The Paradox of Fission and the Ontology of Ordinary Objects

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What happens to a person in a case of fission? Does it survive? Does it go out of existence? Or is the outcome indeterminate? Since each description of fission based on the persistence conditions associated with our ordinary concept of a person seems to clash with one or more platitudes of common sense about the spatiotemporal profile of macroscopic objects, fission threatens the common-sense conception of persons with inconsistency. Standard responses to this paradox agree that the common-sense conception of persons is unstable, differing over which part of the conception requires revision. I will show that this entrenched view of fission is not compulsory. I will develop a solution to the paradox that maintains the consistency of the common-sense conception of persons on the basis of an ontology of persons and other ordinary objects as double-layered compounds. Each of various descriptions of the outcome of personal fission is compatible with principles about the spatiotemporal profile of persons, because the descriptions and the principles manifest different perspectives on persons and are made true or false by different ontological components of the latter. What holds for the fission of persons, holds for the fission of other kinds of objects.

1 The paradox of fission

Suppose that a person P's cerebrum, the organ chiefly responsible for the person's higher-order mental capacities, is separated into its two hemispheres by cutting the nerves that connect the latter. One of these hemispheres is then implanted into a new head and fully connected, with the result that there is a postoperation person who is in every way psychologically continuous with P; the postoperation person remembers the preoperation

person's past experiences, shares her personality traits, and so on. Is the postoperation person identical with the preoperation person? The standard intuition is that the answer is 'yes'; psychological continuity yields personal identity. So let us assume that a psychological criterion of personal identity over time is associated with our ordinary concept of a person.[1]

Next, suppose again that a person P's cerebrum is separated into its two hemispheres. But now each hemisphere is removed and implanted into a head distinct from the one where it came from. Each hemisphere is fully connected and comes to function in its respective new skull just as it used to function in the old one. As a result of this operation, so I shall assume, there are persons Lefty and Righty, who are in every way psychologically continuous with P, the person before the operation; Lefty and Righty share memories, personality and other psychological features with P. This is a case of personal fission.[2]

What happens to P, the preoperation person, in this case, given that the preoperation person survives in the nonbranching case, and hence given that personal identity is grounded in psychological continuity? The fission case under consideration is symmetrical; Lefty and Righty are psychologically continuous with P to the same degree. The response that either Lefty or Righty is identical with P is therefore not available, since there is, *ex hypothesi*, no fact of the matter that could select one candidate. This leaves us with four relevant descriptions of what happens to P.

The first description of the outcome of fission is to say that P survives "twice over" and wakes up in distinct rooms after the operation. The seemingly distinct postoperation persons are really one and the same person exactly located in wholly distinct places at the same time. As a consequence of the operation, P is spatially separated from herself and able to differ from herself in virtue of being able to have incompatible weights, shapes and moods at the same time. All of this sounds unacceptable. Persons are nonrepeatable entities, confined to a single place at a time. In short, the bilocation description of fission clashes with the following platitude of common sense, the antibilocation principle:

(AB) A person cannot occupy distinct places at the same time.[3]

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[1]It is commonly viewed as a mark of sortal concepts that they encode some such criterion of identity over time.

[2]For standard contemporary sources, see Parfit 1984, Wiggins 1967 and Williams 1956. For the history of personal fission cases, see Martin, Barresi and Giovanelli 1998.

[3]Henceforth, occupation is to be understood as exact occupation and impossibility as impossibility under the actual laws of nature.

I shall say more about this and similar principles later on. For now, I rest content voicing it.

The second description of fission is to say that P was not alone before the operation. Fission does not divide one person, but rather separates distinct persons; distinct persons part ways.[4] At preoperation times, these persons are qualitatively indistinguishable and exactly occupy the same places; they are colocated at these times. As the previous attempt of understanding fission, this one is incompatible with the folk conception of persons. As persons are conceived of on the street, two persons cannot fit into the same place at the same time. The colocation description of fission thus clashes with the following platitude of common sense, the anticolocation principle:

(AC) Distinct persons cannot occupy the same place at the same time.

According to the third description, P dies in the operation. But how can P survive a successful transplant of one hemisphere, yet die when both hemispheres are successfully transplanted? In Derek Parfit's words, "How can a double success be a failure?" (1984, p. 256). The answer urged by best-candidate theories of personal identity is that the persistence of persons is nonlocal.[5] The persistence of persons is nonlocal if a person-state x-at-t_1 and a person-state y-at-t_2 belong to some one person just in case y-at-t_2 is the "closest continuer" of x-at-t_1, in virtue of exhibiting a higher degree of psychological continuity with x-at-t_1 than any other state at t_2.[6] In the simple transplant case, a preoperation state of P, P-at-t_1, has a closest continuer, P^*-at-t_2. Hence P-at-t_1 and P^*-at-t_2 are states of one person; P survives. In the fission case, however, a preoperation state of P, P-at-t_1, has two equally close continuers at the same time, Lefty-at-t_2 and Righty-at-t_2. Hence P-at-t_1 has no closest continuer, and accordingly neither P-at-t_1 and Lefty-at-t_2 are states of one person, nor P-at-t_1 and Righty-at-t_2 are states of one person; P dies. This is how a double success can be a failure.

The nonlocality description of what happens in the fission case has wild consequences. Suppose that P's hemispheres are separated and transplanted as before. While t_1 is a time before the operation, t_2 is the time at which the left hemisphere is fired up in person Lefty in operation room L. Suppose further that two minutes later, at t_3, the right hemisphere is fired up in person Righty in operation room R, while in room L at t_3 there is a person

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[4]See Lewis 1983, Perry 1972, and Robinson 1985.

[5]See Nozick 1981. I adopt the term 'locality' from Eklund 2002, p. 469.

[6]A person-state is an instantaneous qualitative cross-section of a person. (More on such states in section 2).

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Lefty*. By the closest-continuer view, Lefty-at-t_2 is the closest continuer of P-at-t_1, and hence there is a person with both P-at-t_1 and Lefty-at-t_2 as states. However, Righty-at-t_3 and Lefty*-at-t_3 are equally close continuers of P-at-t_1, and hence there is neither a person with P-at-t_1 and Righty-at-t_3 as states, nor is there a person with P-at-t_1 and Lefty*-at-t_3 as states.[7] What this implies in more accessible terms is that the pre-operation person a survives and wakes up in room L at t_2 but dies two minutes later as a consequence of the events occurring at t_3 in room R. Thus, a goes out of existence by a cause that does not involve a at all; a dies by a purely extrinsic cause. Immaculate destruction—a strange way of killing a person! This consequence of the closest-continuer view is unpalatable. The situation, in short, is that the nonlocal-persistence description of fission, predicting the death of prefission person a, clashes with the following platitude of common sense, the anti-extrinsicness principle:

(AE) A person cannot go out of existence by purely extrinsic causes.[8]

The fourth and final description of fission is to say that the outcome is indeterminate. There is no fact of the matter as to whether there is a single pre-fission person who is identical with both fission-products or with none, or whether there are distinct, colocated prefission persons. In short, it is indeterminate which of the reviewed descriptions of the case applies.[9] It is thus indeterminate whether a person can occupy distinct places at the same time. The problem with this claim is that *prima facie* it still clashes with principle (AB). For if this principle is taken seriously, then it should be read as saying that it is determinately true that a person cannot occupy distinct places at the same time. For analogous reasons, the

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[7]The fact that Lefty*-at-t_3 has a psychologically continuous preceding state at t_2 but Righty-at-t_3 does not, surely bestows no higher degree of psychological continuity with P-at-t_1 on Lefty*-at-t_3, since t_2 and t_3 are only two minutes apart. In other words, a short temporal delay in transplanting the right hemisphere does not break the symmetry and yield a decision concerning whether P survives or not. If in doubt, let the degree of psychological continuity between P-at-t_1 and Righty-at-t_3 be slightly higher than between P-at-t_1 and Lefty*-at-t_3, in order to compensate for the temporal delay. Cf. Mark Johnston's case of the brain-state transfer machine in his 1987.

[8]As my aim in this essay is largely constructive, I shall refrain from attacking cycles of modifications of the best-candidate outlook in response to this type of problem. I am concerned to argue that even if immaculate destruction is an unavoidable consequence of the nonlocal-persistence description of fission, there is a way of saving the latter from clashing with (AE). I shall adopt an analogous perspective on the other proposals reviewed here.

[9]See Johnston 1989 and 1997.

indeterminacy description seems to conflict with principles (AC) and (AE). All of these platitudes of common sense should be understood as assertions of determinate impossibilities. Hence, the present move faces more resistance than its competitors; it seems to conflict with *all* featured common-sense principles. The indeterminacy move fails to escape the threat of conceptual inconsistency, since we do not refrain from making a decision in favor of one of these descriptions. Instead, we decide against each of them by holding (AB), (AC) and (AE).

These four attempts of describing what happens to a person undergoing fission are problematic because they clash with highly compelling principles (AB), (AC) or (AE). Given that the four descriptions exhaust the logical space of options, assuming a psychological criterion of personal identity over time, it follows that there is a rift in our conception of persons.[10] This is the paradox of personal fission.

This type of paradox does not exclusively threaten our conception of persons. By whichever lines of qualitative continuity we typically track an object of an ordinary kind K through time, if it is nomologically possible for such a line to branch out, then there is a paradox of fission for Ks. For in each of these cases, we are stuck with descriptions of the outcome of fission that seem to clash with one or more analogues of principles (AB), (AC) and (AE).[11] The metaphysical paradox of symmetrical fission, in whichever form it may arise, is the subject of this essay. For ease of exposition, I shall focus on personal fission.

The apparent conflict in the face of fission between psychological persistence conditions of persons and principles (AB), (AC) and (AE) is typically thought to require a choice between rejecting such persistence conditions and rejecting one or more of the principles.[12] Both of these approaches accept

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[10]A *conception* of Ks, as I shall use the term, is, roughly, a set of deeply entrenched and widely shared beliefs about Ks. I wish to distinguish a conception of Ks from the *concept* of a K. As will become clear in later sections, our conception of Ks may include beliefs about Ks that are in no way encoded in our concept of a K.

[11]There is a broad consensus that organisms follow lines of biological continuity. If it is nomologically possible for causal lines of biological continuity to branch out, then a paradox of dividing organisms is waiting in the wings. One often hears that the division of amoebae constitutes an actual case of this type of fission. (See Robinson 1985 for a discussion of fission in terms of amoeba division.) Probing into the realm of the counterfactual, one might even construct cases of biological fission involving human organisms, cases in which a human body splits down the middle, while each resulting half bears to the original body the type of biological continuity by which we track human organisms in actual, nonbranching cases. There is, further, an abundance of cases of dividing artifacts. The Ship of Theseus, as first presented in Hobbes 1839/2004, is a glamorous representative.

[12]For the first route, see Williams 1970, Thomson 1997, and Olson 1997. For the second

that the paradox of fission uncovers an inconsistency in the common-sense conception of persons. They concede that fission cuts deep, thereby leaving the most serious problem about fission untouched. For it is much harder to accept that the common-sense conception is inconsistent than to accept that it is partially or even completely false.[13] In what follows, I shall propose a solution to the paradox that avoids the breakdown of our conception of persons in the face of fission. What I shall offer is a dissolution of the apparent conflict between our four alternative descriptions of the outcome of fission and principles (AB), (AC) and (AE): properly understood, there is no conflict; the descriptions and the principles are compatible. I shall not argue that the common-sense conception of persons is true on the whole. I shall rather argue that it is internally stable. What holds for our conception of persons, holds for our conceptions of organisms and of artifacts. The strategy I shall propose for dissolving one fission paradox will dissolve all.

The picture to be defended looks roughly as follows. Ontologically speaking, persons and other ordinary objects are double-layered compounds. The different layers permit different perspectives on persons, from which we are able to describe them in different ways. The various descriptions of the outcome of personal fission manifest the sortal-sensitive perspective, privileging psychological properties that make objects persons. The common-sense principles, by contrast, manifest the sortal-abstract perspective, privileging purely spatio-temporal properties of persons. The descriptions and the principles, manifesting different perspectives, are compatible, because they are made true or false by different ontological components of persons.

In Section 2, I shall sketch an ontology of ordinary objects as double-layered compounds. In Section 3, I shall develop a perspectival semantics of predication about ordinary objects based on the compound ontology. In Sections 4 and 5, I shall apply this framework to the paradox of fission.

2   A double-layered ontology of ordinary objects

Ordinary objects include persons, chairs, trees and mountains. What follows is a sketch of an ontology of ordinary objects as compounds of material objects and K-paths, where K is an ordinary kind of object.

route, see Nozick 1981 and Lewis 1983. I shall ignore any attempt of weakening the force of fission by questioning the cases' empirical basis, and thus allow purely imaginary cases to elucidate our concepts.

[13]For a view according to which we should learn to live with conceptual inconsistency, see Eklund 2002.

There is a fundamental sense of existing at a time, of occupying a place at a time, and of having a property or relation at a time. A *material object* is a thing that exists at times, occupies places at times, and has properties or relations at times in this fundamental sense. I shall assume that there are material objects. Note that this is a technical use of the term, which differs from the common use that subsumes ordinary objects. On the picture to be proposed, ordinary objects are not material objects. They do not have a spatiotemporal profile in the fundamental sense, though they do have such a profile in a derivative sense to be characterized later. Material objects are among the bulding blocks of ordinary objects. In order to understand how ordinary objects are built up from material objects, no further metaphysical assumptions about material objects will be required. (The picture of material objects will be enriched in section 5.)

Next, the notions of a K-state and of a K-path will be introduced. For any time t, any material object a, and any ordinary kind K, a *K-state* of a at t is the maximal conjunction of the facts that a exists at t, that a has ϕ_1 at t ... that a has ϕ_n at t, such that each ϕ_i is an intrinsic property of a or a property that realizes K-hood. A K-state is a temporally brief, intrinsic and K-realizing profile of a material object. For example, a person-state of a material object at a time is a conjunctive fact that contains all intrinsic and person-realizing properties, including certain mental properties, of that object at that time.[14]

A *K-path* is a series of K-states with the following properties:

- A K-path is unified by K-continuity. The K-realizing properties in any two temporally close K-states in a K-path are massively similar. Local property-variation encoded by a K-path is small. Person-states in a person-path, for example, are psychologically continuous: any two temporally close states in the path are massively psychologically similar; psychological change from one moment to the next is gradual.

- A K-path is unified by K-connectedness. The K-realizing properties in any two K-states in a K-path, no matter how temporally distant they are from each other, are similar to some minimal degree. Global property-variation encoded by a K-path can be extensive but happens within limits. How much similarity is required is a vague matter.

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[14]Some ordinary kinds are presumably completely realized by intrinsic properties of material objects, while others are partially realized by extrinsic as well as intrinsic properties. For example, the property of having a certain belief, as construed by externalists, may be an extrinsic, partial person-realizer.

Person-states in a person-path, for example, are psychologically connected: any two states in the path are psychologically similar to some minimal degree; psychological change over longer periods of time is limited.

- A K-path is unified by lawful causal dependence. If a material object's being in a K-state now and an object's having been in a K-state yesterday are included in the same K-path, then the current K-state causally depends on the previous K-state. That is, each K-state in a K-path depends for its character on the K-states before it. The causal relation linking K-states is often called 'immanent causation'.[15]

- A K-path is maximal. No segment of a larger conjunction of K-states interrelated by K-continuity, K-connectedness and causal dependence is a K-path. Only the largest conjunction of K-states interrelated in this way counts as a K-path.

Let us call a relation that unifies K-states by similarity and causal dependence in the way sketched an *R-relation*. And let us call the complex relation of psychological continuity, psychological connectedness and immanent causation the psychological R-relation. Then a person-path is a series of person-states that is maximally interrelated by the psychological R-relation. This should be understood as a rough criterion of the unity of person-paths, merely intended to introduce the idea. When fission enters the stage again in section 5, this protocriterion will be given various more careful statements.[16]

While a K-state is an instantaneous, three-dimensional qualitative profile, a K-path is a cross-temporal, four-dimensional qualitative profile, which includes a distribution of facts across a particular spatiotemporal trajectory. It is central for present purposes that the characterization of K-paths does not include the condition that a K-path "trace" a unique material object, that it have a material object with a matching spatiotemporal boundary as its unique subject. (Let us say that any material object that is the subject of a K-state in a K-path is also a subject of that K-path.) This means that the trajectories of K-paths and those of their material subjects may diverge. Think of the unity conditions of K-paths—the conditions under which two K-states belong to the same K-path—as persistence conditions of K-paths. According to the present account, the persistence conditions

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[15]The locus classicus is Johnson 1924. For recent developments, see Swoyer 1984 and Zimmerman 1997.

[16]My constraints on K-paths and the term 'R-relation' derive from Lewis 1983, pp. 55-60.

are K-continuity, K-connectedness and causal dependence. Now, the mentioned divergence is one between the persistence conditions of K-paths and the persistence conditions of their material subjects. Material objects need not go where their K-paths go; they need not behave in a K-ish way. One consequence is that a K-path may have distinct material objects as subjects: there may be distinct material objects a and b, such that a is the subject of some K-states in a K-path, while b is the subject of other K-states in the same K-path. Another consequence is that a material object may be a subject of distinct K-paths. Under which conditions a K-path may fail to carve a material object at its spatiotemporal boundary is an issue in the metaphysics of material objects, on which the present characterization of K-paths stays neutral. Furthermore, it will be left open whether a K-path may include distinct K-states at the same time. This is partly a metaphysical issue concerning the nature of R-relations and partly a conceptual issue concerning which R-relation is associated with a given sortal term. (I shall return to these issues in section 5.)

Ordinary objects are the things to which ordinary sortal concepts, or kinds, apply. An ordinary sortal concept K carves out a class of K-paths. An ordinary object of kind K is a compound of a material object and a K-path, such that the material object is a subject, perhaps one of many, of the K-path—that is, the subject of some fact included in the K-path. How are these compounds related to their components? The simple plan that will be adopted here is to view a compound as a mereological sum, or aggregate, of a material object and a K-path which has the latter as a subject. Sums are formed by the standard operation of fusion that takes any given plurality of entities into a sum of those entities. On this account, if o is an ordinary object, then for some material object a and some K-path i, $o = a + i$. Thus, the components of o, namely a and i, are parts of o. Since o has the parts of a as well as a itself as parts, a is the biggest material object that is a part of o—the maximal material part of o, for short.

This ontology of ordinary objects may be viewed as a variant of hylomorphism. For a given material object that is a subject of a person-path, the sum of the material object and the person-path is a person. The component material object may be characterized as the person's *matter*, and the component person-path may be characterized as the person's *form*. The person-path is a form of a person because it contains properties that realize personhood; and it is an *individual* form of a person because it is localized, a distribution of facts across a particular four-dimensional region of spacetime. The material object is the person's underlying matter, because we get to it by stripping away the person's form. The most significant and unusual

aspect of this hylomorphic ontology is that it permits hylomorphic divergence: the spatiotemporal and qualitative profile of an ordinary object's matter and the profile of the same object's form may diverge; the material subjects of K-paths need not behave in a K-ish way. Specifically, the persistence conditions of material objects may differ from the persistence conditions of person-paths.

I anticipate the immediate complaint that the proposed ontology yields a counterintuitive abundance of ordinary objects. Ordinary objects o and o^* are identical iff o and o^* have the same individual form and the same underlying matter. Suppose that two material objects are subjects of a single person-path. Then there are two distinct compounds, two persons with a common individual form, where we thought there was just one person. This problem will be addressed in the following section, in the context of an account of ordinary predications of identity.

3 Perspectivalism about predication

Having sketched an ontology of ordinary objects, I shall turn to the semantics of ordinary discourse about these objects.[17] My central semantic thesis is that ordinary predication about objects is perspectival, employing modes of predication that correspond to different perspectives on ordinary objects.

We may conceive of ordinary objects from different perspectives in different contexts. These perspectives correspond to different methods of individuating ordinary objects.[18] Three perspectives may be distinguished: the *sortal-sensitive*, the *sortal-abstract* and the *absolute* perspective. From the sortal-sensitive perspective, we conceive of an object in ways that are sensitive to the kind or kinds to which the object belongs. When we conceive of an object as a person, we conceive of it as belonging to a particular kind, and as having properties that realize that kind. This is the default perspective of unreflective common sense. From the sortal-abstract perspective, we strip away an ordinary object's sortal covers and conceive of it in primarily spatio-temporal terms, without representing it as belonging to a particular ordinary kind. From this perspective we ignore which ordinary kinds (if any) the object's properties and relations realize, and accordingly do not trace the object by means of kind-realizing properties, as we do under the sortal-sensitive perspective. The availability of a sortal-abstract

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[17]In the interest of length, I will slide over some details. I lay out the following apparatus in finer grain in Sattig 2010.

[18]Individuation is here understood psychologically; see section 4.2 for elaboration.

perspective on objects is controversial and its nature in need of clarification. I shall address these concerns shortly. From the absolute perspective, we do foundational ontology, transcending both the sortal-sensitive and the sortal-abstract perspectives. This is the perspective of the philosopher who uncovers the metaphysical structure of an ordinary object, analysing it, for instance, as a compound of matter and form. The sortal-sensitive perspective and the sortal-abstract perspective are prephilosophically accessible; the absolute perspective is not.[19]

To a type of perspective on objects corresponds a mode of predication, a certain way of predicating a property or relation of an object. Let us focus on predications of the form 'o exists at t', 'o is F at t' and 'o is identical with o^*'. By adopting the sortal-sensitive perspective on o, a speaker employs the *formal* mode of predication: o exists formally at t, o is formally F at t and o is formally identical with o^*. By adopting the sortal-abstract perspective on o, a speaker employs the *material* mode of predication: o exists materially at t, o is materially F at t and o is materially identical with o^*. By adopting the absolute perspective on o, a speaker employs the *absolute* mode of predication: o exists absolutely at t, o is absolutely F at t and o is absolutely identical with o^*. In accordance with what has been said about the accessibility of the various perspectives, predications about objects in prephilosophical discourse may employ the formal or the material mode. The absolute mode, however, is not represented in prephilosophical predications about objects; it is confined to the technical language of the seminar room. The thesis that ordinary discourse may employ both the formal and the material mode of predication will be called *perspectivalism*.

The rough semantic picture of how these modes of predication work is the following. First of all, the semantics of absolute predication will be taken as understood. As regards formal and material predication, it will be assumed that an ordinary object has a material object—its matter—and a K-path—its form—as components. When we ask what the object is like *formally*, we ask which properties are contained in the object's individual form, emphasizing the kind or kinds to which the object belongs. When we ask what the object is like *materially*, we ask which properties are in-

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[19]Shifts between an ordinary perspective and an ontological perspective on objects are fairly common. For example, while we ordinarily think of chairs as having only material parts, some ontologists view chairs as "bundles" of properties, and hence as having non-material parts. Moreover, while we ordinarily think of chairs as having only spatial parts, some ontologists view chairs as having temporal parts as well. The present refinement of this dichotomy between an ordinary and an ontological perspective is a distinction between different ordinary perspectives, namely the sortal-sensitive and the sortal-abstract one.

stantiated by the object's underlying matter, abstracting from the object's kind or kinds. In short, formal predication concerns form, whereas material predication concerns matter. The basic idea of perspectivalism is that while our typical, formal predications describe ordinary objects under sortal covers, material predications strip away all those covers. Since ordinary objects are double-layered, composed of form and matter, shifting between between formal and material predication is shifting between different aspects of the same subject.

Suppose, for example, that I conceive of an object o as a person and assert that o exists formally at t. For o to exist formally at t is for o's component person-path to contain the fact that a exists at t, for some material object a. It is important that in order for o's person-path to contain existence at t, it is not necessary that o's component material object itself exist at t—if $o = a + i$, then for o to exist formally at t, it is not necessary that a exist at t. For a person-path to contain a property is for some material subject of the person-path, not any particular subject, to instantiate the property. If K-paths have many subjects, then property-containment is a division of labor among them. Suppose, on the other hand, that I conceive of o in purely spatio-temporal terms, as a mere physical body, and assert that o exists materially at t. For o to exist materially at t is for o's component material object itself to exist at t. While o's formal persistence through time depends on the temporal trajectory included in o's component person-path—by virtue of this path's including, for example, the facts that a exists at t and that b exists at t^*, for some material objects a and b—o's material persistence depends on the temporal trajectory of o's component material object.

The truth conditions of monadic temporal predications in the formal mode and in the material mode may be stated as follows: for any ordinary object o,

(T1) o exists formally at t iff there is a kind K and a K-path i, such that o has i as a part, and for some material object a, i includes the fact that a exists at t.[20]

(T2) o is formally F at t iff there is a kind K and a K-path i, such that o has i as a part, and for some material object a, i includes the fact that a is F at t.

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[20]Designators of the form 'the fact that a exists at t' and 'the fact that a is F at t' are to be read as 'the fact that a exists absolutely at t' and 'the fact that a is absolutely F at t'.

(T3) o exists materially at t iff there is a material object a, such that o has a as its maximal material part, and a exists at t.[21]

(T4) o is materially F at t iff there is a material object a, such that o has a as its maximal material part, and a is F at t.[22]

Perspectivalism does not incur extravagant metaphysical commitments, because the formal and the material mode of predication do not correspond to multiple modes of instantiating a property or relation. Being absolutely F at t is being F at t in the fundamental sense, whereas being formally or materially F at t is being F at t in a derivative sense. Predications that are syntactically in the formal or the material mode are made true by facts concerning the absolute instantiation of properties or relations. If the statement 'o is formally F at t' is true, then it is true because o instantiates the property of having a component K-path that contains the property of being F at t. And if the statement 'o is materially F at t' is true, then it is true because o instantiates the property of having an object as its maximal material part that is F at t.

Perspectivalism also applies to ordinary statements of identity. Such statements do not ascribe identity absolutely; they only do so formally or materially. This is an instance of my thesis that the absolute mode of predication is not represented in ordinary discourse about objects. Consider a person o and a person o^*. Adopting the sortal-sensitive perspective, we can ask whether o is formally identical with o^*; and adopting the sortal-abstract perspective, we can ask whether o is materially identical with o^*. Both of these questions are distinct from the fundamental question whether o and o^* are absolutely identical. When we ask whether o and o^* are formally identical, we ask whether they have the same individual form. When we ask whether o and o^* are materially identical, we ask whether they have the same underlying matter. And when the foundational ontologist interested in the deep structure of ordinary objects asks whether o and o^* are absolutely identical, she asks whether they have the same individual form and the same underlying matter. Furthermore, given the close relationship between the concept of identity and the concept of number, if statements of identity can be read in these different ways, then so can statements of cardinality,

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[21]In (T3) and (T4), all predications with material objects as subjects are to be understood as absolute predications.

[22]While the extension of (T4) to temporal predications of relations is straightforward, the extension of (T2) requires some work, since K-paths were characterized as containing only intrinsic and K-realizing properties of material objects; see Sattig 2010.

statements about the number of things.[23]

The truth conditions of predications of identity in the formal mode and in the material mode may be stated as follows: For any ordinary objects o and o^*,

(T5) o is formally identical with o^* iff there is a kind K, a kind K*, a K-path i and a K*-path i^*, such that o has i as a part, o^* has i^* as a part, and i is identical with i^*.[24]

(T6) o is materially identical with o^* iff there is a material object a and a material object b, such that o has a as its maximal material part, o^* has b as its maximal material part, and a is identical with b.

Many have objected to the idea that ordinary statements apparently predicating strict identity in fact predicate another relation.[25] I do not endorse this revisionary idea. Formal predications of identity, as well as material and absolute ones, neither have unexpected subjects nor predicate unexpected relations. They predicate the same familiar relation, strict identity, to the same familiar objects in different modes. Strict identity is ascribed to the same objects from different perspectives. Here it is important not to confuse predications in the formal or in the material mode with their truthmakers. While the statement that o is formally identical with o^* is made true by the fact that o and o^* have the same component K-path, the statement does not predicate the relation of having the same component K-path to o an o^*. The statement rather predicates the relation of strict identity to o and o^* in the formal mode. Similarly for identity statements in the material mode.

The most important feature of this framework, the key to the dissolution of the paradox of fission to be offered in the following sections, is that perspectival predication permits perspectival divergence. The recognition of different perspectives on ordinary objects and of accompanying modes of predication allows judgements about ordinary objects to diverge: it may be

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[23]I do not wish to suggest that philosophers only ask absolute questions about persons. The philosopher of personal identity who asks whether a person can survive brain transplant is certainly asking a formal question specifically about persons. The ontologist, however, who is after the deep structure of ordinary objects, including persons, is asking an absolute question.

[24]An i is allowed to contain properties that jointly realize K-hood as well as K*-hood, and hence is allowed to be both a K-path and a K*-path.

[25]See Bishop Butler's view, and more recently Chisholm's, that we typically identify and count ordinary objects by a "loose and popular sense" of 'identity'; see Butler 2000, Dissertation I, and Chisholm 1976, ch.3.

true to say one thing about a given compound in one mode, while it is false to say it in another mode. For example, the formal trajectory of an ordinary object may diverge from its material trajectory. Suppose that material object a exists at t_1 but not at t_2, that material object b does exist at t_2, and that a K-path i includes the facts that a exists at t_1 and that b exists at t_2. Consequently, there is an ordinary object o, the mereological sum $a+i$, such that, by truth conditions (T1), o exists formally at t_2, and by truth conditions (T3), o does not exist materially at t_2.

Perspectival divergence between formal truths that track properties contained in K-paths and material truths that track properties of material objects is possible because K-paths need not trace a unique material object. The persistence conditions of K-paths may diverge from the persistence conditions of their material subjects. The former are K-dependent, whereas the latter may be K-independent; material objects need not behave in a K-ish way. In short, perspectival divergence rests on hylomorphic divergence.

The possibility of perspectival divergence also extends to predications of identity. Being formally identical is grounded in having the same component K-path. Being materially identical is grounded in having the same component material object. Being absolutely identical is grounded in having the same component K-path and the same component material object. If person o has a certain person-path and a certain material subject of that person-path as components, and if person o^* has the same person-path but a distinct material subject of the latter as components, then o is formally identical with o^* but absolutely and materially distinct.

Now recall the earlier complaint about the compound ontology that the world may end up counterintuitively overpopulated with persons and other ordinary objects. I respond that the abundance of ordinary objects does not clash with common sense, because it is merely an absolute abundance, the result of counting in the absolute mode, which is not represented in ordinary discourse about objects. The formal number of ordinary objects, the number we come up with when counting from the sortal-sensitive perspective, is different and accords with the expectations of common sense.

I shall close my presentation of the framework of perspectivalism with brief reflections on two neighboring schemes of temporal predication, which resemble the proposed framework in their account of sortal-sensitive predication but leave no room for sortal-abstract predication.

First, friends of temporal counterpart-theory construe an ordinary object as an instantaneous material object, a stage, and understand temporal predication in terms of temporal counterpart relations, R-relations, between stages: an ordinary object o is F at t iff o has a temporal counterpart at t

15

that is F.[26] On this picture, sortal sensitivity is "built into" the semantics of predications in the scope of temporal operators. Temporal predication of a property is a matter of locating the instantiation of that property along a diachronic chain of R-related stages. R-relations correspond to persistence conditions of objects encoded in sortal concepts. Since stages typically stand in different R-relations, a speaker must determine a particular R-relation by representing the subject of the predication as possessing the persistence conditions corresponding to this R-relation. In other words, the speaker must think of the object under a sortal concept. Does this picture allow for sortal abstraction?

From the sortal-abstract perspective, we carve objects by spatio-temporal properties, independently of kind-determining properties. Having said little so far about the content of our sortal-abstract conception, I shall begin addressing this issue by noting an important limitation. Whatever sortal abstraction gives us, I doubt that it gives us purely spatiotemporal persistence conditions of objects. Suppose that in abstracting from sortal information we represent a macroscopic object as shrinking in size continuously, and suppose that this process of shrinking terminates in a point-sized object. We surely do not judge the macro-object to shrink to a point. So we expect the object to go out of existence at some time during the shrinking process. But we are clearly unable to determine when that happens—we cannot even determine it roughly—without appealing to a specific kind to which the object belongs. We do not possess a sufficient criterion of tracking objects through time that is independent of the ways of tracking associated with ordinary sortal concepts. The thesis of the availability of a sortal-abstract conception is plausible only if this conception is allowed to yield at most a partial principle of individuation.[27] We saw that temporal counterpart-theory requires speakers to think of the subject of predication in a way that is rich enough to determine a particular R-relation. Given that sortal abstraction does not yield sufficient persistence conditions, conceiving of an object in a purely spatiotemporal way does not determine any particular R-relation. Sortal abstraction is therefore unavailable in temporal counterpart-theory.

The second scheme is to construe an ordinary object as being identical with a K-path, for some K, and to say that *o* is F at *t* iff *o* includes the fact

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[26]See Sider 1996 and 2001a, section 5.8, and Hawley 2001, section 5.7. Sider and Hawley offer temporal analogues of David Lewis's modal counterpart-theory; see Lewis 1983, chs. 3 and 4. See also Gibbard 1975 and Gupta 1980 for sortal-sensitive modal predication.

[27]Note that the concept of a material object, as used here, does not function as a general sortal concept. A material object is merely an object that exists at times, occupies places at times and has properties at times in the fundamental sense.

that a is F at t, for some material object a (compare (T1)).[28] Where does this leave sortal abstraction? If a K-path has more than one material object as a subject, then it is hard to make sense of the idea of stripping away an ordinary object's form. If the ordinary object has different maximal material parts at different times, which material object are we stripping it down to? Notice that if an ordinary object is a compound of a K-path and a unique material subject of the latter, this problem does not arise. In response, one might propose to relativize stripping away an ordinary object's sortal cover to a time t, and to understand stripping away a sortal cover at t as passing from a K-path to its unique subject at t (if it has one). I reply that this is not sortal abstraction, because the strategy requires "looking for" a material object along a K-path, whereas sortal abstraction allows the ascription of a property to an object at a time in complete ignorance of K-paths.

4   Fission and perspectivalism

The paradox of fission will be dissolved in three steps. First, I will interpret the various descriptions of personal fission reviewed in section 1 within the framework of perspectivalism. Second, I will propose an interpretation of principles (AB), (AC) and (AE) within that same framework. Finally, I will show that the descriptions and the principles thus construed are compatible.

4.1   Describing fission in the formal mode

We encountered four alternative descriptions of symmetric personal fission: bilocation (B), colocation (C), nonlocal, or extrinsic, persistence (E), and indeterminate persistence (I). These descriptions are plausibly construed as manifesting the sortal-sensitive perspective on the world. Each description is specifically about the behavior of persons undergoing fission, presupposing that our ordinary concept of a person encodes psychological persistence conditions of some form or other. Assuming that ordinary thought and talk may be sortal-sensitive in the way characterized in section 3, (B), (C), (E) and (I) should be read as employing the formal mode of predication:

(B_{form}) P is formally identical with both Lefty and Righty. Hence, P formally occupies distinct places after fission.

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[28]This type of view has enjoyed support from C. D. Broad, Richard Montague and the later Roderick Chisholm. See Broad 1925, pp. 34-8, Montague 1979 and Chisholm 1986, pp. 66-7.

(C_{form}) There are prefission persons P and P^*, such that P is formally distinct from P^*, P is formally identical with Lefty, P^* is formally identical with Righty, and P formally occupies the same places before fission as P^*.

(E_{form}) P formally goes out of existence in the operation, since Lefty and Righty are equally good candidates for being formally identical with P. The formal persistence of P is nonlocal.

(I_{form}) It is indeterminate whether (B*), (C*) or (E*) applies to the fission case.

4.2 Against material bilocation, colocation and extrinsicness: Lessons from the psychology of object individuation

Our acceptance of principles (AB), (AC) and (AE) is the reason why we find cases of fission so puzzling. No description of fission seems compatible with all of them. What is the status of these principles? My hypothesis is that they are sortal-abstract principles. They are about persons. What they say about persons, however, abstracts from specific person-realizing attributes. The principles do not seem to derive from any of the psychological, biological or social ways in which we think about persons. The impressions that ordinary objects cannot bilocate, that distinct ordinary objects cannot coincide, and that one cannot destroy an ordinary object without exerting any causal influence on it, seem entirely independent of the specific qualitative features that make an object a person. We have a minimal conception of the behavior of an object in space and time, which is independent of representing the object as belonging to a particular kind. This conception embraces and unifies the rich and varied realm of ordinary objects. The principles partly constitute this conception. While I find the construal of the principles as sortal-abstract intuitively compelling, I offer the following considerations in its support.

Psychological research on object individuation suggests that young infants individuate objects by spatiotemporal criteria prior to individuating objects as belonging to particular kinds.[29] The spatiotemporal criteria are principles of dividing surface layouts into objects. Among the criteria adduced by Elizabeth Spelke (1990, pp. 49-50) are the following three. According to the principle of *cohesion*, "two surface points lie on the same object only if the points are linked by a path of connected points." Thus, when

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[29]See Spelke 1990, Spelke et al. 1995, Xu and Carey 1996, Xu 1997.

two surfaces are separated by a spatial gap, they are surfaces of distinct objects. According to the principle of *boundedness*, "two surface points lie on distinct objects only if no path of connected surfaces links them." Thus, distinct objects have no surface point in common. According the principle of *no action at a distance*, "separated objects are interpreted as moving independently of one another if such an interpretation exists." Thus, objects are expected to act on each other only on contact.

Infants individuate objects in a purely spatiotemporal, sortal-abstract way, whereas adults individuate objects in a sortal-sensitive way. Infants carve the world into objects prior to representing them as falling under familiar kinds. Adults carve the world into objects of familiar kinds. How does object individuation in infants develop into object individuation in adults? Consider the following two hypotheses. The first hypothesis is that object individuation changes radically over the course of development: the early spatiotemporal, sortal-abstract criteria of object individuation are replaced by fundamentally different, sortal-sensitive criteria. In the course of development, infants come to represent objects as belonging to particular kinds and then abandon the sortal-abstract criteria completely. The second hypothesis is that object individuation does not change radically over the course of development: the early sortal-abstract criteria of object individuation are supplemented by sortal-sensitive criteria. Purely spatiotemporal criteria of object individuation underlie adults' representations of objects as belonging to particular kinds.[30] If the sortal-abstract criteria continue to play a role in object individuation by adults, then these criteria may be viewed as forming the basis of common-sense principles (AB), (AC) and (AE). The principle of cohesion, according to which spatially separated surfaces are represented as belonging to distinct objects, is a natural source of the modal belief that an object cannot occupy distinct places at the same time. Likewise, the principle of boundedness, according to which distinct objects are represented as having no surface point in common, is a natural source of the belief that distinct objects cannot occupy the same place at the same time. And the principle of no action at a distance, according to which objects are expected to act on each other only on contact, is a natural source of the belief that an object cannot go out of existence by purely extrinsic causes.

There seems to be a consensus in favor of the second hypothesis. The most straightforward argument for the latter is an argument from simplicity. A basic constraint on an explanation of the path from object individuation by infants to object individuation by adults is that the explanation should

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[30]See Spelke 1990, pp. 51-2, 54.

be as simple as possible. *Ceteris paribus*, the simplest explanation minimizes the cognitive distance between infants and adults.[31] The hypothesis according to which there is no radical developmental change and principles governing object individuation by infants continue to operate in the adult scheme, forming the basis of common-sense principles (AB), (AC) and (AE), is clearly the simpler, and hence preferable, hypothesis, assuming that a plausible overall account of adults' object individuation in concert with purely spatio-temporal criteria is available. Given that the underlying criteria of individuation are sortal-abstract, (AB), (AC) and (AE) should be construed as sortal-abstract as well.[32]

Their status as sortal-abstract principles is captured in the framework of perspectivalism by reading them as employing the material mode of predication:

(AB_{mat}) A person cannot materially occupy distinct places at the same time.

(AC_{mat}) Distinct persons cannot materially occupy the same place at the same time.

(AE_{mat}) A person cannot materially go out of existence by purely extrinsic causes.

5 Dissolution of the paradox

The paradox of fission consists in the seeming incompatibility of (B), (C), (E) and (I) with (AB), (AC) and (AE). If the various descriptions of the outcome of fission are interpreted as sortal-sensitive, and if the various principles of common sense are interpreted as sortal-abstract, then the paradox dissolves, since (B_{form}), (C_{form}), (E_{form}) and (I_{form}) are compatible with (AB_{mat}), (AC_{mat}) and (AE_{mat}). I will establish this compatibility in two steps. First, I will specify a consistent material basis of fission that preserves principles (AB_{mat}), (AC_{mat}) and (AE_{mat}). Then, on the assumption of this material basis, I will specify alternative conceptual bases of fission that make true descriptions (B_{form}), (C_{form}), (E_{form}) and (I_{form}), respectively. I shall refer to truth conditions (T1), (T2) and (T5) as the semantics of formal

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[31]See Hirsch 1997, p. 411.

[32]Carey and Xu (2001) provide impressive evidence that the object representations of young infants are identical with the object files of mid-level visual cognition, supporting the thesis, to which I appeal in support of perspectivalism, that two distinct representational systems underlie object individuation in adults, a sortal-abstract system that privileges spatiotemporal information, and a sortal-sensitive, kind-based system.

predication, and to truth conditions (T3), (T4) and (T6) as the semantics of material predication.

5.1 The material basis of fission

Let us assume that a material object cannot occupy distinct places at any time, that distinct material objects cannot occupy the same place at the same time, and that the persistence conditions of material objects are local and nonpsychological. By the compound view of persons and the semantics of material predication, these assumptions about material objects entail principles (AB_{mat}), (AC_{mat}) and (AE_{mat}). These metaphysical assumptions are made for the sake of establishing the consistency of our common-sense conception of persons in the face of fission. While the assumptions are compelling, the question of their truth will not be of primary concern.

Suppose now that in a case of personal fission there is a material object a that exists at a time t_1, before fission, that a uniquely and exclusively occupies a place p_1 at t_1, that a is in person-state s_1 at t_1, and that this person-state includes the fact that a occupies p_1 at t_1. Suppose further that there is a material object b that exists at time t_2, after fission, that b uniquely and exclusively occupies place p_2 at t_2, that b is in person-state s_2 at t_2, and that this person-state includes the fact that b occupies p_2 at t_2. Suppose, finally, that there is a material object c that also exists at t_2, that c uniquely and exclusively occupies place p_3, distinct from p_2, at t_2, that c is in person-state s_3 at t_2, and that this person-state includes the fact that c occupies p_3 at t_2. Both b and c are related by psychological continuity, psychological connectedness and causal dependence—in short, by the psychological R-relation—to a. But this R-relation is neither necessary nor sufficient for diachronic identity; no material object persists by following causal lines of psychological continuity and connectedness. Material objects a, b and c are absolutely distinct. I shall refer to this specification as the material basis of fission, which may be illustrated by the following Y-shaped figure whose lines represent the psychological R-relation:

s_2: b-at-t_2 s_3: c-at-t_2

s_1: a-at-t_1
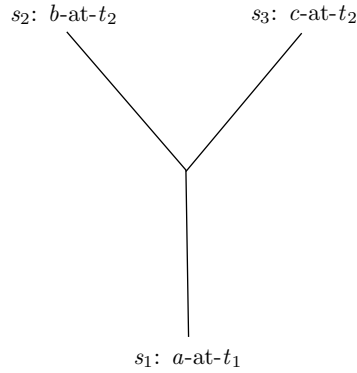
5.2 Bilocation

Let us next specify a conceptual basis of fission. The material basis of fission delivers a range of candidates for personhood. Each candidate is a compound of a person-path and a material subject of this person-path. The availability of a candidate is a metaphysical matter. The choice of candidate for personhood is a conceptual matter. This choice depends on which class of person-paths the sortal *person* selects. The meaning of *person* determines a unity criterion of person-paths in terms of the psychological R-relation: roughly, a K-path is a maximal series of R-interrelated person-states. For the purpose of describing what happens to a person when causal lines of psychological continuity and connectedness branch out, this protocriterion may be clarified in at least three different ways. Each of these clarifications yields a different outcome of fission from the sortal-sensitive perspective, since formal truths about persons are dependent on the meaning of the sortal *person*. The first clarification is (P1):

(P1) A person-path is a maximal series of person-states, such that each state in the series is R-related with *some* other state in the series.

Different unity criteria of person-paths correspond to different ways of conceptually carving up the Y-shaped material basis of fission. Assuming (P1), we may suppose that person-path i includes the person-states s_1, s_2 and s_3.

22

Thus, a, b and c are subjects of the same person-path, as illustrated by the following figure:
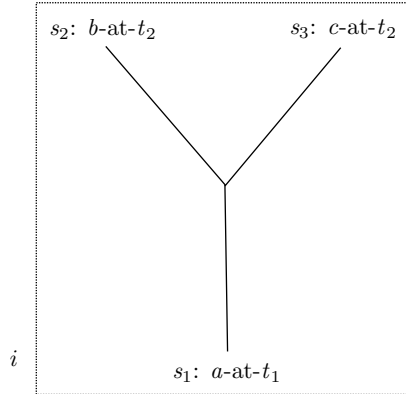
Given the compound ontology of ordinary objects, there is a person P_1 = $a + i$, a person $P_2 = b + i$, and a person $P_3 = c + i$. By the semantics of formal predication, these specifications make (B_{form}) true. While P_1, P_2 and P_3 are absolutely distinct, they are formally identical. Moreover, P_1 exists formally at t_1, before fission, formally survives fission, and formally occupies places p_2 and p_3 at t_2, after fission. Likewise for P_2 and P_3, since they are formally identical with P_1. This model of sortal-sensitive (B_{form}) shows the compatibility of (B_{form}) with the sortal-abstract antibilocation principle (AB_{mat}), since the model rests on a material basis of fission that was designed to preserve (AB_{mat}).[33]

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[33] The way for bilocation by fission is almost clear. If a person formally survives twice over, then the same person may have incompatible properties, such as happiness and sadness, at the same time, which should not be possible if the task is to sustain the common-sense conception of persons. In order to remove the appearance of contradiction, our ordinary tools of temporal predication may be further extended. Very roughly, the first step might be to require ordinary temporal predications to be relativized not only to times, but to pairs of places and times—place-times—yielding predications of the form 'o is formally F at $\langle p, t \rangle$'. The second step would then be to specify truth conditions of formal predications modified by place-times: o is formally F at $\langle p, t \rangle$ iff there is a kind K and a K-path i, such that o has i as a part, and i includes the fact that a is F at t and that a occupies place p at t, for some material object a. The threat of inconsistency is

5.3 Colocation

We saw that the outcome of fission at the level of persons depends on which unity criterion of person-paths is in play. Consider the following alternative to (P1):

(P2) A person-path is a maximal series of person-states, such that each state in the series is R-related with *every* other state in the series.

This unity criterion, just as (P1), corresponds to a certain way of conceptually carving up the Y-shaped material basis of fission. Since the R-relation is intransitive, failing to hold between the post-fission states s_2 and s_3, there is, by (P2), no person-path i that includes both states s_2 and s_3. We may suppose, however, that there are two person-paths, i_1 and i_2, such that i_1 includes s_1 and s_2, while i_1 does not contain the property of occupying p_3 at t_2, and i_2 includes s_1 and s_3, while i_2 does not contain the property of occupying p_2 at t_2. Thus, a and b are subjects of person-path i_1, and a and c are subjects of person-path i_2, as illustrated by the following figure:

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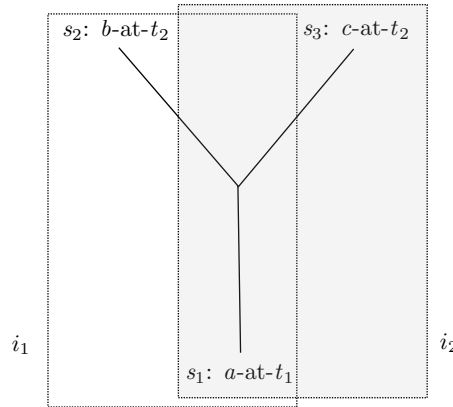
banned, if after fission our person is formally happy in one place-time and formally sad in another. In short, if there is no material bilocation, then there is no serious obstacle to extending our linguistic practices of formal temporal predication to formal spatiotemporal predication in light of extraordinary cases of fission.

Then there is a person $P = a + i_1$, a person Lefty $= b + i_1$, a person $P^* = a + i_2$, and a person Righty $= c + i_2$. By the semantics of formal predication, these specifications make (C_{form}) true. P is formally identical with Lefty; and P^* is formally identical with Righty, while P/Lefty and P^*/Righty are formally distinct. P/Lefty exists formally at t_1, before fission, at which time it formally occupies place p_1, formally survives fission, and formally occupies place p_2 at t_2, after fission. P^*/Righty exists formally at t_1, at which time it also formally occupies place p_1, formally survives fission, and formally occupies place p_3 at t_2. This model of sortal-sensitive (C_{form}) establishes the compatibility of (C_{form}) with the sortal-abstract anticolocation principle (AC_{mat}), since the model is built on a material basis of fission that was designed to preserve (AC_{mat}).

5.4 Nonlocal persistence

In order to defend a third description of personal fission, consider the following unity criterion of person-paths:

(P3) A person-path is a maximal series of person-states, such that each state in the series is R-related to a sufficient degree with every other state in the series, and no state s in the series has a simultaneous competitor state that is R-related with any other state in the series to the same or a higher degree than s.[34]

This unity criterion of person-paths, just as (P1) and (P2), corresponds to a certain way of conceptually carving up the Y-shaped material basis of fission. Since by (P3) no person-path includes person-states with strong simultaneous competitors, there is no person-path with both a and b as subjects, nor is there one with both a and c as subjects. We may suppose, however, that there are person-paths i_1, i_2 and i_3, such that i_1 includes s_1, i_2 includes s_2 and i_3 includes s_3. Thus, a is a subject of i_1, b is a subject of i_2, and c is a subject of i_3, as illustrated by the following figure:

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[34] Degrees of R-relatedness are degrees of psychological continuity and connectedness.

s_2: b-at-t_2 s_3: c-at-t_2

i_2 i_3

i_1 s_1: a-at-t_1
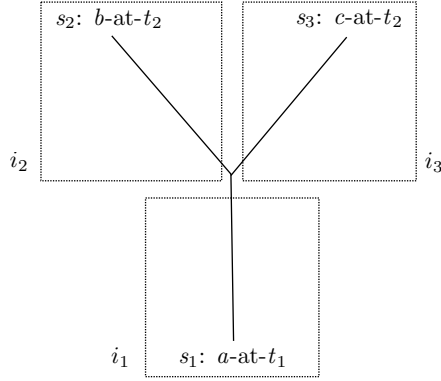
Then there is a person $P = a + i_1$, there is a person Lefty $= b + i_2$, and there is a person Righty $= c + i_3$. By the semantics of formal predication, these specifications make (E_{form}) true. P is formally distinct from both Lefty and Righty. Thus, P formally goes out of existence in the operation. That is so because Lefty and Righty are equally good candidates for the formal continuation of P. The formal persistence of P is nonlocal. This model of sortal-sensitive (E_{form}) establishes the compatibility of (E_{form}) with the sortal-abstract antiextrinsicness principle (AE_{mat}), since the model rests on a material basis of fission that was designed to preserve (AE_{mat}).[35]

5.5   Indeterminate persistence

Where are we now? If predication is perspectival, then several descriptions of personal fission are consistent. The consistency of each of the alterna-

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[35]Owing to the nonlocality of the formal persistence of persons, the present description of the branching case is consistent with the following description of the nonbranching case. Consider distinct material objects a and b, such that a exists at preoperation time t_1, b exists at postoperation time t_2, and a-at-t_1 is R-related to b-at-t_2, while there is no competitor state of b-at-t_2 that is also R-related with a-at-t_1. (P3) now allows there to be a person-path i, such that i includes a-at-t_1 and b-at-t_2. There are further a person $P = a + i$ and a person $P^* = b + i$ that are formally identical. Allowing the original person formally to die in the double-hemisphere transplant is thus compatible with allowing the original person formally to survive in the single-hemisphere transplant, although the mental life flows on in both cases.

tives is grounded in the ontology of persons as double-layered compounds of material objects and person-paths—of matter and form. The key is the relationship between the components: the qualitative profiles of person-paths may diverge from the profiles of its material subjects. This is why our judgements about persons may vary depending on perspective. Choosing among the consistent alternatives, on the other hand, is a matter of semantics. Given that the ontology of ordinary objects permits an abundance of compounds, different classes of compounds are available as candidate extensions of the sortal *person*. No single criterion of personal identity carves nature at the joints. The question then is whether our ordinary concept of a person is rich enough to select one specific unity-criterion of person-paths from the list of (P1), (P2) and (P3) as criterion of personal identity, and hence to trigger one particular description of fission. Perhaps further conceptual considerations may be adduced to single out one of the alternatives as the best. In the absence of such considerations, on pain of arbitrariness, a fourth option may prove most suitable: the outcome of fission is indeterminate; as (I_{form}) states, there is no fact of the matter concerning whether (B_{form}), (C_{form}) or (E_{form}) applies.

Prima facie, the indeterminacy picture is hopeless, since it seems to conflict with the antibilocation, the anticolocation and the antiextrinsicness principles, all of which are to be understood as determinately true: it is not indeterminate which description applies; it is determinate that none does. As we saw, however, the sortal-sensitive principles (B_{form}), (C_{form}) and (E_{form}) are compatible with the sortal-abstract principles (AB_{mat}), (AC_{mat}) and (AE_{mat}). Accordingly, the prospects for the indeterminacy description are good, if it is interpreted as sortal-sensitive indeterminacy, as indeterminacy regarding what formally happens to a person when causal lines of psychological continuity and connectedness branch out.

Such conceptual indeterminacy may be sustained by supervaluationism. The sortal noun *person* is vague in virtue of having an imprecise meaning with different admissible ways of making this meaning precise. This imprecise meaning encodes a criterion of personal identity that has actual nonbranching cases as clear cases and counterfactual branching cases as borderline cases. The different precisifications of the meaning of the sortal *person* correspond to unity criteria (P1), (P2) and (P3), respectively. These different criteria put different persons, different compounds of material objects and person-paths, into the extension of the sortal. Taking the sortal-sensitive perspective on fission, the number of persons involved in fission and the outcome of fission vary relative to which criterion is in play. As I showed in detail, on (P1), there is a single person involved, and this

person is bilocated after fission; on (P2), there are two persons involved, and these persons are colocated before fission; and on (P3), there are three persons involved, where the prefission person dies in the operation and is succeeded by distinct persons. What makes each of (P1), (P2) and (P3) constitute *admissible* precisifications of *person* is that each criterion yields the intuitively correct account of what happens to persons in nonbranching cases.[36] If the sortal *person* is vague in the way specified, then the outcome of fission is indeterminate between (B_{form}), (C_{form}) and (E_{form}).

Let me close by emphasizing the significant difference between the present version and the standard version of the indeterminacy description of fission. The indeterminacy of fission, as the standard view has it, is a semantic phenomenon with dark metaphysical undertones. Cases of fission highlight semantic indecision between various candidate material objects with different, metaphysically exotic spatiotemporal profiles. The indeterminacy of fission, as I view it, is metaphysically innocent. Cases of fission highlight semantic indecision between different unity criteria of person-paths. Different unity criteria select paths with different spatiotemporal profiles. But these profiles may fail to be isomorphic to the spatiotemporal profiles of material objects, the subjects of person-paths. A K-path need not mirror the path of a material object.

6   Conclusion

Fission seems to threaten our conception of persons. Each sensible extension of our common way of tracking persons through time to fission cases seems to conflict with our picture of the spatiotemporal profile of ordinary objects on the whole. While standard responses to this paradox agree that the common-sense conception of persons is inconsistent, I have argued that there is a plausible way of maintaining the conception's consistency in the face of fission. Our conception of persons is double-layered, spliced together from sortal-sensitive and sortal-abstract beliefs, which manifest different perspectives on the world and are made true or false by distinct ontological components of persons.[37] True sortal-sensitive predications about persons are

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[36]Notice that since principles (AB_{mat}), (AC_{mat}) and (AE_{mat}) are sortal-abstract principles, they do in no way shape our ordinary concept of a person, and hence do not qualify as constraints on which precisifications of *person* are admissible.

[37]Our conception of persons includes beliefs that are encoded in our concept of a person together with beliefs that abstract from this concept, while still being beliefs about persons. This is why our conception of persons is not to be identified with our concept of a person; see n.10 above.

materially neutral, in the sense that they do not license conclusions about when and where material objects begin and end, and hence do not stand in the way of our sortal-abstract picture of the world.

What holds for the fission of persons, holds for the fission of other kinds of objects. By whichever lines of qualitative continuity we typically track an object of kind K through time, if it is nomologically possible for such a line to branch out, then there is a paradox of fission for Ks. To those who attempt settlement of a fission paradox for Ks by rejecting a particular criterion of identity of Ks, the prospects of a unified treatment of all fission cases look poor; different remedies are likely to be required for different cases. The proposed solution of the paradox of personal fission, on the other hand, straightforwardly extends to all potential cases of fission. Any expected clash of the space of possible accounts of K-fission with various platitudes of common sense about Ks is merely apparent, since the accounts as plausibly interpreted in a K-sensitive way are compatible with the platitudes as plausibly interpreted in a K-abstract way. Sortal-sensitive promiscuity allows the world to match up with sortal-abstract purity.[38]

References

[1] Broad, C. D. 1925. *Mind and its Place in Nature.* London: Routledge and Kegan Paul.

[2] Butler, J. 2000. *The Works of Joseph Butler.* Elibron Classics, Book-Surge Publishing.

[3] Carey, S. and Xu, F. 2001. "Infants' Knowledge of Objects: Beyond Object Files and Object Tracking," *Cognition* 80: 179-213.

[4] Chisholm, R. 1986. "Self-Profile," in R. J. Bogdan (Ed.), *Roderick M. Chisholm* (pp. 66-7). Dordrecht: Reidel.

[5] Chisholm, R. 1976. *Person and Object: A Metaphysical Study.* La Salle, Ill.: Open Court.

[6] Eklund, M. 2002. "Personal Identity and Conceptual Incoherence," *Noûs* 36: 465-85.

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[7] Gibbard, A. 1975. "Contingent Identity," *Journal of Philosophical Logic* 4: 187-221.

[8] Gupta, A. 1980. *The Logic of Common Nouns.* New Haven: Yale University Press.

[9] Hawley, K. 2001. *How Things Persist.* Oxford: Oxford University Press.

[10] Hobbes, T. 1839/2004. "De Corpore," in Sir William Molesworth (Ed.), *The English Works of Thomas Hobbes.* Elibron Classics. (Originally published by J. Bohn, 1839.)

[11] Hirsch, E. 1997. "Basic Objects: A Reply to Xu," *Mind and Language* 12: 406-12.

[12] Johnson, W. E. 1924. *Logic*, Part III. Cambridge: Cambridge University Press.

[13] Johnston, M. 1997. "Human Concerns without Superlative Selves," in J. Dancy (Ed.), *Reading Parfit* (pp. 149-79). Oxford: Blackwell.

[14] Johnston, M. 1989. "Fission and the Facts," *Philosophical Perspectives* 3: 369-97.

[15] Johnston, M. 1987. "Human Beings," *Journal of Philosophy* 84: 59-83.

[16] Lewis, D. 1983. *Philosophical Papers*, Vol. 1. Oxford: Oxford University Press.

[17] Martin, R., Barresi, J., and Giovanelli, A. 1998. "Fission Examples in the Eighteenth and Early Nineteenth Century Personal Identity Debate," *History of Philosophy Quarterly* 15: 323-348.

[18] Montague, Richard 1979. "The Proper Treatment of Mass Terms in English," in F. J. Pelletier (Ed.), *Mass Terms: Some Philosophical Problems* (pp. 173-8). Dordrecht: Reidel.

[19] Nozick, R. 1981. *Philosophical Explanations.* Oxford: Clarendon Press.

[20] Olson, E. 1997. *The Human Animal: Personal Identity Without Psychology.* Oxford: Oxford University Press.

[21] Parfit, D. 1984. *Reasons and Persons.* Oxford: Clarendon Press.

[22] Parfit, D. 1971. "Personal Identity," *Philosophical Review* 80: 3-27.

[23] Perry, J. 1972: "Can the Self Divide?," *Journal of Philosophy* 73: 463-88.

[24] Robinson, D. 1985: "Can Amoebae Divide Without Multiplying?," *Australasian Journal of Philosophy* 63: 299-319.

[25] Sattig, T. 2010. "Compatibilism about Coincidence," *Philosophical Review* 119: 273-313.

[26] Sider, T. 2001a. *Four-Dimensionalism: An Ontology of Persistence and Time.* Oxford: Oxford University Press.

[27] Sider, T. 2001b. "Criteria of Personal Identity and the Limits of Conceptual Analysis," *Philosophical Perspectives*, Vol. 15, *Metaphysics*: 189-209.

[28] Sider, T. 1996. "All the Worlds a Stage," *Australasian Journal of Philosophy* 74: 433-53.

[29] Spelke, E. 1990. "Principles of Object Perception," *Cognitive Science* 14: 29-56.

[30] Spelke, E., Kestenbaum, R., Simons, D., and Wein, D. 1995. "Spatiotemporal Continuity, Smoothness of Motion and Object Identity in Infancy," *British Journal of Developmental Psychology* 13: 113-42.

[31] Swoyer, C. 1984. "Causation and Identity," *Midwest Studies in Philosophy* 9: 593-622.

[32] Thomson, J. 1997. "People and Their Bodies," in J. Dancy (Ed.), *Reading Parfit* (pp. 202-29). Oxford: Blackwell.

[33] Wiggins, D. 1967. *Identity and Spatio-Temporal Continuity.* Oxford: Blackwell.

[34] Williams, B.A.O. 1970. "The Self and the Future," *Philosophical Review* 1979: 161-80.

[35] Williams, B.A.O. 1956. "Personal Identity and Individuation," *Proceedings of the Aristotelian Society* 57: 229-52.

[36] Xu, F. 1997. "From Lot's Wife to a Pillar of Salt: Evidence that *Physical Object* is a Sortal Concept," *Mind and Language* 12: 365-92.

[37] Xu, F. and Carey, S. 1996. "Infants' Metaphysics: The Case of Numerical Identity," *Cognitive Psychology* 30: 111-53.

[38] Zimmerman, D. 1997. "Immanent Causation," *Philosophical Perspectives*, Vol. 11, *Mind, Causation, and World*: 433-71.