If a person, A, branches into B and C, then it is widely held that B and C are not identical to one another. Many think that this is because B and C have contradictory properties at the same time. In this paper, I show why this explanation cannot be right. I argue that contradictory properties at times are not necessary for non-identity between descendants, and that contradictory properties at times are not sufficient for non-identity. I also argue that the standard explanation cannot be salvaged by a shift to personal time. Appeals to a lack of continuity, or to the absence of unity of consciousness likewise fail. Rather, B and C are non-identical simply because A branched into B and C. Why branching should be problematic for personal identity remains a deep puzzle though I offer some tentative suggestions.

1 Introduction

Fission, when one person ‘splits’ or ‘branches’ into two, is often used as a test case in theorizing about personal identity. Indeed, the example is so powerful that many theories of personal identity incorporate radically counterintuitive claims, simply to accommodate branching. On David Lewis’s (1976b) four-dimensional theory, multiple people can

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occupy the same place at the same time. On Eric Olson’s (1997) human animal theory, a person can survive the loss of her cerebrum. And, according to Derek Parfit (2008), personal identity doesn’t matter for survival after all. If it is possible for persons (or indeed, any object at all) to persist through time, the considerations discussed in this paper ought to be of interest.

The problem is that the feature or features which seem essential to identity can ‘split’ symmetrically. For instance, memories can be duplicated, universes (and the minds within them) can branch, and brains can be split and transplanted. When A divides into B and C, it seems that B and C cannot be identical to each other; from which it follows, from the transitivity of identity, that B and C cannot both be identical to A.

The commonly cited explanation for why B and C cannot be identical to each other is that this follows from Leibniz’s Law: one person cannot have contradictory properties at a single time, as B and C do (perhaps B is happy while C is not). In this paper, I flesh out this explanation and argue that it is flawed. If branching is problematic for a person’s survival, it is because of branching itself, and not because of contradictory properties at times. One upshot of this is that a ‘non-branching’ clause in an analysis of personal identity is well-motivated, and not ad hoc, as one might have thought. Thus, Lewis (1976b), Parfit (2008), and Shoemaker (2008) are right to stipulate that identity is non-branching.

2 Personal Identity and Branching

One of the main challenges in the literature on personal identity is to come up with necessary and sufficient conditions for how a person persists through time. There are some changes that do not threaten numerical identity (Sarah is happy one day and not happy the next) while other changes do (Sarah’s atoms are dispersed). These persistence conditions may include bodies, brains, consciousness, memories, personality, dispositions, human animals, or some combination of the above. Importantly, without ‘non-branching’ clauses, all of these theories run afoul of counterexamples—precisely because there are cases in which each of the features listed above branch symmetrically.1 I will describe three such scenarios.

Duplication: A brain-and-body scan or a teletransporter could create two (or more) atom-for-atom duplicates of an existing person’s brain and body. If, as many theories maintain, identity supervenes on properties of our brain states and body states, then

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1The only exception is in the case of an indivisible soul. On such a theory, the branching scenarios still raise troubling questions. For instance, when the body/brain/memories of a person branch, does the soul ‘pick’ one of the descendants to occupy? How does this work? Does the other body/brain/set of memories continue as a ‘zombie’ with no inner life, or is a new soul created to occupy the other? These are interesting questions, but I will not address the soul theory in this paper.
such duplicates would have all the relevant features of the original. Thus, both duplicates would have equal claim to be identical to the original.

**Division:** Some worry that teletransporters don’t produce genuine fission because they involve a ‘deviant’ causal process (e.g., the ‘memories’ wouldn’t really be memories). So, consider Wiggins’s (1967) example of brain bisection and transplantation. Suppose that a person is able to survive a hemispherectomy—the removal of either half of her brain. Suppose, further, that with improved technology, half of a healthy brain could be successfully transplanted into a new (or robotic) body. Then, it would be possible to bisect a healthy brain and transplant each half into a new body. If the hemispheres are symmetric and redundant, the resulting two people would have all of the relevant features of the original.

**Branching:** Finally, consider one of the most popular interpretations of quantum mechanics: the Everett interpretation. According to this theory, the entire universe—and everything in it—is constantly branching. Thus, there are infinitely many ‘copies’ of you who will exist in the future. None of these is privileged over any of the others and all of them bear the same causal relations to you now.\(^2\) Thus, all of the people who exist in future branches have equal claim to be identical with the original. Note that if this theory of quantum mechanics is right, then fission actually occurs (and actually occurs all the time!)—it is no longer a purely hypothetical thought experiment.

Eric Olson (1997) argues that the human animal theory can avoid fission counterexamples because a human animal cannot be duplicated or divided (and still be a human animal). In a case of brain bisection and transplantation, Olson (1997, 115) claims, “If we examine the detached cerebrum closely, though, we see that it bears little resemblance to a living animal.” He argues that since we are living (human) animals, we cannot continue to exist as detached or as transplanted cerebrums. Significantly, such a response will not work in the case of a world governed by Everettian quantum mechanics because all animals, including human animals, undergo fission via branching. Thus, two future human animals (indeed, many more!) have equal, but mutually inconsistent, claims to be identical with the original. And, surely, the fact that Everettian quantum mechanics is metaphysically possible (not to mention, epistemically possible) is enough to pose a problem for the animalist.\(^3\)

All of these examples are cases in which A, who is uncontroversially a single entity

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\(^2\)More technically, the wave function of the universe goes into a superposition of states that are unable to interact with one another. See Saunders and Wallace (2008) for a more thorough description of this scenario.

\(^3\)Jacob Ross (n.d.) develops a clever example in which the left and right halves of each particle of an animal are separated and duplicated to produce branching for animals. That also provides a satisfactory case of human animal branching, though I prefer the example from Everettian quantum mechanics because Everettian quantum mechanics is a live epistemic possibility.
be it a person or a human being), is succeeded by entities $B$ and $C$. Additionally, $B$ and $C$ each bear relations to $A$ that are considered essential to survival (be they psychological continuity, persistence of human animal, persistence of brain matter, etc.). Throughout the rest of the paper, I will only discuss the case of fission that involves branching (since branching is relevant for all theories of personal identity of which I am aware), though the arguments go through equally well for the other cases of duplication and division.

Fission is a problem because two people who are descended from one original have equal claim to be identical to the original, yet they cannot be identical to each other. It is widely accepted that the two descendants cannot be identical to each other because they have contradictory properties at (at least) one time. Consider the quotations below.

According to Sydney Shoemaker (2008, 265), when there is branching, we cannot say that the two ‘offshoots’ “are thereby copersonal without committing ourselves to the unattractive conclusion that a person can be in two different places, and can have two different total mental states, at one and the same time.” Here, Shoemaker claims that one person cannot be in two different places or have two different total mental states at one and the same time.

Olson (2010) claims that a person cannot have contradictory properties at a single time. In a case where one person splits into ‘Lefty’ and ‘Righty’, Olson gives the following reasoning:

It follows that you are Lefty and also that you are Righty. But that cannot be: Lefty and Righty are two, and one thing cannot be numerically identical with two things. Suppose Lefty is hungry at a time when Righty isn’t. If you are Lefty, you are hungry at that time. If you are Righty, you aren’t. If you are Lefty and Righty, you are both hungry and not hungry at once: a contradiction.

As Katherine Hawley (2005, 609) says, “Fission cases make problems for straight continuity accounts of persistence because an earlier object and a later one stand in an intrinsic relation that would suffice for identity were a rival candidate not simultaneous with the later object.” In other words, fission is a problem when the products of that fission are simultaneous with one another. Hawley (2005, 603) also appeals to objects that are contemporaneous.

And, according to John Perry (2008, 330), the two descendants, “clearly are not identical with one another. They have different bodies, will have different perceptions when they awake from the operation, and so will soon have different memories.”

These quotations demonstrate the widely held belief that fission is problematic because the two resulting people have contradictory properties at the same time (occupy
different places, have different total mental states, have different bodies, have different perceptions, will have different memories).\footnote{It is worth noting that not everyone thinks that splitting is bad for identity. Hilde Lindemann Nelson (2001) suggests that a single person could have many different, incompatible ‘strands’ to her narrative identity and John Wright (2006) argues that a person can be identical with each future descendant. And they, in turn, are identical to one another.}

We can restate the above intuition this way: If $B$ and $C$ have contradictory properties at a time, then $B$ and $C$ cannot be identical to one another. Indeed, it is (the contraposition of) a time-indexed case of the uncontroversial direction of Leibniz’s Law, which states that if two things are identical, they must have all the same properties. And, if the two descendants are not identical to each other, they can’t each be identical to the original, since that would violate the transitivity of identity.

First, a stipulation about my terminology: when I say that an object has “contradictory properties” I do not mean for that to imply that there is a logical contradiction. It requires further substantive work to show that. For instance, a single object unproblematically can have contradictory properties at two different times. For instance, Sarah is happy today, but was not happy yesterday. Some have taken this to show that objects cannot have monadic properties at all; rather properties such as being happy are disguised relations to times. Others have argued that having is really disguised having-at-$t$. Still others have argued that objects have properties in virtue of their temporal stages having monadic properties. No matter what your theory, there is an important sense in which being happy and not being happy are contradictory—indeed, this is why there is a literature on temporary intrinsics.\footnote{If my cases are persuasive, the debate on temporary intrinsics will need to be reformulated as well. For instance, in light of some of the time travel cases I present below, Kristie Miller (2006) argues that an endurantist could appeal to spacetime-indexed properties, or relativizing property instantiation to spacetime regions. However, John Carroll (2011) argues that the possibility of persisting, time-traveling ghosts provide a counterexample to such a theory. (Thanks to Joshua Spencer for bringing this case to my attention.)} If you prefer, feel free to add “apparently” to each mention of “contradictory properties” throughout the paper.

I will show that in some cases of time travel, a single person unproblematically can have contradictory properties at the same time. This argument applies equally well to human animals (though I will leave it to the reader to fill in the relevant details). Relatedly, this argument ought to generalize to any time-traveling object.

Conversely, in certain other cases of time travel, I will show that fission is problematic even when there are no contradictory properties at the same time.

These examples show that we cannot explain why fission is a problem for identity by appealing to contradictory properties at times. Contradictory properties at a time are not sufficient for non-identity, and in cases of fission, contradictory properties at times are
not necessary either.\(^6\)

## 3 Contradictory Properties Don’t Matter

In this section, I will argue that in cases of time travel, one person can unproblematically have contradictory properties at the same time. I will also argue that if \(A\) branches into \(B\) and \(C\), \(B\) and \(C\) can exist at different times (and thus never have contradictory properties at the same time). Even so, we still judge \(B\) and \(C\) to be distinct from one another. This conclusion applies equally whether persons persist by enduring (wholly existing at each time) or persist by perduring (having stages that exist at each time).

**Case I:** Consider a time traveler, Amy Pond, who travels to her own past. Let us suppose that Amy has a conversation with her younger self.\(^7\) Clearly, Amy could have contradictory properties at a single time. She could occupy different places (two adjacent chairs at a cafe), she could have different total mental states, different perceptions, different memories, and she would have two bodies.\(^8\)

**Case II:** Suppose a time traveler, Rory\(_0\), branches into Rory\(_1\) and Rory\(_2\). Now, suppose that Rory\(_1\) is immediately put into a time machine that whisks him away to the distant past (or future) while Rory\(_2\) lives a normal life. Rory\(_1\) will never exist at the same time as either Rory\(_0\) or Rory\(_2\). In such a case, there are no contradictory properties at any time. Whatever properties Rory\(_1\) has, he has them in the Jurassic period. Whatever properties Rory\(_2\) has, he has them immediately after Rory\(_0\)’s operation.

Case I shows that a single person unproblematically can have contradictory properties at a single time. If Amy persists by enduring, then she has contradictory properties at a time by wholly existing in two different places, etc. at the same time. If Amy persists by perduring, then she has contradictory properties at a time by having temporal parts that are in two different places, etc. at the same time.

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\(^6\)Obviously, contradictory properties at times are not necessary for non-identity, generally. I am distinct from Hypatia, though she and I do not have any contradictory properties at a time. (I bracket the question of whether non-existence is a property, since whether, and where I exist is exactly what is at issue). This is why I restrict the claim to cases involving fission.

\(^7\)David Lewis (1976a), and Frank Arntzenius and Tim Maudlin (2013) persuasively argue that physics gives us no reason to think this scenario is impossible.

\(^8\)This example is expanded in more detail in Ehring (1987) and Wright (2006). Wright argues for a different conclusion than I do—namely, that in cases of fission, \(B\) and \(C\) are indeed identical to one another.
Case II shows that branching is sufficient for non-identity, even if there are no contradictory properties at any time. Thus, the common explanation for why $B$ and $C$ are not identical to each other fails. If Rory persists by enduring, then he never wholly exists with contradictory properties at the same time. And, if Rory persists by perduring, then he never has temporal parts with contradictory properties at the same time.

It seems that the relevant feature is branching itself. If there is branching, then the two resulting branches are not identical to one another, regardless of ‘where’ they are located in time. (For instance, it seems quite reasonable for Rory$_0$ to wonder whether he’ll wake up to see dinosaurs or the operating room or indeed, whether he will wake up at all.) And, if no branching occurred, then a single person can have contradictory properties a time (depending on how many of her future and past selves are present).

It is important that Rory$_1$ does not come into existence until the moment he begins time traveling to the past. Such a scenario is easy to imagine in the case of brain bisec- tion. First, remove each half of Rory$_0$’s brain. Then send one half back in time. Finally transplant each hemisphere in a new body and wake them up. Consider the following de-
scription from Schechtman (1996, 33): “It has been pointed out, for instance, that in such a circumstance the original donor would have a motive to bribe the hospital staff to make sure that an ‘accident’ happened to one hemisphere of the brain before transplantation, thus ensuring her survival. […].” If identity puzzles can be avoided by destroying one hemisphere after removal, and before implantation, this gives us an easy way to guarantee that Rory$_1$ and Rory$_2$ never exist at the same time. In the case of Everettian branching, we can suppose that Rory performs a quantum experiment with two possible results: up and down. The up result just is the beginning of the time travel process. One branch instantiates outcome up, the other, outcome down. In the up branch, Rory$_1$ is the descendant of Rory$_0$, and Rory$_1$ travels back in time to the Jurassic period. In the down branch, Rory$_2$ is the descendant of Rory$_0$, and Rory$_2$ lives normally.

It is a widespread assumption that a certain amount of ‘psychological unity’ is required for personal identity. But, this assumption cannot be accepted uncritically in cases of time travel. Plausibly, Old-Amy has a unified consciousness and Young-Amy has a unified consciousness, but the object Old-and-Young-Amy (if indeed, this counts as an object) does not have a unified consciousness. Thus, if we presuppose that unity at a time is required for identity, then Old-Amy and Young-Amy cannot be the same person. But this assumption directly rules out the possibility of traveling to one’s own past—something that few would wish to endorse. Therefore, claims about the unity of consciousness have an analogous worry.

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9 Thanks to Theron Pummer for pointing out that this ignorance is not sufficient for non-identity, though it may indicate it.
4 Personal Time

It is tempting to defend the traditional understanding of why branching disrupts identity by appealing to David Lewis’s (1976a) distinction between *external time*—that of the universe at large—and *personal time*—that of the individual time traveler. Intuitively, external time is the one of the whole spacetime block. It ‘marches on’ regardless of how individuals move about within that block. Personal time is the one that is measured *personally*—by our aging cells, our wristwatches, and our heartbeats. Personal time is the notion of time that can “follow” us as we travel on relativistic spaceships or in time machines to the distant past or future. In physics, this time is that of the local *frame of reference* and it can diverge from other frames of reference. Physicists routinely rely on such a notion when they discuss relativity. For instance, time dilation (where a spaceship’s clock appears to slow down to someone who is watching it zoom by) can only be correctly accounted for if we carefully distinguish the time that passes in one frame of reference compared to another. Note that within a given frame of reference, all of the ways of measuring time agree with one another—thus, heartbeats and thoughts don’t slow down or speed up relative to the spaceship’s clock. This is why it makes sense to talk of personal time as measured by a clock attached to one’s frame of reference. Perhaps the problem was our appeal to external time, rather than personal time.

We can consider the following principle: If *B* and *C* have contradictory properties at the same *personal time*, then *B* and *C* cannot be identical to one another. Conversely, we can ask whether the non-identity of branch-persons *B* and *C* entails that *B* and *C* have contradictory properties at the same *personal time*. First, I will show how an intuitive gloss of personal time explains away the counterexamples of Case I and Case II. However, I will go on to argue that new counterexamples arise, even when we understand those cases with personal time instead of external time.

4.1 Personal Time and Case I and Case II

Let us see how this intuitive notion of personal time accommodates Case I and Case II, salvaging the idea that *B* and *C* are non-identical because of contradictory properties at (personal) times.

**Case I**<sub>pt</sub>: When Amy travels to her own past, we can say that her younger self is located at thirty-years<sub>pt</sub> (personal time), while her older self is located at fifty-years<sub>pt</sub>, and that they’re both located at 2020<sub>et</sub> (external time). There is no problem here because the contradictory properties are had at different personal times. Amy<sub>old</sub> is the same person as Amy<sub>young</sub>. 
Case II pt: Rory₁ has the property of being-scared in the Jurassic and Rory₂ has the property of not-being-scared in 2020—these times are external times. If Rory₀ undergoes the branching operation when he is thirty years old, then Rory₁ is scared at thirty-one-yearsₚt and Rory₂ is not-scared at thirty-one-yearsₚt. Thus, Rory₁ and Rory₂ do indeed have contradictory properties at a time, because they have them at the same personal time, namely, at thirty-one-yearsₚt.

The switch to personal time explains Case I and Case II in a way that supports the idea that branching is problematic for personal identity because of contradictory properties at a (personal) time.¹⁰ We can rephrase the original principle as follows: if B and C have contradictory properties at one personal time, then B and C are not identical. And, conversely, supposing B and C are branch-descendants of A, then if B and C do not have contradictory properties at any personal time, then B and C are identical. Unfortunately, different ways of making the notion of personal time more precise yield new counterexamples.

4.2 Defining Personal Time

Intuitively, personal time is time that passes for a person. If we think of a person as a ‘worm’ stretched out in four different dimensions, personal time could be simply the location of a three-dimensional stage. Call this the ‘location on a spacetime worm’ view of personal time. Another option is to measure personal time with a (working) clock that follows person-stages (that are linked to one another in the appropriate way). Whatever personal time is, it must be distinct from external time in order to avoid the counterexamples discussed above. Below, I will argue that these ways of understanding personal time cannot salvage the claim that contradictory properties at (personal) times cause problems for identity.

4.3 Personal Time—Location on a Spacetime Worm

Suppose personal time is just a location along a person’s spacetime worm. Thus, consider all of the stages that are properly related to one another (via psychological continuity,¹⁰

¹⁰There is an interesting and persuasive argument from John Carroll (2011), according to which a switch to personal time is not enough to reconcile contradictory properties even for this case. The idea is that any event which occurs near Amy₂₀ is one that occurs at Amy₂₀’s personal time of thirty-yearsₚt. Thus, not only does Amy₂₀’s sitting occur at Amy₂₀’s personal time of thirty-yearsₚt, so does Superbowl LIV. Likewise, Amy₂₀’s standing occurs at Amy₂₀’s personal time of thirty-yearsₚt, in virtue of the fact that Amy₂₀ is there.
causal relations, etc.). Any two distinct such stages can have contradictory properties, as long as no single stage has contradictory properties. This seems to be what Lewis (1976a) has in mind when he makes sense of consistent time travel. Also, this is the way that Wright (2006) explicitly cashes out the notion of personal time.

But, this notion of personal time will not recover the result that $B$ and $C$ are not identical. When $A$ splits into $B$ and $C$, the spacetime worm splits as well. Even though $B$ and $C$ have contradictory properties, they have them at different locations on the same (branched) worm. So, on this account, $B$ and $C$ never have contradictory properties at the same personal time, and if contradictory properties at personal times are required for the non-identity of $B$ and $C$, then on this account, $B$ and $C$ are identical to one another.\(^{11}\)

On Lewis’s (1976b) theory of personal identity, if there is branching, we should say that there are two persons, even before the branch, when it seems as if only $A$ exists. On this theory, there are two, partially overlapping spacetime worms, one that includes the stages of $A$ and $B$, and one that includes the stages of $A$ and $C$. Lewis avoids the conclusion that $B$ and $C$ are the same person, but he does not appeal to contradictory properties at times to do so, he directly appeals to branching (though perhaps he is motivated to posit overlapping worms due to worries about contradictory properties at times). Where there is branching, Lewis posits two worms instead of one.

### 4.4 Personal Time—Clock (PTC) Attached to Stages

Intuitively, we need an accurate clock that tracks the features that are relevant to identity. If being a human animal is what matters for personal identity, then our “personal time clock” (PTC) would measure the time elapsed for a human animal. If the human animal undergoes a change that renders it non-human (perhaps by having its mental content ‘uploaded’ into a computer before being destroyed) then the clock stops. If continuity of conscious process is what matters to personal identity, then the PTC would measure the time elapsed by a continuous conscious process. If the conscious process paused (during upload, say), the clock would pause, and then resume when the conscious process resumed. If $A$ branches into $B$ and $C$ (in the relevant way, e.g., as a human animal in an Everett world or as a conscious process via a duplication machine) then the PTC, which tracks the relevant features of identity, also branches. (Note that if you do not think the PTC should branch in such a case, then there will be no contradictory properties at any personal times. The central conclusion immediately follows and you may skip the remainder of this section.) Then, if branching is problematic because of contradictory properties at a personal time, at least some properties had by $B$ at one time (according to $B$’s PTC) will contradict properties

\(^{11}\)While most philosophers would take this result to be a reductio of this notion of personal time, Wright (2006) bites the bullet and maintains that $B$ and $C$ are identical to one another after all.
had by C at the same time (according to C’s PTC). We can assume that a PTC assigns a
time to every stage of a person, and that no stage is assigned more than one time.

I will argue that on this account of personal time, contradictory properties at one
personal time are not necessary for the non-identity of branch-persons.

**Case III**<sub>pt</sub>: Consider a closed causal loop in which a time traveler, James Cole,
travels to the past, and then undergoes changes which (say, via a locally anti-
thermodynamic process) restore him to the state he was in when he traveled
back in time.<sup>12</sup> Now imagine that James undergoes fission just before he trav-
els back in time. One continuant, James<sub>1</sub>, travels back in time and gradually
turns into James while the other continuant, James<sub>2</sub>, lives a normal life.<sup>13</sup>

Given the assumptions of completeness (every stage is assigned a time) and unique-
ness (no stage is assigned more than one time), the PTC must begin somewhere on the
loop—by contrast, if it began on James<sub>2</sub>’s branch, the stages of the loop would not be
assigned any PTC time, violating our assumption of completeness.

Suppose the PTC begins as soon as James<sub>1</sub> comes into existence. The PTC tracks
James<sub>1</sub> around the time travel loop until James<sub>1</sub> gradually becomes James Cole. Then,
the PTC tracks James Cole until the branch, and then follows James<sub>2</sub> until James<sub>2</sub>’s death.
The PTC does not branch because James<sub>1</sub>’s stages have already been assigned a PTC
time (and by assumption, no stage may receive more than one PTC time). And, all of
the person-stages are assigned a unique time by the personal clock. Even though there
is branching that is problematic for personal identity—it seems clear that James<sub>1</sub> is not
identical with James<sub>2</sub>—there are no contradictory properties at any personal time. So,
when there is branching, contradictory properties are not necessary for the non-identity of
the descendants. Thus, we see that personal time cannot rescue the ‘contradictory prop-
erty’ explanation for the badness of branching. When someone splits into two or more
people, that is sufficient to destroy personal identity, even when those two people do not
have contradictory properties at any single (personal) time.

Now, I will argue that on this PTC account of personal time, one person can have
contradictory properties at the same personal time.

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<sup>12</sup>This is a consistent, if surprising, time travel story. A more familiar version is Shakespeare handing
himself the entire works of Shakespeare, which Shakespeare carefully preserves in order to bring along
when he travels back in time. Another consistent story is one in which a time machine opens containing
only the weathered instructions for building a time machine that include the instructions to place these very
instructions into the time machine when finished, etc. See Lewis (1976a) and Arntzenius and Maudlin
(2013) for more details about such cases.

<sup>13</sup>Thanks to Theron Pummer for extremely helpful discussions of this case.
Case IV. Consider an intrepid space explorer, Kaylee, in orbit around a very massive black hole. She always sits at the controls with her right side toward the black hole and her left side away from it. Now, one of the effects of being near a black hole (or any massive body) is that all processes (including the mechanisms used to build Kaylee’s PTC) occur more slowly relative to processes that are farther away from the black hole.

Even making use of personal time as measured by an accurate clock, it becomes impossible to define a coherent notion of personal time for Kaylee. This is because accurate clocks attached to different bits of Kaylee will disagree with one another (whether they are attached to bits of her human animal body or bits of her brain). Kaylee does not have just one PTC. Since the right hemisphere of Kaylee’s brain is slightly slower than the left hemisphere, we can think of a ‘right’ PTC and a ‘left’ PTC, both of which have equal claim to be Kaylee’s personal time clocks. Yet, since the difference in her PTCs is so slight, and since there is constant communication between her left and right hemispheres, it certainly seems that Kaylee is just one person. Nevertheless, in such a scenario, it is easy to see how Kaylee has contradictory properties at the same personal time. As soon as she began to orbit the black hole, her left and right PTCs started ‘ticking’ at different rates, resulting in a large difference, e.g., an entire hour, after a few years. For instance, when Kaylee’s ‘left’ PTC reads exactly 3 years, Kaylee is happy. But when her ‘right’ PTC reads exactly 3 years, she is not happy.

Therefore, in the absence of branching, one person may have contradictory properties at a single personal time, assuming that this notion of personal time can be made sense of in such a case. And, if the notion of personal time cannot be used in such a case, then we cannot rely on it in theorizing about what explains non-identity when there is branching. It is worth pointing out that this case is not as far-fetched as it may seem. According to general relativity, all processes slow down in both accelerating frames of reference and gravitational fields. And, even though the effect is small, there is a difference in the time clocks associated with the right side of our bodies and brains compared to our left whenever we sleep on our sides, go around a bend in the road, or sit sideways in an accelerating subway car. Even so, we do not think that these everyday events destroy our personal identities. Thus, contradictory properties at a personal time are not sufficient for non-identity.

14Strictly speaking, there will be many more than two, since the right half of the right hemisphere is likewise slower than the left half of the right hemisphere, and so on.

15The effect can be made as small as you like by adjusting the distance from Kaylee’s ship to the black hole.
5 Fission and Discontinuity

Marya Schechtman offers a more direct reason for thinking that fission is a problem for psychological continuity theories. Suppose A branches into B and C. According to Schechtman (1996, 30),

Although B and C are both defined as psychologically continuous with A, there is no reason to believe that after the split they will be psychologically continuous with each other. They will conduct their lives separately, move through different environments, have different experiences, and need not even know of each other’s existence.

Thus, it is not contradictory properties of B and C per se that is the problem, it is rather that B and C are not psychologically continuous with each other.

But why aren’t B and C psychologically continuous with each other? Consider a psychological state in A’s distant past, P. We can ‘get from’ P to B via an unbroken chain of states that are psychologically continuous with each other. And, in ordinary cases (i.e., in the absence of C), we certainly think that B is unproblematically related to P by this chain in a way that guarantees identity. But, now consider the chain from B to C. We can likewise ‘get from’ B to C via an unbroken chain of states that are psychologically continuous with each other. After all, B is psychologically continuous with A, and A is psychologically continuous with C. The only way to exclude connected chains such as the one from B to C is to add a requirement that the chains are non-branching—or equivalently, that every link in the chain is ‘forward’ or every link ‘backward’. So, again, we see that it is not the lack of psychological continuity that renders B and C non-identical, but branching itself.

We can give a similar analysis of Parfit’s (1984, 302) claim, “But psychological continuity is not a transitive relation, if we allow it to take both directions [going forward and going backward] in a single argument.”

According to David Lewis (1976b, 7-8), where the R-relation stands in for whatever features of continuity are required for personal identity, two stages can be part of the same person by being part of a chain formed of R-relations. Lewis achieves the non-identity of branch-persons B and C by stipulating that chains of R-relations are forward-only or backward-only. For Lewis, A and B are R-related, and A and C are R-related. But, B-A-C cannot form an R-related chain because it is partly-backward, partly-forward. But this is just another way of prohibiting branching. Such a constraint doesn’t say anything about properties at times (external or personal); it disallows branching in cases of identity by stipulation.
6 Stipulate Away

Non-branching constraints are often presented as ad hoc modifications to preserve a favorite theory. According to Marya Schechtman (1996, 31),

Both Parfit and Shoemaker solve the transitivity problem by brute force. The problem here is that personal identity is defined in terms of psychological continuity, but psychological continuity is a relation that a person can bear to more than one individual. Parfit and Shoemaker both avoid this problem by modifying the definition of identity to say that it is constituted not simply by psychological continuity, but by non branching psychological continuity.

In this paper, I have argued that such stipulations are not ad hoc at all, but essential. There is no way to eliminate them by appealing to contradictory properties at a time, or to a lack of psychological continuity. I have already addressed how Lewis stipulates away branching via ‘forward-only’ (or ‘backward-only’) chains of $R$-relations. Others have introduced their own stipulations.

Shoemaker’s account includes a specific ‘no-branching’ clause, which directly (and correctly) addresses the problems of branching: “If $S$ remembers$_w$ event $E$ (or remembers$_w$ action $A$ from the inside), and if there has been no branching of M-type causal chains during the relevant stretch of $S$’s history, then $S$ is one of the witnesses of $E$ (is the person who did $A$).” (2008, 270)

And, according to Parfit (2008, 208), “even if psychological continuity is neither logically, nor always in fact, one-one, it can provide a criterion of identity. For this can appeal to the relation of non-branching psychological continuity, which is logically one-one.” Interestingly, he goes on to say, “The criterion might be sketched as follows. ‘$X$ and $Y$ are the same person if they are psychologically continuous and there is no person who is contemporary with either and psychologically continuous with the other.’” The implication is that these are equivalent statements. By now it should be clear that I think the former characterization, which appeals directly to non-branching, is to be preferred to the latter, which appeals to persons at times. As I have argued, there is no way to accurately characterize the problematic aspects of branching in terms of persons at times.

7 Some Thoughts on What to Do

Throughout this paper, I have assumed, and have not directly argued, that branching is problematic for personal identity. But, if branching need not go hand in hand with con-
tradictory properties at times, why is it bad news for personal identity? I think this is the most puzzling and pressing question currently facing personal identity accounts.

7.1 Extrinsic Effects

In terms of person-stages, why is it that if one stage, $S_1$ is followed (in the appropriate way) by two distinct stages, $S_2$ and $S_2'$, it affects how $S_1$ relates to $S_2$? Without a general explanation of why branching is problematic, a non-branching clause will be ad hoc, not because it is 'tacked-on', but because, as Katherine Hawley (2005, 618) argues, “it undermines the initial motivation for the position.” In other words, if a theory of personal identity specifies what is required for a person to persist (e.g. psychological continuity), then adding a non-branching clause seems to concede that psychological continuity isn’t all that matters for identity after all.

Furthermore, branching intuitively does not seem like the kind of thing that could affect persistence because it involves non-causal, extrinsic correlations between distinct objects. According to Hawley (2005, 612), “It is not the absence of cause which is puzzling, but the correlation without the cause. [Some solutions to branching, namely, closest continuer] accounts are objectionable because they posit unexplained correlations”. For instance, if $A$ branches into $B$ and $C$, then on some closest continuer theories of persistence, person $A$ ceases to exist when $B$ and $C$ come into existence (due to symmetry, neither $B$ nor $C$ counts as the unique closest continuer to $A$). But, person $A$, were it not for $C$, would continue to exist as $B$. Thus, the non-local, non-causal facts of distinct object $C$ can affect the persistence of $A$. As David Wiggins (1980, 96) notes, “objects distinct from $a$ or $b$ are irrelevant to whether $a$ has $R$ to $b$.” Following H. W. Noonan (1985), this has come to be known as the ‘only $x$ and $y$’ principle, because facts about the identity of $x$ and $y$ ought to depend only on $x$ and $y$.

Indeed, the case can be made especially counterintuitive by putting $C$ in a time machine that travels to the distant future. Whether or not $B$ counts as the same person as $A$ depends on whether or not $C$ survives. But, puzzlingly, $C$ doesn’t even come into existence until long after $B$’s death. Thus, $B$ will never be in a position to know whether or not she is the same person as $A$. Depending on what one thinks of future contingents, there may not even be a fact of the matter as to whether or not $B$ is the same person as $A$ until long after $B$’s death.

Thus, where there is branching, it seems that something extrinsic—namely $C$—can affect the identity properties of something else—namely $A$ and $B$—without any intervening causal process, and without instantiating any contradictory properties at times.
7.2 Branching Itself vs Products of Branching

I have argued that the problems with branching cannot be explained in terms of contradictory properties at times and that branching intuitively seems problematic even when there are no contradictory properties at times. This is suggestive. Perhaps the problems for identity arise due to the branching itself, rather than as a result of C’s existence more generally. Thus, if we want to know whether B is the same person as A, we have to know whether there were any stages of A that had more than one descendant. If there were, then B cannot be identical to A (or, for Lewis, A cannot be a unique person).

There are other properties like this. For instance, imagine that deep in space, Mae shoots a laser at Shannon. The laser light moves away from Mae—and is spatiotemporally and causally isolated from her immediately following the discharge. Nevertheless, Mae is guilty of attempted murder merely in virtue of her causal past. A stage of Mae has a causal effect (the laser light) that does not affect her. And, just as it may be indeterminate whether or not A survives as B (until it is determinate whether or not C is brought into existence), so it may be indeterminate whether or not Mae is a killer (until it is determinate whether or not the laser beam kills Shannon—and, Shannon may be millions of light-years away!)

Even so, Mae becomes a killer because of her past stage’s causal effects (that do not in turn causally affect her). This idea requires we distinguish between two kinds of ‘Cambridge’ change: one kind does not require any causal connections (e.g., being such that there is a distant star), and another that requires outgoing causal connections (e.g., being a killer). Perhaps fission is slightly less puzzling if personal identity depends on this second kind of Cambridge change.

7.3 Generalizations

In this paper I have focused on branching and personal identity. I have not discussed branching and the persistence of other objects, such as trees or bicycles. However, there is every reason to think that these arguments will generalize. Since other objects can be duplicated and undergo fission, they will face all of the same problems for determining persistence conditions over time. After all, if people can time travel or orbit massive black holes, so can bicycles. We tend to worry less about the persistence of ordinary objects than we do of people, but as far as these arguments go, they are on a par. This suggests that if there is a way to explain why branching is problematic for persons (again, it cannot be contradictory properties at times), it ought to also explain why it is problematic for ordinary objects. Thus, one should hesitate before appealing to, e.g., the unity of consciousness, or the continuity of consciousness in response to these counterexamples.

If branching destroys personal identity (or affects the number of co-located persons), it does not do so via contradictory properties at times. I leave it as an outstanding
question: why is branching problematic for personal identity?

8 Conclusion

If a person A branches into B and C, then it is widely held that B and C are not identical to one another. Many think that this is because B and C have contradictory properties at the same time. In this paper, I have shown why this explanation is not right. I have argued that contradictory properties at times are not necessary for non-identity between descendants, and that contradictory properties at times are not sufficient for non-identity. I have also argued that the explanation cannot be revived by a shift to personal time. Additionally, the non-identity of B and C does not follow from the fact that B and C are not psychologically continuous with each other. Rather, B and C are non-identical simply because A branched into B and C. Why branching should be problematic for personal identity remains a deep puzzle.

References


Ross, J. (n.d.). Any way you slice it: On fission, fusion, and the weighing of welfare, draft.


