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A DEFENSE OF PRESENTIST TIME TRAVEL**

Abstract

Presentism usually holds that only present entities exist. In contrast to presentism, eternalism holds that past, present, and future entities all exist. According to some philosophers, presentism is intuitively incompatible with time travel. In this paper, I defend the compatibility between presentism and time travel by arguing for a plausible account of causation in the presentist framework. To achieve my goal, I respond to an objection to presentist time travel that is based on the nonexistence of the past: the Causation Objection. According to the Causation Objection, causal relations between objects at different times are necessary for time travel, but these are impossible for presentists. I evaluate a possible reply based on a non-relational account of causation and show that this reply is not satisfying. Subsequently, I put forward a fact-based account of causal relation. I argue that presentists could accept facts instead of events as causal relata, thus establishing causal relations. As all facts about the past, the present, and the future exist in the present, we could explain how backward causation works and describe the discrepancy between personal time and external time in presentist time travel; in this way, I argue, we could vindicate the compatibility between presentism and time travel.

Keywords: presentism, time travel, causation, personal identity

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People are obsessed with time travel, and modern physics tells us that time travel is, in principle, possible. However, it is not easy to explain time travel with the theory of time. As a type of A-theory which is seen as an intuitive

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explanation of time, presentism usually holds that only present entities exist.[1] In contrast to presentism, eternalism holds that past, present, and future entities all exist. According to some philosophers, presentism is incompatible with time travel.[2] It is not hard to see why people tend to hold such a view. After all, when we talk about time travel, usually we are discussing traveling to the past or the future (from the present).[3] As the past and future do not exist in the theory of presentism, however, it seems presentism faces some difficulties when discussing time travel. For example, how could time travel be possible if the destination (the past or the future) does not exist?[4] Does presentism imply that the time traveler would fall out of existence when going to the past or the future?[5] To defend presentist time travel, philosophers have put forward certain reasons which are usually centered on providing a presentist model of time travel.[6] As time travel is usually defined as a discrepancy between personal time for the traveler and external time (i.e., the time in ordinary life), presentists need to construct both personal time and external time within a presentist framework and view the causally related set of person-stages as one person.[7] Nevertheless, as presentism holds that the past and the future do not exist at all, it seems presentism would still have some trouble with explaining how causation works in time travel.[8]

In this paper, I consider the problem of causation in time travel and show how presentism could deal with it. I argue for a plausible account of causation

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[1] There are some discussions about how to understand presentism properly. For example, see (Sider 2005) and (Deasy 2017). In this paper, I only focus on such a general formulation without considering any variations of presentism.

[2] See (Godfrey-Smith 1980), (Grey 1999), (Pensgard 2001), (Sider 2005), and (Hales 2010, 2011), all of which reject the compatibility between presentism and time travel for different reasons.

[3] For some basic discussions on time travel, see (Lewis 1976) and (Arntzenius 2006).

[4] This is usually called the Nowhere Argument. For example, see (Godfrey-Smith 1980) and (Grey 1999).

[5] This is usually called the Suicide Argument. For example, see (Hales 2010, 2011).

[6] See (Dowe 2000), (Keller and Nelson 2001), (Monton 2003), (Licon 2011, 2012), (Daniels 2012), and (Hall 2014).

[7] See (Lewis 1976). According to Lewis (1976: 146), these disparate sets of personal stages in time travel can be connected and viewed as one person via causal relations. It is worth pointing out that Lewis's account applies to both presentism and eternalism, i.e., both the A-theory and the B-theory of time.

[8] Of course, it is also possible for presentists to deny the possibility of time travel. However, I do not consider this option in this paper for two reasons. First, it seems contemporary physics does allow the possibility of time travel, which demands a theory of time to be at least compatible with time travel. Second, it would be seen as a strength of presentism if we could show time travel is possible in the framework of presentism.

in the presentist framework. For simplicity, I only focus on one kind of time travel – traveling to the past – and thus only provide an account of backward causation (i.e., the direction of causation is backward in external time, which is different from the normal direction of causation in life), though I believe my conclusion also works for traveling to the future. Besides, I only consider a determinist world without discussing the possibility of any open future, even though my conclusion might potentially hold for the open future as well.[9] To move towards the goal of this paper, I respond to one objection to presentist time travel that is based on the nonexistence of the past: the Causation Objection. According to this objection, presentism must explain how backward causation works in the case of traveling to the past. Usually, backward causation, as a kind of relation between a cause in the present and an effect in the past, requires the existence of causal relata. For the presentist, however, the effect in the past does not exist at all. If this is correct, it seems impossible for presentism to explain time travel. After reconstructing this objection, I evaluate a reply that is based on a non-relational account of causation and show that this reply is not satisfying when constructing presentist causation. In this paper, I argue that presentists could adopt a fact-based relational account of causation. As all facts about the past and the future describe the state of affairs in the present for presentists, presentism could refute the Causation Objection.

This paper goes as follows. In Section 1, I introduce an intuitive case and some basic understandings of time travel, following David Lewis. Broadly speaking, one succeeds in time traveling when there is a discrepancy between personal time and external time. I then simply reconstruct the Causation Objection, which claims that presentism fails to explain backward causation in time travel because, for presentists, no causal relata exist in the past. Section 2 evaluates Thomas Hall's reply, which is based on a non-relational account of causation. I show that this reply is not satisfying in constructing presentist causation in Section 3. In order to reply to the Causation Objection, in Section 4 I put forward a fact-based relational account of causation in which the causal relata in causal relations are not events but facts. I explain how this new account works for presentist time travel in Section 5. Section 6 considers some possible objections. If we accept such a fact-based relational account of causation, I argue, presentism is no less plausible than eternalism when explaining time travel.

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[9] For some discussions about the open future, see (Miller 2005, 2008). Norton (2018) argues that a branching universe is incompatible with time travel, which I do not consider in this paper.

1. TIME TRAVEL AND THE CAUSATION OBJECTION
TO PRESENTIST TIME TRAVEL

1.1. What is time travel

Consider an intuitive case of time travel as follows:

> *The Case of Katy*: Suppose Katy owns a time machine now. She decides to travel back to the time of the dinosaurs. So, she enters the time machine and closes her eyes. She waits for two minutes in the time machine and then leaves the machine. She finds a dinosaur in front of her. Katy has succeeded in traveling back to the time of the dinosaurs, which is two hundred million years ago.[10]

According to Lewis's definition of time travel, Katy succeeds in time traveling because there is a discrepancy between her personal time and the external time. The duration of time Katy has experienced when time traveling does not equal the separation of time between her departure and arrival. Specifically, the personal time Katy experienced is two minutes to her future, while the external time is two hundred million years to the past. It is not difficult for us to find that the event of a person seeing dinosaurs is two hundred million years ago in external time. However, if there are only two disparate bodies in different temporal stages, how could we count this as time travel? According to Lewis, one of the main reasons for seeing the person who appeared two hundred million years ago as being identical to Katy is that we think there are causal relations between these two Katies.[11] In other words, we may adopt a criterion of personal time as follows:

> (*Eternalist*) *Personal Time*: if a person P with certain features Fs at t_0 causes the existence of the person P′ with certain features Gs at t_1 in the relevant way, then the existence of P′ is after the existence of P in personal time (or call it "$\Delta PT = PT(t_1) - PT(t_0) > 0$" where "PT" means P's personal time).[12]

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[10] This example of time travel is based on a case in (Sider 2005).

[11] For Lewis (1976: 146), "[a] time traveler, like anyone else, is a streak through the manifold of space-time, a whole composed of stages located at various times and places." The cross-time personal identity is necessary for constructing personal time. Lewis (1983: 55–65) seems to believe that mental continuity and connectedness are individually necessary and jointly sufficient for establishing personal identity.

[12] Again, the cross-time personal identity is presupposed in the construction of personal time. I do not discuss the problem of establishing personal identity here.

We can conclude from this definition that there is a special causal relation in which thing A in the present causes thing B in the past. In time travel, this is called *backward causation* because the direction of this causation is backward in external time. Given this, we can see that, for eternalists, backward causation plays a key role (as a necessary condition) in constructing personal time when explaining traveling to the past.

1.2. The Causation Objection to Presentism

Nevertheless, if backward causation is necessary for time travel, there seems to be an objection to the compatibility between presentism and time travel that focuses on the possibility of backward causation. According to David Pensgard, if presentism holds that only present entities exist, this rules out the existence of at least one of the two relata in such backward causation. Without such backward causation, presentism would be incompatible with time travel (see Pensgard 2001).

This Causation Objection to presentist time travel can be reconstructed as follows:

(C1)   Presentism: Nothing exists in the past (or, only things in the present exist).

(C2)   Backward Causation in time travel: it is possible to have a causal effect on the past.

(C3)   If backward causation is possible, there is a causal relation between an existing past relatum and an existing present relatum, as the cause and the effect must both exist in a causal relation.

(C4)   According to C3, we have to reject either presentism (C1) or backward causation (C2).

(C5)   Therefore, presentism is incompatible with backward causation in time travel and thus also with time travel.

In this objection, C1 and C2 are separate definitions of presentism and backward causation. C3 is implied in a detailed understanding of backward causation. C4 and C5 are logical implications of C1, C2, and C3. To support C3, Pensgard argues that the means presentists adopt to account for everyday causation is the contiguity of times and the contiguity of the events that oc-

cur at those times. In other words, presentists could see all the normal cases of causation as simultaneous and thus do not have difficulty when explaining ordinary life. Nevertheless, these means cannot work in cases of time travel as past events do not exist at all for presentists.

If presentists want to insist that presentism is compatible with time travel, they have to reject C3, and this requires that presentists provide a presentist account of backward causation in time travel. This account of causation would allow backward causation even if the past does not exist. In Section 2, I explore a reply from Thomas Hall.

2. THOMAS HALL'S REPLY:
THE NON-RELATIONAL ACCOUNT OF CAUSATION

Unfortunately, presentists are facing a hard choice here. As backward causation contains two different temporal locations, presentists would have to deny at least some intuitive ideas about causation, which could be seen as a trilemma: if cause and effect both exist in a causal relation, causal relata cannot be concrete physical objects such as events as these events do not occur at the same instant; if causal relata are concrete physical objects such as events, however, cause and effect cannot both exist because at least one of them is in the past; if concrete physical objects could construct causation even without existing, then obviously causation is not a relation anymore.[13]

To defend presentist time travel, Thomas Hall's option is to give up the idea that causation is a metaphysically distinguished relation (see Hall 2014: 152). In other words, the standard description "C CAUSE E" (where both C and E are supposed to name existing causal relata) is not the fundamental representation of causation. Instead, we could utilize a two-place sentential causal operator: "BECAUSE p, WILL$_{\text{N-UNITS-OF-TIME-HENCE}}$(q)" (which means that an event p causes another event q, and q occurs n units of time after p) for ordinary causation and "BECAUSE p, WAS$_{\text{N-UNITS-OF-TIME-AGO}}$(q)" (which means that an event p causes another event q, and q occurs n units of time before p) for backward causation. According to Hall, we do not need to commit to the existence of non-present entities with this approach to engage in discussions on

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[13] As Hall (2014: 151) points out, some popular assumptions about the metaphysics of causation are troublesome for presentists: if causation is a relation between relata that are existing physical objects such as events, and if causation is not always simultaneous, then presentism is straightforwardly false. This implies that presentists have to give up some of their intuitions.

causation. People who hold a relational account of causation can also accept this approach when discussing causation.

Based on Hall's account of causation, we could construct backward causation with such a non-relational account of causation. For example, in the *Case of Katy*, we can describe the backward causation with "BECAUSE (Katy enters the time machine), WAS$_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$(Katy gazes upon a dinosaur)." In Hall's account, we can see this sentence as a case of backward causation, even though the event "Katy gazes upon a dinosaur" does not exist in the present and therefore does not exist at all. Such an account of causation is a non-relational one because there is no relation between these two events – after all, one of them does not exist at all. Given this, we have a different account of backward causation which does not accept C3, i.e., we do not need a causal relation between an existing past relatum and an existing present relatum. Instead, if backward causation were possible, there would be a two-place sentential causal operator: "BECAUSE p, WAS$_{\text{N-UNITS-OF-TIME-AGO}}$(q)," where both p and q describe physical objects, such as events.

According to Hall, we can engage in discussions on backward causation without committing to the existence of past events now. Now that we have rejected C3 with a non-relational account of causation, we could hold that presentism is not incompatible with time travel.

3. SOME PROBLEMS WITH THE NON-RELATIONAL ACCOUNT OF CAUSATION

Although I believe Hall's approach could provide a way to engage in discussions on causation, it seems better to keep the "relation" content when discussing causation, the reasons for which are presented below.

First, we usually see causation as a relation instead of merely a sentential operator. In other words, such an approach does not provide us with a substantial and intuitive understanding of causation. Although this approach may be easier and useful in discussions on causation, presentism still needs a more sufficient account of causation.

Second, some unacceptable consequences may emerge in this approach. For example, we may take the risk of counting some Cambridge changes (i.e., non-intrinsic changes) as cases of causation as well.[14] Assume that it is

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[14] See (Pensgard 2001). For Lewis (1976: 146), when discussing causation, it is important to "distinguish change from 'Cambridge change,' which can befall anything. Even a number can 'change' from being to not being the rate of exchange between pounds and dollars. Even a momentary event can 'change' from being a year ago to being a year and a day ago, or from

2016 now and the 2012 London Olympics was the most expensive one in history before 2016. Nevertheless, the 2016 Rio Olympics is being held in Brazil now, which costs more than the London Olympics. So, we may say that because of the 2016 Rio Olympics, the London Olympics became the second most expensive one in history. Granted that, we may see the sentence "BECAUSE (the Rio Olympics is held), WAS$_{\text{FOUR-YEARS-AGO}}$(the second expensive Olympics in history is held in London)" as true. Nevertheless, we would not think this is a case of causation because becoming the second most expensive one in history is not an intrinsic change for the London Olympics. Instead, what the Rio Olympics changes is the external descriptions about the London Olympics. According to Pensgard, we usually think there should be non-Cambridge changes (i.e., intrinsic changes) in causation. Even without accepting Pensgard's explanation, it should be clear that an account of causation is more than a sentential operator.

Of course, as Hall admitted, his account of causation could be accomplished in a relation-based framework as well, which means these two shortcomings could be avoided. Nevertheless, this is where the third reason against it lies: given that causation is a sentential operator, it is unclear what the truthmakers of such causal sentences are. These truthmakers are clear if we have already presupposed a relational account of causation. After all, the metaphysical relations of causation would make these sentences true. If there is no metaphysical commitment to causal relations, however, what could make these causal sentences true? According to Hall, it seems that we may adopt a reductive view (see Hall 2014: 152). For example, the causal operator reduces to the laws of nature plus the instantiation of qualitative properties and a single-time relation. Nevertheless, Hall's account may need to presuppose some other accounts of causation again, which may be problematic for three reasons. First, it is unclear whether a reductive account of causation is successful or not. For instance, it is hard for a reductive account of causation to distinguish cause and mere background conditions.[15] Second, if we already have a successful reductive (and naturalist, in this sense) account of causation, why do we still need

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being forgotten to being remembered. But these are not genuine changes. Not just any old reversal in the truth-value of a time-sensitive sentence about something makes a change in the thing itself."

[15] For example, say that the strike causes the match to light. Intuitively, the strike is the cause of the combustion, while the presence of oxygen is only the mere background condition; however, both of them work with the laws of nature. We may say both "BECAUSE (the strike), WILL$_{\text{FIVE-SECONDS-HENCE}}$(the combustion)" and "BECAUSE (the presence of oxygen), WILL$_{\text{FIVE-SECONDS-HENCE}}$(the combustion)." Again, I am not arguing that there is no way to distinguish these two cases. My purpose is to show that we need more explanations for causation rather than merely a two-place sequential operator.

this sentential operator of causation? If causation is no more than the laws of nature plus the instantiation of qualitative properties and a single-time relation, Hall's account would not be arguing for another metaphysical account of causation but rejecting metaphysical accounts of causation completely. We may need more justifications to support such a strong claim.

Based on these concerns, I believe it is better to develop a relational account of causation, though it is still helpful to apply Hall's formula in some discussions. Now we have two options left: either reject the event-based account of causal relation, or argue for an account of causal relation without the existence of relata. The former seems to be potentially promising.

4. A FACT-BASED RELATIONAL ACCOUNT OF CAUSATION

To reject C3 in the Causation Objection, my solution is to view the relata in causal relations not as events occurring in the past and the present but as facts that make statements about the past and the present true. I use "fact" only in an intuitive sense here. That is, facts refer to a certain state of affairs, e.g., an object exemplifies a property, or one or more objects stand in a relation.[16] As all states of affairs occur in the present, the causal relations could be constructed solely on present facts in presentist semantics.[17] In other words, to reject C3 we may need to adopt a different understanding of "causal relata" than Pensgard's.

Consider the *Case of Katy* again: Suppose Katy travels back to the time of the dinosaurs. It is the case that Katy exists two hundred million years ago. Before entering the time machine, Katy may say: "in two minutes I will gaze upon a dinosaur." Katy entering the time machine indeed causes her to gaze upon a dinosaur two hundred million years ago.

Presentists usually define the past and future as some tensed facts in the present. For example, presentists can say "WAS$_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$ (Katy gazes upon a dinosaur)" to express a present fact that Katy gazed upon a dinosaur two hundred million years ago. In this case, the sentence "WAS$_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$(Katy gazes upon a dinosaur)" is true because it refers to a state of affairs (or fact) in the present, which makes this sentence

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[16] Usually, facts are viewed as different from events, as events are usually temporal and concrete, while facts are not. But facts are usually more fine-grained; for example, the two different facts that "I drink a cup of tea happily" and that "I drink a cup of tea sadly" could refer to the same event. However, some philosophers, such as Jaegwon Kim (1966, 1976), Alvin Goldman (1970), and Noel Hendrickson (2006), attempt to define events as exemplifications of properties by objects at times, which makes the distinction between events and facts less clear.

[17] For a defense of presentist semantics, see (Markosian 2009).

true. In other words, the truthmakers of these sentences describing the past and the future are the state of affairs in the present. Similarly, we can also say "(Katy is entering the time machine)" to express a fact about Katy in the present, which is obviously also true.

In the meantime, we may define "C CAUSE E" whenever there is a causal relation between two relata, in which C causes E. For example, to express that the strike causes the lighting of a match, we can say "(the strike) CAUSE (the match lights)" (assume that the strike and the lighting both take place in the present). And if we want to express that the strike occurring five seconds ago caused the lighting of a match, we can say "$WAS_{\text{FIVE-SECONDS-AGO}}$(the Strike) CAUSE (the match lights)," in which both "$WAS_{\text{FIVE-SECONDS-AGO}}$(the Strike)" and "the match lights" are true and exist in the present. Given this, we can discuss the causal relation in the case of Katy and dinosaurs now. The causal relation of Katy can be expressed as follows:

> (*Katy enters the time machine*) CAUSE $WAS_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$ (*Katy gazes upon a dinosaur*).

In this sentence, both the cause "(Katy entering the time machine)" and the effect "$WAS_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$(Katy gazes upon a dinosaur)" refer to facts in the present. Both are grounded by the states of affairs in the present, which are existing causal relata. There is no difficulty for presentists here.

This fact-based relational account of causation, I believe, has at least three advantages over Hall's non-relational account of causation. First, unlike Hall's solution, this account of causation is still based on a relation, which would be more intuitive for us. Second, as we still see causation as a type of relation, we may accept other standard explanations about how causal relations work. For example, we could reject cases such as "(the Rio Olympics is held) CAUSES $WAS_{\text{FOUR-YEARS-AGO}}$(the second expensive Olympics in history is held in London)" because there is no causal relation between these two existing facts. That is, the relational account of causation demands more than such a causal operator.[18] Third, no matter which metaphysical theory of causal relation we adopt, it could potentially be compatible with this fact-based relational account of causation. For example, if we accept a counterfactual theory of causation, we may say that it would not be the case that "$WAS_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$

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[18] Of course, we need more explanations of the differences between these sentences and causal relations as well, but it is enough for this paper to point out that causal relations are different from these sentences. One possible view presentists could adopt, for example, may hold that facts in causal relations should contain non-Cambridge changes. Other possible explanations may tend to rely on physical changes, etc. In short, this is dependent upon what a theory of causal relation is.

(Katy gazes upon a dinosaur)" if it were not the case that "(Katy enters the time machine)." Or, if we accept a Reverse Counterfactual theory of causation, we may say that it would not be the case that "(Katy entering the time machine)," if it were not the case that "WAS$_{\text{TWO-HUNDRED-MILLION-YEARS-AGO}}$ (Katy gazes upon a dinosaur)." In other words, there is a certain metaphysical construction of causal relation behind the fact-based relational account of causation.[19]

In short, even granted that Hall's non-relational account could be compatible with our account of causal relations, it is better to accept this fact-based relational account of causation as it could provide more substantial support for presentism.

Now it is time to reject the Causation Objection and reply that Pensgard does not distinguish the relatum *about* the past from the relatum *in* the past when using the term "past relatum." For presentism, nothing in the past exists, thus there is no "relatum in the past." If we accept a fact-based account of causation, however, presentism could appeal to relata *about* the past to construct causal relations between the present and the past. Therefore, presentists could reject the original version of C3, which requires a causal relatum in the past. Instead, they could argue that if backward causation were possible, there would be a causal relation between an existing relatum *about* the past and an existing relatum *about* the present, as the cause and the effect must both exist in a causal relation. If we accept this, there would be no incompatibility between presentism and time travel.

5. A MODEL OF PRESENTIST TIME TRAVEL

After defending the compatibility between presentism and time travel, it would be helpful to provide a model of presentist time travel here as this may help explain how a fact-based relational account of backward causation works in presentist time travel.

Take the *Case of Katy* again: Katy enters the time machine, waits for two minutes, and then leaves the machine. She finds a dinosaur in front of her. Katy has succeeded in traveling back to the time of the dinosaurs, which is two hundred million years ago.

To see this, assume that the external time of Katy entering the time machine is $ET(t_o)$, and the personal time of Katy entering the time machine is

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[19] There are so many discussions on causation that I cannot consider them all in this paper. For some general discussions, see (Davidson 1967), (Lewis 1973), (Tooley 1990), (Sosa, Tooley 1993), (Pearl 2000), (Hall 2004), and (Hitchcock 2007).

$PT(t_0)$, both of which are in the same instant. So, the external time of Katy seeing a dinosaur (i.e., leaving the time machine) is two hundred million years before $ET(t_0)$, which we may express as "ET (t_1) = $ET(t_0)$ - TWO-HUNDRED-MILLION-YEARS." Nevertheless, the personal time of Katy seeing a dinosaur is two minutes after $PT(t_0)$, which we may express as "$PT(t_1) = PT(t_0) +$ TWO-MINS." The duration in time Katy has experienced when time traveling does not equal the separation of the time between her departure and arrival. We may define time traveling as follows:

> *Time Travel:* Time travel happens whenever the separation in time between departure and arrival for a time traveler does not equal the duration of her journey (i.e., personal time does not equal external time).

> Technically, assume that upon departure, the personal time of the time traveler and the external time are $PT(t_0)$ and $ET(t_0)$; and upon arrival, the personal time of the time traveler and the external time are $PT(t_1)$ and $ET(t_1)$. Time traveling happens if and only if $\Delta ET \neq \Delta PT$ ($\Delta ET = ET(t_1) - ET(t_0)$; $\Delta PT = PT(t_1) - PT(t_0)$).

With this technical expression, we can see that time travel to the future happens when $\Delta ET > \Delta PT$, and time travel to the past happens when $\Delta ET < \Delta PT$. In ordinary cases of traveling to the past, such as Katy seeing the dinosaurs, the result of ΔET is negative (i.e., $ET(t_1)$ is earlier than $ET(t_0)$) and the result of ΔPT is positive (i.e., $PT(t_1)$ is after $PT(t_0)$), which makes the satisfaction of the requirements clearer because the former value must be lower than the latter.

Similarly to the eternalist version of personal time, the presentist definition of personal time could be constructed as follows:

> *Presentist Personal Time*: if the fact about a person P with certain features Fs at t_0 causes the fact about a person P' with certain features Gs at t_1 in the relevant way, then the appearance of P' is after the appearance of P in personal time (i.e., $\Delta PT = PT(t_1) - PT(t_0) > 0$).

For example, say that the fact that Katy eating a cake causes the fact that Katy is full now. It is apparent that the one who is full now is causally after the one who is eating a cake. The same analysis applies to time travel as well: the fact of Katy entering the time machine causes the fact about Katy who was gazing upon a dinosaur two hundred million years ago, i.e., the appearance of Katy who was gazing upon a dinosaur two hundred million years ago is causally after Katy entering the time machine. Even though the event of enter-

ing the time machine did not exist two hundred million years ago, it is reasonable for her to think that she has just entered the time machine because of her cross-time personal identity, which is constructed via the causal relation (and the other required conditions).

After establishing personal time, it would not be difficult for presentists to see the case of Katy as a case of time traveling: presentists could count the personal time of Katy entering the machine and the external time as $PT(t_0)$ and $ET(t_0)$, both of which are at the same instant; and upon arrival, the personal time of Katy and the external time are $PT(t_1)$ and $ET(t_1)$. For presentists, $ET(t_0)$ and $PT(t_0)$ are both the present; $ET(t_1)$ is two hundred million years before the present, which makes ΔET negative (i.e., it is two hundred million years ago); $PT(t_1)$ is two minutes later because Katy seeing the dinosaur is causally after Katy entering the time machine within two minutes, which makes ΔPT positive (i.e., it is two minutes later). Now, given that $\Delta ET < 0 < \Delta PT$, we can see this is a case of traveling to the past.

With this fact-based relational account of causation, presentists can accept the same definition of time travel as eternalists. The fact-based relational account of causation, which supports a presentist model of personal time and external time, plays a crucial role in defending the compatibility between presentism and time travel.

6. SOME POSSIBLE OBJECTIONS AND REPLIES

A possible objection may hold that it is problematic to see facts instead of events as causal relata in the first place. According to this objection, we usually think there are some key differences between facts and events. Intuitively, events are spatial, temporal, and concrete, while facts just describe the states of affairs at a certain time. To defend my choice of denying the physical dimension of causal relata, I provide three reasons here. First, the definition of causal relata is still unclear, and there is also considerable support for facts as causal relata.[20] Furthermore, there are some reasons to think omissions could be causal relata as well, but omissions are not events.[21] Assume that I forgot to water my plant, therefore it is dead. It seems intuitive to say that my omission caused the death of my plant; however, my omission cannot be simply described as an event as it is intuitively viewed as atemporal and abstract. Second, the differences between events and facts are not always clear. For example,

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[20] For example, see (Vendler 1967), (Bennett 1988), (Menzies 1989), (Mellor 1995), and (Dowe 2000, 2001).

[21] For some discussions on omissions, see (Bernstein 2015).

some may think both events and facts are "states of affairs."[22] Even if there are some differences between events and facts, it is usually not hard to construct one of them with the other. For example, we can say both "the fact that Katy enters the time machine" and "the event of Katy entering the time machine" to express the same meaning in many contexts. This implies that the functions of facts and events may not be clearly different in many cases. Third, as presentists only admit the actuality of the present, all actual events share the same temporal status. Other events in the past and future can only be translated into what is real in the present, i.e., the facts or the states of affairs in the present, which makes the distinction between events and facts more difficult to clarify for presentism. Nevertheless, I do not attempt to put forward a comprehensive and complete theory of causation in this paper. Instead, my purpose is to argue that a fact-based account of causation could help explain how presentist time travel works, and it might be the best choice for presentists.

Another possible objection may hold that causal relations are insufficient to establish personal identity. For example, Katy's actions or states could also cause certain changes in another person, Jack (say that Katy feeds Jack with a cake), but this does not make Katy identical to Jack. I agree that the causal relation is not sufficient for personal identity; however, I do not plan to provide a theory of personal identity over time in this paper.[23] What I am doing is providing a defensible explanation of backward causation in time travel. I am attempting to explain how a fact-based account of causation works in explaining the causal relation between disparate personal stages over time. This account is necessary for the model of time travel if we have already assumed personal identity over time. As we need the discrepancy between personal time and external time in this discussion, we must rely on personal identity over time to explain how personal time works in time travel. We also need other explanations about personal identity, such as mental and physical continuity in time travel.[24] However, I believe these problems are common for both presentism

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[22] See (Chisholm 1970). Differently, some philosophers define events in a way similar to the definition of facts as they hope to distinguish between individual events with certain different features, even though they still hold a distinction between facts and events. For example, see (Kim 1966, 1976), (Goldman 1970), and (Hendrickson 2006).

[23] There are plenty of discussions on personal identity that I cannot consider here. Two especially influential views of personal identity are focused on psychological relations and physical relations. For the view that holds that personal identity is established on some psychological relations, see (Parfit 1971, 1984), (Lewis 1976, 1983), and (Nagel 1986). For the view that holds that personal identity is established on brute physical relations, see (Carter 1989), (Mackie 1999), (Olson 1997), and (van Inwagen 1990). For the view that combines psychological relations and physical relations, see (Nozick 1981).

[24] If a non-human object such as a T-shirt travels to the past or the future, we will need an explanation about its identity over time as well. But again, this is a problem that is common

and eternalism, thus they do not constitute an objection specifically for presentists.

CONCLUSION

Given that the past and future do not exist for presentism, it seems presentists face some difficulties when discussing time travel. The key to constructing a presentist account of time travel is to explain how backward causation works in a presentist framework. However, critics such as Pensgard hold that presentism cannot provide a satisfying account of backward causation because the causal relata in backward causation do not exist for presentism. As I have argued, if we could accept a fact-based relational account of causation, causal relations could be constructed on the basis of existing facts in the present without appealing to Hall's non-relational account of causation or denying the possibility of presentist time travel. If this argumentation is correct, presentism is not less plausible than eternalism when accounting for time travel.

BIBLIOGRAPHY

Arntzenius F. (2006), "Time Travel: Double Your Fun," *Philosophy Compass* 1(6): 599–616. https://doi.org/10.1111/j.1747-9991.2006.00045.x

Bennett J. (1988), *Events and Their Names*, Indianapolis: Hackett Publishers.

Berstein S. (2015), "The Metaphysics of Omissions," *Philosophy Compass* 10(3): 208–218. https://doi.org/10.1111/phc3.12206

Carter W. R. (1989), "How to Change Your Mind," *Canadian Journal of Philosophy* 19(1): 1–14. https://doi.org/10.1080/00455091.1989.10716464

Chisholm R. M. (1970), "Events and Propositions," *Noûs* 4: 15–24. https://doi.org/10.2307/2214288

Daniels P. R. (2012), "Back to the Present: Defending Presentist Time Travel," *Disputatio* 4: 469–484. https://doi.org/10.2478/disp-2012-0012

Davidson D. (1967), "Causal Relations," *Journal of Philosophy* 64(21): 691–703. https://doi.org/10.2307/2023853

Deasy D. (2017), "What is Presentism?," *Noûs* 51(2): 378–397. https://doi.org/10.1111/nous.12109

Dowe P. (2000), "The Case for Time Travel," *Philosophy* 75: 441–451. https://doi.org/10.1017/S0031819100000504

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for both presentism and eternalism.

Dowe P. (2001), "A Counterfactual Theory of Prevention and 'Causation' by Omission," *Australasian Journal of Philosophy* 79(2): 216–226. https://doi.org/10.1080/713659223

Godfrey-Smith W. (1980), "Travelling in Time," *Analysis* 40: 72–73. https://doi.org/10.1093/analys/40.2.72

Goldman A. I. (1970), *A Theory of Human Action*, New York: Prentice-Hall.

Grey W. (1999), "Troubles with Time Travel," *Philosophy* 74: 55–70. https://doi.org/10.1017/S0031819199001047

Hales S. D. (2010), "No Time Travel for Presentists," *Logos & Episteme* 1: 353–360. https://doi.org/10.5840/logos-episteme2010129

Hales S. D. (2011), "Reply to Licon on Time Travel," *Logos & Episteme* 2(4): 633–636. https://doi.org/10.5840/logos-episteme20112412

Hall N. (2004), "Two Concepts of Causation" [in:] *Causation and Counterfactuals*, J. Collins, N. Hall, L. Paul (eds.), Cambridge: MIT Press, 225–276.

Hall T. (2014), "In Defense of the Compossibility of Presentism and Time Travel," *Logos & Episteme* 2: 141–159. https://doi.org/10.5840/logos-episteme20145213

Hendrickson N. (2006), "Towards a More Plausible Exemplification Theory of Events," *Philosophical Studies* 129(2): 349–375. https://doi.org/10.1007/s11098-004-1647–9

Hitchcock Ch. (2007), "Three Concepts of Causation," *Philosophy Compass* 2(3): 508–516. https://doi.org/10.1111/j.1747-9991.2007.00084.x

Keller S., Nelson M. (2001), "Presentists Should Believe in Time-Travel," *Australasian Journal of Philosophy* 79: 333–345. https://doi.org/10.1080/713931204

Kim J. (1966), "On the Psycho-Physical Identity Theory," *American Philosophical Quarterly* 3(3): 227–235.

Kim J. (1976), "Events as Property Exemplifications" [in:] *Action Theory*, M. Brand, D. Walton (eds.), Dordrecht: Reidel, 159–177. https://doi.org/10.1007/978-94-010-9074-2_9

Lewis D. (1973), "Causation," *Journal of Philosophy* 70(17): 556–567. https://doi.org/10.2307/2025310

Lewis D. (1976), "The Paradoxes of Time Travel," *American Philosophical Quarterly* 13: 145–152.

Lewis D. (1983), "Survival and Identity" [in:] *Philosophical Papers*, Vol. I, Oxford: Oxford University Press.

Licon J. A. (2011), "No Suicide for Presentists: A Response to Hales," *Logos & Episteme* 2(3): 455–464. https://doi.org/10.5840/logos-episteme20112325

Licon J. A. (2012), "Still No Suicide for Presentists: Why Hales' Response Fails," *Logos & Episteme* 1: 149–155. https://doi.org/10.5840/logos-episteme20123157

Mackie D. (1999), "Personal Identity and Dead People," *Philosophical Studies* 95(3): 219–242. https://doi.org/10.1023/A:1004239225105

Markosian N. (2009), "The Truth About the Past and the Future" [in:] *Around the Tree: Semantic and Metaphysical Issues Concerning Branching and the Open Future*, F. Correia, A. Iacona (eds.), Synthese Library, 127–141. https://doi.org/10.1007/978-94-007-5167-5_8

Mellor D. H. (1995), *The Facts of Causation*, London: Routledge Press. https://doi.org/10.4324/9780203302682

Menzies P. (1989), "A Unified Account of Causal Relata," *Australasian Journal of Philosophy* 67(1): 59–83. https://doi.org/10.1080/00048408912343681

Miller K. (2005), "Time Travel and the Open Future," *Disputatio* 1(19): 223–232. https://doi.org/10.2478/disp-2005-0009

Miller K. (2008), "Backwards Causation, Time, and the Open Future," *Metaphysica* 9: 173–191. https://doi.org/10.1007/s12133-008-0030-2

Monton B. (2003), "Presentists Can Believe in Closed Timelike Curves," *Analysis* 63: 199–202. https://doi.org/10.1093/analys/63.3.199

Nagel T. (1986), *The View from Nowhere*, New York: Oxford University Press.

Norton J. (2018), "If Time Travel to Our Location Is Possible, We Do Not Live in a Branching Universe," *Analysis* 78(2): 260–266. https://doi.org/10.1093/analys/anx149

Nozick R. (1981), *Philosophical Explanations*, Cambridge: Harvard University Press.

Olson E. (1997), *The Human Animal: Personal Identity without Psychology*, New York: Oxford University Press.

Parfit D. (1971), "Personal Identity," *Philosophical Review* 80: 3–27. https://doi.org/10.2307/2184309

Parfit D. (1984), *Reasons and Persons*, Oxford: Oxford University Press.

Pearl J. (2000), *Causality: Models, Reasoning and Inference*, New York: Cambridge University Press.

Pensgard D. (2001), "Presentist Time Travel and the Limits of Presentist Causality," *Philosophy* 79(3): 333–345.

Sider T. (2005), "Traveling in A- and B- Time," *Monist* (Special Issue on Time Travel) 88: 329–335. https://doi.org/10.5840/monist200588326

Sosa E., Tooley M. (eds.) (1993), *Causation*, New York: Oxford University Press.

Tooley M. (1990), "Causation: Reductionism versus Realism," *Philosophy and Phenomenological Research* 50: 215–236. https://doi.org/10.2307/2108040

van Inwagen P. (1990), *Material Beings*, Ithaca: Cornell University Press.

Vendler Z. (1967), "Causal Relations," *Journal of Philosophy* 64(21): 704–713. https://doi.org/10.2307/2023854