Stephen Mumford and Rani Lill Anjum

CAUSATION

A Very Short Introduction

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Contents

Why causation?

Causation is the most fundamental connection in the universe. Without it, there is no moral responsibility: none of our thoughts would be connected with our actions and none of our actions with any consequences. Nor would we have a system of law because blame resides only in someone having caused injury or damage. There would be no science or technology. Any intervention we make in the world around us is premised on there being causal connections that are to at least a degree predictable. It is causation that is the basis of this prediction and also of explanation.

But what is it for one thing to cause another, such as when a stone smashes a window or an oil slick causes a skid and a crash? Philosophers have struggled with this question for millennia, at least since Aristotle (384–322 BC). They approach the problem in the abstract while scientists encounter it in its concrete instances. The sciences are full of causal claims and a scientist is bound to wonder at some point what it is they are dealing with exactly.

There are a number of views. Some think the basis of causation is regularity: that one thing or event is constantly conjoined with another. Others have said that this is neither sufficient nor necessary for a causal connection. Another theory is that the existence of the effect depends on the existence of the cause; but does this adequately distinguish causes from other, related

phenomena? This *Very Short Introduction* will introduce the reader to the key theories of causation and also the surrounding debates and controversies. Do causes produce their effects by guaranteeing them? Do causes have to precede their effects? Can causation be reduced to the forces of physics? And are we right to think of causation as one single thing at all?

We will not shy away from the disputed territory of causation. Rather, we will be open about the fact that there is yet to be a final consensus on this most immediate and vital element of the world. Without attempting a systematic survey, we will introduce the reader to what is one of the core topics in philosophy. But the book is not only for philosophers. Every engineer and pharmacist is working with causation; indeed, none of us has any other choice. Without it, none of our interventions in the world would have any point. And in other sciences the most common form of explanation is a causal explanation, and prediction is premised on the known causal laws. Causation is just as much an integral part of physics, biology, chemistry, geology, meteorology, astronomy, and oceanography as it is of philosophy. And we should not forget the social sciences—economics, history, sociology, anthropology, psychology, education, political science, and law—where causal claims are equally ubiquitous.

Like a number of other areas of philosophy, causation is a topic that could intimidate the novice because of its abstract and technical nature. Many of the basic ideas, concepts, and questions of causation are simple enough, however, and we aim to explain and motivate the key issues without the aid of technical vocabulary.

Only if we are armed with a theory of causation will we be able to go out and look for it. Improving one's theory of causation—through philosophy—should thus improve the process of discovering causes. This can be a vital task. Lives depend on identifying the causes of certain diseases and, of course, on finding medicines that can cause

recovery from them. And we can only hope to bring climate change under control once we have understood what causes it. The causes of war, poverty, suffering, and pain are all things that we need to identify and avoid. In their place, we should promote the causes of stability, peace, and prosperity. But how could we even hope to find these things if we do not understand what it is for one thing to cause another? Here is the place to start for anyone who needs to know this, which we argue is everyone.

Chapter 1
The problem: what's the matter with causation?

An invasion of rats sweeps through town. They fill the streets, eating from rubbish bins and invading homes. The townsfolk have never seen the like before and their attempt to repel and exterminate the rodent visitors is a losing battle. A few days after the rats first arrive, people start getting ill with an unpleasant stomach bug, some cases of which are life threatening. The disease spreads, affecting the majority of the town's population. Neither the rat invasion nor the epidemic had occurred there before. Someone raises the inevitable question: Did the rats cause the disease?

Perhaps it looks like an open-and-shut case against the rats. A new factor was introduced into the local environment and was quickly followed by a spread of illness. But did one thing cause the other? Perhaps it was mere coincidence that people got ill just after the rats arrived. Or there might have been a different factor that brought the disease: one young lady had just returned from an exotic holiday looking none too good. Perhaps she brought the bug.

The problem shows the importance of identifying causes. If the rats are responsible for the continued spread of disease, then their containment or eradication will probably be a high priority. But if the causes lie elsewhere, the rat problem can wait.

There is nevertheless a prior question. How can we even start looking for the causes, of a disease or whatever, before we have some understanding of what it is for one thing to be a cause of another? Surely we have to know what causation is before we start saying that this was the cause of that. We need a theory of causation. And anyone who makes a causal claim must have such a theory, whatever it may be, otherwise the claim would be empty.

One such theory—not a very sophisticated one—could be based on the fact that there was no disease in town before the rats came, therefore the rats caused it. The theory coming out of that observation might be formulated as follows: a cause is a new factor that has been introduced and that precedes a conspicuous change. But we will see that we should be able to do better than that. Causation is likely to be more complex than such a basic definition would allow. The task ahead of us is to explain some of the complexities involved.

Being philosophical

The question we are asking is a specifically philosophical one. What is causation? It is initially a conceptual question: What do we *mean* by causation? But it could easily advance from that to a question of what is the real-world essence of causation, which is more of an ontological one: What *is* causation? But we needn't get too far into the distinction between conceptual and ontological at this stage. The point is that these questions are not ones that we can settle simply by recourse to experience.

Science deals with matters that should ultimately be settled by the evidence of the senses. Often there is an interplay between theory and observation and many theories are thought viable long before they can be tested empirically. Empirical evidence is the evidence we gain through our observations, whether unaided or with the

use of devices such as microscopes and oscilloscopes. Empirical testing remains the mark of science and is thought the ultimate tribunal of scientific truth.

And on the issue of what causes what, we should of course grant this to be an empirical matter. We can let the scientists decide what causes solar flares, drought, chemical bonding, cancer, and Down's syndrome. Social scientists can tell us what causes inflation or social unrest. And we can judge on more mundane and domestic causal matters ourselves from the empirical evidence we have available, for instance that the dog always barks when the post arrives.

The methods of philosophy are slightly different. It is not the easiest task to state exactly what they are as the nature of philosophy is itself one of the topics of philosophical debate. Traditionally, however, it is understood to be non-empirical in that philosophical truths are not settled primarily through recourse to experience. Consider a philosophical theory in ethics, for example, that the good is that which procures the greatest happiness of the greatest number. This ethical theory is called utilitarianism. The point is that the evidence of our senses doesn't seem to help us decide whether this theory—of what the good consists in—is right or not.

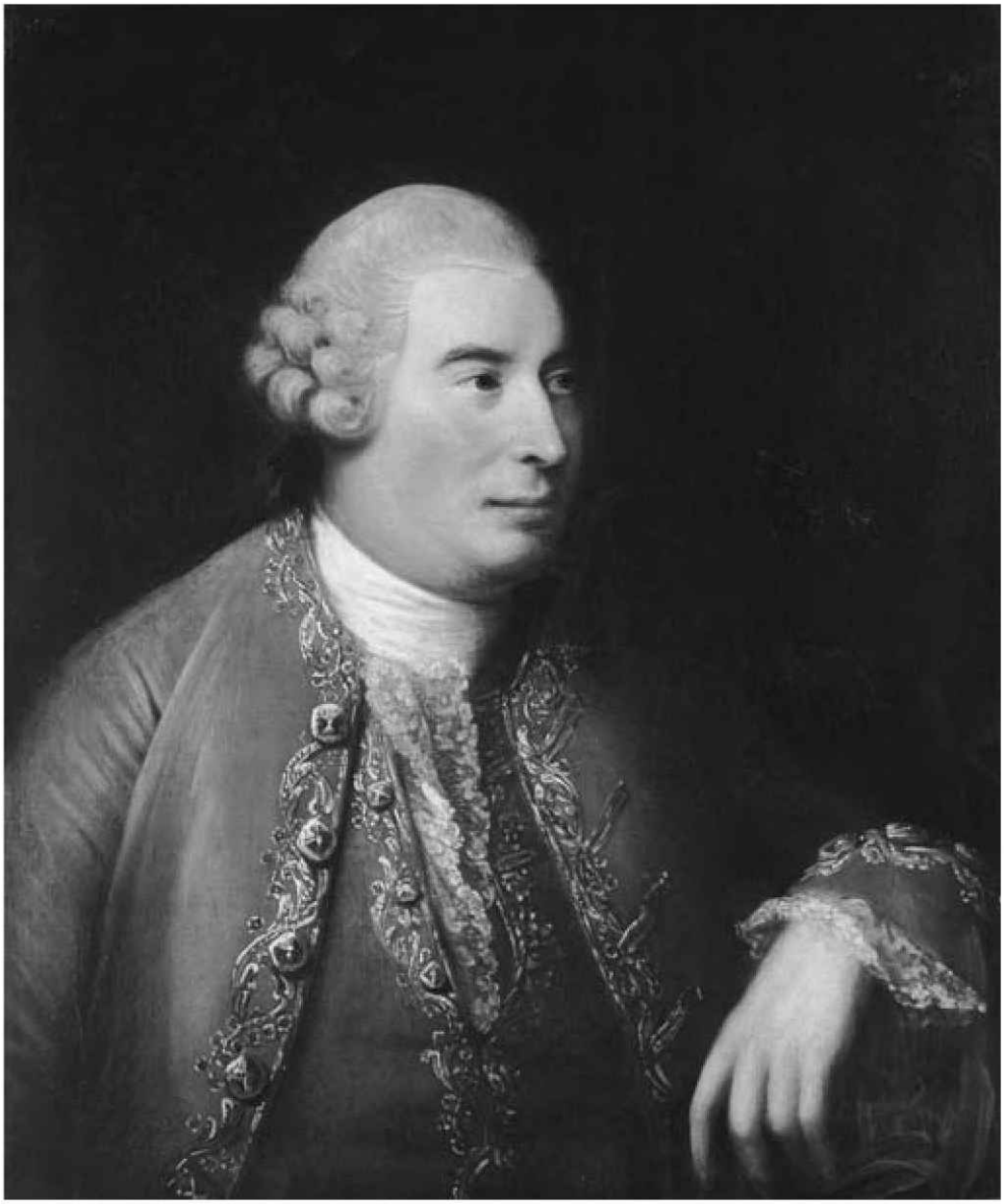
How do we decide on such questions? A traditional answer is that we use our reason to explore and settle philosophical questions. We consider likely theories and test them against hypothetical scenarios to see if they remain intuitively appealing. Some experience of the world is of course needed in order to acquire our basic concepts and be able to talk about anything at all. But once this has been acquired, it seems that we are able to reason about it in fairly abstract terms. Using just our thinking, we might decide that knowledge consists in justified, true belief or that an equal distribution of wealth would be morally more defensible than an unequal one.

This is the kind of approach that will be taken in this book. We will try to use our thinking to reason through such questions as whether causes must always occur before their effects. Is there any absurdity in supposing so; or any in supposing not so? And what then would be at the core of a credible account of causation? We will also be assuming the priority of philosophy in these matters, by which we mean that the basic philosophical commitments must come first, before the empirical investigation into their application. In simple terms, this means that we have to know what causation is before we can start to look for it. At least we must have some idea of it.

Let us consider another causal scenario by way of illustration. Suppose we trial a drug on a group of patients and 50 per cent subsequently die. Such an outcome sounds alarming and one might conclude that the drug is harmful. Can we say straight away that this drug kills half of those who take it?

The first thing to point out about the example is that it shows how widespread causal claims are. If you say that this drug—or anything else, for that matter—kills, you are making a causal claim. You are effectively saying that it causes death. Similarly, if a rock breaks a window, Jane upsets John, a noise wakes the baby, or a machine drills a hole, then causal claims are being made. To break, upset, wake, and drill are all causal verbs that we use to make specific claims about causation. All of them seem to involve one thing making another happen. It is what exactly this consists in that is our topic. And we can see, therefore, that while it is a philosophical issue, it is one in which all empirical disciplines have an interest because they are often full of causal claims.

Second, we can question the plausibility of any causal claim in the drug case, based on just this information. Simply that a patient died after taking the drug is no sure sign that the drug was the cause of death. What if all those who took the drug also had an illness of which the expected death rate within that same time



1. David Hume, who couldn't see causation

span was 80 per cent? That information puts the issue in a different light. Although many who took the drug died, it might be that the drug was not harmful at all. Perhaps it prevented a number of deaths or increased the length of life of those suffering the illness. And even if this is not the scenario, there might be an even simpler explanation of the deaths. Perhaps after taking the drug, there was a cataclysmic earthquake that affected the area in which it was trialled. There could be a far more plausible explanation of the deaths than the action of the drug.

What philosophical conclusions might one then draw? The immediate lesson seems to be that causation requires more than one thing being followed by another. A man might take a pill and then die, or touch a rat and then die, but for us to say that the pill or the rat caused the man's death, we need something more. It is this something more—the causal connection—that we will be investigating in the rest of the book.

The elusive cause

An important point lurks in the background of this discussion and we should now articulate it. David Hume (1711–76) promoted an idea, which continues to attract adherents, that there is something elusive about causation that makes it a particularly difficult matter to know. This is a claim that could be challenged but first we should try to understand it.

In his 1739 book *A Treatise of Human Nature* (Book I, Part III, Section VI) Hume argued that all we can observe in nature is a series of events. One thing happens and then another, and then another, and so on. The problem when we start wondering about whether any of those events are causally connected is that the supposed causal connection is not itself part of our experience. A match is struck, for instance, and then almost immediately that same match lights. But what we cannot see is that the striking of the match caused it to light, at least according to Hume's account.

How much simpler would it be to make causal claims if it was just a matter of seeing the causal connection tying the two events together, like a rope? Instead, all we see are the two events, the striking of the match and its lighting. The causal connection itself seems unobservable. It hides away and we have to infer its presence from other factors of the situation.

This is why we often struggle to pin down causal connections. To a large extent it is a vast scientific endeavour to figure out what causes

what and even when we think causation has been established there is no guarantee that we are right. In the case of the rats, for instance, it was a matter of looking to the wider context of the situation to see if something else could have caused the epidemic. There is always the possibility that the real cause has not yet been discovered.

Bertrand Russell flexes his muscle

Because causation doesn't exactly hit you in the face, there are even some who deny that it exists at all. There are weaker and stronger ways of stating this view. The weaker would be a reductive strategy, which would be to claim that what we commonly take to be causation is actually just something else: something far less mysterious and elusive. This is to make a move that is familiar in philosophy: to explain a problematic phenomenon in other terms that are arguably less so. The reductionist is not denying that there is causation, but they are denying that it is an additional thing in the world, over and above other, more familiar elements. We will be looking at a number of reductive accounts in the chapters that follow.

The stronger kind of strategy, however, could be called eliminativist. The idea here is to find some reason to eliminate a certain category of thing from our considerations altogether. The claim applied to the current topic would be that causation does not exist at all. Whereas the reductionist says that what we took to be causation was actually something else—something that is more obviously part of the world—the eliminativist says simply that there is no causation. Nothing in reality matches that for which we thought we needed the notion of cause.

As an example of such eliminativism we might take Bertrand Russell's classic 1913 paper 'On the Notion of Cause'. Russell (1872–1970) pointed out that although we conceptualize the world in causal terms, if we instead defer to the way physics understands things, we will see that causation has no place.

The notions of causation that philosophers have produced involve asymmetry, Russell noted. The cause produces the effect, for example, and does so asymmetrically. This means that the effect cannot then produce the cause. Causation has a direction. Hence, if the throwing of a stone caused a window to break, then the breaking of the window did not cause the stone to be thrown. That seems to make perfectly good sense to us but Russell thought that common sense, and even philosophy, should be prepared to defer to the expertise of science, and physics in particular.

Russell noted that in science, asymmetric causal relations don't appear at all. Rather, physics is full of equations such as $E = mc^2$ and $F = Gm_1m_2/d^2$. And an equation can be read left to right or right to left. In other words, the directionality of causation is not really a feature of the world because in its scientific formulation it can just as easily run in the opposite direction. There is thus no reason in principle why the breaking of a window couldn't cause a rock to be thrown at it. This would be unproblematic from a mathematical point of view in physics. The causal conceptualization of the world is thus an ignorant and prescientific one and, in a famous passage, Russell says: 'The law of causality, I believe, like much that passes muster among philosophers, is a relic of a bygone age, surviving, like the monarchy, only because it is erroneously supposed to do no harm.'

Russell's view still has some adherents in philosophy but why has it not prevailed? We still do use causal concepts all the time and physics itself has not seen a wholesale abandonment of asymmetric relations. In the first place, we can note that the reading of the equals sign ' = ' is not unambiguous. We become used to it in arithmetic where it indicates an equivalence but it is one that seems to permit at least some directionality. We say that 2 + 2 = 4, for instance, which is to say that each side is of equal sum. But it is less obvious that 4 = 2 + 2 insofar as 4 can also be the sum of 1 + 3. The point is that 2 + 2 can equal only one sum, 4; whereas 4 can be the sum of several combinations (2 and 2, 1 and

3, 10 and minus 6, and so on). And in this respect there is at least some asymmetry.

This consideration can be brought to bear on the equations of physics because they also are indicative of equivalent magnitudes. From a specific value of m and c, one can derive only one value for E in $E = mc^2$. But for any value of E, there is an infinite number of values for m and c that would produce an equivalence. And there is thus still some asymmetry that needs to be explained. It is not clear, therefore, that an equation automatically rules out asymmetry.

Second, Russell's account was based on his understanding of the physics of 1913. There have been a number of attempts by physicists to put asymmetry back into physical theory. One such notion is entropy, which is an irreversible thermodynamic property. Physics is still a developing science, even though its successes allow us to do so much. We cannot take the case against causation to be settled, in the way Russell thought, because the final physical theory of everything is not yet with us and may never be.

Metaphysics and better physics

This brings us to a third, and perhaps the biggest, consideration against Russell's view. Physics provides a representation of the world: a largely mathematical one. It is useful that it does so. Results within a mathematical model are sometimes borne out and used in explanation, prediction, and technology. But we should not forget that physics is the representation and should not be mistaken for the world itself.

In that case, if we felt that physics had left out of its representation a central datum about the world—the asymmetry of causation—then we might be entitled to ask for a better physics. The world is not a number, nor an equation. It is a concrete particular inhabited by

physical objects and some of them appear to be causally related to others. Physics sometimes forces us to rethink and revise common sense, which may be perfectly legitimate. But it should not follow automatically that because a theory works out mathematically, within a model, the world is exactly like that model or like the maths. That is still open for debate. A belief in causation may well be a philosophical one—a metaphysical one, even—but there may be occasions where we can ask for a better physics: one that reflects our metaphysical commitments.

And here, we would maintain, there is much debate still to be had. Willard Van Orman Quine (1908–2000) talked about our beliefs forming an interconnected web. All were open to revision in the light of new evidence but some of them were more central within the web. We would not easily give up our belief in logic, for instance, because it is central to everything else that we believe. We would always try to sacrifice a more peripheral belief first, if it clashed.

A belief in causation, we would maintain, is a very central one. Causation matters so much. Nothing that occurs would have any real significance unless it was causally connected with other things. One might not even mind being beheaded but for the fact that it is a cause of death, pain, inconvenience, and whatever. That lawyers sue for damages is premised on harm being caused. That medicines are worth discovering is premised on them being potential causes of health. And that the Earth revolves around the Sun is determined by it having a gravitational effect on us. Without causation, nothing in our universe would seem to hang together. Hume even called it 'the cement of the universe' ('Abstract of the *Treatise*', 1740).

Now if we were to jettison causation from our web of belief, so much else would have to go with it. It would require an entire reconceptualization of the world and almost everything we have ever believed about it. That is not to say that it is impossible or

inconceivable, but that the evidence requiring it had better be very, very good. As we have seen, the theories of physics remain tentative and open to interpretation. In that case, we would argue that we have not yet reached the point Russell thought we had, where we ought to abolish causation.

We will therefore proceed on the basis that causation is a real feature of the world. Indeed, we stand by the argument that it is a vital and central component, without which things would look so different. There would be no cement of the universe. When you strike a match, you expect that it will light. Sometimes that expectation is disappointed but the world is predictable to at least some degree. If the wind blows, the match might not light but at least we know that the match cannot evaporate or transform into a frog. The relative order and predictability of the world seem founded on its causal connections. Having claimed it as a legitimate object of study, we will now proceed to look at some of causation's alleged features. Along the way, some of the leading theories will emerge.

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