

FOREWORD

Might we some day be in a position to move about in time, just as we can already move about in space? Today, few would question that deliberate change in temporal location is *logically* possible. There is no contradiction in the thought that Tim could step into a time machine and travel backwards to visit his grandfather, or forwards to visit his grandchildren. That is, there is no contradiction provided that we take time travel to involve influencing the course of history rather than changing it (no event can both happen and not happen). But is time travel *metaphysically* possible? Is there a genuinely possible world—as opposed to a merely coherent scenario—in which one can freely change one’s location in time? Here is where puzzlement and bewilderment lead to philosophical controversy. For the answer depends on one’s views concerning a wide range of other matters, and such views are themselves the subject of major philosophical controversy. Consider:

1. Is time travel compatible with *presentism*? Presentism is the view according to which only the present is real: the past and the future do not properly exist. Hence it would seem that in a presentist world there is nowhere (“nowhen”) for a time traveler to go.

2. Is time travel compatible with *endurantism*? Endurantism is the view according to which material objects, including persons, persist through time by being wholly present at each moment of their existence. Thus, it would seem that in an endurantist world Tim can travel backwards or forwards to visit his younger or later selves only if he can be wholly present in different places at the same time, hence only if he can have distinct properties at once.

3. Is time travel compatible with *chronological monism*? This is the view according to which there is only one time series: our subjective time arrow necessarily coincides with the time arrow of the external world (modulo relativistic discrepancies). If Tim is a time traveler, however, then it would seem that his personal time and his external time must come apart. If he travels in the future, his personal clock must jump ahead of history; if he goes up in the past, his clock must move in the opposite direction.

4. Is time travel compatible with *free will*? If Tim goes up in the past, then he has already been there. Indeed, he *will* step out of his time machine in the

past if and only if he *has* stepped out of his time machine in the past, and he will take part in some past events if and only if he took part in those events. The past is fixed. Hence it would seem that his actions *qua* backwards time traveler are fully constrained: he cannot do what he has not done, and he must do everything he has done.

5. Does time travel entail *brute necessities*? If Tim goes up in the past, then he cannot do things he has not done. But among the things he has not done and cannot do, there are some that he could have done and others that he couldn't have: he could have killed his grandfather's identical twin (there are possible worlds in which he did) but he couldn't have killed his grandfather. Still, the two killings would seem to be perfectly indistinguishable—the difference would seem to be a matter of brute necessity.

6. Does time travel require *reverse causation*? Ordinary causation flows along the direction of time: what is happening now is causally dependent on what has already happened. But if Tim travels into the past, it would seem that some future events (e.g., his stepping into a time machine in 2006) will cause some past events (e.g., his stepping out of a time machine in 2004).

7. Does time travel entail *fatalism*? If what has not yet happened turns out to be causally responsible for what is happening or has happened, then happen it must. So it would seem that insofar as time travel entails reverse causation, it entails fatalism. Indeed, if it turns out that Tim stepped out of a time machine in the past, then he must step into a time machine in the future: not only are his actions *qua* backwards time traveler fully constrained; he is also constrained to be a time traveler.

8. Does time travel entail the possibility of *ex nihilo* proceedings? Reverse causation may generate causal loops. If Tim leaps ahead a year, buys a best selling novel, returns to his own time, and publishes it, then it would seem that the novel came into existence *ex nihilo*. Tim himself could be the result of a self-creating process, if he goes up in the past and makes pregnant the woman who turns out to be his mother. Or he could be involved in a self-destructing process: he could die of a heart attack upon reading his own obituary in a paper from the next day.

9. Does time travel require *spatial coincidence*? At noon Tim presses the button and begins his travel into the past. At times later than noon, there is no time machine present. But at times earlier than noon, there would seem to be two machines—one going (traveling) backwards in time and one going (persisting) forwards—and these two machines would share the same space-time location.

On the face of it, whether time travel is a genuine possibility appears to depend on a host of tricky matters. And this is just the beginning. Many other worries arise concerning, for instance, the metaphysics of personal identity,

the philosophy of action, the nature of moral responsibility, or even the logic and semantics of ordinary language. (How does tense work in the mouth of a time traveler?) Some may be inclined to think that physics, not metaphysics, should provide the appropriate setting for addressing such worries, but this is wishful thinking. There is, for example, a tradition of arguing against presentism on the basis of its incompatibility with the general theory of relativity, so the first worry in our list would seem to dissolve. On the other hand, presentism seems to be compatible with other, more fundamental physical theories; for instance, there are nascent theories of quantum gravity that utilize a fixed foliation of spacetime, so the worry strikes back. Likewise, there is a tradition of arguing against endurantism on the basis of its incompatibility with special relativity, specifically with the empirical inseparability of space and time. That would take care of the second worry in the list. On the other hand, it is not impossible to work out a relativistically acceptable mereology and to understand endurantism on such grounds—so arguably the worry strikes back. And we could continue. That metaphysical theories should at least be contingently true, hence compatible with our best physical theories, is hardly negotiable. Where to look for the relevant evidence, however, is by itself a question that can hardly be assessed on empirical grounds.

Nor is the very question at issue—the possibility of time travel—one that can be answered *directly* on empirical grounds, bypassing the many philosophical worries that it seems to nurture. Surely time travel is possible, if this amounts to declaring its compatibility with the laws of fundamental physics. Gödel's solutions to Einstein's field equations, for example, uncover a family of rotating universes in which one can freely move about in spacetime without exceeding the speed of light. And surely such universes are possible worlds in a thick sense—they cohere with the laws of logic *and* of physics. But is our world one of them? Are they ways our world could be, in a sense of 'could' that coheres equally well with our philosophy? In the end of the day, physical possibility may well be a subspecies of metaphysical possibility, but the drawing of metaphysical morals from current physical theories is no straightforward business.

So here we are. Bizarre as it may seem, coherent as it might be, time travel remains a source of major philosophical concerns after decades of defenses and rebuttals. *The Monist* looked at the philosophy of time many years ago (vol. 53, no. 3, 1969), when philosophers were still troubled by its logical underpinnings—the “paradoxes” of time travel. It is time for a second look. And it is time to do so with an eye on what matters most: the truly metaphysical part of the story, and the cosmological jet lags that it seems to entail.

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SELECTED READINGS

Review Articles

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