

PHIL 110A
Week 8: Time
 Paul Thagard

Time

Time Travel

Please turn off and put
 away all electronics.



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Questions about Time

1. Is time real, or an illusion?
2. What is time?
3. Is time travel real? Is it possible?
4. How do we know time?



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Time is Unreal



1. Parmenides (500. BC): Reality is eternal, timeless. Change requires that something both is and is not. Zeno: motion is impossible.
2. J. McTaggart (1908): Time (past, present, future) is incoherent.
3. K. Gödel (1949): Relativity theory -> time travel is possible -> time is unreal.
4. J. Barbour (1999): Duration is indefinable and redundant, so reality is timeless.

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Time is Real



1. Time is absolute (Newton): time is a container for events, just as space is a container for objects.
2. Time is relational (Mach): time is a system of relations among events, just as space is a system of relations among objects.

Problem: how do we know events?

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Knowing Time



Augustine (400 BC): “What, then, is time? If no one ask of me, I know; if I wish to explain to him who asks, I know not.”

Knowledge-that (propositional); knowledge-how (procedural); knowledge-of (sensory acquaintance)

Conjecture: time paradoxes result from trying to make time propositional.

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Animals Know Time



Rats, bees, etc. can learn to respond to stimuli at different time intervals.

Rats have place neurons *and* time neurons.

Macaque monkeys have neurons that “time stamp” events (Graybiel, 2009).

Human knowledge of events consists of patterns of neural firing that bind together:

1. Neural encoding of time
2. Neural encoding of objects and their properties.

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Tentative Conclusions

1. Time is real, if understood as a system of relations among events.
2. Knowledge OF events is non-propositional: encoded non-verbally by neural firings that bind time and objects.
3. Time may seem reversible from the perspective of physics, but not from the perspective of biology.

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Time Travel

1. Time travel is necessary (has to be; true in all possible worlds).
2. Time travel is impossible (can't be; true in no possible worlds). Argument: if time travel existed, you could kill your grandfather and take yourself out of existence.
3. Time travel is actual (true in this world). No evidence.
4. Time travel is possible: true in the future.

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Time Travel is Implausible

1. No cases of time travel have been observed.
2. Causation is always forward in time (effects follow causes), so backward time travel is implausible.
3. Causation always has a series of times with no gaps, so forward time travel is implausible.
4. No mechanisms are known for moving through time, e.g. by exploiting wormholes.

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Discussion Question

Is time real? How do you know it?

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