TRUMPING PREEMPTION*

Ex tant counterfactual accounts of causation (CAGs) still cannot handle preemptive causation. I describe a new variety of preemption, defend its possibility, and use it to show the inadequacy of extant CAGs.

Imagine that it is a law of magic that the first spell cast on a given day match the enchantment that midnight. Suppose that at noon Merlin casts a spell (the first that day) to turn the prince into a frog, that at 6:00 pm Morgana casts a spell (the only other that day) to turn the prince into a frog, and that at midnight the prince becomes a frog. Clearly, Merlin's spell (the first that day) is a cause of the prince's becoming a frog and Morgana's is not, because the laws say that the first spells are the consequential ones. Nevertheless, there is no counterfactual dependence of the prince's becoming a frog on Merlin's spell, because Morgana's spell is a dependency-breaking backup. Further, there is neither a failure of intermediary events along the Morgana process (we may dramatize this by stipulating that spells work directly, without any intermediaries), nor any would-be difference in time or manner of the effect absent Merlin’s spell, and thus nothing remains by which extant CAGs might distinguish Merlin’s spell from Morgana's in causal status.

1. TRUMPING PREEMPTION

In order to establish the possibility and relevance of trumping scenarios such as the wizard's case, I rebut the following imagined objections: that the causal judgments evoked are unclear, that the laws involved are question-begging, and that the case invoked is unrealistic, either in the sense that it is empirically implausible, given what we know about our world, or in the sense that it is pretheoretically

* Thanks to John Carroll, Gian Duot, Barry Loewer, Tim Maudlin, Brian McLaughlin, L. A. Paul, and especially to Ned Hall and David Lewis.

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calling her spell a cause of the enchantment posits causation not covered by law.

Now, consider the relation between causes and explanations. Intuitively, if you want to know why the prince became a frog that midnight, Merlin’s spell is part of a good answer. The deductive account of explanation vindicates this intuition:

(1) At noon, Merlin cast a spell to turn the prince into a frog.
(2) No other spells were cast that day prior to or contemporaneous with Merlin’s.
(3) It is a law that the first spell cast on a given day match the enchantment that midnight.
(4) The prince became a frog at midnight.

Thus, treating Merlin’s spell as a cause respects the connection between causes and explainers. Morgana’s spell, in contrast, intuitively explains nothing about the prince’s fate, and the deductive account vindicates this intuition:

(1) At 6:00 pm, Morgana cast a spell to turn the prince into a frog.
(2) ...
(3) It is a law that the first spell cast on a given day match the enchantment that midnight.
(4) The prince became a frog at midnight.

There is no way to fill in (2) so as to get a deductively valid argument without rendering (1) superfluous, since the argument will be deductively valid (in a way that makes essential use of the laws in (3)) only when a first spell is specified, at which point Morgana’s spell need not be. Thus, calling Morgana’s spell a cause involves causes that explain nothing.

\[1\] The main extant accounts of explanation are (a) deductive, (b) causal, and (c) pragmatic accounts. While (b) and (c) are not helpful here, because with regard to (b) the cause of the prince’s metamorphosis is currently at issue, and with regard to (c) these accounts yield (by design) no objective fact, account (a) proves helpful. I take it that most will concede that, whether or not deductive accounts are ultimately viable, they at least provide reasonable codifications of our intuitions in most cases.

\[2\] There are tricks around this, such as by filling in (2) with some sort of disjunction, such as either Morgana’s spell was first that day, or it was not but what was first agreed with Morgana’s in the enchantment it called for. But these are just the tricks which a deductive account of explanation must rule out as implausible anyway, and so in using the deductive account to justify our intuitions, we may assume (though we may not even be able to say how) such tricks are excluded.

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Next, consider the relation between causes and counterfactual variance. Had Merlin’s spell been different, such as a spell to turn the prince into a goat, then the prince’s fate would have been different: he would have become a goat. Thus, the prince’s fate counterfactually varies with Merlin’s magic, just as the barometer reading counterfactually varies with the atmospheric pressure, in that in both cases the noncompositional family of propositions representing differences in the former counterfactually depends on the noncompositional family of propositions representing differences in the latter—a relation that David Lewis points out is typical of such intuitively causal processes as measurement, perception, and control. Not so for Morgana’s spell: had she cast a spell to turn the prince into a goat, to protect his humanity, or even to make the sky the color of gold, come midnight all that would happen would be the prince’s becoming a frog (because we are holding fixed Merlin’s prior spell as well as the laws). To call her spell a cause would be to countenance causes whose alleged effects were counterfactually oblivious to them.

Finally, as to the relation between causes and agency, it is widely agreed that, “If an effect is an end, its causes are means to it.” This is usually spelled out decision theoretically: if E is a desired end and C a prospective means, C will be effective if and only if the probability of E given C is greater than the probability of E given ¬C. One way to spell this idea out in more detail is to use agent probabilities (on which actions are assumed free in having no causal antecedents), so that C will be effective if and only if p*(E/C) > p*(E/¬C). On this test, Merlin’s spell is an effective means for (E) the prince’s becoming a frog, since p*(E|Merlin-casts-his-spell)=1, while p*(E|Merlin-does-not-cast-his-spell)<1 (Morgana is assumed free, so she might not cast her spell). Morgana’s spell, on the other hand, is ineffective, since p*(E|Morgana-does-not-cast-her-spell)=1 as Merlin has already acted to determine the prince’s fate. Thus, treating Merlin’s spell as a cause and Morgana’s as a noncause of the prince’s becoming a frog respects the agential connotations of causes as means.

Finally, consideration of the relation between causes and evidence will converge on the same conclusion, namely, that Merlin’s spell is a cause of the prince’s metamorphosis and Morgana’s not. Intuitively, causes provide (epistemically valuable) evidence both to and from their effects: if I see someone fire a bullet at Jones’s heart, I am licensed to infer that Jones will die; and, conversely, if I see Jones supine with a bullet-shaped entry wound left of his sternum, I am licensed to infer that he was shot. There is typically a relation of scale in both directions: the more details I know about the cause, the more details I have license to predict concerning the effect; and the more details I know about the effect, the more details I have license to retrodict concerning the cause.

Suppose that all I know about Merlin’s spell is that it is the first one cast that day, then all I have license to predict is that there will be some enchantment at midnight. If I learn more detail, such as that it targets the prince, then I can predict the resulting enchantment in more detail, namely, that it will concern the prince. And so on. This relation of scale also holds in reverse. If I know that the prince became a frog, I may infer that a spell of the form ‘Presto, prince to frog!’ was first that day. And if I then learn that Merlin’s spell was first that day, I can come to know its intimate details, though I never witnessed it. Merlin’s magic fits the prince’s fate as the gun its bullet.

Morgana’s spell, once again, fails the test of causes. If I know that hers is not the first that day, I can infer nothing about what will happen.

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4 This follows on such leading accounts of counterfactual implication as David Lewis’s in Counterfactuals (Cambridge: Harvard, 1973). According to Lewis, we evaluate the implications of the counterfactual supposition that Merlin had cast a spell to turn the prince into a goat by postulating a minimal “divergence miracle” on which Merlin says ‘Presto, prince to goat!’ instead of ‘Presto, prince to frog!’ while holding fixed the course of history up to Merlin’s conjuring (so holding fixed the absence of any prior or contemporaneous spells that day) as well as the laws (so presumably keeping the magic laws intact) to the extent compossible with the miracle; all this results in Merlin’s casting the first spell that day to turn the prince into a goat, where the first spell cast match midnight enchantments, and so all this results in the prince’s becoming a goat that midnight.

5 “Causation,” in his Philosophical Papers, Volume II (New York: Oxford, 1986), pp. 159-72, here p. 165. Since I shall show that Lewis’s counterfactual account of causation fails to accommodate this variational type of counterfactual dependence in trumping cases, one way to read this result is that Lewis’s account of causation as counterfactual dependence between event occurrences fails to capture his own intuitions about the general relation between counterfactual variance and causation.


7 The main versions of decision theory are (a) evidential, and (b) causal (turning on whether “the probability of E given C” is interpreted as (a) p(C/E), p(C), or (b) p(C will cause E). While (b) is not helpful since whether C causes E is currently at issue, (a) proves helpful, and since (a) and (b) agree on non-Newcomb cases, (a) can be used neutrally in the case at hand. See William L. Harper and Brian Skyrms, eds., Causation in Decision, Belief Change, and Statistics (Boston: Kluwer, 1988). The point of introducing agent probabilities is to free evidentialism from the spurious correlations of Newcomb cases. For further discussion, see Peter Menzies and How Price, “Causation as a Secondary Quality,” British Journal for the Philosophy of Science, XLIV (1993): 197-205.
at midnight from the details of her performance. If I do not know that hers is not the first that day, any inferences I make based on her performance will be, if true, merely accidentally so (and so not licensed). In reverse, if I know what enchantment has befallen the prince that midnight, I have no license for inferring the details of later spells cast that day, and any inferences I make concerning Morgan's spell out of ignorance as to the fact that Merlin's came earlier will be at best accidentally true.

In summary, Merlin's spell is nomically antecedent for, explanatory of, counterfactually variant with, a means to, and evidence both to and from, the prince's becoming a frog at midnight, while Morgan's spell is none of these. So every individual measure of causeworthiness converges on the result that Merlin's spell is a cause of the prince's becoming a frog, while Morgan's spell is not.

Objection: the arguments that Merlin's spell is a cause and Morgan's not of the prince's metamorphosis all turn on the stipulated law that the first spells cast match midnight enchantments. But such stipulation begs the question against those (such as Lewis, the leading proponent of CACs) who hold that laws supervene on occurrences. Why not stipulate that last spells cast match midnight enchantments, or that at least they do when first and last spells agree, since in any case the result is the same: the prince becomes a frog at midnight? If these stipulations represent genuine possibilities, then the supervenience of laws on facts is lost.

Reply: even if the wizards scenario were incompatible with the supervenience of laws on facts, this would still show (surprisingly) that the success of CACs is tied to the supervenience of laws. Those who would deny supervenience in the manner of Fred Dretske, Michael Tooley, and Armstrong* (who hold that laws are contingent necessitation relations between universals) could not avail themselves of this objection, since on their view there may well be a contingent necessitation relation between the universals 'first spell cast on day x' and 'midnight enchantment on day x'; those who would deny supervenience in the manner of John Carroll and Tim Maudlin* (who hold that laws are primitive) could not avail themselves of this objection either, since on their view there is no barrier at all to the existence of a primitive lawful relation between the first spells and midnight enchantments. But no matter. To the philosopher who is willing to tie the success of CACs to the supervenience of laws on facts, I reply that the existence of laws favoring the first spells even when first and later spells agree (as per the wizards) is fully compatible with the supervenience of laws on facts, and is actually entailed by leading supervenientist accounts of laws, given certain facts in the world's history.

Suppose laws supervene on facts, and suppose for the sake of definiteness that (1) laws supervene as per the Mill-Ramsay-Lewis** (MRL) account: L is a law of nature if and only if L is a theorem of the axiomatization of the facts that best balances simplicity and strength. Now (2) let the world history contain "decisive competition" between spells, where first and later spells disagree, and where the first spell cast always wins (that is, you try first to turn the queen into a frog, I try later to turn her into a goat, and she becomes a frog). Finally (3), let the laws summarizing the nonmagical remainder of the world history be independent of the magical laws (so, the world is otherwise Newtonian). This suffices to fix the laws as per the wizards case: when first and later spells agree, it will be simpler (and just as strong) to regard these cases as extensions of the same overall pattern of first-spell dominance found in (2), rather than as new examples of a second pattern of later-spell dominance or first- and later-spell equality; this gain in simplicity will not compromise the simplicity/strength of the other laws since they are assumed independent by (3), and so this local and not-compromised elsewhere gain in simplicity without loss in strength will by (1) entail laws favoring the first spells even when first and later spells agree.

Somewhat more precisely, consider how the laws of a world in which the first spells dominate when first and later spells disagree might cover cases in which first and later spells agree:

* In a sense, Morgan's spell is evidence for the prince's becoming a frog, since given certain (plausible) prior probability distributions, one may assign a greater subjective probability to the prince's becoming a frog given Morgan's spell. But this is not a sense of 'evidence' relevant here, since in this sense, given certain prior probability distributions, anything may count as evidence for anything (in particular the increased probability that the conditionalizer may assign prince-to-frog given Morgan's spell is exactly parallel to the increased probability assignable victim's death given backup shooter's presence; Morgan's spell carries exactly as much as and as little evidence of the effect as any preempted process). The sense of 'evidence' relevant here, which typically holds between cause and effect, which holds between Merlin's spell and the prince's becoming a frog, is evidence with epistemic value: that which may confer knowledge.


thinks laws are contingent necessitation relations between universals in the manner of Dreiske, Tooley, and Armstrong, or who thinks laws are primitive in the manner of Carroll and Mandl, should accept that there are at least some worlds with laws as per the wizards (they will presumably add that there are other worlds, factually identical to the wizards with laws as in (b), (c), and (d), and maybe with no laws at all). Thus, the laws invoked should be unproblematic on reflection.\footnote{Perhaps some will balk at the laws invoked, not because of worries about supervenience, but because of disbelief in the possibility of laws projecting extrinsic properties, such as being first cast on a given day. I see no grounds for such disbelief (moreover none of the leading accounts of lawhood provides grounds for such disbelief). Further, I take worlds such as the wizards world, in which there is perfect covariation between events with the extrinsic property of being-the-first-spell-cast-on-a-day and events of midnight enchantments, and in which there may well be no such covariation between events mere-intrinsic all-described and midnight enchantments, to show exactly why such disbelief is unwarranted.}

**Objection:** causation is an empirical concept, and an account that mishandles fairy-tale cases like the wizards will be no less empirically adequate. Even if the wizards case is a conceptual possibility, it involves magic and action-at-a-distance, and so is too far-fetched to worry about.

**Reply:** I think accounts of causation need to be not just empirically but conceptually adequate. Without prior conceptual analysis, how could we tell whether an empirical investigation had hit its mark? But no matter. To the philosopher who scorns such "merely conceptual possibilities" as those involving magic and action-at-a-distance and demands empirically plausible scenarios, I reply that there exist empirically plausible trumping scenarios.

Imagine a world whose laws of physics are very much like our own, but for recognizing types of fields, 'black', 'grey', and 'white', which do not superpose. Whenever a particle is subject to just one of these fields (assume for simplicity that no further forces are present), the particle will accelerate along a curved trajectory:

\[\text{Source (black, grey, or white)}\]

Whenever a particle is subject to multiple fields, the particle will ac-
Thus, the laws of physics at this world would include a color-field law, most simply formulated as: the intensity of the darkest fields on a given object = the color force on that object. Although this world does not have the physics we now believe our world to have, it is relatively easy to imagine actual physicists discovering further types of fields, performing the experiments represented above, and supplementing our laws of physics in accord. Moreover, this world is free of magic, action-at-a-distance, and other types of “far-fetched” causal connections. It is in this sense that it is empirically plausible.

Now, if a particle is subject to both a black and a white field that “pull in the same direction” with the same magnitude, it is still only the black field that causes the resultant acceleration:

Here, we have an empirically plausible trumping scenario: replace Merlin with the black source, Morgana with the white source, the prince’s fate with the particle’s acceleration, spells with fields, and laws favoring earlier spells with laws favoring darker fields—the arguments from cause-worthiness all carry over.

The fields case shows that all that is needed for trumping are three events, C1, C2, and E, where E would be produced by C1 alone or by C2 alone (redundant causation), but where the laws render C1

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10 This does not mean that white fields in general are always trumped: there may be times when no black fields exist, or the black fields might have finite spatial extent, or the black fields might trump only insofar as they exceed a certain threshold. Nor does it mean that this particular white field is completely epiphenomenal: it might trump on other types of particles, or trigger a white flag in the distance, or have any number of other effects as long as they are not manifest on this particle. More interestingly, there might be a functional law on which the ratio of darker field to lighter field influences cycles through the epoch, with the relevant experiments done in a 1:0 epoch. This raises the empirically open possibility that our world is such a world (with respect to, say, types of electromagnetic force): our epoch just happens to be 1:1, so we do not notice.

11 This particular case is a variant of one due to Bas van Fraassen, though the discovery of this type of case is Ned Hall’s. A variant of one of Hall’s cases illustrates just how common these cases are: the Bradfs are deciding where to vacation, and Cindy and Bobbi both plead “Hawaii!” Since Mr. and Mrs. always do what Cindy wants, the Bradfs decide on Hawaii. Trumping is everywhere.
that causation is a folk concept are not entitled to such sophisticated presumptions. Perhaps the corporal decides to charge via some such unconscious intermediate filter (as in standard preemption), or perhaps he decides to charge because his training has simply made his decision module exclusively sensitive to ranking orders (as in trumping preemption). The folk do not know how the mind is wired here, and from the point of view of attributing causation, they do not care.

In conclusion, trumping preemptions are intuitively clear, unproblematic in their assumptions, and fully realistic in being both empirically and pretheoretically plausible. Pending further objections, I take the above to show that delivering the right verdict in trumping cases is an adequacy condition on an account of causation.

II. COUNTERFACTUAL ACCOUNTS OF CAUSATION

CACs, developed especially by Lewis, in their simplest form claim that: C causes E if and only if (i) C and E are actual, distinct events, and (ii) if C had not occurred, E would not have occurred.

Preemptions show that simple counterfactual dependence is not necessary for causation, because, in evaluating the counterfactual implications of C's not occurring, we hold the presence of the backup fixed, and so still get E. In response, defenders of CACs have refined the counterfactual-dependence relation. The leading extant refinements (Lewis's ancestral dependence, fragility, and quasi-dependence; Peter Menzies's continuous processes; Michael McDermott's minimal-counterfactual sufficiency; Murali Ramachandran's minimal-dependence sets) all rely on failed intermediaries along the backup process or on would-be differences in the effect absent the main process to distinguish preempting causes from preempted backups. For this reason, none has the resources to distinguish trumping causes from trumped backups.

Ancestral dependence, quasi-dependence, continuous processes, and minimal-dependence sets all rely on failed intermediaries along the backup process to distinguish preempting causes from preempted backups. According to ancestral dependence (suggested by Lewis to transitize simple counterfactual dependence and handle preemption cases in one swoop), C may cause E even though E does not counterfactually depend on C, as long as there is an event D (or some finite set of Ds) such that E counterfactually depends on D and

Thus, where there are two gunmen C and C' but only C shoots, the death E does not counterfactually depend on either C or C', but does presumably depend on the bullet-flying D, which in turn depends on C. Ancestral dependence works only if there are failed intermediaries on the backup process prior to the effect (early), since these failures are what create counterfactual dependence of the effect on some post-failure intermediary D along the main process, by spoiling the dependency-breaking redundancy. For this reason, ancestral dependence miscounts the trumping cause as a noncause. There is no intermediary along the trumping process such that the effect depends on it, either because the causation is direct (no intermediaries), as in the wizards, or because the trumped process is fully intact, as with the white field that propagates all the way to the particle, and with the sergeant's order that remains with the corporal throughout the decision process, breaking the dependency of the effect on all intermediaries along the entire trumping process.

According to quasi-dependence (tentatively adopted by Lewis at the end of postscript E to "Causation"), C may cause E even though E does not counterfactually depend on C, as long as C and E are part of a process that is intrinsically such as typically to induce counterfactual dependence (this relation of counterfactual or quasi-dependence is then transitized by taking the ancestral). Thus, where there are two gunmen C and C' but only C shoots, the C to E process will still be intrinsically such as typically to induce counterfactual dependence, because the presence of a backup gunman is presumably atypical. What about the C' to E process? The only reason I can see why this process (understood, for example, as the sequence of events C' armed and malevolent, E dead) is intrinsically not such as typically to induce counterfactual dependence is that there are failed requisite intermediaries along this process, such as a failure of C' to pull the trigger.17 For this reason, quasi-dependence miscounts the trumped backup as a cause. If Merlin's spell is to count as a cause because the great majority of intrinsic duplicates of the sequence <Merlin casts prince to frog, prince turns to frog> exhibit counterfactual dependency, then Morgana's spell must count as a cause as well, since the great majority of intrinsic duplicates of <Morgana casts prince to frog, prince turns to frog> will exhibit just as much dependency, since in both cases we abstract away from the atypical presence of a rival spell caster; likewise for the field-process and sol-


dier-process duplicates. Trumping cases show that the intuition that motivates quasi-dependence—namely, that causation is determined by the intrinsic character of events (plus the laws)—is hasty, since the laws may well be sensitive to extrinsic characteristics, such as which spell is earlier.

The continuous-process refinement (suggested by Menzies as a solution to “making it the hard way” preemption cases) requires that C and E be connected by a temporally continuous chain of counterfactual dependencies. Here, failed intermediaries function as discontinuities in the dependency chains from the backup. Without these discontinuities, the backup will spoil the final dependency of effect on the immediately prior event along the causal process. Thus, because the trumped backup runs continuously in the fields case, the final dependency of the particle’s acceleration on the black source is spoiled by the continued propagation of the white field, and so the continuity requirement miscounts the trumping cause as a noncause. Worse, requiring temporal continuity rules out by brute stipulation the intuitive possibility of action-at-a-distance and so could not count Merlin’s spell as a cause even if Morgana had not cast a spell at all.¹⁸

According to minimal-dependence sets (devised by Ramachandran), preempter C counts as a cause of E because the C-process involves only actual events, while backup C′ is not a cause because the C′-process includes failed events. First, Ramachandran defines an M-set for E as a nonempty set of events S such that:

(i) E is not a member of S, (ii) no members of S had occurred, E would not have occurred, and (iii) no proper subset of S meets (ii).

He then shows that M-sets will contain exactly one event, actual or not, from each process, preempted or not, leading to E, and concludes that C causes E if and only if:

(iv) C and E are actual events, (v) C is in an M-set for E, and (vi) there

¹⁸ Menzies has recently moved to a theoretical definition of causation on which causation is that intrinsic relation between actual, distinct events which typically induces counterfactual dependence between them—“Probabilistic Causation and the Pre-emption Problem,” Mind, 87 (1986): 85-116. This definition is still troubled by trumping, since it takes as platitudinous that causation is an intrinsic-to-its-pairs relation between events. Take different-day duplicates of the pair <Merlin’s spell, prince’s metamorphosis>. Whether a given duplicate is causal will depend, inter alia, on whether there was a Morgana spell at 9:00 am. Thus, trumping refutes Menzies’s central assertion that, “The distinctive mark of our intuitive concept of causation... is that it takes causal relations to be determined by the natural properties of the relata and the natural relations holding between them, taken in isolation from everything else happening in the world” (ibid., p. 100).

are no two M-sets for E which differ only in having one or more nonactual events in place of C.

The failed-intermediaries idea is implemented in (vi), since given that M-sets contain exactly one event from each process, C′ will be replaceable by a nonactual event (and thus not a cause) only if there is a nonactual event on its process. Ramachandran is fully explicit in his reliance on the failed-intermediaries idea:

It seems true in all genuine cases of causal pre-emption... that the preempted processes do not run their full course,... For any pre-empted cause x, of an event, y, there will be at least one possible event... which fails to occur in the actual circumstances but which would have to occur in order for x to be a genuine cause of y. All genuine causes, on the other hand do seem to run their full course; indeed, they presumably count as genuine precisely because they do so (op. cit., p. 273).

Thus, minimal-dependence sets miscounts the trumped backup as a cause, because it runs its full course. In the wizards case, [Merlin’s spell, Morgana’s spell] will be an M-set for the prince’s metamorphosis, but there will be no nonactual event substitutable for Morgana’s spell, since there is no nonactual event along the process from Morgana’s spell to the effect; likewise for the fields and soldiers cases.

Thus, ancestral dependence, quasi-dependence, continuous processes, and minimal-dependence sets cannot distinguish trumped from trumped. It is important to see that this failure is due, not to the mere details of each refinement, but to the underlying assumption they share (call this the cutting assumption) that backup processes are such because they have failed intermediaries. Trumping preemption show that the root idea of these refinements is inadequate.

Both fragility and minimal-counterfactual sufficiency add the strictest standards of event individuation to the failed-intermediaries idea. According to fragility (proposed though tentatively rejected by Lewis on grounds of spurious causation), the above ancestral-dependency analysis is to be implemented on the understanding that events have their times and manners of occurrence essentially.¹⁹ Fragility-based approaches are intended to handle late preemption cases in which the failed intermediaries delay the occurrence of the event, and can be implemented with a view to preserving the idea of causation as a natural property of events.

¹⁹ We may distinguish temporal fragility from fragility of manner, and fragility of effects from fragility of events generally. All Lewis needs (for his reply to late pre-emption) is the temporal fragility of effects. In fact, all that is needed is the stipulation that the effect not be delayed, as L. A. Paul has shown in “Keeping Track of the Time,” Analysis, 33 (1983): 191-98. Nothing here will turn on the details of how the fragility proposal is implemented.
aries on the backup process occur at or after the time of the effect (since it then follows, assuming no simultaneous/backward causation, that had the backup been left to produce the effect, the effect would have been delayed) and are no help at all with trumping. In the wizard's case, for instance, the prince's metamorphosis, absent Merlin's spell, would still take place at exactly midnight, and in precisely the same manner; the analogous point applies to the fields and soldiers cases. Thus, the fragility refinement discounts the trumping cause as a noncause. According to minimal-counterfactual sufficiency (due to McDermott), the root causal notion is of counterfactual sufficiency between strictly individuated events, where a set of actual events C is counterfactually sufficient for E if and only if:

There is no set of actual events D, where E is not a member of D, such that (if the members of C had all occurred and the members of D had all not occurred, then E would not have occurred.)

Now, C is minimally counterfactually sufficient for E if and only if:

(i) C is counterfactually sufficient for E, (ii) no proper subset of C is counterfactually sufficient for E, and (iii) there is no actual event D (distinct from E and the members of C) such that for some proper subset C' of C, C' U |D| is counterfactually sufficient for E, and for some proper subset C'' of C, C'' U |形成的 D| is counterfactually sufficient for E.

McDermott equates direct causation with minimal-counterfactual sufficiency, and claims that, "a part of a minimal sufficient condition is always a cause" (op. cit., p. 535). He denies the converse, and so supplements his account by defining processes via chains of minimally counterfactually sufficient conditions, relativizing causes to processes, and distinguishing between realizing the real as opposed to nominal essence of an event. I need not spell out these (considerable) complications here, since the trumped backup disproves the claim that a part of a minimally counterfactually sufficient condition is always a cause, and since these complications merely countenance more causes. Consider the set [Morgan's spell]. It is a sufficient condition, according to the strictly-individuated counterfactual-based definition, since its occurrence by itself would still lead to the prince's becoming a frog exactly as and when he actually does. It is clearly minimal, since (i) it is sufficient, (ii) its only proper subset, [], is not sufficient for the prince's becoming a frog, and (iii) there is no actual event D such that both [] U |D| as well as [] U |形成的 D| are sufficient for the prince's becoming a frog (in particular Merlin's spell fails the latter). But Morgan's spell, despite being part of a minimally counterfactually sufficient condition, is not a cause of the prince's becoming a frog.

Thus, fragility and minimal counterfactual sufficiency cannot distinguish trumping from trumped. This failure is due to the underlying assumption they share (call this the precision assumption), namely, that backup processes are such that had they run to completion, the effect would have been somewhat different in time or manner. Trumping preemptions show that the root idea of these refinements is inadequate.

In conclusion, extant CACs still cannot handle preemptive causation. Trumping preemptions show that the failed intermediary and would-be differences strategies that extant CACs use are inadequate as general solutions to the preemption problem. Of course, there may yet be some new strategy for CACs which will prove adequate, but at this point the prospects look dark.

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21 Adding the rest of McDermott's machinery: the set P of all events involved in the process is [Morgan's spell, the prince becoming a frog], the set B of intermediate events is [], and the set Pr of primary causal factors is [Morgan's spell]. Now, it is clear that Morgan's spell is counterfactually sufficient relative to P, and minimally so, and so vis-à-vis realizing the nominal essence of E, which is just the prince's becoming a frog. The added machinery will not help with the fields of soldiers, either. In the fields case (the analogous points will hold for the soldiers), the process is something like [the insertion of the white source, the propagation of the white field, the white field hitting the particle, the particle accelerating along a curved trajectory]. The set Pr is [the insertion of the white source]. Now, all the intermediaries in the process are held fixed, and so the insertion of the white source now counts as counterfactually sufficient relative to P, and minimally so, and so vis-à-vis the nominalization "the particle's accelerating along a curved trajectory," and thus the presence of the white source is misconstrued as a cause.

22 One solution to trumping is to analyze causation via nonsemantic subsumption rather than counterfactual dependence, since Merlin's spell is subsumed under the magic law while Morgan's is not (likewise for the fields, and likewise presumably for the soldiers given that the corporal's decision module works as described). But this is a whole other story.