1. INTRODUCTION

One of the curious things about time travel concerns not the act itself (and all of the oddities, coincidences, closed causal loops, ex nihilo information, and such that it is supposed to allow), but the fact that we philosophers even discuss its possibility. In one sense, this is no surprise. We get a whiff of a paradox (Tim the time-traveler can and cannot kill his younger self) and feel compelled to check it out. The sense in which it is curious is that it that physics (by and large) seems to have already given time travel the green light. Closed time-like curves, physics apparently tells us, are possible — they might be excessively difficult to construct or energetically expensive to traverse. Supposing this is correct, philosophy’s agreement seems prima facie superfluous. Philosophical possibility is surely broader than physical! Had we differed — had physics allowed for the possibility of time travel and philosophy dissented — would we thus be in possession of an a priori refutation of, say, General Relativity? That seems wrong. Shouldn’t the physics community’s verdict on the matter be the last word?

We think that this tempting picture of disciplinary priority must be flawed. For even if physics had declared closed time-like curves impossible, philosophy might have nevertheless made room for time travel by allowing for non-causally maintained personal identity. This approach to personal identity (though controversial) is interesting in its own right, as is its relevance to the paradoxes of time travel.

2. CIRCLES OF POSSIBILITY

A simple way of defending the thought that physicists should get the final say about whether time travel is possible (so far as any say in physics or philosophy is final) involves distinguishing a nested series of senses of possibility. In the inner-most circle, we have compatibility with actual physical laws. Call this “Indiscriminate Physical Possibility”. Discriminating physical possibility adds a series of concentric circles by requiring in addition compatibility with some range of actual facts. Travel to Alpha Centauri is physically possible (in the indiscriminate sense), but not by lunch, given that we’re having breakfast here on earth.

However, the laws might have been different. Perhaps lunching on Alpha Centauri falls within the wider circle of “Metaphysical Possibility” which disregards the laws in favor of more basic ontological principles (such as the nature of substance and persistence). Less restrictive still are logical and conceptual possibility, enclosing those propositions that fail to generate logical or conceptual absurdity.

On this picture, if physicists place time travel in one of the inner circles of physical possibility, it’s automatically included in the outer circles. So what is the point of our asking after the conceptual or
metaphysical possibility of time travel? It cannot be that something which is physically possible is
metaphysically or conceptually impossible. There might have been more of a point if our world had been
physically different. Had the laws of nature forbid time travel — if, say, Newton had it right — we still might
have wondered whether it was possible in a more liberal sense. Or perhaps we might wonder whether some
other ensemble of physical laws broadly compatible with our existence would also be compatible with the
existence of time travel.

We contend that the following is possible (in a sense to be explained): even had physics roundly rejected
the physical possibility of time travel, philosophers could still uphold its possibility in the physical sense (not
just the conceptual, metaphysical sense). Here’s how: there are theories of personal identity that might be true
and are apparently compatible with extant physical laws on which time travel is possible. If one of those
theories were true, then there is a sense in which time travel is possible irrespective of what physics has to say
about the matter.²

3. LEWIS’S MODEL OF TIME TRAVEL

David Lewis (1976) holds that, although strange, time travel is not impossible. A time-traveling individual is
like anyone else: “a streak through the manifold of space-time, a whole composed of stages located at various
times and places” (146). Unlike ordinary individuals continuously spread through this manifold, time-
travelers are “zig-zag” or broken streaks through spacetime. Though broken from an “external” perspective,
their personal experience may be as smooth and linear as ours. Tim time travels in that he has stages that he
(and others) regard as “later” located in his past. Lewis resolves the Grandfather Paradox by distinguishing
between these stages having an affect on states of affairs (time-traveling-Tim is causally related to goings on in
the past) and changing those states of affairs (impossible for anyone without more timelike dimensions).

Notice that this brief defense of time travel makes no reference to the laws of physics. For all Lewis says,
they might as well be Newtonian — with time flowing equably, ineluctably forward.³ One might be tempted
to conclude that Lewis’s defense of time travel’s possibility is independent of physics’ gloss. That’s too quick,
though. It is one thing to tell a coherent story (or defend a story against a specific charge of incoherence) and
another to claim that a certain state of affairs is compatible with actual physical laws and initial conditions.

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¹ as some present physicists do; see Hawking (1992) and Thorne (1994).
² This is, of course, not to say that time travel is compatible with anything physics might have told us — that is clearly false. Thus it
depends on precisely what physics says that supposedly rules out time travel. We shall return to this point below.
³ One might argue that inasmuch as the Lewisean picture of time travel requires a four-dimensionalist, perdurantist account of time
and persistence, it is incompatible with classical approaches to physics on which time and space are conceived of in very different ways.
Whether four-dimensionalism is something that Newton, Halley, Hooke, and company would have accepted doesn’t much concern
us. The point is just four-dimensionalism in no way depends on special or general relativity (even if the move toward spacetime was
partly responsible for time being thought of as yet another dimension).
Suppose we do so as follows: Quantum mechanics allows for atoms to spontaneously come into and pass out of existence through a process of proton decay and electron positron annihilation (Yao 2006). This might happen to your atoms — all of them at the same time — so that all that would remain of your body is many free floating neutrons and a flash of radiation. But don’t worry: it’s astronomically, mind-numbingly improbable that you’ll “quantum-poof” out of existence any time soon. But so long as it is not impossible, there is a possible world in which it occurs. Consider a moment in 1920 in which, suddenly and seemingly out of nowhere, an individual — call him Tim — quantum-poofs into existence. While apparently lacking any personal history, Tim claims to have thirty years of memories — except that they are memories of events that haven’t happened. Let’s say that Tim progresses forward on the natural timeline of life and eventually dies at eighty. However, somewhere along that line, an individual — call him Tom — is born, grows up, and eventually begins to look like Tim when he first appeared. Finally, at the exact moment when Tom perfectly resembles our first picture of Tim, he quantum-poofs out of existence. It just so happens that when Tom disappears, he is exactly 30 years old.

This scenario (nauseatingly improbable, though it is) looks like Lewisean time travel. We have here what seems to be a spatiotemporally scattered streak through time. And though scattered, Tim and Tom feature psychological continuity and connectedness. If they are two names for different “time periods” of one individual — like ‘the early Wittgenstein’ and ‘the later Wittgenstein’ — then we have time travel, apparently independent of considerations from Relativity which are generally thought to bear on its physical possibility. Yet Lewis denies that this is genuine time travel:

After all, most of us think that the kinds of objects we find around us only persist if the right sorts of causal relations hold between their object-stages or, for three-dimensionalists, between the object considered at one time, and considered at another time. But then the object that exists at t- is not O at all, and consequently O has not travelled in time. (2006, 199–200)

Or consider Bernard Williams’ description of apparently spurious non-causal psychological continuity (1956, 237). He presents a scenario in which a person is mentally continuous with a historical figure such as Guy Fawkes but is not bodily continuous with them. He argues that we would not think of this person as Guy Fawkes, but as somebody who claims to remember being Guy Fawkes. Why shouldn’t we say the same thing of Tim “remembering” Tom’s future life?

4. PERSONAL IDENTITY WITHOUT CAUSATION
Causal connection is certainly a plausible requirement for persistence over time. Ordinarily, we expect that previous stages causally influence later ones. Ordinarily, whatever psychological continuity obtains is maintained by straightforward causal connections between psychological states. Our purported case of quantum-assisted Lewisean time travel lacks these connections. As we’ve told it, Tim’s memories do not
causally depend on Tom’s later experiences. We merely have psychological continuity. It seems for all the world to Tim that his recollections of being surprised by his 21st birthday party are caused by actually having been surprised. Supposing one believes that psychological continuity is crucial to (or even constitutive of) personal identity (cf. Olson, 1997 #1094), must we insist that it should be causally maintained? Can we be satisfied without causation? Some philosophers, at least, seem open (if not committed) to dropping this requirement. We shall briefly survey three: Nozick, Parfit, and Lewis himself.

4.1. Nozick’s Closest Continuer View

Williams’ intuitions about the Guy Fawkes case seem to depend on features perpendicular to the question of causal continuity. Perhaps the fact that Guy did not disappear “into thin air” is responsible for our wanting to deny that the man who claims to be Guy really is. So let’s imagine a slightly different scenario. A person appears out of thin air in the room with you (through our improbable “quantum-poofing” process), dressed in clothes that look like they belong from the early 17th century, claiming to be Guy Fawkes’s younger brother Ritchie. Of course you would be skeptical, but he seems to accurately recount all of the events of the time period and even can tell you about his brother. You look for historical information about Ritchie Fawkes and find that this person looks exactly as Ritchie did and seems to accurately remember everything that Ritchie did. You find that when Guy was put in prison for treason, Ritchie was also imprisoned. However, one morning when the guards came to get Ritchie, they found the cell empty but the door was still locked and no means of escape was ever found; almost as though he disappeared in thin air (ashamed of their failure, they squelch the story). You ask the person standing in front of you now what was the last thing he remembers. He tells you about being put in prison and awaiting his fate the next morning, only to suddenly appear here with you. He is more perplexed than you are. Is it implausible that this is Ritchie Fawkes — that the person who spontaneously and improbably quantum-poofed out of existence in 1605 is the same person who reappeared in 2010? (Of course, the whole story is quite preposterous, but try not to let that distract you — we are merely concerned with possibility here.)

Consider Nozick’s “Closest Continuer” view of persistence (1981). Designed to deal with the branch-line cases that bedeviled discussions of personal identity, Nozick allows for extrinsic, comparative facts to break fission-generated “identity ties”. At first glance, it easily handles the Ritchie Fawkes case: who could be a closer continuer of the mysteriously-vanishing Ritchie other than the man who believes himself to be Ritchie, who is qualitatively identical with Ritchie at the moment of his vanishing, and who has memories of intimate details of Ritchie’s life up until that point?

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4 Even when the psychological continuity between Guy and the person claiming to be Guy is causal, he would seem to deny that the two are in fact one. Williams appears to favor bodily continuity over psychological as a criterion for personal identity.
Things are not so simple, however. Nozick’s theory “holds that y at t₂ is the same [object] as x at t₁ only if, first, y’s properties at t₂ stem from, grow out of, are causally dependent on x’s properties at t₁ and, second, there is no other z at t₂ that stands in a closer (or as close) relationship to x at t₁ than y at t₂ does” (1981, 37).

One might worry in the first place that this condition requires some form of temporal continuity so that properties can be causally linked. Nozick, however, clarifies that his meaning of causal dependence “need not involve temporal continuity” (35). He imagines a world in which everything flickers in and out of existence every other moment in time so that the history of any individual object is filled with temporal gaps. Nozick argues that “if every thing leads this mode of existence, then it is the best kind of continuity there actually is, so all will count as continuing objects” (35). Were Ritchie to merely “flicker” momentarily in his cell, we wouldn’t regard him as having been annihilated and momentarily replaced by an imposter. His “future time travel” is merely a longer flicker. Of course, on our telling, it is also a non-causal flicker: hold that thought.

What about past time travel? Could such temporal gaps be past-directed? Return to the story of Tim and Tom. Tom flashes out of existence in 2010. To an observer in 2010, it would appear as though he ceased to exist. He persists, on Nozick’s account, if he has a closet continuer. Supposing Tim has no serious competitors to the office of closest-continuer-to-Tom, there seems little reason to not take Tim to be Tom. Tim will, of course, insist on this. He may also convince others of his “having come from the future”, as more and more of his “memories” come true. And we, as later observers, can also follow Tim’s timeline from his birth to his disappearance in 2010 and then back to his “reappearance” in 1920. Indeed, the absence of a causal connection may be completely inscrutable (even to those as familiar with the details as mortals could be).

In any case, it is not clear to us why closeness should necessitate causation. If we imagine a world in which objects disappear through quantum mechanical events quite regularly, but also moments after they disappear objects exactly alike to them appear, there would be little reason to doubt that after something disappears, its closest continuer would be that object or person that had appeared moments earlier. Such a world would be strange, but it is entirely physically possible and thus on Lewis’s account of possible worlds, exists. This world allows us to not only permit temporal discontinuities without causation, but would also allow these temporal discontinuities to be past directed, opening the door for time travel. If we can find it conceivable that things can travel back in time a few moments in such a world, why not travel back in time several years or decades?

Perhaps this view is not Nozick’s, but it is a possible view. For all we know, it’s the correct account of personal identity. If it’s possible that personal identity is like this and a grounded physical possibility that the relevant sort of quantum events we describe occur, then time travel is possible, irrespective of what the rest of physics tells us.
4.2. Survival into the Past

We expect that this won’t be entirely satisfying. If some account of personal identity is true, it is true as a matter of metaphysical necessity. If it is false, it is necessarily false. The epistemic possibility of Nozick’s account isn’t a strong enough result to trouble the commonsense picture of disciplinary priority sketched above. We’re skeptical of this general stance, but won’t press the point here. An alternative is to be satisfied with mere “survival” (on Parfit’s famous model).

When individual A’s brain is split and implanted into two empty “body shells”, B and C, we cannot solve the problem of identity by asserting that B is identical with A, and C is identical with A, on pain of violating the transitivity of identity. Parfit contends instead that “A survives as both B and C, but is identical with neither of them” (1971, 12). He views identity as insignificant when we attempt to answer the question “Is A the same as B or the same as C?” What matters, on the other hand is the survival of A in both B and C.

Parfitian survival seems to allow for temporal gaps. Splitting someone’s brain doubtless takes time! Consciousness must be interrupted. So there is a temporal gap between the “end” of A, and the “beginning” of B and C. But nevertheless Parfit maintains that A survives as B and C.

Our questions from above now return: First, can these discontinuities be past-directed? For reasons similar to those adumbrated above, we cannot see any reason for necessitating a temporal orientation to the kind of psychological connectedness that survival requires by Parfit’s lights. If branches can already feature discontinuities why not simply shift one of the branching lines backwards in our diagram. It seems plausible that Parfit would approve of this move, if he acknowledges persistence in the normal branch case regardless of the temporal gaps or discontinuity. Tom the early-20th-century-history-buff might jump at a chance to time travel back to the 1920s, caring not a whit for such abstruse philosophical questions as whether he will be numerically identical with the person who emerges in the past — if “time travel” isn’t really just a fancy way to commit suicide and make it the case that there is a duplicate of oneself in the past. What he wants to know is whether someone in the past will be psychologically connected with him.

Second, does Parfitian survival require causation? Normally it will involve causation, but should Parfit insist on it as a necessary condition? In fact, like Nozick, he does. On Parfit’s model, psychological continuity prominently involves quasi-memory, where:

I am q-remembering an experience if:
1. I have a belief about a past experience, which seems in itself like a memory belief.
2. Someone did have such an experience, and
3. My belief is dependent upon this experience in the same way (whatever that is) in which a memory of an experience is dependent upon it. (Parfit 1971, 22)

Thus, q-memory need not specify who had the particular experience. This evades Butler’s charge of circularity (Parfit 1971, 11).
Condition (3) introduces a causal requirement. But why insist on this? The general tenor of Parfit’s arguments in favor of shifting our attention from ‘identity’ to ‘survival’ focus on the notion that identity should not matter to us when we discuss psychological continuity. Again, we can press the line epistemically. We are often (maybe always) ignorant of causation. Even if Tim’s appearance in 1920 with psychological continuity to Tom in 2010 was a staggeringly improbable, thoroughly random quantum event, he should bet the house against this and conclude that he (Tom!) was brought back by some unknown art.

Put it another way. Suppose we introduce a conception of “s-memory”, including only (1) and (2) above. Since I will be unable to tell whether I am q-remembering or merely s-remembering, it’s unclear why q-memory should be “what matters” for survival. What matters for survival should be something that can matter to the individual(s) in question, to their friends and family, other observers, and so on.

But it doesn’t even seem that we should have to rely on ignorance. For example, imagine that God presents you with some apparently bad news: through some highly improbable quantum mechanical events, you will flash out of existence in ten minutes (perhaps he wants to give you time to bid farewell to your loved ones). Ever the kidder, he further reveals that exactly one microsecond later, a person physically and mentally continuous with you will appear in the same position you are in now. That person is such that, had God never shared this news, he would never had noticed any interruption. You would feel a lot better. You would probably stop dialing your family. Note that God is not outing himself as a cause, he is just informing you of what will happen — its improbability is just that notable.

4.3. Universalism and Four-Dimensionalism

Here’s a final way to get time travel without the cooperation of relativity. As Varzi (2003) has pointed out, the conjunction of the four-dimensionalist or “Perdurantist” account of persistence and mereological universalism (the view on which any collection of things, no matter how miscellaneous, compose a further thing) has some odd consequences. ‘Pavarotti was a child’ is true for the four-dimensionalist just in case there are some temporal parts of Pavarotti that are children. But on universalism, parthood is indiscriminate. There is a four dimensional object which is the sum of Pavarotti plus some past turnip. Thus, on this view, ‘Some tenor was a turnip’ is true, since according to Universalism there is some object which has present temporal-parts of a certain tenor and past temporal-parts of a certain turnip. That we don’t typically acknowledge, name, or quantify over such strange objects does not detract from their existence in the slightest.

Supporters of Perdurantism + Universalism (PU) can bracket this awkwardness by restricting quantifiers or predicates (e.g., to apply not to temporal parts but to whole mereological sums falling under certain sortals; see Varzi 2003, §V). Our not caring about or quantifying over such strange, gerrymandered objects stems from obvious pragmatic considerations: to wit, no tenor remembers or celebrates their humble root vegetable
past. But consider Tom and Tim. The fact that they are causally-disconnected matters not a whit to whether they compose some further thing according to PU. But unlike the turnip-tenor, we seem to have good reason for countenancing their mereological sum. Indeed, we can easily imagine circumstances in which it might become quite famous! And if what we said above is on the right track, it seems plausible to call such a sum a single time-traveling person.

5. Conclusion

While we clearly haven’t shown that we must regard this strange, gut-wrenchingly improbable Tom-Tim scenario as time travel, it at least seems plausible to regard it as genuine physical possibility, irrespective of the existence of causal connections reaching from future to past. Of course, we cannot say that philosophy has complete autonomy to rule on the possibility of time travel. Physics, after all, might have told us (and who would be surprised to hear?) that the “quantum-poofings” that we have leaned on as possible though improbable were in fact not physically possible. Retreat to logical or metaphysical possibility might be an option for the committed, but such a move seems rather facile. The real interest is in locating a sense in which philosophy can occasionally open a window shut by physics in what is apparently physics’ own house. This suggests a way of seeing how the simple concentric circle picture of disciplinary priority is flawed. Physics can tell us whether there are closed time-like curves, but it cannot tell us whether there is travel along such curves (or elsewhere), since ‘travel’ is not a predicate solely within its purview.

There are further interesting questions devolving from possibility of non-causal time travel. Should one rationally look forward to such a trip (if, again, informed of it by God)? Could Tim kill his grandfather (since he would not undermine his own existence)? If Lewis is right that temporal parts cannot be further subdivided along a different temporal dimension, changing the past is impossible. He holds out the possibility that time travelers can indeed affect the past (just like ordinary travelers), but only in ways compossible with their own existence. Tim-quaque-time-traveler cannot kill his own grandfather, though he can in a more expansive sense — for this would be inconsistent with his having been born to grow up to become a time traveler. Such inconsistency apparently vanishes in our non-causal time travel scenario. Tom appears in the past with a rich memory of hate for Tim’s grandfather. He buys a rifle; he spends long hours in target practice; he shadows Grandfather to learn the route of his daily walk to the munitions works; he rents a room along the route; and there he lurks, one winter day in 1921, rifle loaded, hate in his heart, as Grandfather walks closer, closer. . . . Unlike Lewis’s time-traveling Tim, Tom (our non-causal time traveler) can kill

6 [Reference suppressed.]

7 Lewis (1976, 149).
Grandfather — but not qua time-traveler. For in doing so, he makes it the case that Tim is never born and no one has his memories. Tom can change the past as he remembers it; he can prevent what he remembers happening from ever happening. But certain ways of doing this — including preventing Tim’s later birth — make it the case that he is no time traveler at all, even on the permissive views of personal identity we have sketched. For to have “traveled” from the future (rather than merely appeared in 1921 with a bunch of detailed memories of subsequent events), it must be the case that there is someone Tom could have once been — someone of whom he is the closest continuer, someone who meets Parfit’s condition (2).

It is always fascinating to think about the experiences and motivations of time travelers from a first-person perspective. Imagine you are Tom. You find yourself all of a sudden in 1921. You do not know how, but you decide to take advantage of your peculiar situation. Being up on the philosophical literature on time travel, you reason that your desire to kill Grandfather will go unfulfilled. But you can still take pleasure in giving him a fright. Reasoning that he must survive even a hail of bullets, you load your tommy gun and accost him on his way to work. He does not survive. What have you learned about yourself and your future? Well, for one, you can be reasonably confident that (barring resurrection) your memories are flawed. And you might well suspect that you are not in fact who you think you are. You rethink your plans to become rich by betting on horses.

References