

Notes on Chapter 6: Backtracking Influence

2 aims of the chapter:

1. Demonstrate how the principles governing terminance demonstrate *causal directedness*. (Backtracking prob-influence is redundant.)
2. Isolate the empirical phenomena that motivate us to disbelieve in backtracking influence—suggest experimental schemas which disagree over the correctness of this motivation. (Under some schema, we have reason to believe in *some* form ‘pseudo-backtracking influence’, i.e. not quite prob-influence (214), not quite backtracking influence (221).)

6.0 (Definitions and Preliminaries)

Backtracking fixing relation: an event \overline{E}_1 that fixes an event \overline{E}_2 that counts as “happening at a different time” than \overline{E}_1 , which in turn fixes an event \overline{E}_3 that counts as “happening at a different time than \overline{E}_2 in the opposite temporal direction.” (NB. backtracking \neq past-directed.)

Turnaround event: any event in the interior of a chain of backtracking fixing relations. (203)

Backtracking prob-influence is equal to the probability difference \tilde{E}_1 fixes (through mediation of \tilde{E}_2) for E_3 , where \tilde{E}_1 and \tilde{E}_2 , and \tilde{E}_2 and E_3 “happen at different times” and \tilde{E}_2 is a turnaround event.

Causal directedness: Any backtracking prob-influence that \tilde{E}_1 exerts on E_3 (by fixing some turnaround event \tilde{E}_2 that fixes a pair of probabilities for E_3) is equal in value to the prob-influence that \tilde{E}_1 exerts directly on E_3 . (204)

NB what is being ‘fixed’ in each of these cases.

6.1 The Direction of Influence

...A defence of the idea that it is reasonable to keep our minds open to the possibility of past-directed prob-influence in all its forms. (204)

(Adopting a neutral convention for ‘future’ and ‘past’: Let us say that ‘future’ refers (de re) to the direction of time in which seeds grow into plants, wood transforms into ashes, etc., and that ‘past’ refers to the other direction. (205))

Excellent rule for assessing the range of our influence: Let the fundamental laws dictate it. (206)

- This would make it natural to infer that we can influence the past as well.
- There is no evidence anyone has ever presented for the non-existence of (non-exploitable) past-directed influence.
- Lack of evidence of past-directed influence is no indication of impossibility of such influence (cf. Newtonian gravitational enlightenment for our conception of influence).

6.2 Proof of Causal Directedness

...A proof that every relation of backtracking prob-influence is made redundant by a temporally direct relation of prob-influence.

“The intuitive idea behind the proof is that in order to get the backtracking prob-influence going, \tilde{E}_1 has to be so big and have the specification of its material contents so filled in that any influence it has on c is not able (as it goes forward in time) to zigzag around \tilde{E}_1 or go through \tilde{E}_1 or skip over \tilde{E}_1 to have some bearing on the probability of E_2 .” (209)

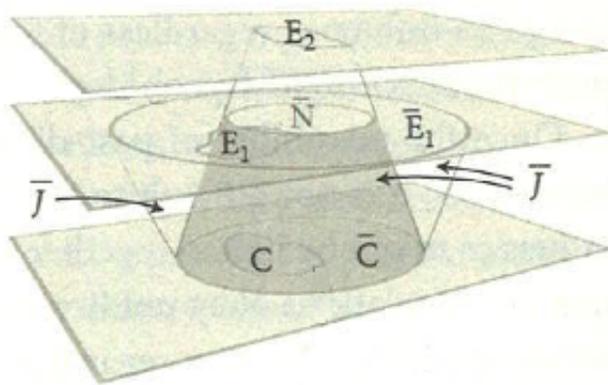


Figure 6.1

(Selected) Ingredients:

- Non-spatiality: The fundamental laws disallow space-like terminance (and thus space-like fixing).
- Continuity of Probability-fixing: Intermediate regions between contextualised events contain a fixed intermediate (fixed by the first and fixing a probability for the second) on the way from one to the other.
- Shielding of Fixing: For any contextualised event \bar{C} that fixes a contextualised event \bar{E} and for any contextualised event \bar{I} occupying region Q that is a fixed intermediate on the way from \bar{C} to \bar{E} (so that it is fixed by \bar{C} and fixes \bar{E}), then for any region R that lies entirely within \bar{C} 's domain of terminance and contains no points on a c-path going from \bar{I} to \bar{E} , the contextualised event \bar{J} —defined as whatever \bar{C} fixes for $R \cup Q$ —fixes \bar{E} (**just like \bar{I} does**). (orig. 161, my emph.)

Potential complaints with the shielding assumption:

- Closed time-like curves (CTCs): ...**might allow past-directed prob-influence over the future** and future-directed prob-influence over the past. [How exactly does this violate causal directedness?]
- Magic Wands
- Different kinds of terminance that run in opposite temporal directions...
 - But this would require an event specified entirely in terms of one kind of fundamental property (e.g. electromagnetic) could fix another specified in terms of multiple fundamental properties (e.g. electromagnetic and weak).

Potential complaints with the non-spatiality assumption:

- QM reliably exhibits space-like correlations that are arguably causal in some sense.
 - But not such a problem, since doesn't allow *past-directed* influence.
- One could imagine fund. laws might say that past-directed contribution relations stay within the normal light cone but that future-directed contribution can exploit the super-light cone (where super-photons travel twice the speed of light).
 - Implausibly requires two sorts of interaction (one for past-directed terminance, one for future-directed terminance).

- One could imagine laws that allow terminants expand ‘as time goes by’.
 - This would require ‘conspiratorial redundancy’ between space-like events.

“I suspect the best way to question the proof’s assumptions is that space-time may not be the arena of fundamental relativity.” (213)

6.3 A Search for Empirical Phenomena

...what experiments reveal backtracking influence?

Common-cause pattern: A triplet of event-kinds $\{C, E_1, E_2\}$ such that,

1. each instance of C is regularly followed by an instance of E_1 and E_2 ,
2. each instance of E_1 is regularly preceded by an instance of C , and,
3. instances of E_1 do not appear to cause E_2 .

e.g. {infection, itch, fever}, {electrical disturbance, lightning, thunder}.

“The lack of influence via a common cause is historically central to the distinction between genuinely causal probabilistic relationships and non-causal statistical correlations [...] If we are following the method of empirical analysis, however, we should not presume our pre-theoretical grasp of this distinction is adequate. Instead we should attempt to formulate an experiment whose results give us good reason to disbelieve in cases of influence via common cause [...] [T]he empirical phenomena are better organized in terms of three distinct experimental schemas.” (215)

The difficulty of defining an experiment to capture the intuitive content of an initially plausible principle guides an empirical analysis toward novel principles that improve the conceptual architecture. (216)

The Backtracking Experiment

Goal is to consider special case of the promotion experiment [...] where we test whether a common-cause pattern allows one effect to influence the other probabilistically through the common cause.

1. Preliminary checks to ensure we have identified a common-cause pattern.
2. Let $\tilde{A} \equiv (\bar{A}, \neg\bar{A})$ be a contrastivisation of A representing an agent, who is able to fiddle directly with E_1 , wanting E_2 to occur rather than wanting E_2 not to occur.
3. Instantiate a zillion instances of \bar{A} and a zillion instances of $\neg\bar{A}$ and observe the fractions $f_{\bar{A}}$ and $f_{\neg\bar{A}}$ respectively, of runs in which C, E_1 and E_2 occur in both sets.
4. The observed degree of prob-influence of A , $f_{\bar{A}} - f_{\neg\bar{A}}$, should match the theoretically predicted value, $p_{\bar{A}}(E_1 \& C \& E_2) - p_{\neg\bar{A}}(E_1 \& C \& E_2)$.

Four grave deficiencies with the experiment as formulated:

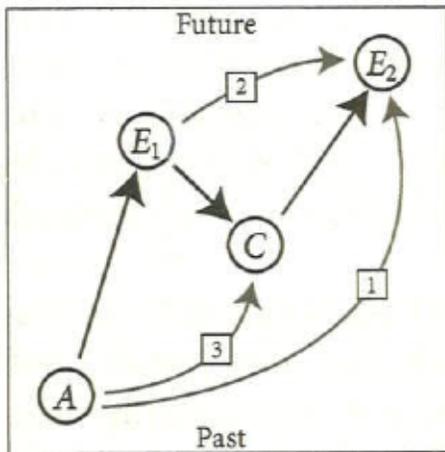


Figure 6.2

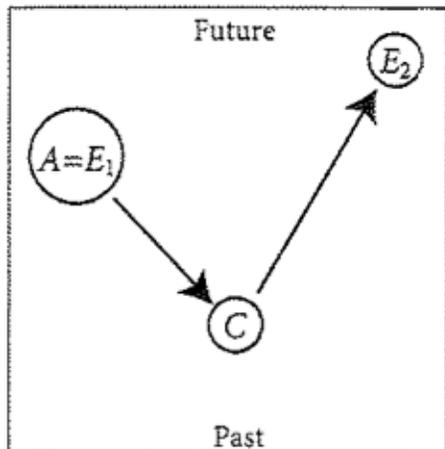


Figure 6.3

No. 4: The experimental design incorporates two concatenated instances of backtracking. This prevents the experiment from distinguishing ‘past-directed then future-directed’ influence independently from ‘future-directed then past-directed’ influence.

Two cases

1. The agent’s action is external to the common-cause pattern s/he is trying to exploit. (Left to the next chapter to show there is no such influence.)
2. The agent’s action *is* the effect E_1 , part of the common-cause pattern the agent is trying to exploit. (Reveals an ambiguity over whether the agent has influence.)

6.4 ‘Past-directed then Future-directed’ Influence

...defining two schemas to decide if agent has past-directed then future-directed influence.

‘Brain correlator’ scenario:

The brain correlator is set up so that it scans the agent’s brain and relays an electronic signal to a separate room where a flag is raised so that the color [green or yellow] of the flag corresponds to the color that the agent will choose. (220)

Q: can the agent’s action E_1 influence E_2 by way of a lawful connection that “goes through” or at least exists by virtue of a brain correlator.

Two ways of modelling the relationship between E_1 and E_2 :

1. Construct a regular contrastivization of E_1 that wholly occurs “at the same time” as E_1 .
 - “[M]y proof of the redundancy of backtracking prob-influence [...] ensures that \tilde{E}_1 can only prob-influence E_2 to the same degree it does in a purely future-directed manner. Thus, \tilde{E}_1 cannot promote E_2 .” (221)
2. Construct an irregular contrastivization of E_1 by adopting \bar{S} as the background.
 - “ $(E_1, \neg E_1, \bar{S})$ exerts a non-zero degree of prob-influence on E_2 [and yet] does not count as *backtracking* prob-influence because neither E_1 nor $\neg E_1$ termine any events toward the past that can in turn termine events toward the future non-redundantly. One should instead understand this example as a case of future-directed prob-influence that exists by virtue of the future-directed fixing that issues from \bar{S} together with the conditionalization on E_1 , i.e. ‘*pseudo-backtracking influence*’” (221)

[The] conditionalization can be interpreted as being evidential in character. Specifically, one can say that the reason $[E_1]$'s existence makes a difference to the probability of E_2 is that it provides evidence about the intervening physical development, which provides a constraint on how \bar{S} eventually evolves toward E_2 . All that is true, yet it is still true that $[E_1]$ makes a difference to E_2 causally because $[\tilde{E}_1]$ prob-influences E_2 to a non-zero degree. I understand that a causal interpretation of this probabilistic relationship is not standard, but its existence follows from the choice to define prob-influence without imposing any restrictions on the scope of the events involved. (165)

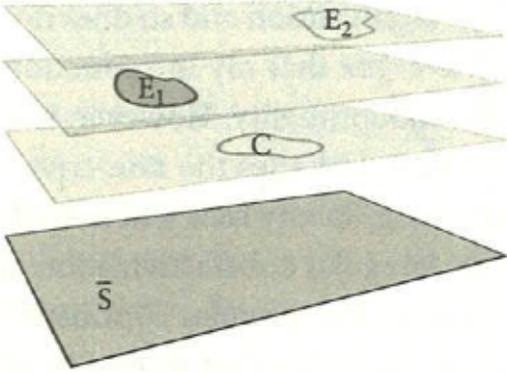


Figure 6.4

A: Whether E_1 affects the probability of E_2 depends on how you render it.

Two potential objections: There needs to be a fact of the matter as to whether E_1 affects the probability of E_2 ...

(i) ...because of some issue beyond explaining empirical phenomena. E.g. The debate between causal and evidential decision theory.

Response:

- Just define a decision-theoretic notion of causation in terms of what events prob-influence when they are contrastivized in ways that do not incorporate events as other times.
- Personally, I see no reason to maintain the traditional distinction [between causal and non-causal], and I think the natural approach toward decision theory from the standpoint of my metaphysics of causation involves accepting that at least some correlations that have traditionally been construed as merely evidential are secretly causal after all. (223)

(ii) ...in order to explain the empirical phenomena associated with effective strategies.

Response:

- There is an alternative way to draw the distinction between effective and ineffective: a certain distinction between exploitable and unexploitable influence (see next chapter).
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