

Causation: hypothesis or theory?

Introduction

I'm going to make three points about my understanding of causation. First, I'll situate it within the **ontological model** I'm using. Second I'll situate it within the **epistemological model** I'm using. Third I'll explain why I think it's an idea currently in deep crisis.

[1] So first, the *ontology* within which I'm working is that there's **one** reality; existing in **two** modes; at **three** levels. The one reality consists, outsidelessly, in everything. Or in philosophy-speak, existence is not **a** predicate because it's **the** predicate: of everything. There is (outsidelessly) everything. Its two modes of existence are (1) as **materio-physical things** (extensional, and *constituting* space), and (2) as the **happenings** which go on in and through them (durational, and *constituting* time). And contrary to some understandings, 'spacetime' does not replace either space or time: it just adds a third concept with which to think. Then finally, the three levels of reality are (1) an **inorganic universe**, coming into existence some 13.8 thousand million years ago; (2) an **organic biosphere**, emerging on just one among millions of planets in that universe, the one called Earth, in the galaxy called the Milky Way, some 3.5 thousand million years ago; and (3) a **personic world**, emerging from just one among millions of species on planet Earth, the one called *Homo sapiens*, some 150,000 years ago. It's into this framework that my concept of causation needs to fit. And I think it does so like this.

Most cosmologists suggest that the coming into existence of the universe was a happening with no cause: not because it had some extra-normal or supernatural cause; not because it was a 'causa sui'; but because there was nothing before its beginning in which any cause, of any kind, could operate. In the beginning it was what they call 'the initial singularity', which consisting as it did in all the mass of the universe before it began to expand into 'the Big Bang' and inflation beyond, was of infinite density. There then followed four 'epochs' during which, in most tellings of the tale, the singular became *very* plural. First the Plank epoch, beginning with that initial singularity and lasting for miniscule parts of a second, during which it doubled in size many times. Then, in very quick succession, the quark-hadron-lepton epoch, lasting for no more than ten seconds; the epoch of stable protons and neutrons, lasting about 20 minutes; and the photon epoch, lasting for the next four hundred thousand years or so: these last three together seeing the emergence of sub-atomic particles. After which, at about 3 million years after the bang when temperatures were down to about 3000 K, the sub-atomic particles began to combine into atoms, thereby producing the grains of a fundamentally granular reality.

But I want to suggest that the *whole* of that reality – the universe, the biosphere and the world – remains to this day 'a singularity'. Not a singularity in the technical sense of the cosmologists, but a singularity in the more general sense of a oneness. There is just *one* reality. For most of its 13.8 thousand million year existence, it consisted in just an inorganic universe. Recently, from only about 3.5 thousand million years ago, an organic biosphere emerged from it. And very recently, from about 150,000 years ago, a personic world emerged from that. But the oneness of the whole has been maintained. And that's because each additional level has consisted *not* in an utterly *new* formation *toto caelo*, but in the

transformation of a part of the previous level. Which fact makes the *source* of the oneness of the whole ‘causation’.

Operative in both *modes* of reality and at all three *levels* of reality, it’s causation which is the unifier. Why? Because every materio/physical thing and every happening *was brought into very existence* by the transformation of *antecedent* materio/physical things and happenings. The element helium in our balloons is the same stuff as emerges from hydrogen in the sun. The element sodium (the sixth most abundant in the earth’s crust), and the element potassium (its near mate in Group 1 of the Periodic Table) combine to produce the sodium-potassium pump mechanism which carries the workings of our nervous systems. The genes carrying the instructions for making a hippopotamus come from the same grand gene-pool as those carrying the instructions for making me. Nothing in reality – no thing and no happening either – is autonomous. All the things and all the happenings of reality are one caused and causing whole, connected to each other through a common causational history.

[2] So now second, what makes me think that we *know* this? What about the *epistemology* of causation? Well, in old-fashioned philosophy, causation was seen as part of something called ‘metaphysics’: a name which emerged from the titles given to the collected works of Aristotle. The earlier ones, dealing with topics concerning the physical, were ‘the physics’. The later ones, dealing with everything else, were the ‘metaphysics’ - - - where ‘meta’ is to be read as ‘above and beyond’ and ‘physics’ is to be read as ‘science’. Metaphysics has therefore been taken to mean above and beyond science. But that was all more than 2000 years ago. Today, because our understanding of what science actually *is* has developed considerably, it’s my contention that metaphysics is dead. For with science understood, as now it most usually *is* understood by philosophers of science, as a *method*, as a *way* of analysing anything and everything, it has no ‘beyond’. Anything and everything can be understood scientifically (or unscientifically) depending on the way in which it’s studied. Science is a method of study. So along with everything else, we can now study *causation* scientifically too. And when we do, it emerges, I contend, as either an hypothesis or a theory - - - like this.

Science-as-a-method is most commonly thought of as a four-stage process. First, **observation**. Initially *presented directly* by sight, sound, touch, taste and smell, we gain a (non-linguistic) ‘sentient’ impression of things: then, *represented indirectly* primarily by sound, secondarily by sight, occasionally by touch, we gain a (linguistic) ‘conscious’ impression of things. Next, an **hypothesis**: a guess as to what is causing the patterns, regularities and irregularities which we experience. Third, the collection of what evidence we can to justify (or challenge) our guess, where possible by **experiment**. And fourth, when we have accumulated what the current cognoscenti judge to be enough evidence to support it, our hypothesis, which until then has been only a *candidate* theory, becomes an *actual theory*: the pinnacle of scientific endeavour. Science is thus a method: a way of moving, via **observation, hypothesis, experiment** and **theory**, to knowledge - - - in our case, of causation. And it’s vital to recognise in all this that none of it has anything to do with proof. Science does not deal in proof. It leaves that to simpler things like maths and logic. Science deals instead in **validity** and **reliability**.

So what of causation within *this* epistemology? Where does it fit into *this* scheme of things? Well despite the efforts of Hume and others to limit that which is observed only to that which is directly *experienced*, instead of more broadly into that which is directly or indirectly *detected*, stage one is secure. The best treatment of these issues within *philosophy*, I think, is that provided by Wesley Salmon ^[1]. As a realist, his process theory identifies a ‘marking principle’ which enables a distinction to be drawn between merely sequential happenings and causation. If you haven’t already done so, read him. And be confident: causes have been **observed** alright. So now, is their observation only sufficiently well supported for there to be a causation **hypothesis**? Or is it sufficiently well supported for there now to be a causation **theory**?

To get at an answer here, we have first to rid ourselves of a very widespread and very wrong idea about hypotheses. It’s sometimes suggested that hypotheses need to be able to be tested. They don’t. Most of them couldn’t be tested anyway: we say they are ‘non-operational’. What we have to do instead is derive from them what are known as ‘operational statements’: that is, statements of what *would* be the case if the hypothesis *were* the case. And then test *them*.

A simple if somewhat daft example. Suppose your (non-operational) hypothesis was that carrot eating improved night vision. OK. So if when driving at night, rabbits had fewer car accidents than foxes, that would be evidence supportive of it. And the statement ‘when driving at night rabbits have fewer car accidents than foxes’ is ‘operational’: you *can* ‘operate’ on *it*. As long as the animal police keep good records, that’s pretty easy. And if it turned out to be the case, there’s *one* bit of evidence in favour of the hypothesis. Put it on the ‘yes’ pile. Of course you need many more than *one* piece of evidence: something more like hundreds, probably. They would have to have been collected on a number of separate occasions (to control for fluke), in a number of different ways (to control for method bias), by various and independent workers (to control for experimenter bias or just plain fraud), and so on: modern scientific method has become, over time, pretty sophisticated. And evidence which can identify a *mechanism* at work – in this night vision case, for example, the identification of the different roles of rods and cones in the eye – is always crucial, sometimes definitive.

So now, what if your hypothesis, instead of being that carrot eating improves night vision, had been that the **happenings** existing at all three levels of reality are determinately **caused** by their antecedent conditions? Well, no hypothesis could so obviously be more untestable: that is, non-operational. But that doesn’t matter. For the abundance of ‘operational statements’ which could be derived from *this* one is almost unimaginably huge. Testing all *these* could take hundreds, no thousands of years. **As so it has**. For human persons have been testing them – recently and *formally* as ‘scientific method’: for much longer and *informally* as just living their lives – for as long as they’ve been around. So for time’s sake, let’s look at just one example which can show us both the informal and the formal in operation.

For the informal beginnings of scientific method, take a walk with a female *Homo sapiens* on a cliff beside the sea. If it was ‘now’, we’d call her a woman, and identify her route as that along what is now called the Pembrokeshire Coast Path. But it’s not now. Let’s say it’s maybe some 50 thousand years ago. She stops dead in her tracks, and looks very carefully (**observation**) at a black line that appears across her way. She’s heard tell of the long, black

evil spirit which by biting can cause death to her kind. But she guesses (**hypothesis**) that because it doesn't seem to move, this can't be it. Perhaps it's just a fallen twig. But she needs to be sure. So she picks up a stick and pokes it (**experiment**), and it slithers off into the undergrowth. Alert! A dangerous bite can't be caused by a lifeless twig. But it can be caused by a hideously slithering and thus living evil spirit. Experiment had shown her 'it's nothing important' hypothesis to be unsupported. [And note in passing that the *supported* hypotheses (**theories**) which these ancients did not have would in time be formulated by their descendants: theories of the causation of animal behaviour in general, snake behaviour in particular, would reveal that the black adders that bask in the sun along this particular path are relatively harmless if not disturbed.]

But now for the formal development also illustrated by the example. The female's unsupported hypothesis would cause both *her* future behaviour *and* that of the others she would inform, to be different: a nice illustration of behaviour being caused by its consequences. This is now spelled out as a formal theory in current psychological sciences, whereby the consequences of behaviour in the past, whether of the self or of others, *cause* the adoption (or avoidance) of the same or similar behaviour by the self or others, in the present and future. It's called learning. And **learning theory** is now reasonably well developed.

So back to our examination of the idea that the **happenings** existing at all three levels of reality are determinately **caused** by their antecedent conditions. Hypothesis then, or theory? It's my claim that causation so understood is, bar none, *almost* certainly (remember: only simple stuff like maths and logic deals in certainties) *almost* certainly the single most 'tested-by-its-derivative-operational-statements' hypothesis that has ever been formulated: the single best-supported theory in the book. [And what's more, on that certainty question, register also, on behalf of future developments, maybe in physics, that in stating *as a certainty* 'we can never be certain you know' doubters are asking us not to believe them. So don't.]

But now [3], the crisis.

There are many who would expect an argument claiming that there's currently a crisis concerning causation to be *mounted* in terms of happenings in physics. For fully launched maybe in 1927, it began to be claimed, by Bohr and the Copenhagenists, that anyway at the level of sub-atomic particles, it's *indeterminism*, interpreted as the *a-causal*, which is the order of the day. But that's *not* the crisis I mean. Indeed, compared with the crisis I mean, *that one* is probably going to be looked back on as just 'a little local difficulty', sorted. And if you need signs that this 'sorting' is already beginning to happen, try this. On line, read the review article 'The Defeat of Reason' ^[2] in the current Boston Review (June 1, 2018), drawn to our attentions by our own Bill Radcliffe in one of his ever helpful posts. Then comfortably forget it. The physicists are onto it: the recognition that Copenhagen is only one among several possible interpretations of quantum phenomena, several of them not requiring either *indeterminism* or the *a-causal*, would appear to be growing. And we can turn instead to think about a crisis much more fundamental: one which has been building maybe for as long as persons have existed, and which now reaches fever pitch. For reasons which will emerge, I'm going to call it 'the headless man crisis'.

We started by getting to know the easier stuff: the stuff of the **first** level of reality, of the inorganic universe. And even there, although the stories that had planets and stars doing all sorts of unlikely things just because they felt like it were the first to topple to the sciences

revealing causation, it was a process which took thousands of years, and which even now can be found lingering: ‘pathetic fallacies’, as they’re called, are still, if feebly, around. Then, as our knowings accumulated, confidence increased. And we began to tackle the more difficult stuff of the **second** level of reality: of the organic biosphere. So OK. Maybe causation rules at the inorganic level. But in the biosphere? Here be life. And that, surely, just *has* to be magic! For thousands of years the bounties of nature were seen as presents from the gods; its aberrational disfigurements as divine punishments for evil doing; and its mysteries forever ineffable. But the still small voice of scientific calm pressed on in. And now our understanding of causation in the organic is bringing unprecedented relief to unprecedented numbers of people around the world. Perhaps it’s now even *most* of the human race, more than 50% of us, who have *some* knowledge of evolution, *some* knowledge of genetics, *some* understanding of the causation which sits behind the flowers that bloom and the birds that sing.

But it’s with the very latest ‘now’ that the real crisis looms. Beginning perhaps somewhere in the middle of the 19th century we began seriously to tackle the stuff of the **third** and most recent level of reality: essentially ourselves. And in many places, the growing panic is almost tangible. That thunder is caused by lightening cutting a temporary vacuum through space: fine. That cystic fibrosis is caused by an anomaly on chromosome 15: fine (ish). But that my *private* thoughts are caused by the shifting states of a brain – indeed *are* the shifting states of a brain (or worse, as some idiot is suggesting, that it’s my words that speak me rather than I who speak my words): well that’s just too much. Stop the world, I want to get off.

But the still small voice presses on in. It was the great Italian philosopher Vico^[3] who suggested that we only ever really understand that which we make. Well just a couple of months back, in June, we celebrated the 70th birthday of Manchester’s ‘Baby’: the world’s first stored-programme electronic computer. And the ensuing computer revolution of the last 70 years has meant that we have now *made*, actually *made*, momentarily complex wholes out of the simplest of on/off parts. There are many consequences of that huge achievement. But not least among them is the fact that we are now able to look, with greater confidence and a steadier gaze, at the most complex thing in reality, and say: this too we can come to understand. The human brain itself is within our sights. As someone who trained in psychology, I think neuroscience is, without doubt, the most exciting scientific enterprise of our time. But I also know that, at least for some, it’s instead the most terrifying. So why is that?

Well enter ‘the headless man’. The detail here is mine. But it was the Australian philosopher D.M. Armstrong who, in a *different* context and with *different* detail, introduced this character into philosophy. Here’s the story.

There’s a conjurer, a highly skilled performer at magic shows. She has sawn in half many a scantily-dressed-man-in-a-box in her time. But her most compelling trick is to show her (hopefully) startled audience a man without a head walking around the stage with her. Her skill is in such things as the use of clever lighting; the colours used both as backdrop and as clothing; and the way in which she directs the attention of her audience *from* things which might give the game away *towards* things that don’t. This is how she creates her illusion. For illusion it certainly is: walking men *do have* heads. But when the trick works, this is what

happens. The audience mistakes *not being able* to see that the man *has* a head with *being able* to see that he hasn't.

And the *analogous* illusion which forms the basis of the *real* crisis of causation? As brain science proceeds, it's beginning to look as though, for thousands of years, perhaps for as long as there have been persons, they (we: or anyway most of us) have been mistaking *not being able* to feel that we *are* causally determined with *being able* to feel that we're not. At least in its modern form, the doctrine of free-will as propounded by most of the world's religions, has been the major version of this which might be called 'personic exceptionalism'. We, subjects not objects, doers not the done-to, are somehow *outside* the world – the *outside* world as we actually call it – looking at it from nowhere. Maybe not from God's majestic nowhere. But from a nowhere enough to enable us to recognise causation everywhere around us, out there, but only from within the freedom-from-causation of ourselves.

It's an illusion with many facets. Here are just three. One: it overlooks the fact that a view from nowhere, whether God's majestic one or our more modest variety as creatures made in his image, would not be of everything but of nothing. For views are like that. They are *from* viewing platforms: *from* points-of-view. It would be the view from everywhere which would give us everything. Two: it's an illusion which some few across history have half recognised, maybe even totally recognised, *as* an illusion: for me it was the incomparable Spinoza who began my enlightenment. And three: it's an illusion which, as it fades, presents us human persons with the biggest constraint which is also the biggest enablement we have ever faced.

This, I contend, is the *real* 'causation crisis'. It's that we're probably being revealed as being *as* determinedly caused as everything else in reality. We don't have free will. We're not able to *feel* that we're determinedly caused. But then we're not able to *feel* that we're hurtling round the sun at 100 thousand kilometres an hour either. But we are. Our science has enabled us to *know* what we cannot *feel*. The illusion of free will, of our being the uncaused observers of a caused world, has been comforting, but also vicious. It has a terrible history. Think of all those poor, damaged, weak and afflicted ones; those tired, broken, unproductive and undeserving ones; those bad, wicked, inferior and unimportant ones: those who across centuries have been punished, derided, punished, excluded, punished – just 'blamed' – for not exercising their 'free will' to be other than they were. Should we really lament the loss of the somewhat smug idea which permitted all that? As blame recedes, as the still small voice of science presses on in and the better angels of our nature, which are actually the better angels of our culture, require that it should, there are *two* causation questions which need answering here.

One: have I been the one who, by the selection of its wording, *caused* this paper to emerge as it has? Yes. But two: what *is* this 'I' which has so caused? Ever more firmly on the table now is the proposition that it's the continuously changing state of a brain, determinately formed and reformed by the continuously changing input into it of linguistically structured experience. And that it's one such unique experience which is me. And another such unique experience which is you.

Notes

[1] Wesley C. Salmon (1925 – 2001) was an American philosopher of science, whose main interest was in the nature of scientific explanation. He was a philosophical realist - - - and a realist, therefore, about the role of causality in such explanation: a position which placed him in opposition to most philosophers working in this area who, intellectual descendants of Hume's 'constant conjunction of sensory events', understood scientific explanation to be describing regularities but not thereby identifying causes. Salmon, by contrast, saw the statistical models of those such as the very influential Carl Hempel as just stop-gap approximations, offering law-*like* description in the absence of law-*full* explanation. True explanation, he argued, comes only via the eventual identification of causal mechanisms. His theory of causation argued that the two basic causal mechanisms were 'causal process' and 'causal interaction'. Insisting that causation was an *ontological* reality not merely an *epistemic* reality, his main concept was what he called a 'marking principle'. Causal processes were the means by which causal influence is transmitted, and such influence involves the 'marking' of the effect by its cause. In simple picture-book terms, think of billiard-ball A, chalk-covered, leaving a chalk-mark on billiard-ball B, while the mere 'constant conjunction' of day following night, for example, leaves no such 'mark'.

[2] 'The Defeat of Reason' is a review by Tim Maudlin in the June 1st 2018 issue of the Boston Review. He is reviewing two books, but it is the first – Adam Becker's *What Is Real?: The Unfinished Quest for the Meaning of Quantum Physics* (Basic Books) – which is relevant to the issues we are discussing. After many pages of analysis – it's a long and detailed review – Maudlin's conclusion is - - -

'- - - following the fate of Einstein, Bohm and Everett, Becker could just be ignored. But if you have any interest in the implications of quantum theory, or in the suppression of scientific curiosity, *What is Real?* is required reading. There is no more reliable, careful and readable account of the whole history of quantum theory in all its scandalous detail'.

And in case you don't know, the 'suppression' refers to the 'scandalous' politicking of the Copenhagenists which has led to many people, perhaps even most people, not even being *aware* that theirs is not the only interpretation available: and in particular, that determinist interpretations, particularly that of David Bohm, are serious contenders in the field.

[3] Giovanni Battista Vico (1668 – 1744) was an Italian academic at the University of Naples. He was a generalist, writing and lecturing on rhetoric, jurisprudence, philology, and philosophy. His most important book was *Scienza Nuova* (*The New Science*). During his lifetime his work was for the most part either ignored or misunderstood, but he was 'rediscovered' two centuries later, and is now widely acknowledged as a highly original thinker. In 1709 he published *On the study methods of our time*, comparing the then current methods with those of the Ancient Greeks. His most often remembered thought was *verum et factum convertuntur*, variously translated as 'the true and the made are convertible'; 'the true is precisely what is made'; or 'the true is the made'. Against metaphysics, he argued that morality has to be studied via an analysis of the causes – meaning the activity – through which things are made. Phenomena can only be known by their causes (*per causas*). And

right at the beginning of *The New Science* he makes a clear distinction between *il vero* and *il certo* - - - 'the true' and 'the certain'. The hypothetico/deductive method errs, he thinks, by tending to treat phenomena which can't be expressed mathematically or logically as illusions. And on morality, he suggests that the three vices inherited from nature which culture needs to tame are 'ferocity, avarice and ambition'.