Causation and Misconnections

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In this paper I show how the conserved quantity theory, or more generally the process theory of Wesley Salmon and myself, provides a sufficient condition in an analysis of causation. To do so I will show how it handles the problem of alleged 'misconnections'. I show what the conserved quantity theory says about such cases, and why intuitions are not to be taken as sacrosanct.

1. Introduction. I wish to deal with a specific objection to the process theory of causation as articulated by Wes Salmon (1997, 1998) and myself. By 'process theory' I mean an account of causation that takes causal processes and interactions as more fundamental than causal relations. To express this, Salmon liked to quote John Venn's words to the effect that our thinking about causation would benefit from replacing the metaphor of the chain of causation with one of a rope of causation. On the process theory, then, any truths about causation as a relation between events are true only on account of more basic facts about causal processes and interactions. The alternative is to treat causal relations as more basic, and then to define processes as chains of causal relations (e.g., David Lewis 1986).

Take Salmon's version of the conserved quantity theory:[1]

> A causal interaction is an intersection of world-lines that involves exchange of a conserved quantity. . . .

> A causal process is the world-line of an object that transmits a non-zero amount of a conserved quantity at each moment of its history (each spacetime point of its trajectory). (Salmon 1997, 468)

The concept of transmission is to be understood by the following definition:

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1. The same arguments will apply to my version given in Dowe 1992, 2000.

> A process transmits a conserved quantity between A and B (A ≠ B) if and only if it possesses [a fixed amount of] this quantity at A and at B and at every stage of the process between A and B without any interactions in the open interval (A, B) that involve an exchange of that particular conserved quantity. (Salmon 1997, 462)

Further, we can think of the relata of causal relations as facts, events, or whatever involving an object possessing a conserved quantity. Causal relations hold between such events or facts only if there is a set of causal processes and interactions connecting them. The process theory is therefore *localist*, meaning that facts about causation obtain in virtue of actual local features of the world.

The process theory is offered as an *empirical analysis*, meaning that it concerns an objective feature of the actual world and that it draws its primary justification from our best scientific theories. Empirical analysis is to be contrasted with *conceptual analysis*, the approach that says in offering a theory of causation we seek to give an account of the concept as revealed in the way we (i.e., folk) think and speak. Conceptual analysis respects as primary data intuitions about causation; empirical analysis has no such commitment (Dowe 2000, ch. 1).

2. The Problem of Misconnections. The problem of misconnections is that there are cases which our clear intuitions say are not cases of causation, but which, according to the process theory, are cases of causation. It is then argued on the basis of such cases that the process theory does not provide a sufficient condition for causation (Ehring 2003). We will consider two cases.

Case 1. Irrelevance.—Suppose someone takes a photo of a game of billiards, such that just as the white and black balls collide, the flash illuminates the balls. The black ball continues on into the pocket as a result of the collision. Intuitively, the white ball striking it causes the black ball to sink, but the flash illuminating the collision does not. It is causally irrelevant. However, there is a set of causal processes and interactions connecting the taking of the photo with the ball sinking, so on the process theory it counts as a cause. This is because there is a small exchange of energy between the light and the black ball as it is struck by the white ball, so the light is part of the causal interaction.

Case 2. Negative relevance.—John turns on the heater. Jane comes into the room and opens the window. Subsequently the room is colder than it was before. Intuitively, John's turning on the heater doesn't cause the room to be colder; on the contrary, it is negatively relevant. However, since there is a set of causal processes and interactions linking John's

turning on the heater to the room being colder later, the process theory entails that it is a cause.

Thus, the objection goes, we need a more restrictive account of causal relevance than that provided by the process theory. I have provided an answer to this objection (Dowe 2000, ch. 7). However, in a conversation with the late Wes Salmon, another answer came to light which I wish to outline in this paper. First, however, we need to discuss the dangers of appealing to intuitions.

3. Intuition Dangers. As mentioned above, conceptual analysis—of the concept as revealed in the way we (i.e., folk) think and speak—relies on as primary data intuitions about causation. It requires that the analysis should yield the same answer any competent user of the language would give about particular cases. If our intuitions say such and such is a clear case of causation, then as far as is possible the theory should also give that result. In actual practice it's the "clear" intuitions of philosophers that form the relevant data. I have three problems with this methodology.

1. The method as practiced is untested for reliability. Are the intuitions of philosophers a reliable guide to folk concepts? Nobody knows; it's a claim that needs testing. My anecdotal evidence is that philosophers routinely disagree about what is taken as "clear intuitions of the folk." And are the intuitions of philosophers biased by philosophical commitments? Again, this needs testing. My anecdotal evidence is that philosophers' "clear intuitions" tend to be associated with our own theories.

2. The methodology encourages far-fetched examples because the analysis if true is taken to be a conceptual truth. For example, we often read something like: "Take a world with very different laws. Would we say intuitively that x is a case of causation?" Such worlds might be inhabited by gods or demons, or they might contain virtually nothing. But not only are such 'intuitions' as might be mustered meaningless for empirical analysis, given that such worlds are so removed from common sense. they also seem suspect as data for a mapping of a concept in any actual culture. (This problem doesn't apply to the cases under consideration in this paper.)

3. I also worry that folk intuitions about causation are biased towards specific human interests such as responsibility. Such interests are not specifically part of the concept of causation itself.

There is long standing tradition which deals with problem 3. Take J. S. Mill. On the Millian tradition a scientific theory of causes tells us that all partial causes are relevant: together they make up the total cause. Any partial cause could be treated as a 'cause' in virtue of the fact that it is

part of the scientific cause, but our everyday intuition of '*the* cause' which tends to select one partial cause over others, does so because of human interests and is of no relevance to a scientific account. For example, intuitively the striking of the match is the cause of the explosion, but not the presence of oxygen. We make this mistake because striking the match is something which we have more control over and are likely to be held responsible for. The tradition then tends to relegate consideration of such interests to so-called 'pragmatics'.

Another aspect is transitivity. A mother sends her son to buy milk at the shop, but he steals some chocolate. By transitivity, since her sending him to the shop caused him to be in the shop where he had the temptation, which in turn caused him to steal, she therefore caused his stealing, albeit counterintuitively. Since causation is transitive (according to most theorists of causation), but intuitively she doesn't cause him to steal even though she caused him to go to the shop, the tradition deals with this by relegating such considerations to 'pragmatics'. Typically we think of longer chains as not causation even though they are, because they are less within our control. Thus in law there is usually a 'break' before the chain is traced back too far, even though the definition of causation utilized in law—sine non qua—is transitive. The same treatment can be given for cases like "the big bang caused today's rain."

Thus we have a tradition which relegates counterintuitive cases to pragmatics, a tradition well accepted because most theorists of causation take causation to be transitive and deny special status to any partial cause. With this general discussion of the dangers of intuitions in place, we now turn to specific answers to the examples of alleged misconnections.

4. Irrelevance. The objection we outlined in Section 2 notes that the process theory takes intuitively irrelevant factors as causes. Intuitively, the flash illuminating the collision did not cause the black ball to sink, but there is a set of causal processes and interactions (as defined by the conserved quantity theory) connecting the flash with the ball sinking.

There are two possible cases. First, if the incident light makes no difference to the momenta of the balls, where 'difference' is understood in terms of the application of the conservation law to the interaction, then indeed the flash is not a cause, as we would think intuitively. But second, if the light makes a small, even "negligible" difference to the momenta of the balls, then it is indeed a cause on the conserved quantity theory.

That this is counterintuitive can be handled straightforwardly in line with the Mill tradition on partial causes. On the conserved quantity theory, all contributions count as causes, however small. It is not necessary for the theory to explain why we intuitively count some partial causes as causes and not others, but the 'pragmatics' no doubt will tell us to ignore

negligible contributions. (It may be objected that the reason we don't count the light as a partial cause is that the ball would have sunk all the same without it. We deal with this kind of objection in the next section.)

5. Negative Relevance. John turns on the heater (event x). Jane comes into the room and opens the window (event y). Subsequently the room is colder than it was before x (event z). Counterintuitively, there is a set of causal processes and interactions linking x to z.

First, we need to expand a little on the conserved quantity theory. Causal events or facts involve just the actual obtaining of local quantitative properties (Dowe 2000, ch. 7). The description "is colder than before" is disjunctive—there is a very large range of possible room temperatures that fit this description. If our causal events—in this case the effect—involve just the actual obtaining of local quantitative properties then we need to redescribe the effect in terms of just the actual room temperature at that time, let's say 4 degrees C (call this event z^*). Thus we must say that the process theory says that x causes z^* (rather than z).

Second, z^* has partial causes x and y. Put this way, all theories of causation would be in agreement. For example, z^* depends counterfactually on both x and y. And put this way, we can see why our interests (intentions, remoteness, etc.) would lead us to focus on y and not x.

And third, this example is like a standard counterexample to transitivity (granting that Jane opens the window in effect because the heater was on). As Lewis (2000) puts it, Red acts for an end, leading Black to counter successfully. Does Red cause that success? Lewis sees no option but to abandon the intuition and go with transitivity. We do too. Such intuitions can be explained by 'pragmatics'.

Finally, to see why we can be comfortable disregarding intuitions, consider what folk intuitions might be about the following two claims. (1) Turning on the heater caused the room to get colder. (2) Turning on the heater (together with other factors) caused the room to be 4 degrees C an hour later. I submit that intuitions would be (1) No; (2) Yes. This illustrates how sensitive our intuitions are to which factors are focussed on. But the causal story remains the same, and the difference is well explained by pragmatics. This connection is not a misconnection.

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