by identity-at-t as long as they don't differ in any

[44] I owe this objection to an anonymous referee.

properties rooted in t. Hence, any thoughts about whether there are non-*identical* people coinciding at some time t cannot focus on what there is at t but instead must ride on how what there is at t is related to what there is at other times. I suspect that the intuition there is only one person at a place is like the intuition that right here there is only one road. This is Ethan Allen Highway and this is Highway 2, yet Ethan Allen Highway is not identical to Highway 2. Just as the intuition that this is a single road is a thought involving counting by identity-at-location-l, so too is the intuition that here sits a single person a thought involving counting by identity-at-t.

Summary

If our natural language quantifiers are tensed, then the Lewisian account of fission involving two overlapping people reconciles the central common sense claims about fission. Only one person exists prior to the fission; nobody ceases to exist with the fission; and yet afterwards there are two people, both of whom once *were* the original person. With two overlapping people, however, we cannot really speak of *the* person who undergoes fission; such talk is ambiguous. A preferable account, which more fully reconciles the claims of common sense, instead countenances branching persons.[45]

[45] Many thanks to David Christensen, Troy Cross, Matti Eklund, Kit Fine, Hilary Kornblith, Tim Maudlin, Brian McLaughlin, Martin Montminy, Ernest Sosa, and an anonymous referee for reading drafts and supplying many useful comments.

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