

Some Reflections on Causation

Yafeng Shan

1. Recent Debates over Causation

Philosophical analyses of causation have been centred on the question of what causation is. From a philosophical point of view, this question can be interpreted in at least four different senses.

Metaphysical issue: What is causation out there?

Epistemological issue: How can a causal claim be established and assessed?

Conceptual issue: What does the word 'cause' mean?

Methodological issue: What methods ought one to use in order to establish and assess a causal claim?

A popular way to explore the nature of causation is to analyse the concept of causation in terms of more fundamental, non-causal notions. Much effort has been made to explicate what these fundamental, non-causal notions are. It has been widely debated whether causation is reducible to regularity (e.g. Mackie [1974](#); Graßhoff and May [2001](#)), probabilistic dependence (e.g. Reichenbach [1956](#); Suppes [1970](#); Glynn [2011](#)), counterfactual dependence (e.g. Lewis [1973](#); [2000](#)), disposition or power (e.g. Harré and Madden [1975](#); Anjum and Mumford [2010](#); Bird [2010](#)), intervention (Woodward [2003](#)), mechanism (e.g. Glennan [1996](#); Machamer, Darden, and Craver [2000](#); Machamer [2004](#)), transmissional process (e.g. Salmon [1980](#); Kistler [1998](#); Dowe [2000](#)), information transfer (Collier [1999](#)), or something else. Most of these accounts of causation can be classified into two approaches: the difference-making approach and the mechanistic approach. The regularity account, the probabilistic account, the counterfactual account, and the interventionist account can all be characterized as variants of the difference-making approach to causation, whose basic idea is that a cause is what makes a difference. In contrast, the mechanism-based account, the transmissional process-based account, and the information transfer-based account can be construed as variants of the mechanistic approach, which assumes that two events are causally connected if and only if they are connected by an underlying mechanism of some appropriate sort. In the past two decades, the difference-making and mechanistic approaches somehow dominated the philosophical examination of causation, especially in the philosophy of science. It has been assessed whether they can be fruitfully applied to causal enquiry in the natural and social sciences (e.g. Russo [2009](#); Chao, Chen, and Millstein [2013](#); Reutlinger [2013](#); Runhardt [2015](#); Zwier [2017](#); Maziarz [2020](#)).

That being said, there have still been attempts to explore alternative approaches to causation. Causal pluralists (e.g. Anscombe [1971](#); Cartwright [2002](#); Hall [2004](#); Crasnow [2011](#); Illari and Russo [2014](#); Reiss [2015](#)) doubt that any one variant of the difference-making or mechanistic approaches can fully capture the nature of causation, given the diversity of the use of causal concepts in different contexts. It has been argued that there is a plurality of types or concepts of causal relationships. Evidential Pluralism was also developed to accommodate the fact that there are a variety of methods to establish and assess causal claims across the sciences. In contrast to causal pluralists, Evidential Pluralists do not think that there are different types or concepts of causal relationships. Rather they argue that there are just different types of evidence obtained from various methods for a causal claim. The key idea of Evidential

Pluralism is that in order to establish a causal claim one normally needs to establish the existence of an appropriate correlation and the existence of an appropriate mechanism complex. It has also been argued that Evidential Pluralism can be applied to the biomedical and social sciences (e.g. Russo and Williamson [2007](#); Gillies [2011](#); Clarke et al. [2014](#); Wilde and Parkkinen [2019](#); Maziarz [2021](#); Shan and Williamson [2021](#); [2023](#)). Causal non-reductionists (e.g. Tooley [1987](#); [1990](#); Carroll [1990](#); Fales [1990](#)) argue that causation is primitive and unanalysable, while causal eliminativists (e.g. Russell [1912](#)) maintain that science has no need of the concept of causation at all. Recently, some traditional approaches, especially the dispositionalist approach (e.g. Mumford and Anjum [2011](#); Anjum and Mumford [2018](#)), were further developed in a more science-informed way, whereas new approaches, including the epistemic approach (e.g. Williamson [2005](#); [2006a](#); [2006b](#)), the fictionalist approach (Eagle [2007](#)), the inferentialist approach (Reiss [2012](#)), and the powerful particulars approach (e.g. Ingthorsson [2002](#); [2021](#)), were introduced. Unfortunately, these approaches, though important and promising, are to a great extent inadequately discussed and assessed.

This book explores and examines these alternative approaches to causation. It revisits causal non-reductionism and causal eliminativism in the context of recent literature. It further explores the pluralistic approach, the fictionalist approach, and the inferentialist approach. It also examines the application of the dispositional approach, the epistemic approach, and the powerful particulars approach to the natural and social sciences.

2. Alternative Approaches: Beyond Difference-making and Mechanism

An obvious alternative to the difference-making and mechanistic approaches is the so-called non-reductionist approach, sometimes also called primitivism or anti-reductionism. The central thesis of the non-reductionist approach is that causation is non-reductionist or primitive in two senses:

- a. Causation is not supervenient on the total history of the world and laws of nature.
- b. Causal relations are not reducible to other states of affairs, including non-causal properties or relations.

Therefore, from a non-reductionist's point of view, the concept of causation cannot be analysed in terms of difference-making or mechanism. As a leading proponent of the anti-reductionist approach, Michael Tooley provides a detailed and systematic defence of a non-reductionist, theoretical-term account of causation in Chapter 2. He argues that such an account of causation has some highly desirable properties: it is by far the simplest of all analyses of causation; it immediately entails the correct relationships between causation and probabilities; and it provides the basis for the only satisfactory account of the relation of temporal priority. Then he examines three alternative accounts: Humean reductionist approaches (especially variants of the difference-making approach), non-Humean reductionist approaches (such as the dispositionalist approach), and the view that the concept of the relation of causation is analytically basic (see a defence of this view in Chapter 3). Tooley argues that all of those approaches are open to some decisive objections, so none of them pose any serious challenges to his non-reductionist, theoretical-term account of causation.

Evan Fales, another long-term supporter of the non-reductionist approach, defends a different version of non-reductionism—namely, robust causal realism—in Chapter 3. Although he agrees with Tooley that causal relations are not reducible to other states of affairs, Fales contends that the concept of causation is analytically basic and thus unanalysable. His central

argument is that causal relations are basic and in some instances directly perceived; they cannot be analysed by way of subjunctives, dispositions, regularities, or the like. He takes causal relations to be grounded in a second-order non-contingent relation between the fundamental properties that ground (many) laws of nature. In the chapter, he examines two (related) issues, one concerning the epistemological implications of the view (specifically, its support for inductive inferences), and the other ontological: viz. exploring the nature of the basis for the relationship between a universal's nature and the causal relations it bears to other universals.

Even if they are interested in the epistemological issues, both of Tooley's and Fales's concerns are fundamentally about the metaphysics of causation (i.e. what is causation out there?). However, John Norton is highly sceptical of such a kind of enquiry. In Chapter 4, he makes an empirically based, sceptical critique of the metaphysics of causation. Norton presents an old dilemma for any metaphysical analysis of causation:

EITHER conforming a science to cause and effect places a restriction on the factual content of a science; OR it does not.¹

If the metaphysical analysis of causation aims at some pronouncements on the nature of causation as a deep metaphysical truth, history shows us a sustained record of failure: many pronouncements are shown to be false with the development of science. If the metaphysical analysis of causation adds nothing factual to what we already know by empirical science, it is difficult to see what its value is. Nevertheless, it should be noted that Norton does not try to dismiss the value of any philosophical analysis of causation at all. He argues even if designations of causality are mere matters of definition, some designations are worthwhile. And the interventionist account is such a designation. In a nutshell, Norton argues that the identification of causal processes in the world is one not of factual discovery, but of the application of convenient definitions.

Norton's conclusion might seem polemic, but his message is clear and loud: any serious philosophical examination of causation ought to take science seriously. Chapter 5 by Rani Lill Anjum and Elena Rocca is an exemplar of engaging the philosophical analysis of causation closely with scientific research. They develop a traditional metaphysical approach—namely, the dispositionalist approach (or Causal Dispositionalism, to use their term)—and try to show how it can inform and improve the practice of the biological sciences. According to Causal Dispositionalism, causes are intrinsic dispositions or powers, which cannot be further analysed into other states of affairs.² Importantly, these dispositions or powers can be unmanifested. Accordingly, a causal process typically results from the interaction of multiple dispositions in some appropriate circumstances. They contrast Causal Dispositionalism with the Humean two-event model, according to which causation is an unobservable relation between two observable occurrences. They argue that the well-known problem of low external validity in medical research, gene technology, and ecological study is a product of standard risk assessment approaches used in these fields that are motivated by the Humean two-event model. Anjum and Rocca call for a change of the methods for studying causal complexity and interactions in standard risk assessment by replacing the

1 This dilemma was first posed by Norton in an earlier paper (Norton 2003) and is refined in Chapter 4.

2 This is why for Causal Dispositionalists (e.g. Stephen Mumford, Anjum, and Rocca) causation is primitive, though in a different sense compared with the non-reductionist account of causation.

Humean two-event model with the dispositionalist model as the underlying, implicit philosophical assumption.

R. D. Ingthorsson argues for his powerful particulars approach in Chapter 6. In contrast to the difference-making and mechanistic approaches, the powerful particulars approach maintains that causal production is a reciprocal interaction rather than a unidirectional process. Ingthorsson critically assesses whether four rival accounts of efficient causation—the transmissional process-based account, mechanism-based, dispositionalist, and powerful particulars accounts—can well characterize the scientific understanding of two often discussed cases of causal phenomena: (i) collisions between billiard balls and (ii) how water dissolves salt. He argues that only the powerful particulars view can be considered compatible with our scientific understanding, mainly because the other three characterize interactions—to varying degrees—in terms of a unidirectional exertion of influence of one thing on another, which is incompatible with the established scientific understanding that all interactions are perfectly reciprocal.

Phyllis Illari and Federica Russo put forward a different account (*viz.* the information transmission account) of causal production in Chapter 7. It is worth highlighting that this information transmission account should be understood within their pluralist framework of causation in general, what they call ‘the causal mosaic’ (Illari and Russo [2014](#)). Illari and Russo are causal pluralists in the sense that they regard different approaches, such as in terms of counterfactuals, dispositions, and mechanisms, as tiles that need to be put next to one another to form a dynamic image of the mosaic of causal theory. They highlight the role of causal production within the causal mosaic, and argue that a metaphysics for causal production as information transmission is in need of a set of epistemological strategies to trace whether information is transmitted or not; such epistemological strategies can be in terms of ‘variation’ as well as ‘information transmission’. They also explain the ‘ontoepistemological’ combination of information transmission and variation with the aid of four examples of causal production.

In contrast to other authors, Julian Reiss focusses on the conceptual issue of causation. He poses a challenge to a standard way of analysing the concept of causation in philosophy, which is neatly summarized by John Carroll:

Philosophers routinely seek a certain sort of analysis of causation. They have sought a completion of

(S) *c* caused *e* if and only if ... (Carroll [2009](#), 279)

Reiss argues that none of the philosophical accounts which aim to provide truth conditions for causal claims like (S) can be a fully general theory of causation. In Chapter 8, Reiss argues for an inferentialist approach, according to which the meaning of a causative statement is given by the network of statements with which it is inferentially related. He contends that the inferentialist account of causation is the only theory of causation that can handle the richness of our causal vocabulary satisfactorily.

In Chapter 9, Antony Eagle defends a fictionalist approach to causation. He argues that the models of fundamental physics do not involve any obvious role for causal relations. However, Eagle admits that causation is nevertheless pragmatically indispensable, especially in the human sciences. He thus argues that while we ought to disavow belief in causes we ought to retain causal talk and our deployment of causal models in situations of human interest.

In Chapter 10, Yafeng Shan, Samuel Taylor, and Jon Williamson develop the epistemic approach to causation, which views causation as a tool that helps us to predict, explain, and control our world, rather than as a relation that exists independently of our epistemic practices. They outline four considerations that motivate the epistemic theory. First, they argue that the epistemic approach does not succumb to the problems and counterexamples that beset difference-making and mechanistic approaches and causal pluralism (the argument from failure). Second, they argue that the epistemic approach is simpler than its rivals as it does not need to analyse causality in terms of one of its indicators, or in terms of a pluralist panoply of indicators (the argument from parsimony). Third, they argue that the epistemic approach can accommodate Evidential Pluralism perfectly well, while Evidential Pluralism poses a serious challenge to standard accounts of causation (the argument from Evidential Pluralism). Fourth, they argue that the epistemic approach is needed to provide a unified conception of causal explanation in cognitive science (the argument from neutrality). They illustrate these four considerations in the contexts of the social sciences and the cognitive sciences. They conclude that the epistemic approach provides a very natural account of causation across these contexts.

3. A Practice Turn (and Towards a Functional Approach?)

As we may notice from some chapters of this book as well as the recent literature, there is a gradual, ongoing practice turn in the philosophical examination of causation. More and more philosophers are paying serious attention to methods of causal enquiry across the sciences and exploring the philosophical implications. There has been an increasing interest in the methodological issue of causation. For example, the role of Randomized Controlled Trials (RCTs) in causal enquiry in the biomedical sciences has been extensively evaluated (e.g. Cartwright [2007](#); [2010](#); Worrall [2010](#); Northcott [2012](#); Krauss [2021](#)), while the legitimacy of process tracing in the assessment of causal claims in political science has been hotly debated (e.g. Crasnow [2017](#); Beach [2021](#); Runhardt [2021](#); Dowding [2023](#)).

What is more, philosophers have begun recognizing the significance of the use of causal claims in practice. In addition to the metaphysical, epistemology, conceptual, and methodological issues, the practical issue of causation is now being taken seriously.

Practical issue: What is a causal claim for in practice? Or, what is the use of a causal claim?

In this book, Illari and Russo regard the practical issue as one of the five important philosophical questions of causation. Eagle highlights the instrumental feature of causal talk in the human sciences. Shan, Taylor, and Williamson emphasize the role of causal claims in predicting, explaining, and controlling the phenomena in the world. All these seem to echo the so-called functional approach, proposed by James Woodward.

[B]y a functional approach to causation, I have in mind an approach that takes as its point of departure the idea that causal information and reasoning are sometimes useful or functional in the sense of serving various goals and purposes that we have. It then proceeds by trying to understand and evaluate various forms of causal cognition in terms of how well they conduce to the achievement of these purposes. Causal cognition is thus seen as a kind of epistemic technology—as a tool—and, like other technologies, judged in terms of how well it serves our goals and purposes. (Woodward [2014](#), 693–94)

I particularly like Woodward's idea of taking 'causation' as a tool. As I have argued, a scientific concept should be understood as a tool for scientists to define and solve problems in practice (Shan [2020](#), 147). More specifically, I argued that a scientific concept is used as a tool to contribute to various intertwined activities in scientific practice, including problem-defining, hypothesization, experimentation, and reasoning. We should understand conceptual practice in a broader context of scientific practice. Accordingly, regarding causal concepts, we need to analyse and examine them within the context of scientific practice by scrutinizing how a causal claim contributes to various scientific activities.

Moreover, I argue that the practical issue of causation is highly relevant to the metaphysical, epistemological, conceptual, and methodological issues of causation. In contemporary discussion of causation, the ultimate task for philosophers is to develop an approach to articulate and account for the nature of causation. There is a philosophical motivation for such an inquiry: we need a good account of the metaphysics, epistemology, concept, and methodology of causality. In addition, there is a practical motivation of a good theory of causation: we need a concept of cause which can be used, especially in scientific practice, to represent, explain, manipulate, and understand various phenomena in the world. We need such a theory of causation in order to make good sense of various phenomena around us. As Williamson ([2006b](#), 269) indicates, causal beliefs are 'heuristic devices', which help reason about the world by means of making strategic decisions, predications, diagnoses, etc.

Woodward ([2014](#), 694) argues that a functional approach has two important benefits by shedding light on the connections between causal concepts to elucidate the 'usefulness of causal thinking' and evaluate 'various strategies of causal cognition and other concepts', and leading to a focus on methodology to assess 'the usefulness of different causal concepts, and of procedures for relating causal claims to evidence', though he is implicit on the meaning of usefulness. In my functional approach to scientific progress (Shan [2019](#); [2022](#)), I develop an account of usefulness: an exemplary practice (i.e. a particular way of problem-defining and problem-solving) is useful if and only if its way of defining and solving research problems is repeatable and provides a reliable framework for further investigation to solve problems and to generate novel research problems across different areas (or disciplines).

Thus, I propose that there is a fundamental desideratum that a good philosophical theory of causation should satisfy:

A good theory of causation ought to offer a good account of the nature of causation, and show how causation provides a conceptual tool contributing to a useful exemplary practice in order to represent, explain, manipulate, and understand various phenomena in the world.

Of course, we may never have such a comprehensive theory of causation. Nevertheless, I contend that any philosophical enquiry into causation without an examination of the practical issue is incomplete. In other words, a promising approach to causation ought to take all of the metaphysical, epistemological, conceptual, methodological, and practical issues into account.

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