Philosophy of Causation in the Age of Science

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Chapter 9

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1 Introduction

What is philosophy of science in an age of science? What should its method be, given presently accepted scientific theories? In order to answer this broad question, I focus on one particular aspect of philosophy of science: the philosophy of *causation.* There is an ongoing and ancient dialogue between philosophy of science and science itself regarding causes, first exemplified in the work of individual philosopher-scientists like Aristotle, and later separated out into specialized fields of study (cf. Hankinson, 2001; Clatterbaugh, 1999; Vlastos, 1969). Scientists attempt to find causal relations: between youth unemployment and civil war, alcohol consumption and clinical depression, or carbon emissions and sea level rise. Metaphysicians ask if causal relations are mind-independent and what it is about the fundamental nature of the world in virtue of which there are causal relations. Epistemologists question whether and how we perceive causal relations and make inferences about them.

When philosophy and science interact, we see both contributions that use philosophical theories to improve our scientific reasoning, but also discussions of what our scientific theories have to say about philosophy of causation. I will call the view that such a back-and-forth between philosophers and scientists on the subject of causation is legitimate and informative the *dialogue view* of causation. The chapter will briefly survey both how philosophy of causation influences science, and vice versa, before introducing and resolving a *pluralist tension* which speaks against the dialogue view of the relation between science and philosophy.

The tension, I will show, stems from a popular theory of causation in philosophy: *causal pluralism,* the idea that there is not one unique "tye or connexion between the cause and effect" (Hume, 1748/1999, p. 4.10) but rather a variety of acceptable causal claims corresponding to a wide range of presumed equally valid scientific methodologies (cf. Anscombe, 1971; Cartwright, 2007; Hall, 2004). I will show that pluralism can lead to conflicting methodological advice to the working scientist by discussing this issue for the *process tracing* method in political science. If we say, per the dialogue view, that philosophers can advise on scientific methodology, then the pluralist will make a contribution that seems to force us to accept conflicting methods, which is plainly implausible. So, evidently, we should either reject pluralism or even say that philosophers should not contribute to scientific method in this area. Either way, if one argues for a pluralist view of causation the view that philosophy and science are in a fruitful dialogue will get into trouble. The final section of this chapter considers some solutions to the tension, including a better, alternative pluralist view.

2 The Dialogue View

The dialogue view of science and philosophy argues that our best scientific theories can contribute to the philosophy of causation. It also argues that philosophy of causation can tell us what scientific methods are appropriate for causal perception and inference. I will discuss a few examples in this section of such fruitful dialogues.

As an example of the former, consider the advice psychological research can give to those philosophers who support the counterfactual interpretation of causation. This counterfactual interpretation contains the view that an event *e* causally depends on a separate event *c* if and only if, "if c had not been, e never had existed" (Lewis, 1973, p. 563). To evaluate this view of causation, psychological research is relevant; think of David Mandel's empirical finding that causal and counterfactual reasoning are distinct (Mandel, 2003). According to Mandel, human reasoning on counterfactuals and human reasoning on causes "differ in

important respects that will lead to predictable dissociations in the focus of the (…) corresponding types of judgment" (Mandel, 2003, p. 420). Or consider David Danks' more general claim that "[research into] causal perception (…) seems to be a (partial) psychological vindication of Kant over Hume: certain judgements of causality seem to be part-and-parcel of perception, rather than something that occurs after 'basic' perception has taken place" (Danks, 2009, p. 451) . Both in Mandel and in Danks' work, a scientific theory contributes to the epistemology of causation.

But philosophy also informs science. Think of the many methodologists who are applying philosophical theories to their work. Machamer, Darden, and Craver's modern classic "Thinking About Mechanisms" (Machamer, Darden, & Craver, 2000), published in *Philosophy of Science*, outlines a mechanistic philosophy and applies this to examples in molecular biology and neurobiology. The authors propose we analyse such mechanisms "in terms of entities and activities, organized such that they are productive of regular changes" (Machamer et al., 2000, p. 1). It is cited over 2,500 times, and many of those times by authors not in MDC's original fields of application, in fields as diverse as public health, analytical sociology, and geographical economics. Or think of Judea Pearl's *Causality* (Pearl, 2000), which provides a concrete philosophical framework for analysing causal relations in terms of statistical data. It tells scientists which sources of evidence are admissible to make causal claims and which, e.g. merely support correlations.

Such positive examples lead us to what I will call the *dialogue* view of causation: the view that an exchange of ideas between philosophers and scientists on the subject of causation is legitimate and informative. The above examples seem to indicate that the dialogue view is not a pipedream. However, I will show in the next section that in some practical cases philosophers' advice to scientists is confusing at best.

3 The Pluralist Tension

As we have seen, the dialogue view of causation claims that philosophers have concrete advice for scientists. I gave some examples of when this advice is clear-cut, limiting myself to philosophers who support one fundamental ontological and epistemic theory of causation. I will now show for whom the dialogue view is problematic, namely, for the *evidential pluralists of causation*, those who argue there is a variety of acceptable epistemic theories of causation. I will start the section by briefly reviewing the arguments in favour of evidential pluralism. I will then give a concrete example from the social sciences which shows that advice from the pluralist can be confusing, or even internally inconsistent. I conclude by evaluating pluralism's impact on the dialogue view and presenting an adapted version of pluralism which avoids inconsistencies.

3.1 Evidential Pluralism

In general, causal pluralism is "the view that causation is not a single kind of relation or connection between things in the world. Instead, the apparently simple and univocal term 'cause' is seen as masking an underlying diversity" (Godfrey-Smith, 2009, p. 326). One variation of this view is *evidential pluralism* (cf. Reiss, 2009; Russo, 2006): the idea that "evidence of a variety of kinds – say, probabilistic, mechanistic, regularity – can bear on a causal hypothesis and strengthen it" (Reiss, 2009, p. 27). Since we are concerned with the question of how philosophy may impact science and vice versa, arguably evidential pluralism is a more relevant philosophical position to evaluate than ontological pluralism of causation[1] and thus I will limit discussion to the evidential position. What should science look like for the evidential pluralist? Problematically for the dialogue view, I will show below that there are contexts in science when evidential pluralism would have us accept mutually contradictory methodologies.

The argument in favour of evidential pluralism goes somewhat along the following lines. Each fundamental theory of causation, the pluralist argues, is faced with counterexamples, i.e. situations in which the theory either cannot recognize a causal relationship or claims there is a causal relation where in fact there is not. For example, the counterfactual view of causation has

difficulty dealing with situations of redundant causation (in which a number of different causes are each sufficient for bringing about an effect of interest, meaning that another event would have caused the effect if the cause of interest had been absent; e.g. different soldiers shooting a prisoner at the same time, where the prisoner would still have died because of Private Jones' bullet even if Private Brown's gun had misfired). There are different counterexamples for each other theory of causation as well (cf. Cartwright, 2007; Reiss, 2009). And so, the evidential pluralist argues, because each individual theory of causation cannot deal with all types of causal relations in the world, we need to accept not just counterfactual evidence for causation but also mechanistic, probabilistic, and interventionist evidence (to name just a few).

3.2 A Case of Conflicting Advice

Let me now give an example of a case when evidential pluralism leads to mutually contradictory advice. Consider the methodology *process tracing*, common in political science. This method is, broadly speaking, an attempt to "identify and verify the observable within-case implications of causal mechanisms" (George & Bennett, 2005, p. 138), that is to say, the observable implications of a putative causal mechanism in one particular case study. Part and parcel of this method is political scientists' contrasting of their own proposed causal mechanism with alternative mechanisms found in the literature.

A popular example of process tracing (cf. Bennett & Checkel, 2015; Collier, 2011) is Nina Tannenwald's analysis of the "nuclear taboo", people's revulsion against the use of nuclear weapons (Tannenwald, 1999). Tannenwald argues that a nuclear taboo is a robust explanation for the United States' non-use of nuclear weapons during the Korean, Vietnam, and Persian Gulf War. She compares the taboo with alternative explanations like deterrence (pressures persuading rival countries against nuclear weapon use). Specifically, the "nuclear taboo" refers to several causal mechanisms behind the non-use of nuclear weapons: "domestic public opinion, [adverse] world opinion (…), and personal conviction informed by beliefs about American values and

conceptions of the appropriate behavior of civilized nations" (Tannenwald, 1999, p. 462). To illustrate, one of the causal claims in Tannenwald is that US domestic public opinion caused President Eisenhower to abstain from using nuclear weapons during the Korean War. She "traces" the observable implications of this claim and contrasts it with what one would expect to observe if, for instance, deterrence were a stronger explanation.

We should not conflate the notion of a mechanism in the natural sciences, e.g. biology, with that of a causal mechanism in the social sciences. The "cogs and sprockets" of a biological mechanism are arguably clearly circumscribable entities such as cells and proteins, whereas in the social sciences the "mechanistic" aspect is more metaphorical. In social science, "mechanism" is a concept that can hide a large variety of different notions of causation (cf. Mahoney, 2001). What exactly constitutes good *evidence* for such a causal mechanism varies widely between different philosophers of social science. Specifically, "differing understandings of mechanisms (…) inform (…) divergent arguments about how process tracing should proceed" (Jacobs, 2016, p. 14).

If we accept a pluralist notion of causal evidence, what would strengthen our belief in the existence of the hypothesized "causal mechanism"? We have seen above that an evidential pluralist argues that evidence of a variety of kinds can strengthen our causal belief. For process tracing, we can take this to mean that although philosophers do not agree on what constitutes good evidence, we can take the evidence advised by each of them and jointly use these pieces of evidence to inform our belief in the purported causal mechanism. However, the advice from different methodological perspectives is as of yet mutually contradictory, as I will now go on to show. So, one may be tempted to think that "anything goes" for the pluralist.

Let us consider two pieces of mutually contradictory advice. In a 2016 symposium in the American Political Science Association's *Qualitative and Multi-Method Research Newsletter*, several philosophers (including myself) answered two questions: "How should we conceptualize causal mechanisms for the purposes of empirical social inquiry? How, given this

conceptualization, should we undertake process tracing as an approach to causal inference?" (Jacobs, 2016, p. 13).

One position, based on the mechanist philosophy of Machamer, Darden, and Craver from the previous section, was defended by Derek Beach (2016). Beach proposes a "systems view" of causal mechanisms, i.e. to see mechanisms as a set of entities engaging in activities, where causal force is transmitted from one entity to another. Political scientists were therefore urged to seek "thick" observations of causation (i.e. observations where one does not only observe two contiguous events but where one also directly observes that there is a relation between them) and state exactly "how each activity transmits causal force from one entity to another" (Jacobs, 2016, p. 13) . This view is "more concerned with what actually took place in the empirical record" (Beach, 2016, p. 19).

My own position in process tracing defended in this newsletter (Runhardt, 2016), was to have an "interventionist view" which sees a mechanism as a chain of intervening variables, each of which is in a counterfactual relation with the next. This view is based on Woodward's manipulability philosophy of causation (Runhardt, 2014; Woodward, 2003). The interventionist view claims one can only make "thin" observations (i.e. merely seeing two contiguous events without observing their putative causal relation). This leads one to search for evidence of counterfactuals, e.g. what would have happened if the putative cause had not occurred in other case studies.

An "interventionist view" of mechanisms thus claims one cannot observe causation in single cases. The "systems view" of mechanisms claims that single case observations are the only trustworthy source of evidence for causation. In fact, it explicitly warns against collecting evidence for counterfactuals in other case studies; Beach argues that "there are no objective empirical truth conditions for assessing a non-existent but possible alternative world" (Beach, 2016, p. 17) and that in an interventionist view "we gain little information about how the process actually played out in a case" (Beach, 2016, p. 19) .

One naïve response would be that only one of these views "gets" evidence for causal relations in general "right". However, as I have argued earlier, there are counterexamples both to a view of causation in terms of entities and activities and to a manipulability view (cf. Williamson, 2009). This is what got us in the pluralist position in the first place, and there is no reason to believe the process tracing example is any different. What, then would the pluralist argue the social scientist does? Taking both the interventionist view's and system view's advice given is confusing at best, and at worst internally inconsistent.

The pluralist tension, stated more generally, is as follows. If we accept evidential pluralism for causation, we argue it is unclear which methodology is suitable for finding causes and therefore, we will accept not one methodology, but several. However, in some contexts (such as the political science example above), two or more different theories of causal evidence suggest we find evidence from a different source. These sources may be inconsistent with one another, in which case pluralism leads to internal inconsistency. Even if evidence from the different sources is not directly inconsistent, the sources might still be mistrusting of the other method's evidence, leading to confusion. In the example above, scientists would be urged to mistrust evidence from the interventionist view if they accept the specific line of thinking, equally present in the pluralist repertoire, from the systems view.

3.3 Moving Beyond the Pluralist Tension

Given the tension outlined earlier, what is left for the dialogue view in such cases as the political science example? There are two options: either we give up on evidential pluralism for causation, or we give up on the dialogue view. The former would imply that we reject pluralism when evidence is mutually contradictory. However, the motivation that led to pluralism in the first place still stands; each evidential method has its own scope limitations and seeming paradoxes. As such, there is no a priori reason to prefer, say, a system's view over an interventionist view. This means we are led to the latter option: (political) scientists have no clear guidance on which

methods are acceptable and which are not, and at the moment there is nothing philosophy can do about it. In this section, I will consider different solutions for moving beyond the pluralist tension.

One potential solution to the pluralist tension viewed more generally is that, although the evidential pluralist advises to seek evidence of different kinds, in practice we will know whether a particular source of evidence will be appropriate for a causal analysis. Counterfactual evidence is not helpful in cases of redundant causation; so we know that we must avoid seeking it when we are reasonably sure that several independent causes are likely to have overdetermined the effect. For that reason, scientists must be clear on their goals before asking for advice from the philosopher.

However, while this solution shows that bold claims like "anything goes in causal analysis" is an exaggeration, it still leaves open the door for competing methods. For example, in the case of likely overdetermination, one might equally well seek probabilistic or interventionist evidence, as both theories of causal evidence can deal with such cases. And indeed, this is also what happens in the process tracing example above. Process tracing was developed for within-case causal analysis, an area where correlational methods generally fail (cf. George and Bennett, 2005). As such, we could say that our pluralist is constrained to avoiding the probability view of causation. Otherwise, however, having to work within cases does not directly imply any restrictions on method. Yet as we have seen there is a tension between the methods that are, at first view at least, appropriate.

A pragmatic solution to the pluralist tension is more convincing. Philosophers of causation do not have a convincing monist theory, so evidential pluralism is all we have. By applying different methods in the process tracing example above, one may or may not gain different results as to whether a particular path was causal or not. I will consider each option in turn and propose a response.

If one gets the same result (i.e. both the system's view's preferred "thick observation of causation" and the interventionist view's preferred "supporting regularity based on other case

studies"), we should increase our faith in the causal hypothesis. This is what Reiss refers to as "triangulation" for the pluralist: "Since any given method is fallible – as shown by the counterexamples to the various accounts – the epistemically responsible strategy is to bring as much evidence as possible to bear on the hypothesis at stake, and confirmation from a number of independent methods is one and perhaps the only way to be reasonably confident about the truth of the hypothesis" (Reiss, 2009, p. 27).

If one does not get the same result, however, we must suspend our judgement, waiting for one of two things to happen: either, a convincing monist theory of causation is formulated after all (and we have already seen some reasons to think that chances of this are slim); or until we have delimited the situation to such an extent that we do know which *monist* source of evidence is applicable. Importantly, this latter solution adapts the pluralist view I introduced earlier in this chapter. Instead of arguing that each causal analysis benefits from differing sources of evidence, we now say that every individual causal analysis potentially benefits from a different source of evidence. While (say) Tannenwald would benefit from an interventionist view, others may benefit from the system's view. Can we delimit the scientists' aims and research question well enough, and in doing so, could we avoid mutually contradictory advice?

Let me finish this section by discussing the latter in more detail. Recall Nina Tannenwald's analysis, in part of which she attempted to explain Eisenhower's reluctance to use nuclear weapons in the Korean War. We can delimit this research project to such an extent that we can prefer either a system's approach or the interventionist's approach. Tannenwald situates her analysis of the Korean War in a wider context: She is interested in the broader question of why *no* states use nuclear weapons in war. In her conclusion, Tannenwald ventures beyond the US case by investigating similarities between the United States and other countries: "Because the United States is an open democracy, penetrated by domestic opinion and ideas, and with a perceived tradition of humanitarian rights and values, it may in this sense be an 'easier' case (…). This suggests that if the taboo operates in the United States, it probably operates in other democracies less committed to, and reliant on, nuclear weapons historically" (Tannenwald, 1999,

p. 464) . To give evidence for the causal role the nuclear taboo played in other democracies, Tannenwald says, we must show these countries are sufficiently similar. Applying interventionism to this particular study in detail is beyond the scope of this chapter, but we can see that a search for what would have happened if the putative cause (domestic opinion) had been different in other case studies fits very well with Tannenwald's overarching aims, more so than an investigation of the US case alone, as the system's view proposes. Thus, this is a case where a scientist's aims and research question helps us choose a single evidential theory.

4 Conclusion

This chapter presented the dialogue view of causation, as an example to the question of what our philosophical method should be. I briefly argued that scientific theories of causation can inform our philosophy of causation, and moved to a discussion of what philosophers can advise scientists. I showed that while monist philosophies of causation can deliver concrete methodological advice, sometimes this advice is mutually contradictory. As such, philosophers must choose which theory of causation is applicable for each particular scientific research project. We have seen one example of this, from political science. Let me finish the chapter by linking these results to the broader questions of this book.

We can conclude from the above that by working out details like which theory of causation is called for in each scientific context, we will make progress in philosophy. It is not yet straightforward how the paradoxes and limitations to theories of causation (like redundancy and overdetermination) link to concrete scientific research questions. Moreover, this chapter leaves unanswered whether the pluralist tension is unique to the examples given, i.e. to political science.

Regarding philosophy's relevance for society, this chapter spent time on philosophers' advice for *warranting* conclusions, and not on finding out when we can use these conclusions in practice. As we know from Nancy Cartwright, it is not so easy to move between warranting

conclusions and using them: “We have a panoply of methods for warranting conclusions in social science that are well tried, well developed and well understood. My hypothesis is that our problems with social policy arise primarily from the fact that we do not know how to use the knowledge we can legitimately claim to have” (Cartwright, 2007, p. 23). We need to know when and how we can use causal claims to see what relevance philosophy can have for society. So, before it can have an impact on society, philosophy of causation ought to work out whether evidential pluralism leads to similar tensions in *using* causal conclusions.

Note

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1 Evidential pluralism is not committed to either a monist or a pluralist ontology of causation. The latter would claim that there are different *types* of causal relations in the world, e.g. some mechanistic, some probabilistic, and some counterfactual. Yet we do not need to be ontological pluralists in order to advice scientists to use different evidential sources; we

may well believe that there is only one type of causation in the world but we cannot have access to it through only one source of evidence. I will not discuss ontological pluralism here, but arguably many of the arguments in this chapter would apply to ontological pluralism as well.