

# The metaphysical possibility of time travel fictions

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DOI:

[10.1007/s10670-021-00403-y](https://doi.org/10.1007/s10670-021-00403-y)

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*Document Version*

Publisher's PDF, also known as Version of record

*Citation for published version (Harvard):*

Effingham, N 2021, 'The metaphysical possibility of time travel fictions', *Erkenntnis*.

<https://doi.org/10.1007/s10670-021-00403-y>

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# The Metaphysical Possibility of Time Travel Fictions

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Received: 2 December 2019 / Accepted: 18 March 2021  
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## Abstract

In some stories, time travellers cannot change the past. It is widely accepted that this is metaphysically possible. In some stories, time travellers can change the past. Many philosophers have explained how that, too, is metaphysically possible. This paper considers narratives where sometimes the past can change and sometimes it cannot, arguing that this is also something that is possible. Further, I argue that we can make sense of stories where some events appear to be ‘fixed points in time’.

## 1 Introduction

In some time travel stories, the past can change e.g. Kleiser’s *The Flight of the Navigator* (1986), Curtis’s *About Time* (2013), or Landon’s *Happy Death Day* (2017). As an example, consider *Happy Death Day*. The protagonist, ‘Tree’, is murdered in a tunnel. She then awakes earlier that day, having travelled in time. Tree lives through that day again, but this time things play out differently and she isn’t murdered in a tunnel. The past has changed!

In other time travel stories, the past cannot change e.g. Moorcock’s *Behold the Man* (1969), Gilliam’s *12 Monkeys* (1995), and Vigalondo’s *Los Cronocrimenes* (2007). As an example, consider *Los Cronocrimenes*. The protagonist, ‘Hector’, sees a woman, naked in the forest. Investigating, Hector finds her unconscious, whereupon he is attacked by a bandaged man. Managing to later travel in time, it transpires that it was Hector’s later self who forced the woman to strip and who knocked her unconscious, as well as being the bandaged man. Nothing plays out differently;

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whilst the viewer sees the same event multiple times, it always plays out the same way.

These two types of film mirror the two main philosophical approaches to time travel: ‘Ludovicianism’ (Lewis, 1976), the theory that the past cannot be changed, and the ‘non-Ludovician’ theories which allow for the past to change. For each, much work has already been done to show that they are metaphysically possible (for discussion, see Effingham, 2020).

But some stories don’t correspond to either. In those stories, the past is sometimes changeable whilst, on other occasions it cannot be changed. This paper argues that even these time travel scenarios are metaphysically possible.

There are two reasons to be interested in whether such fictions are metaphysically possible. First reason: It builds on the project David Lewis started. David Lewis asks whether *any* time travel narrative is consistent (1976: 145). It’s only natural to further ask exactly *which sorts* of narratives are consistent i.e. whether a narrative according to which the past is only changeable on occasion is possible or not. Second reason: It’s independently interesting to map what logical space is like and what sort of time travel might be permitted, regardless of its connection with fiction.

Section 2 explains the Ludovician model and how probability works in that model. Section 3 explains the hypertemporal non-Ludovician model, arguing that it’s the best non-Ludovician model for understanding most fictional stories. Section 4 moves to those time travel fictions where the past is intermittently changeable, arguing that a model ‘mixing’ Ludovicianism with hypertime can account for such fictions. Section 5 discusses ‘fixed points in time’, whereby time travellers find they can change some events but not others; I discuss how the mixed model can allow for these fixed points.

This paper does not aim to explain all problematic elements in all time travel fictions. Many will still go unexplained. Nevertheless, in the spirit of speculation, I suggest that more advanced ‘mixed models’ might help with at least some of these issues. Section 6 gives an example of a narrative which can be explained by further mixing.

## 2 Ludovician Time Travel

### 2.1 Examples in Fiction

Imagine I travel back to 1930 to assassinate Hitler. The Ludovician says that I would fail to succeed. Some event would inevitably get in my way, thwarting me. I might be unable to locate Hitler, or shoot the wrong person, or simply miss when I finally have him in my crosshairs. Taking this through to its natural conclusion, I’d be unable to change anything in the past—what once was, always will be. Were this how

time travel worked, all time travellers will end up in the same situation as Hector from *Los Cronocrímenes*, unable to change events from being the way that they previously were.

Lewis (1976) is the most famous Ludovician [for a fuller exposition and list of supporters see Effingham (2020: 67–73)]. It is a theory adopted by many fictions.

- *Star Trek*. In ‘Captain’s Holiday’ (1990), aliens from the future attempt to rescue an artefact destroyed by Captain Picard. Partially due to the efforts of the aliens, Picard ends up destroying the artefact. Another example: In ‘Time’s Arrow’ (1992) the crew travel back in time, having found Data’s head buried at an archaeological dig. Their time travelling then leads to Data being decapitated in the past and his head being left for the future crew to find.
- *The Terminator* (1984). A soldier from a dystopic future comes back to save the mother of an unborn child who will lead the resistance against the robots that have taken over the world. The mother is saved and the future stays the same (and the soldier turns out to be the biological father of the unborn child).
- *Harry Potter*. In ‘The Prisoner of Azkaban’ (Rowling, 1999) the protagonists, believing (but not having seen) a friendly hippogriff killed, return in time to save it. It turns out that the hippogriff never died in the first place, due to the actions of their future time travelling selves.
- *Doctor Who*. In ‘The Aztecs’ (1964) the Doctor avers that history cannot be changed and that the Aztecs’ practice of human sacrifice cannot be stopped.
- *Red Dwarf*. In ‘Future Echoes’ (1988) Lister witnesses an image from the future in which one of his companions loses a tooth. To demonstrate that he can change the future, Lister tries to prevent the tooth loss. In doing so, he breaks his companion’s tooth.

These examples also neatly describe ‘causal loops’ wherein an event causes another event which causes another event, and so on, until—via the miracle of time travel—they loop back to cause the original event. For instance, finding Data’s head brings about the time travel which results in him losing his head; it’s a causal loop. Similarly, in the other examples: the time travelling soldier in *The Terminator* is the father of the man who sends him back in time in the first place; Lister’s attempt to stop the future happening causes it to happen; and so on.

## 2.2 Ludovician Probability

In *Red Dwarf*’s ‘Cassandra’ (1999) the protagonists meet an oracle who knows all future facts. The oracle reveals that one character, Rimmer, will imminently die before leaving the ship, whilst the other protagonists will live for some time yet. Another character, Kryten, notes that this means that the others are now invulnerable. Taking a gun, he points it at his own head, pulls the trigger, and—against the odds—it misfires. He then does the same to the other characters fated to survive,

each time amazingly failing to discharge. Shooting it in Rimmer's direction, it fires perfectly.

This fictional example is instructive (if not entirely representative!) of how probability would function in a Ludovician time travel case (Effingham, 2020: 147–75). To see why, imagine that when I try and kill Hitler I am committed enough to make fifty attempts before giving up. Imagine also that I am so skilful an assassin that only one of two things can prevent my success: (i) a commonplace event, out of my control, occurring every time I try; (ii) a random heart attack killing me before I even make my first attempt. (In reality, of course, there'd be more outcomes than (i) and (ii), but they will do as heuristic placeholders.)

Let the chance of me being struck down by a heart attack be one in a billion. Let the chance of a commonplace event preventing an assassination attempt be 0.05; the chance of a chain of fifty of them occurring is then  $8.9 \times 10^{-66}$ . Given those probabilities, were I to try and kill a regular, presently existing, dictator, I would almost certainly succeed. The chance would be  $1 - 1 \times 10^{-9} - 8.9 \times 10^{-66}$  i.e. roughly 1.

But when I try to kill Hitler, things are different since something will stop me—indeed, given the assumption, one of (i) or (ii) will save Hitler. As a rational Ludovician, my credence of (i) and (ii) coming about should therefore proportionately increase given that I know I will fail (Effingham, 2020: 152–54). Since the chance of (ii) is greater, by 57 orders of magnitude, than the chance of (i), the proportionate increase means that that my expectation of dying from a heart attack should be 57 orders of magnitude greater than my expectation of a chain of coincidental events coming about. So, were I to try and kill Hitler, I should *expect* to die of a heart attack.

In other time travel cases, similar thoughts will apply. If I try to change the past, something will stop me and it'll be more likely that it's a singular—quite possibly dangerous—event which does that preventative work. Time travel is dangerous for my health!

There are two objections the Ludovician might raise.

First objection. Lewis says that the events which play the preventative role are 'commonplace' (Lewis, 1976: 150). Likewise, we might think he thought the probabilities of events in time travel cases would be normal and mundane, not strange and dangerous like I've indicated.

But Lewis's talk of 'commonplace' events just means that the things which prevent me killing Hitler needn't be outlandish events like supernatural agents or interventionist 'time patrols'. For Lewis, the events which stop me can be 'commonplace' events like my gun misfiring, or me mistaking my target, and so on. Lewis says nothing about the *likelihood* of such 'commonplace' events occurring.

Second objection. The Ludovician says that in different contexts I have different abilities. For instance, I can't kill Hitler in 1930 in a context which assumes that he survives 1930. Ludovicicians are quick to point out that the same also applies in non-time travel scenarios e.g., assuming I will fail to assassinate a contemporary dictator, then I don't have the ability to kill them. That said, the second objection is that the same parity between *abilities* in time travelling/mundane scenarios should apply to *probabilities*. Were that so, nothing strange would be going on. Rather, when we recognise that I have a high probability of having a heart attack when I try to kill

Hitler, that's no more unusual than recognising that, *assuming I would fail*, I'd have a high probability of having a heart attack were I to try and kill a contemporary dictator.

But something strange *is* going on and what is said about abilities *cannot* be said of probabilities. I agree that there's *some* probability function according to which I have a high probability of a heart attack both when I try and kill Hitler and when I try and kill the contemporary dictator. But that's because probability functions are cheap and plentiful; *that* probability function is not the *salient* probability function. The probability function we should care about is the 'rational credence' probability function of a (presumably non-actual) well-informed agent. When you're trying to figure out what to expect (and what actions to take), it's *that* function which you're aiming for with your own probability judgements. And since the rational credence an agent assigns to a proposition varies depending only upon what that agent believes, not the context in which the agent finds themselves in, then the function we're interested in isn't context sensitive in the way that ability claims are.

Moreover, the rational credence function of a well-informed agent returns the result that it's dangerous to use a time machine to kill Hitler but not for me to attempt the assassination of a contemporary dictator. Imagine a rational agent is gambling as to whether I'll succeed in killing a contemporary dictator. Since they're well-informed, they know that only one of (i) or (ii) could stop me. In this case, the gambler's well-informed body of beliefs says nothing about whether—at the future time—I succeed or fail. Thus, the gambler will say I'll likely succeed and bet accordingly. Next, imagine we ask the gambler to bet on me succeeding in killing Hitler. Being well-informed they know that I'm using a time machine, that Hitler survived 1930, and that only one of (i) or (ii) will stop me. Given all *that* knowledge, it's now rational for them to predict that my assassination attempt will fail; indeed, the gambler will instead expect me to have a heart attack. Since we want our actions and expectations to mimic those of the well-informed rational agent, we should likewise expect me to have a heart attack when attempting historical assassinations but not contemporary ones.

The question then arises: Why are time travellers faced by these dangers whilst regular assassins are not? A bad answer is to think that contemporary assassins can change the future whilst time travellers cannot change the past. It's a bad answer because, for the Ludovician, *no facts* can ever change, whether they're past, present, or future (Horwich, 1987: 116; Lewis, 1976: 150; Putnam, 1962: 669). Even contemporary assassins can't change facts about the future—they can *causally affect* the future, but not *change* it.

The correct answer instead focuses on what 'well-informed' consists in. In the case of killing contemporary dictators, it'd be wrong to imagine that the rational gambler has an antecedent commitment to my succeeding or failing. But in the case of me using a time machine to kill Hitler, it *is* appropriate to imagine the rational gambler antecedently believing that I will fail. That is: In the former case, it's unreasonable to think my succeeding or failing is part of being well-informed, whilst in the case of me attempting to kill Hitler, it's the other way around (Hall, 1994: 508–9; Lewis, 1986: 94). This, in turn, is because when I try and kill Hitler I'm involved in (or potentially involved in) a causal loop, but I'm not involved in one

when I try to kill the contemporary dictator. When killing Hitler, I'm involved in (or could be involved in) a causal loop because Hitler's surviving 1930 plays a causal role in my personal history e.g. his survival, and later heinous acts, cause me to come back to kill him. (The 'personal history' of an agent is that web of events which has causally influenced—i.e. affected the intrinsic properties of—the person up until that point; this includes, say, events from long before the person is born e.g. those involving their ancestors.) Since causal loops appear only in time travel cases, killing contemporary dictators doesn't involve causal loops and so won't come hand-in-hand with weird expectations. Wannabe assassins of Hitler, from Helmut Hirsch to Fabian von Schlabrendorff, would *not* have been rational to expect to be definitely thwarted in their assassination attempts. Likewise, if I time travel to the past, and also travel to a place in space so far away that my activities can't affect my personal history, no probabilistic peculiarities will arise. Similarly, if one time travels in a non-Ludovician fashion one avoids being in a causal loop (see Section 3) and, if loops are avoided, no probabilistic weirdness arises. But in the causal loop case, it's reasonable for the well-informed rational gambler to know everything about my causal history—that is part and parcel of their being well-informed. In the case of me killing Hitler, this includes my failing in the assassination attempt. In the case of the contemporary dictator, even if it turns out that I actually fail and have a heart attack, that failure isn't part of my causal history and so it's illegitimate for it to feature in the beliefs of the imaginary well-informed agent.

In conclusion, time travellers caught up in causal loops (or liable to get caught up in causal loops) should expect weird events to happen. In particular, they should expect a single unlikely event to prevent their changing the past. It's not hard to reach the conclusion that the singular event might well be deleterious to one's health and well-being. Ludovician time travellers beware!

Even apparently inconsequential events may be part of my personal history, such that interacting with them is dangerous for me. Imagine that it's 800 AD. Sigeburg is currently enamoured of Cuthbert. But tomorrow morning, Cuthbert will yawn when he opens his door. Wandering by, Sigeburg will find this repugnant and deem Cuthbert to be an unsuitable suitor. Years later, Sigeburg will go on to marry someone else. One of their descendants will be a man who, in 1915, arrives at the navy office slightly earlier than my great-grandfather. In turn, that descendant, rather than my great-grandfather, is assigned to a vessel destroyed by U-boats. Thus, if Cuthbert does not yawn at that exact moment in 800 AD, I will not be born. I can no more stop the yawn than I could assassinate Hitler. Were I to sit talking to Cuthbert—where I might accidentally cause him to sleep in a little longer by drinking just a tad more mead, in turn causing Sigeburg to miss his romantic faux pas—I am increasing the probability of some event thwarting my doing just that. Strange probabilistic occurrences would happen, thwarting my interacting with Cuthbert. Even if I were unaware of his role in my personal history, that'd make no difference to these probabilistic issues. Talking to Cuthbert could be deadly to me.

One last note. Even non-time travellers might be caught up in these cases if they—knowingly or otherwise—start interacting with time travellers. If, for instance, I go back in time and try and trick someone into killing Hitler for me, that will increase *their* chances of having a heart attack. Similarly, if I go back in time to

Cuthbert's village, those around me (who I might otherwise accidentally influence into stifling Cuthbert's yawn) will likewise be threatened by unlikely events.

### 2.3 Probability and Fiction

In fictions portraying Ludovician time travel, there is a tendency to see either no strange coincidences or only a very limited number. But, given Section 2.2, this isn't representative of how it actually would be were Ludovicianism true. Indeed, elsewhere (2020: 168) I've argued that the practical upshot of the probabilistic concerns from Section 2.2 is that, since any time travel to within your past light cone will likely result in *some* interaction (even at a sub-atomic scale!) with your personal history, any attempt to activate a time machine would likely kill you. Very few fictions represent *that* probabilistic fact [for exceptions, see Niven's 'Rotating Cylinders and the Possibility of Global Causality Violation' (1977) and Levinson's 'The Chronology Protection Case' (1995)].

Two things should be said about this. First, fictions often suppress truths about the world. In *Die Hard II* (1990) a plane blows up when John McClane lights its trail of fuel. In reality, aviation fuel has too high a flashpoint to ignite like that. In *Point Break* (1991) Keanu Reeve's character conducts a lengthy conversation whilst sky-diving. In reality, this would be impossible given the loud sound of rushing wind. In numerous TV shows and movies, chloroform soaked rags almost instantly render people unconscious, far from the real world truth. Fictional depictions of Ludovician time travel similarly involve such suppression.

Second, by failing to realistically depict how probability would work in a Ludovician time travel case, time travel fictions end up depicting *unlikely* narratives. But 'unlikely' doesn't mean 'impossible'. If we're interested solely in their possibility, then possible they are! (And some narratives may lend themselves to the idea that the time travellers have supraphysical powers allowing them to warp probability, avoiding these problems entirely.)

## 3 Non-Ludovician Time Travel

### 3.1 Examples in Fiction

Fiction contains many examples of time travellers changing the past:

- *Star Trek*. In 'Yesterday's Enterprise' (1990) a ship comes back from the past to the future, escaping a battle. That affects the result of the battle and the future is instantly changed, becoming dystopian. Eventually, the ship returns to the past and history reverts back to how it originally was. Another example: In 'Time Squared' (1989) Captain Picard returns from a future disaster and then dies. The crew then change events so that this never happens.
- *Terminator 2* (1991). A time travelling robot comes back to 1995 from 2029. It teams up with the protagonists and they try and prevent the end of the world.

We discover, in *Terminator 3: Rise of the Machines* (2003), that they change the future by delaying the apocalypse eight years.

- *Harry Potter*. In ‘Harry Potter and the Cursed Child’ (2016) the protagonists travel in time and change history so that Voldemort now lives and rules the world.
- *Red Dwarf*. In ‘Tikka to Ride’ (1989) the crew of the ship return to the past for supplies, accidentally saving JFK which ultimately results in a nuclear war. Realising their error, they recruit JFK’s future self and return to 1963 where they get JFK to assassinate himself. The nuclear war is now averted.

### 3.2 Universe and Hypertemporal Indexing

*Prima facie*, changing the past seems to be impossible. Consider some instant,  $t_{1930}$ , in 1930. At  $t_{1930}$ , Hitler is alive. Later, I go back in time and change things so that Hitler is now dead at  $t_{1930}$ . Where  $P$  is the proposition ⟨Hitler is alive⟩ the following contradiction would be true:

$$\text{At } t_{1930} : P \wedge \neg \text{At } t_{1930} : P$$

‘Non-Ludovician’ theories of time travel solve this problem by introducing extra entities to avoid the contradiction. One model introduces extra universes (Deutsch, 1991). Time travel takes you back to the past, but to a universe different from that which you left. In that new universe, the time traveller can change things however they want. Just as, without fear of contradiction, it can rain at one place and not rain at another, different things can be true at different universes (since a universe is simply a very large place). On this model, if I return to  $t_{1930}$  to kill Hitler then there are universes  $\mathbb{U}_1, \mathbb{U}_2, \dots$  whereby I leave universe  $\mathbb{U}_1$  (at which Hitler was alive at  $t_{1930}$ ) to arrive at  $t_{1930}$  in universe  $\mathbb{U}_2$ . There, I kill Hitler. The following proposition would be true:

$$\text{At } \mathbb{U}_1 : \text{At } t_{1930} : P \wedge \neg \text{At } \mathbb{U}_2 : \text{At } t_{1930} : P$$

That proposition is no more contradictory than it raining right now (in that it’s raining in Seattle) and it not raining right now (in that New York is clear skied). So universe non-Ludovicianism solves the problem.

A spin on this theory, ‘hypertemporal non-Ludovicianism’, introduces an extra dimension of time instead of extra universes (Bernstein, 2017; Goddu, 2003; Hudson & Wasserman, 2010; van Inwagen, 2010). Hypertemporal theories vary over their specifics (e.g. whether they accept growing block theory or eternalism, whether time is fundamentally tensed or tenseless, and so on). I assume an ‘eternalist’ hypertemporal theory (Chown, 2007; Effingham, 2020: 76–79; Hudson & Wasserman, 2010). That model assumes there are two temporal dimensions, time and ‘hyper-time’. They are temporal analogues to the two spatial dimensions one would find in a flatland. Just as, in a flatland, you can go left–right and backwards–forwards, in a world with two dimensions of time there is the pastwards–futurewards direction *and* a hyperpastwards–hyperfuturewards direction.

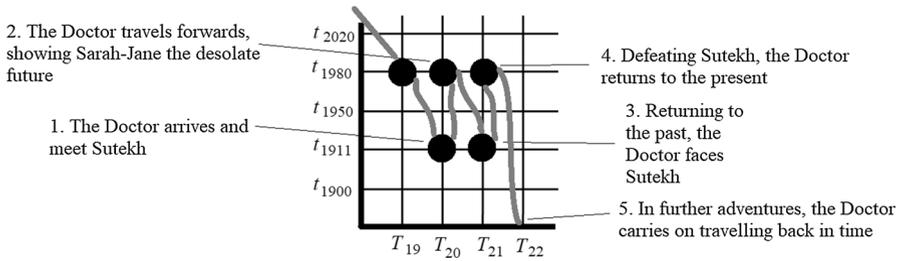


Fig. 1 A Hypertemporal understanding of ‘Pyramids of Mars’

Use the variables  $t_1, t_2, \dots$  to refer to regular temporal instants and the variables  $T_1, T_2, \dots$  to refer to hypertemporal instants. Since the two-dimensional temporal world is analogous to the spatial dimensions of flatland, each hypertime has its own complement of times. For instance, at  $T_1$  there exist instants  $t_1, t_2, \dots$  whilst  $t_1, t_2, \dots$  also all exist at  $T_2$  and at  $T_3$ , and so on for all hypertimes (analogous to how, in a two dimensional flatland consisting of  $x$  and  $y$  spatial axes, every ‘ $x$  point’ exists along every ‘ $y$  point’). Time travellers travel back in the regular temporal dimension but always move forwards in the hypertemporal dimension. If I go back to kill Hitler, I leave one hypertime (e.g.  $T_1$ ) and arrive back in 1930 but at a hyperlater hypertime ( $T_2$ ). It’s at that hypertime at which I kill Hitler and make the following proposition true:

$$\text{At } T_1 : \text{At } t_{1930} : P \wedge \neg \text{At } T_2 : \text{At } t_{1930} : P$$

Again, that proposition isn’t contradictory.

Consider a second example. In *Doctor Who*’s ‘Pyramids of Mars’ [1975] the Doctor and Sarah Jane go from 1980 to 1911. In 1911, the antagonist of the story, Sutekh, conspires to wipe out all life. Sarah Jane says not to worry for, having seen the future, she knows Sutekh fails. To disprove this, the Doctor takes Sarah Jane to 1980, where Earth is now a desolate wasteland orbiting a dead sun. Witnessing the results of inaction, they return to 1911 and defeat Sutekh. 1980 then changes back to how it once was.

See Fig. 1. The Doctor starts at one time,  $t_{1980}$ . Given the hypertemporal model, he’s also at a certain hypertime, in this case  $T_{19}$ . Refer to that temporal/hypertemporal location using Cartesian co-ordinates i.e. ‘ $t_{1980}-T_{19}$ ’. When the Doctor travels back to 1911, he moves forward in hypertime, arriving at  $t_{1911}-T_{20}$ . There, he shows Sarah Jane the future by travelling to 1980. Since he moves forwards in regular time, not backwards, he stays at the same hypertime, arriving at  $t_{1980}-T_{20}$ . Whilst  $t_{1980}-T_{19}$  was nice,  $t_{1980}-T_{20}$  is nasty. Travelling back in time again (and, therefore, ahead in hypertime, to  $T_{21}$ ) the Doctor arrives at  $t_{1911}-T_{21}$ . There he frustrates Sutekh’s plans. Thus  $t_{1980}-T_{21}$  is as nice as  $t_{1980}-T_{19}$ .

### 3.3 In Favour of Understanding Fiction in Hypertemporal Terms

It's curious that whilst there are fictions explicitly relying on universe indexing [e.g. Baxter's *The Time Ships* (1995) and Hamilton's *The Saints of Salvation* (2020)] examples of fictions *explicitly* relying on hypertemporal indexing are absent.<sup>1</sup>

Nevertheless, it is more natural to read fictions as presenting a hypertemporal non-Ludovicianism than a universe non-Ludovicianism. This is because hypertime bests captures the *motives* of fictional characters. Consider 'Pyramids of Mars'. If universe non-Ludovicianism were true, the Doctor would have little reason to act to stop Sutekh. Imagine that time travellers create new universes when they travel back in time. In one universe, 1980 is nice. In a second universe, Sutekh's actions make 1980 nasty. The Doctor then travels to the future of that universe, shows Sarah Jane that it's nasty, and travels back in time to stop Sutekh. Thus, the Doctor creates a third universe (in which 1980 ends up again being nice). But what was the point? I don't ameliorate the problem of global poverty and starving children in the world by fathering some non-starving children of my own. Similarly, if the Doctor is worried about the horrible universe Sutekh brings about, he doesn't ameliorate that problem by creating a third universe at which Sutekh has not done terrible things—all he does is create a place which is nice, not eliminate the place which is nasty.<sup>2</sup>

Given hypertemporal non-Ludovicianism, the Doctor has much more motive to act. Standardly, we favour how things presently are. I have been in pain in the past and my presently *not* being in pain is preferable; when in pain, I have a motive to make my pain a mere item of the past. Were there a second temporal dimension, we should likewise prefer how things *hyperpresently* are. When Sutekh makes 1980 a terrible place, he makes 1980 hyperpresently a terrible place. The Doctor—seeing that this is a bad thing—puts it right and makes it the case that, hyperpresently, 1980 is a nice place. Sutekh's devastation is relegated to being a mere item of the hyperpast; whilst there's nothing the Doctor can do about the hyperpast being the way that it is, at least the way the world hyperpresently ends up being is better in light of his actions. He is therefore clearly motivated to change time (in a way that he isn't, given universe non-Ludovicianism).

I suspect that similar reasons apply to understanding other fictional narratives. We're best advised to treat most fictional cases of the past changing as being cases of hypertemporal non-Ludovicianism.

<sup>1</sup> DC Comics features 'hypertime'. However, it's a mere MacGuffin, rather than anything related to the theory described above.

<sup>2</sup> Alternatively, universe non-Ludovicianism may not involve the creation of universes but the navigation of a pre-existing set of universes. But in the same way that you don't solve the problem of starving children by booking a flight to somewhere where there aren't any starving children, the Doctor again fails to ameliorate Sutekh's actions by travelling back to 1911. All he does is move *himself* to a place where it's not *his* problem.

## 4 The Mixed Model

For both Ludovician and non-Ludovician time travel, the same fictions have been used as examples i.e. *Star Trek*, *Harry Potter*, *The Terminator*, *Red Dwarf*, and *Doctor Who*. In those narratives, the characters can sometimes change time whilst, on other occasions, time travel results in a Ludovician causal loop with no change possible. This section deals with how to allow for the possibility of such narratives.

It can be allowed if we tinker with the hypertemporal model. The vanilla hypertemporal theory from Section 3 has it that time travellers *always* move forwards to hyperlater hypertimes when they travel back in time. Drop that stipulation. Whilst, in some cases, people ‘merely time travel’ (by going back in time and moving forward in hypertime), in other cases they can also ‘hypertime travel’ and go back to hyperearlier hypertimes (or, alternatively, manage to stay at the one they are hypercurrently at whilst nevertheless travelling back into the ‘regular’ past).

If hypertime travel is allowed, we run straight back into the original problem we were faced with. Imagine I ‘merely time travel’ from 2020 to 1930 and kill Hitler i.e. I travel from  $t_{2020}-T_1$  to  $t_{1930}-T_2$  and make it the case that Hitler’s dead at  $t_{1930}-T_2$ . If I have a hypertime machine, I can then travel from  $t_{2020}-T_2$  to  $t_{1930}-T_1$ . Can I then kill Hitler there?

One solution is to redux the same move the hypertemporal theorist made in the original case i.e. add an extra dimension of time. Adding in an ‘ultratemporal’ dimension, which hypertime machines always move forward in, it’d turn out that Hitler’s alive at  $t_{1930}-T_1$  at one ultratime and dead at  $t_{1930}-T_1$  at an ultralater ultratime.

But scotch that suggestion. The crux of this paper’s theory is that, in the example fictions, this *isn’t* what happens. Instead, when someone hypertime travels, that hypertemporal travel ends up being ‘Ludovician’. Were one to go back in hypertime to  $t_{1930}-T_1$  then one would fail to assassinate Hitler. Just as commonplace events like guns misfiring and mistaken identities save Hitler from assassination given regular Ludovicianism, the same sorts of events will occur to prevent Hitler from being assassinated at  $T_1$  were someone to hypertime travel back to that point.<sup>3</sup>

Call this the ‘mixed model’. If, like myself, you think both Ludovician and non-Ludovician time travel are metaphysically possible, there’s little reason to think that this mixed model is not also possible. And, given its possibility, we can allow for fictions wherein sometimes time is changed and sometimes it isn’t. Consider three examples.

Figure 2 depicts the narrative of *The Terminator*. At the first hypertime,  $T_1$ , the protagonist, ‘Reese’, and the Terminator both travel in a Ludovician manner from 2029 back to 1984. Reese then becomes the father of the man who sends him back in time. Slightly later in 2029,  $t_{2029+8}$ , (and at the *same* hypertime,  $T_1$ ) another terminator is sent back in time. But in this case, it is in a *non-Ludovician* manner. Because the time travel is non-Ludovician, that terminator arrives in the past (in 1995) at a hyperlater hypertime,  $T_2$ . That terminator can make time different from

<sup>3</sup> That time machines may have both Ludovician and non-Ludovician ‘settings’ is something which was suggested to me by Sara Bernstein when discussing her MOP view of time travel [Bernstein 2017].

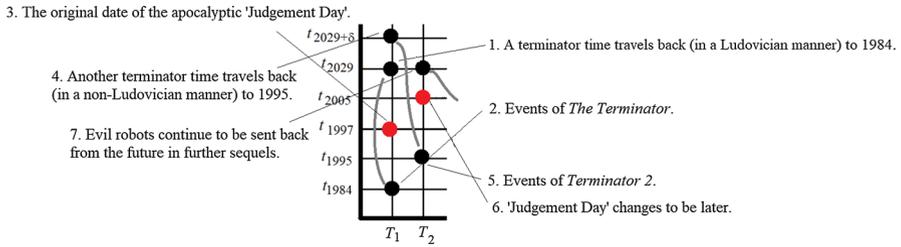


Fig. 2 The mixed model understanding of *The Terminator/Terminator 2*

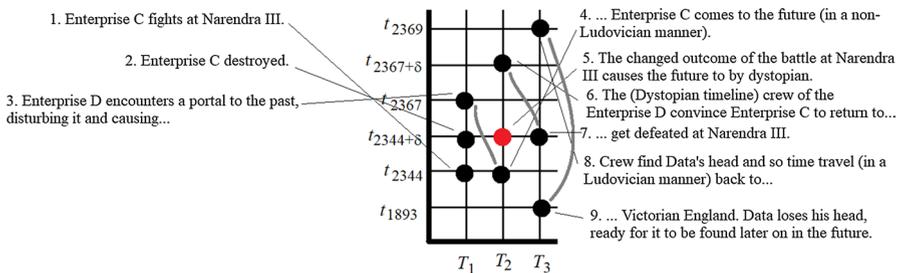


Fig. 3 The mixed model understanding of *Star Trek*

how it hyperwas at  $T_1$ . The events of *Terminator 2* then play out and the protagonists delay the apocalypse occurring by eight years.

As another example, consider (some of) the narrative of *Star Trek*, namely the events of ‘Yesterday’s Enterprise’ followed by the events of ‘Time’s Arrow’. See Fig. 3. This time, the non-Ludovician time travel comes first and the Ludovician time travel comes second. At  $T_1$ , the Enterprise-C is involved in a battle in 2344 and is destroyed. Later, at that same hypertime, the Enterprise-D (led by Captain Picard) somehow disturbs a portal into the past, affecting the past in a non-Ludovician manner. This allows the Enterprise-C through to the future,  $t_{2367}$ , at a hyperlater hyperinstant,  $T_2$ . The history of  $T_2$  is changed by this event to be different than that of  $T_1$  and the world, from  $t_{2344}$  onwards, is more dystopian. The events of ‘Yesterday’s Enterprise’ then take place and the crew of the future convince the crew of the past to return back to the past and put right what once went wrong. So there is yet more non-Ludovician time travel as the Enterprise-C returns to the past (at  $t_{2367+\delta}$ ) at another, hyperlater, hypertime,  $T_3$ . The past is now put aright and 2367 is no longer dystopian at  $T_3$ .

Later on, at  $T_3$ , the crew—at  $t_{2369}$ —come across Data’s head. Using a time machine, they travel back to 1893, but this time in a Ludovician manner—that is, they time travel back within the same hyperinstant. There, Data loses his head. Since that takes place at the same hyperinstant, the head can later be discovered by the crew at  $t_{2369}-T_3$ , creating the causal loop depicted in ‘Time’s Arrow’.

Both these examples involve causal loops arising from hypertime travel within the same hyperinstant. I’ve argued elsewhere (2020: 22–24) that travelling within

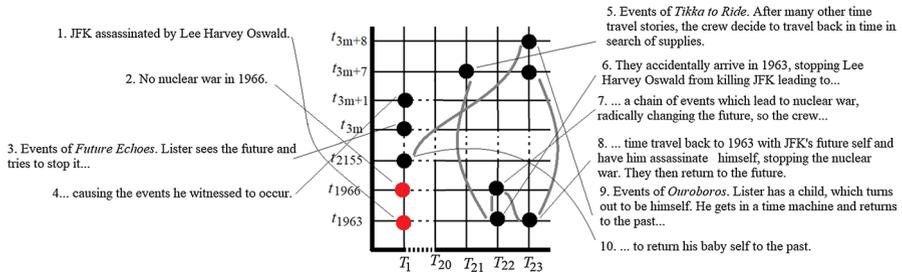


Fig. 4 The mixed model understanding of *Red Dwarf*

the same instant is a type of time travel; similarly, to travel within the same hyper-temporal instant is to hypertime travel. But there are also clearer cases of hypertime travel where causal loops stretch between hypertimes. I'll use *Red Dwarf* as an example, although similar loops appear elsewhere, e.g. in Harry Harrison's *The Stainless Steel Rat Saves the World* (1972), Baxter's *The Time Ships* (1995), and various episodes of *Doctor Who* (e.g. 'The Name of the Doctor' (2013) and, indeed, mostly any episode where multiple Doctors meet one another).

See Fig. 4, which depicts three cases of time travel in the *Red Dwarf* narrative. The first is the Ludovician causal loop from the episode 'Future Echoes'. At one time,  $t_{3m}$ , Lister sees an event from the future and tries to stop it, which then causes it to happen later at  $t_{3m+1}$ .

The second case is the events of 'Tikka to Ride'. Marooned three millions years into deep space (at  $t_{3m+7}-T_{21}$ ) the crew decide to return to the past for supplies. Accidentally arriving in 1963 (at  $t_{1963}-T_{22}$ ) they prevent Lee Harvey Oswald from killing JFK. Trying to escape the police, they travel forwards in time (to  $t_{1966}-T_{22}$ ) where they discover JFK's survival has led to a nuclear war. Realising their mistake, they recruit JFK's future self and travel back to 1963 (to  $t_{1963}-T_{23}$ ) where they get JFK to assassinate his past self. History is, more or less, put back to how it hyperwas (except for the fact that Oswald no longer killed JFK and instead JFK killed JFK). *Red Dwarf* is thus a mixed model.

The third case is a causal loop stretching back in hypertime. In a later episode, 'Ouroboros' (1997), Lister has a child. It transpires that the child *is* Lister [so Lister is a 'bootstrapped' person (cf Effingham, 2020: 59–65)]. Baby Lister is then returned to the past to become the adult Lister. The clear implication of the narrative is that these events have not changed time i.e. it is *not* that, hyperpreviously, Lister was a regular person born to regular parents but that, from  $T_{22}$  onwards, he is instead his own father. Rather, the implication is that throughout the entire show he has always been his own father. Thus, Lister must have returned back to the original hypertime he was born at,  $t_{2155}-T_1$ , and left his baby self to be found by his adoptive parents. That requires going back to a hyperpreviously hyperinstant. (And note that, since it involves a causal loop, we get the same probabilistic issues discussed in Section 2.3; we should, again, appreciate that whilst the narrative of 'Ouroboros' is possible, it's therefore nevertheless very unlikely.)

## 5 Fixed Points

### 5.1 Examples in Fiction

With the mixed model in place, turn to consider another feature common to time travel narratives: ‘fixed points’. In Simon Wells’ *The Time Machine* (2002), Dr. Alexander Hartdegen’s fiancé is killed by a mugger. To save her, Hartdegen invents a time machine, changes the past, and saves her. However, she is then run over by a carriage. Hartdegen realises that no matter what he does, he’ll be unable to stop her from being killed—every time she is saved, she’ll simply die in a different manner. Her dying can be changed in certain respects (e.g. from her being killed in a mugging to being killed in an accident) but not others (e.g. she must always die at roughly that time). Her death is a ‘fixed point in time’.

At first glance, there seems to be no room for fixed points in the mixed model. When Hartdegen travels back in time, he travels forwards in hypertime, so what’s stopping Hartdegen from preventing his fiancé’s death at that hyperlater hypertime? If Hartdegen can change time so his love isn’t shot but run over, why can’t he change time such that she lives to an old age? Why are events fixed in some respects but not others? This problem is compounded later in the film. Hartdegen travels to 802,701 AD and, further again, to the cataclysmic future of 635,427,810 AD. He then returns to 802,701, changing the future so the apocalypse is averted. The questions arise: Why can Hartdegen change *that* future but not that of his fiancé? How come some events are ‘fixed’ whilst other events are ‘unfixed’?

That some events are ‘fixed’ and others are ‘unfixed’ is a common trope in time travel fiction. Usually ‘major historical’ events are fixed and only more minor events are ‘unfixed’. Examples include:

- Various episodes of *The Twilight Zone*. In ‘Back There’ (1961) the protagonist is unable to stop Lincoln’s assassination, whilst still finding themselves able to nevertheless change certain things. In ‘The Time Element’ (1958) the protagonist tries to stop the bombing of Pearl Harbour, finding himself unable to do so, but does manage to change history and cause himself to cease to exist. In ‘Memphis’ (2003) the protagonist tries to stop Martin Luther King’s assassination, failing to do so, but managing to change the past in other respects.
- Fixed points routinely feature in *Doctor Who*. In ‘Earthshock’ (1982), Adric dies and the Doctor refuses to go back in time and save him. Even though the Doctor regularly changes historical events in other stories, there is something about *this* event which means he won’t try. In ‘The Visitation’ (1982), the Doctor accidentally starts the Great Fire of London but recognises that it must be let to run its course. Given the fire causes large amounts of property damage and kills six people—outcomes which the Doctor causes and intentionally allows to happen—that’s somewhat uncharacteristic of the Doctor. Presumably, he puts out other fires he accidentally starts, so what’s so special about *this* fire? In ‘The Water of Mars’ (2009) the Doctor appears on Mars in 2059, meeting the first astronauts on the red planet. He knows that the astronauts he meets there are

going to die. When talking to one of the astronauts, Adelaide, he is quite explicit, saying that ‘Certain moments in time are fixed. [...] those certain moments, they have to stand [...] What happens here must always happen.’ When the Doctor tries to prevent Adelaide’s death, he still fails for she ends up unexpectedly committing suicide.

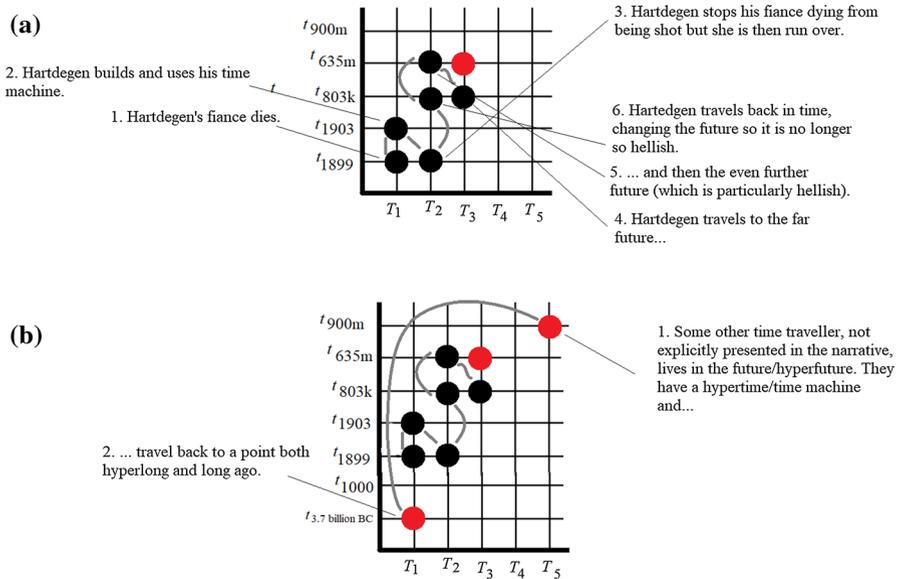
- In *Supernatural*’s ‘In the Beginning’, Dean is sent back in time to 1973. Whilst history can be changed in some respects, Dean is unable to save his mother from being murdered. It is explained to him ‘Destiny can’t be changed [...] All roads lead to the same destination.’
- Fixed points play a crucial role in the plot of Connie Willis’s *To Say Nothing of the Dog* (1997).

## 5.2 Fixed Points and Ludovician Probability

There is a way to make sense of fixed points within the mixed model. In the fixed point cases, unlikely things are happening. In *The Time Machine* the fiancé is—against the odds—run over by a carriage. And, taking Hartdegen at his word, the suggestion is that whatever action he takes to save her, some event will nevertheless kill her anyhow. In *Doctor Who*, Adelaide’s suicide is something which is unexpected and *prima facie* unlikely to have happened. Similarly, random occurrences prevent the derailing of history in *The Twilight Zone* episodes. These unlikely events sound similar to the unlikely events from Section 2’s regular Ludovician cases. In the one-dimensional Ludovician case, when I go to kill Hitler, a low probability event occurs to stop me i.e. a heart attack. This unlikely event comes about because I am interacting with things in my personal history. In the mixed model, the same interactions can arise and in such cases we should expect strange issues with probability to likewise arise on the mixed model. It is these issues with probability which explain why certain things seem to be ‘fixed’.

To understand what’s going on, we first must introduce ‘immanent causation’. There are two types of causation (Zimmerman, 1997: 433ff). The first is the regular ‘transeunt’ causation we are well acquainted with e.g. I flick a switch which then causes a light to turn on. The second is immanent causation, which concerns something being a way at one time causing how it is at a later time. For instance, an electron being stationary and unmoving will, if it remains undisturbed, immanently cause itself to be stationary and unmoving at later times. Or if I prod an indelible mark on myself, it will remain on my body because of how my earlier body was.

Immanent causation plays an important role in hypertemporal models. Hyperlater hypertimes are how they are because they have been immanently caused to be that way by how hyperearlier hypertimes hyperwere. In a hypertemporal world in which no time travel takes place then, for every time  $t_n$ , whatever is true at  $t_n$  at one hypertime is true of it at every hyperlater hypertime. And in a hypertemporal world where I travel back in time to kill Hitler at  $t_{1930}-T_2$  then, whilst  $t_{1930}$  is different from how it was at  $T_1$ , it’s still mainly the same. For instance, how things are in the Andromeda galaxy are unaffected—a similarity explained by immanent causation i.e. how



**Fig. 5** **a** The Time machine: The unembellished narrative. **b** The time machine: The embellished narrative

the Andromeda galaxy hyperwas at  $t_{1930}-T_1$  immanently causes it being that way at  $t_{1930}-T_2$ .

Immanent causation between hypertimes can feature as one of the links in a causal loop. Imagine someone travels back in both time and hypertime, going from  $t_{2500}-T_{10}$  to  $t_{2020}-T_9$  and causally interacting with what they find there. The qualitative features of  $t_{2020}-T_9$  immanently cause  $t_{2020}-T_{10}$  to be a certain way. Assuming that  $t_{2020}-T_{10}$ 's changed features saliently affect the time traveller at  $t_{2500}-T_{10}$  then the time traveller's travelling to the earlier/hyperearlier point results in a causal loop, with one of the links of that loop resulting from that inter-hypertemporal immanent causation. And, just as regular Ludovician travellers should expect weird probabilistic things to happen in causal loops, our imagined hypertime traveller should expect likewise. We can take this insight and use it to explain what's going on with fixed points, although it does require some embellishment to the fictional narratives we are presented with.

Consider Simon Wells' *The Time Machine*. If we thought it took place in a world of hypertime, then, given the narrative as it is explicitly presented, there would be no causal loop. See Fig. 5a. Hartdegen is in 1903 at one hypertime. He travels back in time to 1899 to save his fiancé, moving forward in hypertime. He fails to save her and then travels onwards to 802,701 and then on, again, to 635,427,810. He then travels back in time (and, therefore, forward in hypertime) in order to prevent the apocalyptic future he's witnessed. As Fig. 5a makes clear, there is no causal loop.

But if we embellish the narrative, we get a causal loop—and once we get the causal loop, we can explain the fixed point. Imagine an agent, 'Agent', travels from

a time and hypertime both later and hyperlater than that explicitly shown in Hartdegen's story. As an example, imagine that Agent starts all life on Earth, four billion years ago and at the earliest hypertime. See Fig. 5b. Agent only exists at  $t_{900m}-T_5$  because, five billion years earlier at  $t_{3.7 \text{ Billion BC}}-T_5$ , life formed on the planet. But life formed at that point only because it formed at that point in time at earlier hypertimes e.g. at  $t_{3.7 \text{ Billion BC}}-T_4$  (which is in turn because it formed at  $t_{3.7 \text{ Billion BC}}-T_3$ ,  $t_{3.7 \text{ Billion BC}}-T_2$ , and  $t_{3.7 \text{ Billion BC}}-T_1$ ). So, ultimately, Agent only exists because of a causal loop they started! Notice, also, that Agent also needs Hartdegen to time travel as well. Hartdegen prevents the future from being apocalyptic; had it not been for Hartdegen, Agent would never have been born either.

Given this causal loop, we can explain why points in time appear 'fixed'. Hartdegen would never have travelled in time if not for the death of his fiancé. Indeed, even when he saves her from the mugger, had she not then been killed in the carriage accident, he would've remained in the twentieth century at  $T_2$  and never ended up travelling to the future (and, thus, never have prevented the apocalyptic future of 635,427,810). So some unlikely events will transpire to ensure that Hartdegen keeps time travelling until he ultimately prevents the apocalyptic future, in turn allowing Agent to travel back to  $t_{3.7 \text{ Billion BC}}-T_1$  (an event which itself ensures Hartdegen comes into being). So whilst Hartdegen can change the circumstances of his fiancé's death, because her dying spurs him on to change the future, she will always end up dying. Her dying no matter what Hartdegen does, and the unlikelihood of events which bring that about, are exactly the same as Section 2's example where Hitler always survives my concerted attempts to kill him.

Consider another example. Return to the fiction of *Doctor Who*. Again, embellish the narrative such that the Doctor is part of a causal loop. The Doctor comes from the race of Time Lords. Imagine that the Time Lords came into existence at some point early in both time and hypertime e.g.  $t_{999}-T_1$ . Now embellish the narrative. Imagine that Time Lords from the future/hyperfuture, e.g.  $t_{4000}-T_{500}$ , come back in time/hypertime and interact with their earlier/hyperearlier ancestors e.g. travelling to  $t_{1000}-T_1$  to help their ancestors invent time travel. To distinguish the Time Lords of  $t_{4000}-T_{500}$  from their ancestors of  $t_{1000}-T_1$ , call them 'Future Lords'.<sup>4</sup>

Having interfered with events at  $t_{1000}-T_1$ , the Future Lords have affected the personal history of every Time Lord from  $t_{1000}-T_1$  onwards. Since causation is transitive, events which causally influence the Future Lords coming back from  $t_{4000}-T_{500}$  are likewise in the personal history of every Time Lord. As with Section 2's regular Ludovicianism, strange issues with probability only arise when time travellers are interacting with their own personal history. So when the Doctor is interacting with events which don't form part of his personal history—and, therefore, don't form part of the personal history of the Future Lords—unlikely events are *not* to be expected. But, scattered throughout space, time, and hypertime, there will presumably be events which *are* in the personal history of the Future Lords. And any Time Lord

<sup>4</sup> Such interactions are very dangerous, as we learnt in Section 2.2. But assume that on this occasion they either 'got lucky' or otherwise developed some method to warp probability and purposefully avoid such dangers.

who would interact with such events threatens (possibly deadly!) events befalling them (in just the same way that if I go back in time to Sigeburg and Cuthbert I risk deadly events befalling me). Thus, Time Lords must be careful when travelling through history and hyperhistory, ensuring that they avoid these events and stick just to influencing those events outside of their personal histories.

Personal historical events are the ‘fixed points’ which the Doctor (usually) tries to avoid interacting with. To interact with them would put him in danger, as well as those around him. Add further that the Time Lords are bestowed with some ability to forewarn them when they’re in the periphery of their personal history (a useful ability to have if you’re going to time travel willy-nilly!) and we would then have what we see on screen: the Doctor would have a preternatural awareness that some events should not be interacted with and he would stay well away from them. He would avoid trying to alter Adric’s death, avoid interacting with his own past, sense that some events (e.g. the Great Fire of London) must be let to run their course, and so on.

So we can make sense of fixed points in the mixed model, as long as we suitably embellish a narrative. Fixed points are events in one’s personal history where interaction with them brings about unlikely events. In Hartdegen’s case, they are events which transpire to keep his fiancé dead in order to ensure that he travels to the future and prevent an apocalypse. These events can be compared to similar cases in the regular Ludovician model, whereby unlikely events thwart my every effort to kill Hitler. In the Doctor’s case, he presumes that they are events which are dangerous and so he seeks to avoid them; he won’t try to stop fixed points because he fears what might happen if he did. They can be compared to the worry in the regular Ludovician model whereby I should fear that I would die were I to try and kill Hitler in 1930 (and that, therefore, I should not attempt to assassinate him). In the case of other fictions, I suggest that similar thoughts would apply (given, of course, similar embellishments to the narratives).

## 6 Extensions of the Programme

The mixed model helps make sense of some time travel fictions which have otherwise been thought to be metaphysically impossible. The model, though, doesn’t make sense of every fiction. For instance, in some fictions time changes ‘gradually’ and people pop in or out of existence as ‘the timeline changes’ (see, e.g., *Red Dwarf’s* ‘Timeslides’). Or the past may change but it might take time for the ‘changes to catch up to the present’ (see Effingham [Forthcoming] for discussion). Such phenomena won’t be explained by the mixed model.

But some time travel fictions which are not explained by the mixed model can nevertheless be explained by a suitable extension of the model. Return to Section 3.2’s explanation of ‘Pyramids of Mars’. Given there are fixed points, that explanation now looks flawed. Sutekh changes the future so that 1980 is a wasteland—if the future is a wasteland then (in 2059) Adelaide will never be alive in order to die. If the Doctor has to worry about fixed points, why doesn’t Sutekh? Isn’t it *impossible* for Sutekh to change the future such that Adelaide doesn’t exist? Moreover, the

Doctor seems to think that the Time Lords are *threatened* by Sutekh, which makes little sense given that the Future Lords are *definitely* going to exist in the future/hyperfuture. If the Doctor knows about the Future Lords (and the fixed points which arise because of what they've done), wouldn't the Doctor know that Sutekh's efforts were futile?

By introducing a more complicated mixed model, these problems can be solved. Take the mixed model and mix it *again* with the non-Ludovician hypertemporal theory, adding in a third dimension of time, 'ultratime'. Whilst travel through time and hypertime is easy, imagine that travelling forwards in ultratime is either very difficult or generally proscribed; ultratime travel is very rare indeed. (And assume that backwards ultratime travel, i.e. travelling back to ultraearlier ultrainstants, is impossible.) Sutekh either has resources that make moving forward in ultratime a mere trifle or he obeys no proscription against moving forward in ultratime. Using ' $\mathcal{T}$ 's' to represent different ultratemporal instants, imagine that the narrative of 'Pyramids of Mars' starts at ultratime  $\mathcal{T}_1$ . At  $\mathcal{T}_1$  Sutekh knows full well what history, and hyperhistory, is like i.e. it's a history/hyperhistory which favours his enemies, the Time Lords. Upon escaping, Sutekh moves forward in ultratime to  $\mathcal{T}_2$ . Now Sutekh can change history/hyperhistory however he wants, making it into a wasteland devoid of life. At  $\mathcal{T}_2$ , there are no Time Lords intervening with their earlier selves and no fixed points like Adelaide's death. Sutekh has free reign to do whatever he wants with no fear of unlikely events thwarting his actions.

Either ignoring the general proscription on ultratime travel (because of the severity of the situation) or somehow utilising the fact that Sutekh is moving forward in ultratime to also allow himself to do similar, the Doctor travels to join Sutekh at  $\mathcal{T}_2$ . There he arrives (at some hypertime) at 1980, showing Sarah Jane the desolate solar system. Then, when the Doctor returns to 1911, he again travels forward in ultratime, to  $\mathcal{T}_3$ . At  $\mathcal{T}_3$ , he changes things so that history/hyperhistory goes back to much the same way it was at  $\mathcal{T}_1$  (i.e. the Time Lords are back to being supreme, life isn't extinguished from the twentieth century onwards at the appropriate times/hypertimes, etc.).

This also explains why the Doctor is at such loggerheads with Sutekh. Sutekh threatens the Time Lord's history in a way that a more ordinary time traveller could not hope to. An ordinary time traveller, who travels through merely time and hypertime, cannot wipe the Time Lords from existence (in the same way that, given regular Ludovicianism, Hitler should have no fear of me killing him in 1930). But ultratemporal time travellers *can* wipe the Time Lords from existence.

It's also worth noting *why* the Time Lords might not want to ultratime travel (and either proscribe it or, purposefully, make it difficult). How the world is, right now, immanently causes how it is later. If nothing acts to change it, it will forever remain the same. Similarly, if all of history is a certain way and no agents have used time machines to move forward in hypertime, then for the rest of hypereternity, all of history will be the *same* way. If not for time travellers, every hypertemporal instant would be the same as the hyperearlier hyperinstant. Finally: If all of history/hyperhistory is a certain way, and no agents have used machines to travel forward in ultratime, then at every subsequent ultratime it'll turn out that history/hyperhistory is exactly the same. Having tweaked history/hyperhistory to be exactly how they like

it, the Time Lords will want to make sure no-one travels forward to the next ultratime to muck it up. If you want to ensure that all of history/hyperhistory remains exactly how you prefer, both ultranow and ultraforevermore (i.e. at every subsequent ultratime from the one you're ultrapresently at), then you'll make efforts to prevent people using ultratime machines. For instance, you'd track down scurrilous rogues like Sutekh looking to make history/hyperhistory different by ultratime travelling. Only by doing this can you make the world ultraeternally how you want it.

Thus, another iteration of mixing the mixed model with non-Ludovicianism allows us to make sense of this narrative. More generally, there will be other fictional narratives which might not be captured by the mixed model but could be captured by more sophisticated models including yet more dimensions of time. (Indeed, we might 'mix again' with something other than the hypertemporal theory i.e. mix the mixed model with universe non-Ludovicianism, or the theory I discuss in Effingham [Forthcoming].)

**Acknowledgements** I am particularly grateful to the two anonymous referees for *Erkenntnis*. Their comments were both extensive and exceedingly helpful. Further thanks goes to Sara Bernstein, Tyler Collins, Isabel Finn, Iain Law, and the attendees of my presentation of this paper at the University of Birmingham.

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## References

- 12 Monkeys*. (1995). [Film] Directed by Terry Gilliam. Universal Pictures.
- About Time*. (2013). [Film] Directed by Richard Curtis. Universal Pictures.
- Baxter, S. (1995). *The Time Ships*. New York: HarperCollins.
- Bernstein, S. (2017). Time travel and the movable present. In Keller (ed.) *Being, freedom, and method: Themes from the philosophy of Peter van Inwagen*, Oxford University Press.
- Chown, M. (2007). Time gains an extra dimension, *New Scientist* 2625 (Published 13 October 2007).
- Deutsch, D. (1991). Quantum mechanics near closed timelike lines. *Physical Review D*, 44, 3197–3217.
- Doctor Who*. (1963)–Present. [Tv series] Created by Newman, Webber, and Wilson. UK: BBC Studios.
- Die Hard II*. (1990). [Film] Directed by Renny Harlin. USA: 20<sup>th</sup> Century Fox.
- Effingham, N. (2020). *Time travel: Probability and impossibility*. Oxford: Oxford University Press.
- Effingham, N. (Forthcoming). Vacillating time: A metaphysics for time travel and geachianism. *Synthese*. <https://doi.org/10.1007/s11229-021-03108-5>.
- Goddu, G. (2003). Time travel and changing the past: (Or how to kill yourself and live to tell the tale). *Ratio*, 16, 16–32.
- Hall, N. (1994). Correcting the guide to objective chance. *Mind*, 103, 505–517.
- Hamilton, P. (2020). *The Saints of Salvation*. London: MacMillan.
- Happy Death Day*. (2017). [Film] Directed by Christopher Landon. Blumhouse Productions.
- Harrison, H. (1972). *The Stainless Steel Rat Saves the World*. London: Sphere Science Fiction.
- Harry Potter and the Cursed Child*. (2016). [Theatre] Written by Thorne, J., Rowling, J., and Tiffany, J. Premiered Palace Theatre, London.
- Horwich, P. (1987). *Asymmetries in time: Problems in the philosophy of science*. Cambridge, MA: MIT Press.

- Hudson, H., & Wasserman, R. (2010). Van Inwagen on time travel and changing the past. *Oxford Studies in Metaphysics*, 5, 41–49.
- Levinson, P. (1995). The Chronology Protection Case, *Analog* Sept. 1995 Edition.
- Lewis, D. (1976). The paradoxes of time travel. *American Philosophical Quarterly*, 13, 145–152.
- Lewis, D. (1986). *Philosophical papers: (Vol. II)*. Oxford: Oxford University Press.
- Los Cronocrímenes*. (2007). [Film] Directed by Nacho Vigalondo. KarboVantas Entertainment.
- Moorcock, M. (1969). *Behold the Man*. UK: Allison & Busby.
- Niven, L. (1977). Rotating cylinders and the possibility of global causality violation, *Analog* 102, reprinted in Niven's *Convergent Series*. New York: Del Rey.
- Point Break*. (1991). [Film] Directed by Kathryn Bigelow. USA: 20<sup>th</sup> Century Fox.
- Putnam, H. (1962). It ain't necessarily so. *The Journal of Philosophy*, 59, 658–671.
- Red Dwarf*. (1988)-. [TV Series] Created by Grant Naylor. UK: Paul Jackson Productions.
- Rowling, J. (1999). *Harry Potter and the Prisoner of Azkaban*. London: Bloomsbury.
- Star Trek*. (1966)-. [TV series] Created by Gene Roddenberry. USA: Paramount Television.
- Supernatural*. (2005–Present). [TV series] Created by Eric Kripke. USA: Warner Bros. Television.
- Terminator 2: Judgement Day*. (1991). [Film] Directed by James Cameron. USA: TriStar Pictures.
- Terminator 3: Rise of the Machines*. (2003). [Film] Directed by Jonathan Mostow. USA: Sony Pictures Releasing International.
- The Terminator*. (1984). [Film] Directed by James Cameron. Orion Pictures.
- The Flight of the Navigator*. (1986). [Film] Directed by Randal Kleiser. Walt Disney Pictures.
- The Time Machine*. (2002). [Film] Directed by Simon Wells and Gore Verbinski. Warner Bros Pictures.
- The Twilight Zone*. (1959–1964). [TV Series] Created by Rod Serling. USA: CBS Productions.
- van Inwagen, P. (2010). Changing the past. *Oxford Studies in Metaphysics*, 5, 3–28.
- Willis, C. (1997). *To Say Nothing of the Dog*. London: Orion Books.
- Zimmerman, D. (1997). Immanent causation. *Philosophical Perspectives*, 11, 433–471.

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