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Editorial

Introduction to Special Issue *Time Travel*

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The philosophy of time travel has an illustrious pedigree, having seen ground-breaking physical and philosophical treatments in the late 1940s and early 1950s from Kurt Gödel. Perhaps the key philosophical work on time travel remains David Lewis's paper 'The Paradoxes of Time Travel' (*American Philosophical Quarterly*, **1976**, *13*, 145–152). As several contributions to this Special Issue attest, virtually all modern philosophy of time travel extensively cites, and is actively engaged in responding to, Lewis (1976). Lewis (1976) makes three principal claims. Firstly, Lewis argued that the traditional 'Grandfather paradox' objections to time travel failed. Secondly, Lewis held that time travellers in the past could possess something like ordinary ability. Finally, Lewis argued that there were no in-principle objections to events being self-causing (i.e., forming causal loops). Other important contributions were made by Hilary Putnam, Paul Horwich, Murray MacBeath, D. H. Mellor, Margarita Levin, Kadri Vihvelin, and others. Two recent highlights were full-length monographs from the Oxford University Press: 2018 seeing Ryan Wasserman's *Paradoxes of Time Travel* and 2020, Nikk Effingham's *Time Travel: Probability and Impossibility*.

The philosophy of time travel is positively burgeoning at present, with more and more areas of the subject being illuminated by discussion of time travel issues. Popular areas of interest include time travel and free will, e.g., exploring how far an agent in the past can retain something like normal abilities. Additionally, popular is the discussion of causal, epistemic, and explanatory problems posed by causal loops—cases where a causal chain folds back into the past so that an event can become amongst its own causes. The metaphysics of time, identity, and laws of nature, plus the epistemology of action, counterfactuals, and deliberation, and even philosophy of religion and philosophy of computation have all yielded interesting time travel discussions. It is a great pleasure to introduce this collection of work by noted scholars in the field. My hope is that this Special Issue serves both as a showcase of new work on time travel and as an introduction to the range of different problems being tackled in this field by distinguished practitioners.

Philosophy of time travel can include discussions of how our attitudes towards the different determinations of time can reflect, or be affected by, our views on the nature of time itself. The paper by Kristie Miller, "What Time-Travel Teaches Us about Future-Bias", looks at the question of how our preferences about events (and the different attitudes we adopt towards events in the past and future) might relate to time-structure. Given that we routinely discount past events (or their impact) relative to that of future events, what might our preferences reveal about the nature of time itself? Miller argues that appeals to temporal structure alone (e.g., whether or not past or future events exist) are not sufficient to explain our preferences. Miller considers other candidates for explaining our preferences—for example, one that appeals to causal salience and another that appeals to an event's location in our *personal* time. ('Personal time' is a notion introduced in Lewis (1976) and denotes time as registered in the traveller's frame of reference, as opposed to 'external time' registered in the world at large.) Interestingly, Miller concludes that neither casual salience nor location in personal time suffice to explain why we tend to discount past events.

As noted above, a key topic in the philosophy of time travel in general (and Lewis 1976 in particular) is the causal loop, the chain of events that allows an event to be among

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Citation: Richmond, A. Introduction to Special Issue *Time Travel*. *Philosophies* **2022**, *7*, 100. https://doi.org/10.3390/philosophies7050100

Received: 29 August 2022
Accepted: 31 August 2022
Published: 7 September 2022

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its own causes. Where most discussions of causal loops focus on problems with, e.g., information being transferred into the past, Steph Rennick's 'Self-Fulfilling Prophecies' looks at future-based issues with causal loops. In particular, Rennick explores interesting analogies between causal loops generated in time travel cases and causal loops generated via either foreknowledge or knowledge which comes from a perspective outside time altogether (e.g., Divine knowledge). Much of Rennick's focus is on exploring how future-derived knowledge can affect present actions and under what circumstances such knowledge can yield causal loops. Besides considering a wealth of thought-experiments and fictional examples, Rennick also considers how far loops involving foreknowledge compare to other loops in terms of their probability and explicability.

Rather *un*like Lewis (1976), who held that only a single time-dimension would suffice to make time travel possible, many philosophers of time travel have argued that time travel either requires, or would be greatly facilitated by, a metaphysical picture which allowed time itself to possess more than one dimension. The paper by Nikk Effingham, "Exterminous Hypertime" continues Effingham's significant investigations (e.g., in his 2002 book cited above) into using multi-dimensional models of time to explore (and address) problems in time travel. Besides ordinary (linear) time, Effingham's models include different kinds of second temporal dimension, or 'hypertime', which allow changes in past events. Noteworthy features of Effingham's account include: a) the attention paid to how long a change to past events might take to propagate through the second time dimension, and b) the detailed discussion of how well popular metaphysical theories of time might accommodate multiple time dimensions (e.g., whether situated on the tensed/tenseless spectrum, or considered in terms of presentist, eternalist, or growing block theories).

'Changing, Annulling and Otherwising the Past' by G. C. Goddu continues the debate over what multi-dimensional time might mean for the possibility of time travel. Amongst other things, this paper reviews and develops the debate over whether or not a time traveller can change the past, in the sense of taking an event that had obtained in the past and making that event not to have obtained. Goddu reviews theories that allow past-changing via an appeal to extra time-dimensions, orthogonal to 'regular' time, or other kinds of non-standard temporal structure. Additionally surveyed by Goddu is the nature of how events might persist and causes might propagate in the different temporal dimensions. Goddu discusses two senses of changing the past, one in which some past event is made different from what it was and the other in which the past event is made never to have occurred at all, and argues that the former at least is logically possible.

As noted above, Lewis (1976) claimed that Grandfather Paradox arguments fail to show that time travel is impossible and instead at most show that time travellers in the past might face certain constraints on action. 'Lessons from Grandfather' by Andrew Law and Ryan Wasserman develops and expands a classic thought-experiment from Lewis (1976). Lewis imagines a time-traveller called Tim, who travels into the past with a view to assassinating his Grandfather when Grandfather was still a youth, i.e., before Grandfather has become a parent himself. What foils Tim's mission? Law and Wasserman offer two new theories to account for Tim's failure. One account looks to the causal fixity of the past as it relates to an agent's behaviour, while the other puts a causal spin on the principle that no self-undermining act can succeed. Law and Wasserman further explore the implications of their theories of Tim's failure not only for the compatibility of determinism and being able to do otherwise, but also for theories of divine foreknowledge.

If, as Lewis (1976) suggested, travellers in the past might seem to act under constraints, the nature of such a constraint would seem to have implications about which counterfactual conditionals might correctly describe their behaviour. Many theories of counterfactuals either fail to apply to, or explicitly avoiding engaging with, cases of backward time travel. However, Alison Fernandes' paper "Back to the Present: How Not to Use Counterfactuals to Explain Causal Asymmetry" explores the possibility of a general method for evaluating counterfactuals that will work in backwards time travel cases too. Usually, counterfactuals

are assessed by an appeal to holding fixed as much of present actuality as can be maintained while still allowing the antecedent of the counterfactual conditional to hold. However, what sorts of facts should be held fixed in such assessments? Fernandes considers different kinds and locations for 'holding the present fixed', including fixity of distant events in the present. Relatedly, Fernandes considers how counterfactuals relate to causal asymmetry and addresses the problem of how to recover causal asymmetry in a world where physics is apparently temporally symmetrical.

The paper by Phil Dowe, "Does Lewis' Theory of Causation Permit Time Travel?", brings into sharp focus two aspects of David Lewis's work not often linked together, namely Lewis's theory of causation (and specifically how well it allows backwards causation) and Lewis's (1976) theory of time travel. As Lewis himself granted, travel backward in time seems almost bound to require backwards causation, causation whose effect temporally precedes the cause. Dowe offers new reasons for thinking that Lewis' preferred counterfactual theory of causation does not mesh well with the backwards causation that Lewis himself believed was (almost certainly) bound to feature in backward time travel cases. Indeed, Dowe argues Lewis's theory of causation inadvertently and against Lewis's own express intentions, effectively rules out backwards causation a priori or at least, rules out the very kind of backwards causation needed to make backward time travel possible. (*En route*, Dowe critiques other attempts to bring tensions between Lewis on counterfactuals and Lewis on time travel.)

Again, as noted above, Lewis (1976) concluded that travellers in the past could retain something like ordinary, everyday abilities, but this conclusion has proved more controversial than other aspects of Lewis's (1976) case. Richard Hanley's 'Autoinfanticide Is No Biggie: The Reinstatement Reply to Vihvelin' addresses an important challenge to Lewis's (1976) analysis of time travel ability. Lewis (q1976) argues that an agent like Tim is able to carry his (would-be paradoxical) mission relative to some facts about his situation but not others. (E.g. Tim can succeed relative to his being a good shot with a steady hand but not relative to his target being his own Grandfather-to-be.) Kadri Vihvelin (e.g., in her 'Killing Time Again', *The Monist*, **2020**, *103*, 312–327) argues that Tim cannot in any ordinary sense be said to be able to kill Grandfather, because his succeeding cannot take place in any world like ours. Hanley's paper develops a challenge to Vihvelin, based on a class of 'replacement' examples where the traveller's target is killed but is replaced by some suitable 'ontological understudy'. *En route*, Hanley considers different kinds of replacement scenario, drawing on (Lewis' 1976 and others) views of classic personal identity cases like teleportation and fission cases.

Absent of a time machine itself, predicting where philosophy of time travel might go next would be a risky undertaking. However, as the above hopefully makes clear, the philosophy of time travel, as encapsulated in the following papers, draws on a wide and growing variety of important philosophical notions and problems. While often drawing/responding to Lewis (1976), the authors collected here all advance new and fruitful theories of their own.

Funding: This research received no external funding.

Acknowledgments: The editor gratefully acknowledges the contribution to the Special Issue by all authors whose work features therein and especially for the quality of all their submissions. Thanks and acknowledgement are also due for the sterling support offered by MDPI staff.

Conflicts of Interest: The author declares no conflict of interest.