

Van Inwagen on Time Travel and Changing the Past

Hud Hudson and Ryan Wasserman
Western Washington University

Peter van Inwagen's (2009) discussion of time travel invokes both hypertime and the growing block theory to provide us with a model for changing the past that is both rigorous and ingenious.¹ We are impressed. But we are not yet convinced. In this essay, we present three potential objections for van Inwagen's model (section 1), and then show how his model can be adapted to avoid those worries (sections 2-4).

1. Three Potential Objections for van Inwagen's Model

The reader is directed to van Inwagen's essay for a complete and careful presentation of the model in question. Our purposes here mainly require taking note of the following components of that presentation. Like van Inwagen, we are interested in discussing "non-Ludovician time travel" —i.e., time travel that involves changing the past. Throughout our discussion, we will accept van Inwagen's (restricted) characterization of the growing block thesis, his identification of times with certain properties, and his claim that the existence of hypertime is consistent with (even if not required by) the growing block theory of time. We begin with three potential objections.

The first potential objection, which neither author endorses, is that van Inwagen is guilty of false advertising. One of the most salient features—perhaps *the most* salient feature—of van Inwagen's time-machines is that they obliterate an awful lot of present and past objects and events. Because of this, some might be tempted to say that such "time machines" are really

¹ For a similar discussion see Goddu (2003).

nothing more than annihilation machines and that van Inwagen offers not an account of time-travel but of temporal-annihilation.² We think that this temptation should be resisted. Granted, van Inwagen's machines *obliterate* many present objects, but they are also able to *relocate* present objects in the past and, for this reason, we count his time machines as worthy of the name. That being said, we do have one puzzling—and potentially worrisome—question to ask about van Inwagen's obliteration-and-relocation devices. Suppose that uncountably-many would-be time travelers all set their dials to different times in the past (such that no time is left unselected) and all put their machines into motion at the exact same moment.³ Question: *What happens hyper-next?*

The second potential objection, which at least one author endorses, is that van Inwagen's model does not provide for the possibility of time travel that changes the future. Many of the most familiar time travel stories involve changing the past—the past was one way, then the time traveler did his thing, and now the past is different.⁴ But other time travel stories tell the same kind of tale in the opposite direction—the future was one way, then the time traveler did his thing, and now the future is different.⁵ However, if there are no merely future objects or events (as the growing block theory tells us) and every episode of time-travel-with-change involves the annihilation and eventual replacement of some objects or events (as van Inwagen tells us), then it is impossible to travel to the future and change what will be. Some will find this objectionable.⁶

The third potential objection, which both authors endorse, is that van Inwagen's account includes the growing block theory, which we take to be the least plausible—and least popular—theory of time. Actually, van Inwagen says that his model “presupposes” a version of the growing block theory. This is careful wording. Weakly interpreted, we take him to be announcing that he will present his model by way of that particular theory of time, remaining neutral about whether it could be presented in other ways. Strongly interpreted, we take him to be announcing that the growing block theory of time is *required* for his model. Setting aside hard questions

² This objection was suggested to us by both France Howard-Snyder and Ned Markosian.

³ Taken together, the uncountably many machines might be called a *Boojum*, after the Snark who shares its power.

⁴ See, for example, *Back to the Future I* and *III*.

⁵ See, for example, *Back to the Future II*.

⁶ Note, however, that if we adapted van Inwagen's story so that it made use of a “shrinking block” theory of time (i.e., one in which the present and the future exist but not the past), then we would have an account of time travel to the future and of changing the future every bit as good (or bad) as van Inwagen's account of time travel to the past and of changing the past. Of course, we then would complain about the asymmetry again, just in the other direction. Happily, we believe we have a resolution to this problem below.

about identity conditions for models, we think the strong interpretation is the natural one. But either way, we think it would be a significant advantage to show how van Inwagen's general approach could be combined with other, more popular theories. In the next three sections, we attempt to do exactly this.

2. The Growing Block, Time Travel, and Changing the Past

To prepare the way for the discussion of the eternalist's block theory and for the presentist's slice theory of time, allow us to note some variants on van Inwagen's own use of the growing block theory.

First a refresher on a van Inwagenian version of events: Suppose, for convenience, that hypertime is finite and that there are only a million ticktocks of it (a ticktock being a unit of hypertime as an hour is a unit of time). Unmolested by time travelers, the block would grow some number of standard events per second and would hypergrow some number of seconds per ticktock, and there would be a certain happy historical agreement from the perspective of time and the perspective of hypertime—including agreement on statements such as "Caesar has died but once" and "Napoleon has met his Waterloo." Bring a time traveler into the story, however, and histories diverge. Suppose our time traveler activates his annihilation-and-repositioning machine at 12:00am on the first of January 2000, embarking for the Ides of March, 44 BC and hoping to witness a famous murder. Our hero pushes the button at midnight (and, as it happens, at ticktock 100). At hypertimes after but arbitrarily close to ticktock 100, the leading edge of the growing block is cut back to the Ides of March, 44 BC. You and yours and the roaring 20s and the second world war are all annihilated, and surprisingly the phrase 'the one and only murder of Caesar' is about to have a satisfier for the second time on the hypertime stage. That is, our time machine materializes, a little more hypertime passes, the block grows a little larger, and it is correct to report our temporal history with the claims that "Caesar has died but once" and "Napoleon has not yet met his Waterloo." Those are not correct reports of hypertime history, however, which would instead require noting that "Caesar has died twice" and "Napoleon has met his Waterloo"—it's just that whereas one of Caesar's deaths and Napoleon's

defeat are both hyperpast, neither event is past. So—as advertised—time travel and past changing have been achieved.⁷

Note, though, that the repositioning of our time traveler in the block wasn't required to change the past. The annihilation machine was up to that task all on its own. Vary the story: The button is pushed by our would-be voyeur at midnight (and at ticktock 100), and as hypertime keeps slipping into the hyperfuture the growing block is cut to the first instant on the Ides of March, 44 BC as before. On this version, however, our protagonist and his machine are likewise annihilated, and that first instant on the Ides of March, 44 BC contains exactly what it contained on the previous hypertime that the internal clocks in the leading edge of the growing block read that date—with one exception: some pebble on the floor of the Amazon rainforest has been annihilated, too. Accordingly, even though nothing has been repositioned in the block, and even though nothing has been added to an earlier slice of the block, histories diverge as soon as any hypertime goes by, for at ticktock 99 it was true that the first instant of the Ides of March, 44 BC contained that rock and at ticktock 101 it was not true that the first instant of the Ides of March, 44 BC contained that rock. And this, of course, is simply due to the facts that what is true of the past is fixed by features of the block and that the block looks very different at successive hypertimes—so that what is true of the past can change from hypertime to hypertime.

But then it appears that not only is repositioning unnecessary, annihilation of the leading edge of the block isn't required either. All we need is for there to be two hypertimes, for the growing block to have one of its temporal slices hyperpresent at both hypertimes, and for that slice to differ in its contents between the two hypertimes. Perhaps a malfunctioning machine responds to the press of its starter button at midnight (and at hypertime 100) by leaving the bewildered would-be time traveler right where he is, letting the leading edge of the block continue to creep forward at its steady rate of n seconds per ticktock, and succeeding only in eliminating our Amazonian pebble from its place on the rainforest floor on the first moment of the day of Caesar's murder. If this is the only hypertime such a machine is activated, then at hypertime 101 it is and will always be true that that rock disappeared in the past on that date from its position on the rainforest floor. But at hypertime 99, it is true that the rock did not disappear in the past on that date from its position on the rainforest floor. Once again, the past has been changed and no one had to go anywhen to do

⁷ Space constraints forbid reviewing all the details. We encourage the puzzled reader to review van Inwagen's careful discussion of these sorts of scenarios before investigating their variants below.

it. Moreover, no past or present objects had to be annihilated; so the first potential objection from the previous section is put to rest for good.

If it should turn out to be easier to build a creation machine (rather than an annihilation or repositioning machine) that would do the trick, too. And a machine that merely changes which color properties our rock manifests would also do just as well (although one might think even this requires creating some individuals, too). But the general lesson is now clear. What is *crucial* is guaranteeing that somehow or other our block has different features in one of its time-slices at each of two hypertimes at which that slice is hyperpresent. Just to be clear, it's not as if van Inwagen insists otherwise, but it is important for our purposes below that we clearly distinguish between what makes it true (if anything) that we have a case of time travel and what makes it true (if anything) that we have a case of changing the past, for this distinction enables us to show just how the general lesson might be adapted to other theories of time. That task is the subject of the remaining two sections.

3. The Eternalist Block, Time Travel, Changing the Past, and Changing the Future

Consider the popular eternalist block model of time in which all temporal relations are B-relations, and in which our lives are—so to speak—events frozen in the block. No leading edge or puzzling growth to be explained here. For an event to occur in time is just for it to have a location somewhere or other in the block.

Just as van Inwagen contends that hypertime is not necessary for but is nevertheless consistent with the growing block theory, so too, we contend that (if hypertime is possible at all) it neither conflicts with nor provides some essential component of the eternalist block theory of time. It's simply an add-on with interesting consequences. In particular, it allows us to recapture the crucial component of van Inwagen's story that was identified in the previous section. That is: An eternalist block can be present during each ticktock of hypertime, and for any instant of hypertime, there are facts about what is past and present (relative to any slice of the block) determined by the features of the block at that hypertime. But should the eternalist block happen to manifest different features at different hypertimes, we will be able to recast our story of time travel and of past (and even of future) changing without any recourse to the growing block.

Many of us have spent an afternoon or two daydreaming about different possible pasts that could have brought us to our present state and of different possible futures in which we could live out our days—knowing full well, that those were not our pasts and will not be our futures. Still, as in the Myth of Er from Plato’s *Republic*, we might daydream about choosing the pattern of our lives, and we may fantasize about being embedded in one of those compossible, past-future pairs. With the tools furnished by hypertime, the present model shows how we could construct the Myth of (Hyp)-Er and how such dreams could be realized: Suppose that at ticktock 100 an eternalist block is hyperpresent and determines all the facts about the past and the future (relative to each of its time-slices). Further suppose that at ticktock 101, with the sole exception of some slice, *S*, a new eternalist block has replaced the old one (or else the old one has got some new filling sandwiching *S*—it doesn’t much matter which). Of course, the items that characterize the eternalist block at ticktock 101 determine all the facts about the past and future (relative to each of its time-slices, as well). Finally suppose that slice *S*, the common ingredient, was the slice in which you push the start button in your newly constructed time-changing machine. The bad news . . . at ticktock 99, it was true both that you did not have the fabulous past you’d been dreaming about and you will not have the glorious future you’d been hoping for, for at ticktock 99, it is true that the machine will not work. The good news . . . *hyperwait for it* . . . at ticktock 101, it was true both that you did have the fabulous past you’d been dreaming about and you will have the glorious future you’d been hoping for, for at ticktock 101, it is true that the machine did work.⁸

No need for such greedy, whole-scale change, though. Someone who is desirous of small changes in the past or of minor alterations in the future and who is willing to time travel can MartyMcFly his way around the eternalist block fixing little things then and hence—provided that the relevant features of the eternalist block are hypertemporary and that they cooperate to yield the right hypersequence of past-and-future changes. Either way, the important point is that the hypertime account of time travel can be combined with an eternalist theory of time. Moreover, this combination provides for the possibility of changing the future in the same way that one might change

⁸ For the record, we’re not packing a great deal into the notion of “the machine’s working,” for like van Inwagen, we remain silent on how causal sequences are supposed to interact with and be restricted by time and hypertime. We do note, however, that even if the button pushings don’t cause the eliminations, or redistributions, or alterations of content in the block, we are still left with perfectly good examples of time travel and of the changing of past and future events.

the past, so the second potential objection identified earlier is no longer any problem at all.

4. Presentism, Time Travel, Changing the Past, and Changing the Future

Consider finally the presentist theory of time, according to which only present things and events exist. (For simplicity, we will continue to work with an eternalist picture of hypertime, according to which hyperpast, hyperpresent, and hyperfuture hypertimes all exist.) For the presentist, past and future truths are captured by means of present-tensed sentences prefixed by basic temporal operators like 'It WAS the case that' and 'It WILL be the case that' and metrical tense operators like 'it WILL be the case one minute hence that'. For example, a hyperbeing hyperpresent at ticktock 100 might correctly report some of the temporal facts as follows:

- It is 12:00am on January 1st, 2000 AD.
- A hopeful time traveler sits in his time machine with the dial set for 12:00am on March 15th, 44 BC.
- It WILL be the case one minute hence that (a hopeful time-traveler pushes the start button).
- It WILL be the case two minutes hence that (it is NOT the case that [it WAS the case over two thousand years ago that (a time traveler witnesses a famous murder)]).
- It WILL be the case two minutes hence that (a disappointed non-traveler sits in his machine).

More colloquially: Someone will try to travel back to the ides of March, 44 BC, but will fail. He will thus be disappointed, for it will be the case that he did not travel back in time.

In fact, the following report may even be true at ticktock 100:

- It ALWAYS WILL be the case that (it is NOT the case that [it WAS the case that (there are time travelers)])⁹

⁹ 'It ALWAYS WILL be the case that P' is true iff for all n , [(it WILL be the case n units hence that P)].

More colloquially: It will never be the case that there were time-travelers.

Yet all of the reports made by our imagined hyperbeing at ticktock 100 are jointly consistent with the following reports made at ticktock 102:

- It is 12:02am on January 1st, 2000 AD.
- It is NOT the case that (a disappointed non-traveler sits in his machine).
- It WAS the case two minutes ago that (a hopeful time traveler sits in his time machine with the dial set for 12:00am, March 15th, 44 BC).
- It WAS the case one minute ago that (a hopeful time-traveler pushes the start button).
- It WAS the case one minute ago that (a hopeful time-traveler disappears).
- It WAS the case over two thousand years ago that (a time traveler witnesses a famous murder).
- It WAS the case that (there are time travelers).

And, in fact, this is exactly the set of reports we should expect in a past-changing time-travel case according to the hypertime account, for these reports tell us that what *was* the case changes from one hypertime to another (and, we can add, that this change was due to the actions of the time traveler and his machine).

The presentist hypertime account is very similar to the eternalist hypertime account, but with one obvious difference. On the previous combination of views, there are past time-slices that exist relative to different hypertimes and exemplify different properties at those hypertimes. On the present combination of views, there are no past time-slices that exist relative to different hypertimes, for there are no past (or future) objects or events at all. Rather, there are simply different temporal facts, relative to the different hypertimes. The hypertime being in an eternalist world thus sees a changing block in which past slices, objects, or events alter their properties from one ticktock to the next. The hypertime being in a presentist world sees time-slices come and go from one tick tock to the next and also witness a change in what was or what will be. But in both cases, the hyperbeing observes time travelers changing the past or future.

We conclude that van Inwagen's general picture can be adapted so as to avoid all of the potential objections outlined in section 1 above. Most importantly, the hypertime account of time travel can be divorced from the glowing block theory of time, so that all hypertime realists can embrace the account, regardless of their preferred theory of time.

References

- Goddu, G.C. 2003. Time Travel and Changing the Past: (Or How to Kill Yourself and Live to Tell the Tale). *Ratio* 16: 16-32.
- van Inwagen, P. 2009. Changing the Past. In D. Zimmerman, ed., *Oxford Studies in Metaphysics*. Oxford: Oxford University Press.