

## *A Puzzle About Persistence*

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Our topic is the ontology and persistence conditions of material objects. One widely held doctrine is that identity-over-time has causal commitments. Another is that identity-over-time is just identity (*simpliciter*) as it relates one object that exists at two times. We believe that a tension exists between these two apparently sensible positions: very roughly, if identity is the primary conceptual component of identity-over-time and — as is plausible — identity is noncausal, then the conceptual origins of the causal commitments of identity-over-time become a mystery. We will begin by formulating the two widely held doctrines and our puzzle more fully and more carefully. Then, the remainder of the paper will be devoted to analyzing views one might adopt that could minimize the tension.

### **I The Two Metaphysical Tenets**

Our focus will be on sentences like:

(1) The truck Pam bought at 6:00 P.M. is identical to the truck Jill test-drove at 9:00 A.M.

The pertinent features of this sentence are these: (i) it has 'is identical to' as the primary verb phrase; (ii) it has as its subject a material-object description that makes reference to a time; and (iii) it has as its direct

object a material-object description that makes reference to a different time. What makes matters a little messy is that sentences like (1) are often used in ways not of concern to us. For example, sometimes they are used merely to report surprising similarities. Thus, (1) might be used to report about the truck that Pam bought only that it was the same make, model, and color as the truck Jill test-drove. Our focus will be on sentences like (1) when they, at least *prima facie*, are used to report a genuine numerical identity. We stipulatively take *identity-over-time* to be what is expressed by 'is identical to' in sentences like (1) when used in this way.

Some apparently simple consequences of (1) when used in the relevant way are that there was a truck that existed at 9:00 A.M., a truck that existed at 6:00 P.M., and that the truck that existed at 9:00 A.M. is identical to the truck that existed at 6:00 P.M. This, anyway, is the picture that our first tenet takes very seriously and very literally.

#### *The Face-Value Analysis*

*A* is identical-over-time to *B* if and only if there is a time *t* and a time *t\** such that *A* exists at *t*, *B* exists at *t\** ( $t \neq t^*$ ), and *A* is identical to *B*.

In the face-value analysis, 'is identical to' is to be understood in its most strict and literal way, in the same logical/mathematical/numerical sense it has in an ordinary utterance of '2 is identical to the positive square root of 4' or an ordinary utterance of 'Hesperus is identical to Phosphorus.'<sup>1</sup>

We have identified the other central metaphysical tenet as the view that identity-over-time has causal commitments. The rough idea here is that objects that stand in the identity-over-time relation must also stand in certain causal relations to each other. A common-sense view of how an object undergoes change underlies this tenet, a view that is captured nicely by Sydney Shoemaker:

when things change, their new properties are normally a function of their old; how something is affected by interaction with other things will depend on what properties it had prior to the onset of the interaction, and in processes such as biological growth later stages are causally generated out of earlier ones in a way that yields a fixed pattern of change. If I squeeze a lump of clay, the shape of the resulting piece

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1 Eventually, we will also need to be careful about the phrase 'exists at' as it occurs in the face-value analysis. When we consider the doctrine of temporal parts, we will see that authors disagree about the meaning of this phrase. Some, like Mark Heller in *The Ontology of Physical Objects* (Cambridge: Cambridge University Press 1990), 5 and 12-13, equate 'exists at' with 'wholly exists at.' Other authors will understand 'exists at' in a way that equates it with 'partially exists at.' This difference will not be important until Section V.

will depend on the shape and composition of the original piece as well as on how much force was applied and where.<sup>2</sup>

Or as Chris Swoyer has said, ‘The features that an object has at one time are partly determined by the features that it has at earlier times’.<sup>3</sup> Doing our best to formulate the principle suggested by this picture in as simple and as plausible a way as possible, we offer:

*The Causal Character of Identity-Over-Time*

If *A* is identical-over-time to *B*, then there are times *t* and *t\** ( $t \neq t^*$ ) and properties *F* and *G* such that *A*’s having *F* at *t* is a cause of *B*’s having *G* at *t\**.<sup>4</sup>

Let us make clear that our paper’s focus on *material* objects is important to the plausibility of our second metaphysical tenet. If the principle of the causal character of identity-over-time were not understood as restricted to the realm of material objects, if there were abstract objects like numbers in the domain of discourse, then this principle would not be so widely held. Given its apparently abstract nature, the number 2 has existed for centuries, but there is no interesting sense in which it has ever stood in any causal relations. Let us also make clear that the notion of causation intended in the causal character principle is nothing like a notion of a ‘sufficient’ cause and much like a notion of a ‘necessary’ cause or condition. Standing conditions that would not bring about an effect without many far more important and interesting things going on are

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2 S. Shoemaker, *Identity, Cause, and Mind* (Cambridge: Cambridge University Press 1984), 240

3 C. Swoyer, ‘Causation and Identity,’ *Midwest Studies in Philosophy* 9 (1984) 593-622, at 601

4 Whenever causation is a topic of discussion, there are questions about the nature of the causal relata. We find it useful to think of each of the causes and effects to be mentioned here as an object’s having a property at a time. For convenience, we will sometimes refer to these things as *states of affairs*. But absolutely nothing turns on the issue of what ontological category an object’s having a property at a time falls into. As far as our paper is concerned, the reference of phrases of the form ‘*x*’s having *F* at *t*’ might be an event or a trope or a fact or even a state of affairs in some more loaded sense of ‘state of affairs.’ Such nuanced ontological matters are not our present concern. It will be important to understanding our paper that the reader recognize that the causal relations of interest to us are not fundamentally relations between material objects. We are not talking about so-called object causation. Occasionally, we may speak loosely about an object standing in a causal relation, but this should always be construed as shorthand for speaking of the object being part of a state of affairs that stands in the causal relation.

still causes of the effect. Though Morning Truck's having pistons wouldn't have been a cause of Evening Truck's dented rims without Jill's having test-driven the truck on a flat tire, it is still a cause of the dented rims.

Something like this principle is explicitly defended by Shoemaker, Swoyer, David Armstrong, and Dean Zimmerman, among others.<sup>5</sup> We say *something like* because there are the usual minor variations one would expect when a certain view is expressed by different authors. So, for example, Armstrong, a four-dimensionalist, talks of the 'phases of a thing' standing in the causal relations:

So we seem justified in saying that, for the vast majority of cases at least, preceding phases of a thing are a necessary part of the total cause which brings the succeeding phases to be. The succeeding phases are got by way of the preceding phases, even if for many things (plants and animals especially) much cooperation from the environment is also needed. All this paves the way for the suggestion that, for most sorts of things at least, this causal relation between phases is a logically necessary condition for the *identity* of that thing through time. ('Identity Through Time,' 75)

Also speaking of causal connections between 'stages or phases,' Shoemaker, who takes this sort of talk to be consistent with three-dimension-  
alism,<sup>6</sup> says:

I shall begin with considerations that seem to me to show that it is a requirement of the cross-temporal identity of ordinary sorts of continuants that successive stages or phases in their histories stand in appropriate causal relationships, and that there is a good sense in which the holding of these relationships may be said to be constitutive of the identity. (*Identity, Cause, and Mind*, 237-8)

Though neither author exactly endorses the principle we are calling the causal character of identity-over-time, it is hard for us to see how an (earlier) phase of an object could cause a (later) phase without the object's having some property at the time of the earlier phase causing the object's having some property at the time of the later phase. With regard to the 3D/4D issue, we have made a special effort to formulate the causal character principle in as neutral a way as possible. The *A*'s and *B*'s in the principle are meant to range over material objects *whatever material objects*

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5 See S. Shoemaker, *Identity, Cause, and Mind*, 234-60; C. Swoyer, 'Causation and Identity'; D. Armstrong, 'Identity Through Time,' in P. van Inwagen, ed., *Time and Cause* (Dordrecht: D. Reidel, 1980); D. Zimmerman, 'Immanent Causation,' *Philosophical Perspectives* 11 (1997) 433-71.

6 Cf. S. Shoemaker and R. Swinburne, *Personal Identity* (Oxford: Basil Blackwell 1984), 75.

*happen to be*. So, at first glance anyway, the principle could be accepted by philosophers who disagree about what material objects are. At least *prima facie*, someone who thought that the truck Jill test-drove this morning is a 4D spacetime worm with a temporal part at 9:00 A.M., and someone who thought that this truck is a 3D entity that wholly existed at 9:00 A.M., could both accept the causal character of identity-over-time.

Which philosophers hold both the face-value analysis and the causal character principle? Who exactly will our puzzle make trouble for? We believe that the two tenets are part of the mindset of many contemporary metaphysicians. This is reflected, for instance, in the familiar formulations of the problem of personal-identity as just that (a problem about personal-identity) together with the equally familiar solutions appealing to either psychological continuity or physical continuity, both of which are taken to be causal notions. Also, we have already cited numerous endorsements of the causal character of identity-over-time and we believe that the face-value analysis is often simply taken for granted; it certainly is so by three-dimensionalists. Furthermore, a pretty convincing textual case can be made that at least one prominent contemporary metaphysician, Shoemaker, is committed to both principles. The passages quoted above reveal his commitment to the causal character of cross-temporal identities. And, earlier in the same essay, he tells us that for him 'cross-temporal identities' are 'propositions asserting that something existing at one time is identical to something existing at a different time' (*Identity, Cause, and Mind*, 235). In Section V, we will also see that certain four-dimensionalists, like David Lewis, reject the causal principle but accept similar principles. Our puzzle will reveal a tension between their commitment to these principles and their commitment to the face-value analysis.

There are philosophers who deny at least one of our two popular metaphysical tenets. For example, there are certain four-dimensionalists like Armstrong<sup>7</sup> who are forthright in denying the face-value analysis. Armstrong thinks that identity-over-time sentences like (1) do not involve strict identity, but only a loose sense of identity.<sup>8</sup> About this loose

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7 D. Armstrong, *A World of States of Affairs* (Cambridge: Cambridge University Press 1997), 15-16 and 104

8 Armstrong would understandably take exception to our labeling these sentences as *identity-over-time* sentences, given that when we use the word 'identity' elsewhere in the paper we mean strict identity. Michael Jubien (M. Jubien, *Contemporary Metaphysics* [Malden, MA: Blackwell 1997], 73-4) holds a view that is similar in some ways to Armstrong's. Unlike Armstrong, Jubien thinks the four-dimensionalism/three-dimensionalism issue is a conventional matter not decided by the facts;

sense of identity, we are told that it is an equivalence relation that relates the temporal parts of the object, and for it to obtain there must be a causal connection between the parts. It is also probably fair to include among the deniers of the face-value analysis philosophers like Chisholm, Butler (1975 [f. p. 1736], 101), and Reid (1975 [f. p. 1785], 112) who talk about only a loose sense of identity or only imperfect identity holding between ordinary material objects over time.<sup>9</sup> For other examples of people who deny one of the two key principles, there are spatiotemporal continuity theorists like Eli Hirsch<sup>10</sup> who challenge the causal character of identity-over-time. Nevertheless, though the merits of denying one of our key tenets are worthy of careful consideration, and for all we know may ultimately be part of the best response to our puzzle, our mission here will mainly be to investigate ways of addressing our puzzle while still maintaining both the face-value analysis and the causal character of identity-over-time.

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whether objects like the truck that Jill test-drove endures or perdures is a conventional matter. But about a sentence like (1), as it is used in ordinary contexts, Jubien thinks that 'is identical to' expresses what he calls a similarity relation, one of what may be many same-truck-as relations. (As Jubien sees it, the truck that Jill test-drove, even if it does endure, is a scattered object by 6:00 P.M. with many of its parts spread all about — there will be bits of rubber left on the road — and so is not strictly speaking identical to the one Pam bought.) Theodore Sider also adopts a view with some similarities to Armstrong's. According to Sider (T. Sider, 'All the World's a Stage,' *Australasian Journal of Philosophy* 74 [1996] 433-53, at 446), all identity-over-time sentences like (1) are — strictly speaking — false, since they are present-tense sentences. Analogous past-tense and future-tense sentences can be true, but only because the verb phrases 'was identical to' and 'will be identical to' do not express identity. These sentences are analyzed in terms of Lewis's I-relation, which is discussed in our Section V.

9 See R. Chisholm, 'Identity Through Time,' in J. Kim and E. Sosa, eds., *Metaphysics* (Malden, MA: Blackwell 1999), 277; J. Butler, 'Of Personal Identity,' in J. Perry, ed., *Personal Identity* (Berkeley: University of California Press 1975), 101; and T. Reid, 'Of Identity,' in Perry, *Personal Identity*, 112. Some further evidence of Shoemaker's commitment to the face-value analysis is his reporting his disagreement with much of what Butler, Reid, and Chisholm have to say about identity (*Identity, Cause, and Mind*, 237).

10 E. Hirsch, *The Concept of Identity* (New York: Oxford University Press 1982), 218-22

## II The Puzzle

If identity-over-time admits of the face-value analysis, then identity is one conceptual component of identity-over-time and, indeed, there is not much more to identity-over-time than identity. But, if that is right, then what are the conceptual origins of the causal character of identity-over-time? *Prima facie*, none of the component concepts of identity-over-time has its causal character. All material objects are self-identical at every moment of their existence, but not every material object at every moment of its existence has a property the having of which is a cause of that object's having another property at that same time. (Even those sympathetic to the possibility of simultaneous causation are likely to be reluctant to believe that simultaneous causation is actually so omnipresent.) Thus the puzzle is to explain how it could be that identity-over-time has a causal character when its conceptual components do not.<sup>11</sup> To see the puzzle in only a slightly different way, consider the conjunctive open sentence:

(2) *A* exists at *t*, *B* exists at *t*<sup>\*</sup>, and *A* is identical to *B*.

(2) apparently lacks the causal implications we have characterized as the causal commitments of identity-over-time; nothing in (2) precludes *t* from being *t*<sup>\*</sup>. But also consider:

(3) *A* exists at *t*, *B* exists at *t*<sup>\*</sup> (*t* ≠ *t*<sup>\*</sup>), and *A* is identical to *B*.

This open sentence apparently does have the causal commitments of identity-over-time. But how can this be if the face-value analysis is correct? Conceptually, if either existence-at-time or identity carried the causal commitments of identity-over-time, then (2) would have all the supposed causal commitments (3) has. Yet few think that it does.

A contrast will be useful. Suppose someone held:

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11 This puzzle was brought to our attention by an insightful e-mail message from David Robb. Harold Noonan, *Personal Identity* (London: Routledge 1991), 105-6 and Ken Akiba, 'Identity is Simple,' *American Philosophical Quarterly* 37 (2000) 389-404, at 390-2), both citing Lewis, are concerned with issues with certain similarities to our puzzle. They are concerned with the appropriateness of attempting to analyze identity-over-time given that identity is well understood. Our puzzle is even more reminiscent of Nathan Salmon's argument in 'Modal Paradox: Parts and Counterparts, Points and Counterpoints,' *Midwest Studies in Philosophy* 11 (1986) 75-120, at 111-12 against *x*'s equaling *y* being grounded in or reducible to facts about material origins, bodily continuity, or memory. His argument is based on *x*'s equaling *x* not being grounded in anything but *x*'s existence.

If  $A$  is identical-over-time to  $B$ , then there are times  $t$  and  $t^*$  such that  $A$  exists at  $t$ ,  $B$  exists at  $t^*$  ( $t \neq t^*$ ), and there is a spatiotemporally continuous set of ordered pairs of objects and times including  $\langle A, t \rangle$  and  $\langle B, t^* \rangle$ .

This might be described as the view that identity-over-time has a spatiotemporal character. But the spatiotemporal character of identity-over-time when combined with the face-value analysis does not generate a puzzle in the same way that the causal character of identity-over-time does; at least it does not for anyone who holds (as arguably one might) that something like this spatiotemporal continuity condition is a condition of identity, not just a condition of identity-over-time. Objects are always spatiotemporally continuous with themselves at a time. So one might hold that  $A$  is identical to  $B$  only if for any  $t$  and  $t^*$  such that  $A$  exists at  $t$ , and  $B$  exists at  $t^*$ , there is a spatiotemporally continuous set of ordered pairs of objects and times including  $\langle A, t \rangle$  and  $\langle B, t^* \rangle$ . It is a simple exercise to derive the supposed spatiotemporal character of identity-over-time from this claim about identity (*simpliciter*) and the face-value analysis.

We see no ungerrymandered claim stating a causal requirement of identity (*simpliciter*) that would allow an analogous derivation of the causal character of identity-over-time. The difference is that every material object arguably stands in the relevant spatiotemporal continuity relation to itself at every moment of its existence. But, *prima facie*, there is no property of, say, Pam such that Pam's having that property now is a cause of Pam's having a property now. Of course, there are *disjunctive* characterizations of identity that will get the causal entailments. For example, if one's concern is only in getting the entailments, one might hold that  $A$  is identical to  $B$  only if (i) there is a time  $t$  such that  $A$  and  $B$  occupy the same spatial location at  $t$  or (ii) there are times  $t$  and  $t^*$  and properties  $F$  and  $G$  such that  $A$ 's having  $F$  at  $t$  is a cause of  $B$ 's having  $G$  at  $t^*$ . Nevertheless, this sort of concoction, which we cannot resist calling *the two-faced analysis*, violates the spirit (though not the letter) of the face-value analysis. Identity-at-a-time and identity-over-time would have no more in common than a grue emerald that was first examined before the year 2000 and a grue sapphire that was first examined in 2001.<sup>12</sup>

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12 In something of a similar spirit, one might suggest that the causal character of identity-over-time is not conceptually necessary at all; perhaps it is an *a posteriori* necessary truth that has no conceptual origins. This would be almost as disappointing an end to our puzzle as would be the two-faced analysis, one quite at odds with the *a priori*/analytical flavor of typical philosophical discussions of the causal character of identity-over-time.

Conceivably, our style of puzzle could be raised without bringing in causation. We suppose someone might suggest that there is some other feature of identity-over-time that is not shared by identity-at-a-time. If so, this person would face puzzling questions about the source of that feature. But, as a matter of fact, the kinds of features often mentioned in discussions of identity-over-time seem either to be shared by identity-at-a-time or are themselves causal notions. For example, in discussions of personal identity, some have held that, if *A* exists at *t* and *B* exists at a later time *t*<sup>\*</sup>, then *A* is identical-over-time to *B* only if there is no closer continuer of *A*, i.e., that there is no *C* such that *C* exists during the interval [*t*, *t*<sup>\*</sup>] and *C* is at least as psychologically continuous with *A* as *B* is, where *B* is not psychologically continuous with *C*. (See Noonan, 16-17, for a brief overview.) But these same authors (one assumes) would be perfectly willing to also accept that identity-at-a-time requires there to be no closer continuers. They will accept that if *A* is identical to *B* then, for all *t* and *t*<sup>\*</sup>, if *A* exists at *t* and *B* exists at *t*<sup>\*</sup>, then *B* is the closest continuer of *A* at *t*<sup>\*</sup>. So closest-continuer theories do not generate a puzzle. Others have held that the identity-over-time of persons requires that *A* remembers having *B*'s experiences, or vice versa. This looks like it could be used to generate a puzzle since there is no time such that a person remembers at that time the very experiences he or she is having then. For example, Pam may be driving her truck right now, but she does not right now remember driving her truck right now. Still, though the memory commitments of personal-identity-over-time may well generate a puzzle, it seems that they might do so in virtue of the *causal* nature of memory. So, our suspicion is that, by focusing on the causal character of identity-over-time, we have managed to focus on a very basic version of our style of puzzle.

One response to the puzzle, which we want to address immediately, says that there really is nothing mysterious in any of what we have argued because we have committed the fallacy of composition. We all know a composite can have properties that do not belong to any of its parts, and someone might claim that this is all that is happening here. None of the conceptual components of identity-over-time have its causal character when considered singularly, but perhaps that does not preclude the composite from having them.

Let us consider a typical fallacy of composition. Suppose one concluded from the fact that each of a machine's parts weighs less than one pound that, therefore, the machine weighs less than one pound. Clearly this is a bad argument; one is right to accuse anyone who argues in this manner of the fallacy of composition. We all know how to add the weights of machine parts, so we know that, for instance, if a machine has 10,000 parts that weigh 1/2 pound each, then the machine weighs 5,000 pounds. Or, for a more conceptually oriented example of this type of

fallacy, one might try to argue that there is something puzzling about bachelorhood because none of its component concepts (i.e., being a man, not being married) entail bachelorhood commitments, though somehow the two together do. But here again, it is simple to see why this puzzle is empty. We all understand how bachelorhood commitments can come out of a composite relation containing these two properties as conceptual components.

Our puzzle is of a different nature. Suppose we were to tell you that you can take some graham crackers, chocolate, and marshmallows, mix them all up, and all of a sudden produce a Chevrolet. When you inevitably look at us like we are crazy and protest that we must be mistaken about our ingredients, it would be inappropriate for us to say in response, 'Ah, you're just committing the fallacy of composition.' Our reply is unreasonable because it is not even remotely evident how graham crackers, chocolate, and marshmallows can add up to a Chevy. Sure, we all understand that the s'mores we get out of this mixture will have properties that do not belong to any of the parts, like the property of being scrumptious. Anyone who thinks this is the sign of something deeply puzzling is seeing puzzles that are not really there. (The ingredients at least are all foods, and all have flavor, even if no one of them is on its own a scrumptious food.) But, if one is going to claim that the s'more mixture has the property of having a flat tire, someone has some explaining to do.

Our puzzle about persistence is like the case of the Chevrolet and not like the cases of the 5000-pound machine or bachelorhood. According to some, you can take two simple claims about objects existing at different times, neither of which has causal commitments, add an identity statement, which has no causal commitments, and all of a sudden causality is a necessary feature of the new relationship. In essence, natural necessity comes from a mix of existence and identity! It really does seem as if identity-over-time and identity are substantially different relations, not just in the trivial sense that identity-over-time is transtemporal while identity is not, but in the much deeper sense that different conditions must obtain in the world for the two relations to be instantiated. No causal relations need to be present for identity to obtain, yet they must be present in order for identity-over-time to obtain. There really is a puzzle here.

### III The Causal Commitments of Material Existence

Here is an interesting element of our puzzle. We have assumed that a material object can exist at a time without standing in any causal relations. The puzzle does not get off the ground without this assumption because, according to the face-value analysis, existence-at-a-time is a component of identity-over-time. Someone might object to our assumption.

Here is one way the objection might go. If identity-over-time has causal commitments, then an object that exists at a time, and yet does not stand in any causal relations, must not exist at any other times. Thus, any material object that does not stand in any causal relations must be a momentary object. Now, a momentary object is a strange thing. It exists at a time, but the interval of time for which it exists has zero length. Perhaps such a thing is not really possible. If not, then the mere existence of a material object at a time would carry with it certain causal commitments. As a result, the causal commitments of identity-over-time would be less mysterious. Still, it seems to us that we would be denying a perfectly good possibility were we to deny the possibility of momentary objects. We certainly should not be swayed by the sophistry that reasons from an object's existing for no extended temporal interval to the conclusion that the object does not exist. In a Newtonian world, a ball tossed straight up into the air has zero velocity at its maximum height; it has that velocity for only a moment. So it does not have that property over any extended temporal interval — in a sense, it has that velocity for no time at all. But it does not follow that the object was not really at rest at that moment. *Perhaps*, one could formulate a better argument to the conclusion that no object can exist for only a single instant. In the absence of such an argument, denying the possibility of momentary objects in order to avoid the puzzle has a decidedly *ad hoc* feel.

There is also the matter of the causal commitments of materiality. This line of reasoning takes its cue from the fact that materiality seems to be an important part of the causal commitments of identity-over-time. As we pointed out in Section I, if the principle of the causal character of identity-over-time were not understood as restricted to the realm of material objects, if there were abstract entities in the domain of discourse, then that principle would be much more suspect. So someone might be led to think that our implicit restriction of the principle to material objects somehow brings with it the causal commitments. This is especially tempting since there are independent reasons for thinking that being a material object is a causal notion. First, it is plausible to think that an object's being material is partly a matter of its being impenetrable, of its being disposed to *cause* a certain range of material objects that may collide with it to be stopped from penetrating it.<sup>13</sup> Second, it is also plausible to think that being a thing with parts requires some form of causality. Michael Slote argues specifically that there must always be some causal explanation of why a part stays within a thing (if it does stay

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13 Cf. J. Carroll, *Laws of Nature* (Cambridge: Cambridge University Press 1994), 148-9.

within) and why it does not (if it does not), otherwise the so-called thing would be a mere pile or aggregation.<sup>14</sup>

This possible solution has the virtue of not invoking any principles that obviously lack the popularity and plausibility of the face-value analysis and the causal character of identity-over-time. Still, it is not wholly uncontroversial; there are many who would hold that being a material object is merely a matter of occupying a spatiotemporal region,<sup>15</sup> and no doubt others who would hold that having parts is merely a matter of having something within its spatiotemporal boundaries. Also, considerations about the causal nature of parthood do not seem entirely germane unless one is prepared to dismiss the possibility of a partless material object. Finally, and what is most important, our main concern is that it is not clear how the causal commitments of materiality could give rise to the particular causal commitments associated with identity-over-time. It is one thing to be disposed to repel certain kinds of objects or for there to be causal explanations of the presence or absence of a part. It is something else altogether to be such that the having of certain properties at a time is a cause of the having of certain properties at another time. The question is from where do the *particular* causal commitments of identity-over-time come? Indeed, so long as the possibility of a momentary material object is genuine, and such an object can exist without standing in any causal relations, it seems that materiality could not supply the causal nature of identity-over-time.

#### IV A Counterfactual Solution?

The counterfactual solution, as we will call it, tries to uphold the causal commitments of identity-over-time by trying to tell an interesting story about their source. It maintains that identity (*simpliciter*) has a counterfactual commitment. It is this:

If *A* is identical to *B*, then, for any times *t* and *t\** such that *A* exists at *t* and *B* exists at *t\**, there are properties *F* and *G* such that (i) *A* has *F* at *t*, (ii) *B* has *G* at *t\**, and (iii) if *A* had not had *F* at *t*, then *B* would not have had *G* at *t\**.

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14 See M. Slote, 'Causality and the Concept of a "Thing,"' *Midwest Studies in Philosophy* 4 (1979) 387-400, at 393.

15 R. Cartwright, 'Scattered Objects,' in K. Lehrer, ed., *Analysis and Metaphysics* (Dordrecht: D. Reidel 1975) appears to be one example.

Now *suppose*, just for the sake of argument, that something like a counterfactual account of causation, or better yet the simplistic counterfactual account holding that causation *is* counterfactual dependence between temporally distinct states of affairs, is the true philosophical account of causation. Then, the conjunction of this key supposition conjoined with both identity's counterfactual commitment and the face-value analysis entails the causal character of identity-over-time. On this view, identity-over-time does have the causal commitments we expect because, when we have identity-over-time, we also have counterfactual dependence between temporally distinct states of affairs. This view avoids assigning any causal commitments to identity-at-a-time because the counterfactual commitments that come with identity-at-a-time do not relate temporally distinct states of affairs.

Despite having a certain elegance, this solution depends heavily on the key supposition. Counterfactual accounts of causation come in many forms, and there is no guarantee that there is a correct counterfactual account, never mind one that shares the pertinent features of our simplistic account, namely (i) that counterfactual dependence between temporally distinct states of affairs is sufficient for causation, and (ii) that counterfactual dependence between simultaneous states of affairs is not. The former is threatened by Jaegwon Kim's objections and problems stemming from common-cause situations.<sup>16</sup> The latter may not seem like much of a problem, but it is actually a little trickier than it first appears. Merely stipulating that there is no simultaneous causation as the simplistic account does is not obviously satisfactory since we may want to allow the possibility of time-travel, backwards causation, and causal loops. The trick is to come up with a plausible counterfactual account of causation that permits these as logical possibilities while keeping identity-at-a-time free of causal commitments. This will be no easy trick since it is precisely the stipulated irreflexivity of the causal relation that permits identity-at-time to be noncausal and identity-over-time to be causal on this attempted solution to our puzzle, but that stipulation has to be given up to permit the causal loops that accompany the possibility of backwards causation.

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16 J. Kim, 'Noncausal Connections,' *Nous* 8 (1974) 41-52

## V The Doctrine of Temporal Parts

We have thus far focused on possible solutions to the puzzle that retain both the face-value analysis and the causal commitments of identity-over-time. In the present section, we will discuss some possible solutions that dispense with one or both of these theses. We will argue that defenders of the doctrine of temporal parts, the four-dimensionalists, are likely to reject at least one of the two key metaphysical tenets, but may do so in ways that do not sidestep the puzzle.

Before doing so, let us highlight four solutions that we have considered and that will be relevant to our discussion in this penultimate section of our paper. First, we want to mention the two-faced analysis. It is a disjunctive account of identity that attempts to describe the conceptual origins of the causal commitments of identity-over-time, but in attempting to do so makes identity-at-a-time and identity-over-time thoroughly different relations; it is merely an attempt to preserve the letter of the face-value analysis. Second, there is the reply that denies the possibility of momentary objects. This reply seems to rule out a legitimate possibility without explaining why a causal condition is necessary for identity-over-time but not identity-at-a-time. Third, we noted that we have limited our discussion to *material* objects and admit that the concept of materiality may carry some causal commitments, but these causal implications seem unrelated to the causal commitments of identity-over-time. Fourth, we considered the counterfactual solution. Coupling the counterfactual commitments of identity with the stipulation that causation *is* counterfactual dependence between temporally distinct states of affairs provides an elegant way of reconciling our two principles. The problem here is providing a counterfactual account of causation that avoids standard objections to these accounts, keeps identity-at-a-time free of causal commitments, and leaves possibilities such as causal loops open.

Four-dimensionalists<sup>17</sup> hold that material objects are space-time worms that have temporal parts. As Heller has put the point,

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17 We are setting aside Sider's stage view. Sider takes the stage view to be a four-dimensionalism, but this seems to be because he equates four-dimensionalism with the thesis that objects do not *endure*; stages do not endure — they are not wholly present at more than one time. But neither is it true, according to the stagist, that material objects persist through time by having temporal parts, by *perduring*. So, by the same sort of reasoning, one might just as well conclude that stagism is a 3D view. Indeed, it makes sense that these objects neither endure nor perdure since the main point of stagism is that material objects do not persist at all. In any case, whether or not his view should be labeled a four-dimensionalism, the relevance of Sider's view to our puzzle is addressed elsewhere in our paper. (See Note 8.)

A physical object is the material content of a region of spacetime.

Just as such an object has spatial extent, it also has temporal extent — it extends along four dimensions, not just three. (4)

Consider a truck that is manufactured at time  $t_0$  and is destroyed at a later time  $t_2$ . Three-dimensionalists hold that at any time,  $t_1$ , during the interval from  $t_0$  until  $t_2$ , the entire object that is the truck is present at  $t_1$ . The three-dimensional truck comes into existence at  $t_0$  and endures until it goes out of existence at  $t_2$ . Four-dimensionalists deny that the truck is wholly present at any time from  $t_0$  to  $t_2$ . Rather, they will say that the truck is a temporally extended object that spans a spacetime region from  $t_0$  to  $t_2$ . Since the truck is an object which is extended through time, it follows that the truck has temporal parts.

It is important to keep in mind that a 4D perspective does not influence some aspects of our earlier discussion. The temporal-parts theorist can accept both the face-value analysis and the causal character of identity-over-time, and doing so brings on the puzzle: if he or she allows that some things exist only momentarily (these are worms of zero temporal extent), it is possible for something to exist, say, in the morning and there be no causation at all. Similarly, it is possible for something to exist in the evening and there be no causation at all. But, according to the temporal-parts theorist, if  $A$  exists in the morning and  $B$  exists in the evening *and*  $A$  is identical to  $B$ , then there does have to be causation in the world. So, once again, we are stuck with the surprising result that by adding identity (not causal) to existence claims (again not causal), we get causality. For another example of how four-dimensionalism does not influence some aspects of our puzzle, we recognize that it is as open to the four-dimensionalist as it is to others to pursue the potential solution to the puzzle that denies that there are momentary objects. The potential solution that sees the causal commitments of identity-over-time as grounded in the counterfactual commitments of identity is also available. As troublesome as these prospects look to us, they seem no more dismal from a 4D perspective.

We should also keep in mind that we have already glimpsed one feature of four-dimensionalism that does allow one to sidestep the puzzle. There are four-dimensionalists like Armstrong who are forthright in their denial of the face-value analysis. Mark Heller's approach provides a similar way out. Heller (5 and 12-13) holds that having a temporal part that exists at a time is not sufficient for the object to exist at that time. According to Heller, although the truck has a temporal part that exists at 6:00 P.M., the truck itself does not exist at 6:00 P.M. As a result, he avoids the puzzle by denying the face-value analysis: the truck Pam bought is identical-over-time to the truck that Jill test-drove — Morning Truck is identical to Evening Truck — but the truck Pam bought

does not exist at 6:00 P.M. and the truck Jill test-drove does not exist at 9:00 A.M. This also permits a nifty story about the origins of the causal character of identity-over-time. If  $A$  stands in the identity-over-time relation to  $B$  if and only if there is a time  $t$  and a time  $t^*$  such that  $A$  *partially* exists at  $t$ ,  $B$  *partially* exists at  $t^*$  ( $t \neq t^*$ ), and  $A$  is identical to  $B$  — then it seems plausible to attribute the origins of the causal commitments of identity of time to the causal commitments of partial existence. Having a (proper) part is arguably a causal notion. Armstrong's and Heller's four-dimensionalisms are pertinent because we doubt that the doctrine of temporal parts helps to deal with the puzzle in any way other than by enabling some sort of rejection of the face-value analysis.

Can a four-dimensionalist hang on to the face-value analysis? Well, of course, one way would be to reject the causal character of identity-over-time. This is also an option many four-dimensionalists will be drawn to: more so than three-dimensionalism, four-dimensionalism seems to encourage a rather liberal attitude about what counts as a material object. Four-dimensionalists often accept some sort of principle of unrestricted composition, allowing that any collection of temporal parts constitutes a material object.<sup>18</sup> For one who accepts unrestricted composition, there are such material objects as the worm consisting of Elvis's left arm from 1965 to 1975 and the tallest mountain on Pluto from 1991 to 1999. But it is not true that this thing's having any properties in 1967 caused its having any properties in 1997. So, these four-dimensionalists must deny the causal character of identity-over-time. Our puzzle (at least in its original form) just does not apply.

We doubt, however, that this is really a new way out. The liberal temporal-parts theorist is faced with an analogous puzzle. As Zimmerman points out, they 'need to be able to recognize the difference between a set of person-stages that compose a single person and a set of person-stages that do not; a set of table stages that make up a single table and a set that does not, and so on' (436). Likely, some appeal will be made to causal considerations. If so, liberal temporal-parts theorist are likely to accept the causal character of identity-over-time when that principle is restricted to, say, tables. This will create a tension between this principle, what we might call *the causal character of table-identity-over-time*, and what we might call *the face-value analysis of table-identity-over-time*:  $A$  and  $B$  stand in the table-identity-over-time relation if and only if there is a time  $t$  and a time  $t^*$  such that  $A$  exists at  $t$ ,  $B$  exists at  $t^*$  ( $t \neq t^*$ ),  $A$  is identical to  $B$ , and  $A$  and  $B$  are both tables. It might appear that this form of the

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18 E.g., W.V.O. Quine, *From a Logical Point of View* (Cambridge: Harvard University Press 1953), 65-8.

puzzle is more tractable than the original since, according to this analysis, table-identity-over-time has an additional component: the concept of tablehood, which is in some sense causal. But, actually, this consideration seems to do no better than the reply to our puzzle that makes reference to the causal nature of materiality. Just as we need to know how the apparent causal commitments of materiality give rise to the causal commitments of identity-over-time, we need to know how the causal commitments of tablehood give rise to the particular causal commitments of table-identity-over-time. Given the possibility of a momentarily existing table standing in no causal relations to anything, it seems unlikely that they do. As we see it, '*being a member of a certain kind and lasting over time* are disparate features of an object.'<sup>19</sup>

Sometimes defenders of the doctrine of temporal parts talk about *genidentity* constituting the identity-over-time fact. (See Quine: 'You can bathe in two river stages which are stages of the same river, and this is what constitutes bathing in the same river twice' [65].) So, in the end, a four-dimensionalist might be prepared to hold the face-value analysis and yet *also* hold that *A* stands in the identity-over-time relation to *B* only if a temporal part of *A* is genidentical to a temporal part of *B*, where genidentity is a causal notion. This is fine, but as yet it is no answer to the puzzle. Since this is an analysis of identity-over-time and not an analysis of identity (*simpliciter*), it does not say where the causal commitments of identity-over-time come from; it merely says what they are with different terminology. Recognizing this, the defender of temporal parts could go on to tell us something about identity, say, that *A* is identical to *B* only if a temporal part of *A* is either identical or genidentical to a temporal part of *B*. A simple rhetorical variation on this move would be to define identity (non-disjunctively) simply in terms of genidentity but then define genidentity disjunctively in such a way that identity-at-a-time entails genidentity. Without question, such maneuvers would permit a derivation of the causal character of identity-over-time.

Still, we think these disjunctive maneuvers need to be appreciated for what they are. If one opts for one of them, then one buys into the face-value analysis in only a superficial way, in somewhat the same superficial way the disjunctive view discussed in Section II, the two-faced analysis, does; identity-at-a-time and identity-over-time are left with nothing in common. Admittedly, the four-dimensionalist can accept a disjunctive view more happily than the three-dimensionalist can accept an analogous disjunctive view because commitment to the letter

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19 T. Merricks, 'There Are No Criteria of Identity Over Time,' *Nous* 32 (1998) 106-24, at 113

and spirit of the face-value analysis is not sacrosanct to four-dimension-  
alism in the same way it is to three-dimensionalism. It is in this way that  
we see the main advantage that the 4D approach has over the 3D  
approach *vis-à-vis* our puzzle: four-dimensionalists have the option of  
denying the face-value analysis in either spirit or in letter. Making one  
of these disjunctive moves stops just short of outright denial, preserving  
the letter of the face-value analysis.

We tentatively place Lewis among the temporal-parts theorists who  
both accept unrestricted composition and want to take the face-value  
analysis seriously. Lewis held that having a temporal part that exists at  
a time is sufficient for the object to exist at that time; he says '*what matters  
in survival is identity* — identity between the I who exists now and the  
surviving I who will, I hope, still exist then.'<sup>20</sup> Furthermore, for Lewis,  
identity (including identity-over-time) is 'utterly simple and unprob-  
lematic'<sup>21</sup>; he was prepared to understand 'Hume, who was present in  
1711, is identical to someone who was present in 1776' quite literally.<sup>22</sup>  
So it seems he was committed to the face-value analysis. What about  
causation? Since he accepted unrestricted composition,<sup>23</sup> he must have  
rejected the causal principle.<sup>24</sup> But he does accept something similar.  
Though we think we could easily extrapolate what Lewis would have  
said about material objects like tables and chairs, we will stick to persons  
because it is pretty straightforward what he thought about the causal  
requirements of *personal-identity*: about persons, he believed that, if  
person *A* is identical to person *B*, then *A* and *B* have temporal parts that  
stand in *the I-relation*, where the I-relation is defined as:

*S1* and *S2* are I-related if and only if a continuant person of whom *S1* is a stage and  
a continuant person of whom *S2* is a stage are identical. (*Papers, Volume I*, 60)

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20 D. Lewis, *Philosophical Papers, Volume I* (New York: Oxford University Press 1983),  
56

21 D. Lewis, *Philosophical Papers, Volume II* (New York: Oxford University Press 1986),  
192

22 See D. Lewis, *On the Plurality of Worlds* (New York: Oxford University Press 1986),  
210.

23 D. Lewis, *Parts of Classes* (Oxford: Basil Blackwell 1991), 7 and 79-81

24 We have to be a little careful. Unrestricted composition says that whenever we have  
at least two things, there is also their fusion. Strictly speaking, it does not say that  
their fusion is a material object, only that it exists. With something like the fusion of  
Elvis's left arm from 1965 to 1975 and the tallest mountain on Pluto from 1991 to  
1999, there is no question about its being material (assuming it exists), but there  
might be some question about its being an object.

But for Lewis, the I-relation is *the R-relation* (ibid., 59), which is some relation of mental continuity and connectedness, which for Lewis encompassed the same sort of relations of causal dependence we have specified as the causal commitments of identity-over-time.

Finally, the connectedness and continuity are not accidental. They are explicable; and further, they are explained by the fact that the properties of each stage depend causally on those of the stages just before in personal time, the dependence being such as tends to keep things the same. (*Papers, Volume II*, 72; also see *Papers, Volume I*, 55-6.)

So, for Lewis, personal-identity brings I-related temporal parts, brings R-related temporal parts, brings causally connected temporal parts. If person *A* exists at *t* and is identical to person *B* that exists at *t\** ( $t \neq t^*$ ), then the temporal part of *A* that exists at *t* stands in the R-relation to the temporal part of *B* that exists at *t\** and that is *essentially* the causal character principle as applied to persons.<sup>25</sup> The causal commitments of identity-over-time fall out of his identification of the I-relation with the R-relation and the accompanying 4D framework.

That all seems well and good until we look more closely at the causal nature of the R-relation. Consider identity-at-a-time. If person *A* exists at *t* and is identical to person *B* that exists at *t\** (now with  $t = t^*$ ), then the temporal part of *A* that exists at *t* stands in the I-relation, and so also stands in the R-relation, to the temporal part of *B* that exists at *t\**. So a certain stage stands in the supposedly causal R-relation to itself. There is no question that Lewis believed that every stage stands in the R-relation to itself; he stipulates that the R-relation is reflexive (*Papers Volume I*, 61). But this question now arises: in what sense is the R-relation causal? We doubt that Lewis held that every person stage is causally dependent on itself. But the only way Lewis could have avoided this consequence was if he had in mind a disjunctive characterization of the R-relation, something to the effect that two stages are R-related only if they stand in certain relations of causal dependence *or* stand in certain (noncausal) relations. Such a characterization would avoid identity-at-a-time's having causal commitments, but only by endorsing something akin to the two-faced analysis. It is not exactly a disjunctive analysis of identity, but it is a mere reformulation of that view, one that identifies the I-relation,

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25 As was true of Shoemaker and Armstrong (see Section I), Lewis has not exactly endorsed the causal principle. But we think Lewis will accept that if a property of a temporal part of person *X* at *t* causes a property of a temporal part of person *Y* at *t\**, then there are properties *F* and *G* such that *X*'s having *F* at *t* causes *Y*'s having *G* at *t\**.

the relation closely linked to personal-identity in his four-dimensionalism, with the now disjunctive R-relation. Since he was a four-dimensionalist, this may be a sort of tinkering with the utterly simple and unproblematic nature of identity that Lewis would have been prepared accept. It is tinkering, nonetheless.

## VI Concluding Observations about the Puzzle

We will conclude by revealing one lesson we learned from the puzzle. It is that a thorough-going commitment to the face-value analysis severely limits one's ability to theorize about identity-over-time. Some of those who have theorized about the nature of identity-over-time have implicitly or explicitly accepted the face-value analysis, but have also seen no reason not to talk about various interesting features of identity-over-time. But our puzzle shows that these features probably should not be thought of as part of this relation. If a particular feature in question *is* viewed as part of identity-over-time, it should be clear how it can be a consequence of the conceptual components laid out in the face-value analysis. In other words, if one is tempted to accept that some condition *C* is part of the relation of identity-over-time, then it should be clear, or at least immanently explainable, how *C* stems from two existence claims, a statement of non-identity for times, and an identity statement. As we have taken pains to argue in this paper, this task proves to be extremely difficult when the condition in question is a causal one.<sup>26</sup>

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