

# Causation

PHIL 1480 Metaphysics

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## 1. Causation and fundamental physics

The notion of causation does not *explicitly appear* in fundamental physics. Does fundamental physics undercut the very idea of causation, as Russell thought?

(i) The (dynamical) laws of our best theories in fundamental physics are time-reversal invariant, or at least invariant under some symmetry that involves time reversal as well as the reversal of a few other things (e.g. charge). To the extent that they are deterministic, they are deterministic in both directions.

- Causal talk, on the other hand, presupposes some important temporal asymmetry.
- But even if there is no temporal asymmetry in the laws, there might be some *de facto*, presumably statistical, asymmetry in the facts, around here at least.

(ii) The laws of our best theories in fundamental physics are differential equations. To determine anything about what happens at a given spacetime point, one needs information about all the spacetime points in some temporal slice through its light cone.

- If one thinks of causation as always relating “reasonably concrete” events as opposed to events like *John’s not shooting holes in the pipe*, this threatens to show that every event in something’s backwards light cone is one of its causes.
- Solution: allow omissions as causes.

## 2. What use is the notion of causation?

Field mentions one application of the notion of causation, to the theory of *rational decision*.

*Evidential decision theory*: (roughly) you should do whichever action is such that believing you were going to do it would make you most confident that you were going to achieve your goals.

An apparent counterexample to evidential decision theory: the ‘smoking and cancer’ gene.

*Causal decision theory*: (roughly) you should do whichever action you regard as most likely to cause you to achieve your goals.

Even if this is wrong, the notion of causation seems to be involved in so many of our other concepts: e.g. seeing, acting, believing...

### 3. Analysing causation using counterfactuals

Simple counterfactual analysis: event C is a cause of event E iff C and E are wholly distinct and if C hadn't occurred, E wouldn't have occurred.

Problems for the simple counterfactual analysis:

- backtracking counterfactuals
- causation under indeterminism
- pre-emption

Lewis's first attempt to solve the pre-emption problem: event C is a cause of event E iff C and E are wholly distinct and there are some D1, D2... DN such that if C hadn't occurred, D1 wouldn't have occurred, and if D1 hadn't occurred, D2 wouldn't have occurred.... and if DN hadn't occurred, E wouldn't have occurred.

- This doesn't actually do very well at dealing with pre-emption cases!

Another style of attempt: 'holding fixed'. C is a cause of E iff C and E are wholly distinct and there are some events D1...DN [meeting such-and-such further conditions] such that if C hadn't occurred but D1...DN still had occurred, then E wouldn't have occurred.