

Time Travel

PARADOX AND INFINITY

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Future Possibility

Open Future: There is a reading of 'possible' that is about the future.

- Metaphysical modality is much broader than that reading.
- Future possibility reading is a subset of nomological possibility.
- The laws in our world may be incompatible with time travel.
- We intend to ask if there is any possible world in which someone travels into the actual past of that world.

Grandfather Paradox

Paradox: Tim travels to a time before his grandfather and grandmother met.

- Tim intends to kill his grandfather and is poised to do so.

Question: Can Tim kill his grandfather?

- If so, then neither Tim's parent, nor Tim would have been born.
- So Tim wouldn't have traveled back in time, nor killed his grandfather.
- But how could Tim fail if appropriately poised to kill his grandfather?
- It would seem that Tim both can and cannot kill his grandfather.
- Perhaps this shows that time travel is not possible after all.

Equivocation: Lewis takes this argument to equivocate on 'can'.

- Considering everything, Tim cannot kill his grandfather.
- But 'can' is context sensitive, only taking some things into account.
- There are contexts which do not take everything into account where Tim *can* kill his grandfather.
- Tim has the necessary skills, position, timing, etc., he just doesn't do it.

Example: Holding some facts fixed, I can speak Finnish.

- Holding others fixed, I cannot speak Finnish.
- Thus there are contexts in which Tim can kill his grandfather.
- Nevertheless, it is impossible for Tim to kill his grandfather.

Change: Do we mean to ask about Tim's abilities in this context sensitive sense?

- Instead we may ask: is it possible for Tim to kill his grandfather?
- The answer is already clear, but perhaps this is still frustrating to Tim.

Open Future

Determined: Tim's actions are entirely determined during his journey.

- This includes not killing his grandfather.
- But it may also include a whole lot else to which he is unaware.
- He is only able to become aware of some of the things that he can't do.
- And not just for Tim: no time traveler can kill their ancestor.
- But if there are any time travelers, then there are a lot of them.
- What explains the fact that none of them succeed is consistency.
- But it may still seem strange to Tim that however he tries he fails.

Actuality: For Lewis, each world is a space-time continuum.

- So the actual world is also a space-time continuum.
- So we all do only what we will do, though we don't know what.
- From this perspective, what is strange about time travel is that it puts us in a position to figure out what we cannot do.
- But determinism follows from the conception of possible worlds.

Open Future: Is time travel compatible with the open future?

- Consider a set of *world states* S and a *task relation* \rightarrow over S .
- Let $\tau : \mathbb{Z} \rightarrow S$ be a *world history* iff $\tau(x) \rightarrow \tau(x + 1)$ for all $x \in \mathbb{Z}$.
- Nothing binds us to a single world and so the future is open.
- Just because you travel to the actual past, nothing holds you there.
- But that does that mean such cases don't count as time travel?

Determinism: One cannot change *the* past or *the* future.

- But there need not be a unique past nor a unique future.