

## Humean and Neo-Humean (Deterministic) Causation

- Hume's Account (Review)
- Challenges & Problems to Humean Causation
- Mackie's Neo-Humean INUS Account & Hausman's Refinement
- Summary and Simplification of Neo-Humean Response
- Problems for Neo-Humean Accounts (and others!)
- Summary of Problems So Far (many will be seen again!)

## Hume's (Metaphysical) Account of Causation (Review)

- A relevant quote from Hume is useful here. Hume (*Treatise*, Book 1, Part II, Section XIV) characterizes a *cause* as:
 

... an object precedent and contiguous to another, and where all the objects resembling the former are placed in like relations of precedence and contiguity to those objects that resemble the latter.
- Roughly, Hume's (metaphysical) account of causation can be boiled-down to the following three conditions:
  - Token event *a* causes token event *b* iff:
    1. *a* precedes *b* in time (*i.e.*, *a* starts before *b* does)
    2. *a* and *b* are spatio-temporally contiguous
    3. Events similar to *a* are invariably followed by events similar to *b*
- There are clear problems with two of these conditions ...

## Problems with Hume's Account

- Concerning (2): Cause and effect need not be contiguous. Separated events may be causally connected (*e.g.*, an explosion and the lighting of a fuse), provided there is a (transitive) *causal chain* connecting them.
- Concerning (3):
  - Events similar to *a* might be invariably followed by events similar to *b*, by *mere coincidence*, or with no causal connection between them. *Common causes* yield correlations with no direct causal connection. If “similarity” is understood *strictly*, then “coincidences” will quite common, since the tropes in (3) will rarely be exemplified (see below).
  - Causes are **not** *invariably* followed by their effects. Sometimes striking a match is followed by it bursting into flame, sometimes it is not.
  - Any two events are “similar” in some ways and “dissimilar” in other ways. Which are the *relevant* respects of similarity? If too narrow, then coincidences abound. If too broad, then too many causes.

## Mackie's Neo-Humean INUS Account I

- Mackie has a *syntactical* way of thinking about causation. He starts with a set of “atomic” (possibly relevant) *factors* *A, B, C, ...*. *Conditions* *A, B, C, ...* are constructed out of factors using connectives &, ∨, and ~.
- He identifies conditions with their *disjunctive normal forms*. He does this so as to guarantee that INUS conditions are *non-redundant* (see below).<sup>a</sup>
- He insists that each instance of causation takes place in the presence of a set of conditions — called a *causal field* *ℱ* — “within which the causing goes on”. For Mackie, causal claims are of the form “*a* causes *b*, in *ℱ*.”
- Mackie requires that causes be *at least* “Insufficient but Necessary parts of a condition which is itself Unnecessary but Sufficient” for their effects. That is, causes must be *at least* INUS conditions for their effects.

<sup>a</sup>The DNF of a formula *f* is the disjunction of conjunctions equivalent to *f* in which no conjunction contains a disjunction, *e.g.*, the DNF of ‘(*A* ∨ *B*) & *C*’ is ‘(*A* & *C*) ∨ (*B* & *C*)’.

### Mackie's Neo-Humean INUS Account II

- $A$  is an INUS condition for  $B$  in  $\mathfrak{F}$  if there exists a condition  $\mathcal{X}$  such that (i)  $\mathcal{X}$  is necessary and sufficient for  $B$  in  $\mathfrak{F}$ , and (ii)  $\mathcal{X}$  is of the (DNF!) form  $\lceil (A \& \alpha) \vee \mathcal{Y} \rceil$ , where  $\alpha$  is a non-empty conjunction of factors.
- If  $\mathcal{X}$  (above) is of the one of the following three forms: (a)  $A$ , (b)  $\lceil A \& \alpha \rceil$ , or (c)  $\lceil A \vee \mathcal{Y} \rceil$ , then  $A$  is “better than” an INUS condition for  $B$  in  $\mathfrak{F}$ . How would you characterize (a), (b), and (c) in English (like INUS)?
- Now, we're ready for Mackie's definition of ‘ $A$  caused  $B$  in  $\mathfrak{F}$ ’:
  - $a$  caused  $b$  in causal field  $\mathfrak{F}$  iff there exist<sup>a</sup> factors  $A$  and  $B$  such that (i)  $A$  is at least an INUS condition for  $B$  in  $\mathfrak{F}$ , (ii)  $A$  was instantiated by<sup>b</sup>  $a$ , (iii)  $\alpha$  [if there is an  $\alpha$  in  $\mathcal{X}$ ] was present on the occasion in question (must  $a$  instantiate  $\alpha$ , or may  $\alpha$  be in  $\mathfrak{F}$ ?), and (iv) every disjunct in  $\mathcal{Y}$  [if there is a  $\mathcal{Y}$  in  $\mathcal{X}$ ] not containing  $A$  was absent.

<sup>a</sup>Mackie assumes that  $a$  precedes  $b$ . We may not be able to know what  $A$  and  $B$  are.

<sup>b</sup>Following Hausman, we take factors to be properties instantiated by token events.

### Mackie's Neo-Humean INUS Account III & Hausman's Refinement

- Q: Why does Mackie require (iv) that no other disjunct in  $\mathcal{Y}$  not containing  $A$  be present in the occasion in question? A: to ensure the necessity of  $A$  for  $B$  (leads to *redundant causation* problems, see below).
- Mackie's INUS idea is consistent with *variability*. Even if  $A$  is an INUS condition for  $B$ , the presence of  $A$  does not guarantee the presence of  $B$ .
- But, three serious problems remain. First, Mackie's account is *too syntactical*. Hausman doesn't seem to realize this, but what counts as an INUS condition for what depends on which language we use to describe properties instantiated by events. Why is this? Good paper topic!
- Second, the conditions Mackie lays down seem (at best) only to be *necessary* for a causal connection between  $a$  and  $b$ , but *not* sufficient. *Common causes* of  $a$  and  $b$  will set-up perfectly good correlations between  $a$  and  $b$  — even when there is no causal connection between  $a$  and  $b$ .
- Third, suppose a coin is flipped only twice before it is melted down, and

that it lands heads both times. So, tossing the coin is necessary and sufficient for the coin to land heads. But, would we say that (merely) tossing the coin *caused* it to land heads? Hausman says “No.”

- This suggests that we need to make sure the INUS condition linking cause and effect is “nomological” or “lawlike”. Mackie's conditions are just based on material (truth-functional) relationships between factors.
- Hausman suggests a way to fix the third problem. But, he thinks there is no way to fix the second problem. He gives the following more precise: (DC) If  $a$  is a deterministic cause of  $b$  in set up<sup>a</sup>  $\mathfrak{C}$  during the time interval  $[t, t']$ , then for some  $A$  and  $B$ , given the laws of nature  $\mathbf{L}$ , (1)  $B(\mathfrak{C}, t')$  entails and is entailed by  $[(A(\mathfrak{C}, t) \& \alpha(\mathfrak{C}, t)) \vee \mathcal{Y}(c, [t, t'])]$ , but  $B(\mathfrak{C}, t')$  is not entailed by  $\alpha(\mathfrak{C}, t)$ , (2)  $B(\mathfrak{C}, t')$ , (3)  $A(\mathfrak{C}, t)$ , (4)  $\alpha(\mathfrak{C}, t)$ , and (5)  $\sim \mathcal{Y}(\mathfrak{C}, [t, t'])$ , where  $\lceil \mathcal{Z}(\mathfrak{C}, t) \rceil$  means  $\mathcal{Z}$  is instantiated in  $\mathfrak{C}$  at  $t$ .
- How does this compare to Mackie's definition? How does it fix (or clarify) the problems Hausman raises for Mackie's account?

<sup>a</sup>How do Hausman's set-ups  $\mathfrak{C}$  differ from Mackie's causal fields  $\mathfrak{F}$ ?

### Neo-Humean Causation Simplified & Some Problems

- Here is a simpler way of putting the gist of neo-Humean accounts of deterministic causation (Horwich, *Asymmetries in Time*, chapter 8):
  - A direct (deterministic) cause of some effect is an essential part of an antecedent condition whose intrinsic description entails — *via* basic laws of nature — that the effect will occur. And, causation in general involves a (transitive) chain of direct causation.
- Problem #0: “Temporal precedence”. Temporal precedence is *built-in* to the neo-Humean accounts. It would be nice if we could *prove* that causation is time-asymmetric, by arguing from some deeper characterization of the causal relation. This will also be a problem for probabilistic theories of causation, which do the same thing.
- Problem #1: “Spurious Causation”. Joint effects of a common cause can satisfy all the conditions of the for neo-Humean causation, even if there is no direct causal relation between them. This is a big problem ...

### The “Spurious Causation” (or “Epiphenomena”) Problem Cont’d

- Several possible ways out have been proposed:
  - Argue that joint effects of a common cause can not be contiguous. This is hopeless. Consider relations among images in a mirror.
  - Argue that the laws relating causes and effects are “basic” but those relating joint effects are not, because they require reference to a third event or state of affairs (Horwich). Won’t this rule-out too much? On this view, there is no causal connection between the length of a pendulum and its period, since reference to the earth is required in the law. There is a *general* problem about *laws* here ...
  - Stipulate that *a* and *b* cannot be joint effects. This rules-out too much, since *a* and *b* could be *both* joint effects *and* directly connected.
  - More promising, but along these same lines, argue that, if *A* is “truly” at least an INUS condition for *B*, then *a* and *b* *cannot* be joint effects of a common cause. After all, if *A* is necessary for *B* in the

circumstances  $\mathfrak{F}$ , then including a common cause *C* in  $\mathfrak{F}$  will render *A* redundant, and therefore not an INUS condition after all!

- \* This won’t work either, since (given determinism) it may be that including *A* in  $\mathfrak{F}$  may render *C* not INUS for *B*. We need a reason to deny that *a* is causally connected to *b* which is not equally a reason to deny that *c* is causally connected to *b*.
- \* One might try to break this symmetry between *a* and *c vis-à-vis b* by appealing to the fact that *c* is temporally prior to *a*, and so it is *a* (and not *c*) that should be considered unconnected to *b*.
- \* This fails. Consider cases with a  $c \rightarrow a \rightarrow b$  structure. One does not want the possibility that *C* is INUS for *B* in  $\mathfrak{F}$  to imply that *a* is not a cause of *b*. Similar problems arise in probabilistic causality.
- This seems to be an insurmountable problem for regularity theory. There seems to be more to causation between *a* and *b* than regularity, contiguity, and temporal priority *between just a and b*. It seems causation imposes constraints on *other events* in a “causal nexus”. This becomes especially clear in probabilistic and statistical theories.

### Problems of Redundant Causation: Pre-emption and Overdetermination

- Overdetermination: Holmes and Watson both shoot Moriarty. Holmes shoots a bit sooner, and his bullet kills Moriarty, who falls dead before Watson’s bullet can reach him. *Neither* shot (separately) will count as a Humean cause of Moriarty’s death, since neither is *necessary*.
  - Perhaps a Humean could embrace this conclusion, and say that it was some “complex event” constituted out of the separate shots. But, what is this “complex event,” exactly? Is it just a conjunction?
- Preemption: A mas sets out on a trip across the desert. He has two enemies. One of them puts a deadly poison in his reserve can of drinking water. The other (not knowing this) puts a hole in the bottom of the can. The poisoned water leaks out before the traveler needs to resort to his reserve can; he dies of thirst. Again, neither is a Humean cause.
  - Several proposals have been advanced to deal with preemption ...

### Preemption, Cont’d

- First way out (Hausman): note that only *direct* causes must be necessary in the circumstances for their effects. In this example, the drilling of the hole is an *indirect* cause, but not a direct cause. There is a (transitive) *chain* of direct causes from the drilling to the death. On the other hand, the poisoning isn’t even an indirect (Humean) cause, since there is no chain of direct causes between the poisoning and the death.
  - But, what about “trumping preemption” (Schaffer)? A major and a sergeant are shouting orders at their soldiers. The major and sergeant simultaneously shout “Advance”; the soldiers hear them both and advance. Since the soldiers obey the superior officer, they advance because the major orders them to, not because the sergeant does. The major’s shout “trumps” (and preempts) the sergeant’s. Here, it doesn’t seem plausible to say that the major’s shout is an *indirect* cause of the soldiers’ advance. If this isn’t a direct cause, what is?
- Second way out: Describe the effect in more detail, so that it rules-out

the pre-empted event as cause. In the canteen example, the man dies of thirst. So, if we take the effect to be *dying of thirst* rather than dying *simpliciter*, then perhaps this ensures that the drilling and not the poisoning was the cause. But, how would this apply to the “trumping” case? Do we want to say that the effect was “advancing as if ordered by a major” as opposed to “advancing as if ordered by a sergeant? Perhaps soldiers advance more rigorously when ordered by a major?

- Will this always work? Will we always be able to describe the effect in enough detail to rule-out all trumped or preempted possible causes?
- What if we want to know what caused the man’s death, and not what caused his dying-of-thirst? If we’re able to describe the effect in enough detail so as to rule out all pre-empted putative causes, then mustn’t we already know a lot about the causal nexus?
- Hausman claims that if the second murderer had poured out the water and then refilled the canteen with the same solution, then the traveler would have died in exactly the same way at exactly the same time, yet the actions of the second enemy still would have caused the death.

## Summary of Problems of Causation — So Far (Hausman)

- Regularity and Necessity
  - Token/Type: What are relations betw. token causal claims and regularities?
  - Laws: What are the relations between causation and laws, and what are laws?
  - Necessity: Can one make sense of the necessity, efficacy, or power of causes?
  - Indeterminism: Are there merely probabilistic causes?
- Contiguity: Are direct causes always contiguous with their effects?
- Priority: How do cause and effect differ? What is the connection between causation and time? Must we *stipulate* temporal priority?
- Spurious Causation: Are effects of a common cause causally connected to one another? How do effects of a common cause differ from cause and effect?
- Redundancy:
  - Overdetermination: What, precisely, should one say about such cases?
  - Preemption: Can a theory of causation correctly identify preemptors as causes and correctly rule out preempted alternatives? Even “trumping” preemptors?