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No Good Arguments for Causal Closure

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Abstract: Many common arguments for physicalism begin with the principle that the cosmos is "causally closed." But how good are the arguments for causal closure itself? I argue that the deductive, a priori arguments on behalf of causal closure tend to beg the question. The extant inductive arguments fare no better. They commit a sampling error or a non-sequitur, or else offer conclusions that remain compatible with causal openness. In short, we have no good arguments that the physical world is causally closed.

Keywords: causal closure, materialism, naturalism, physicalism

1 Introduction

Many common arguments for physicalism begin with the principle that the cosmos is "causally closed."[1] What does it mean for the cosmos to be causally *closed*? Roughly, the principle of causal closure (CC) states that forces outside the physical world make no causal difference to what happens in the physical world. I shall revise this rough formulation below.

For now, observe how CC plays the role of the first premise in this commonly cited argument on behalf of physicalism:

1. Every physical effect has a physical cause (the Causal Closure premise).
2. There is no systematic causal over-determination of physical effects (this premise is often labeled the Exclusion Principle.).
3. Mental events sometimes cause physical events.
4. Mental causes for physical events must *themselves* be physical causes. (The Physicalist thesis. Compare Bishop [2005])[2]

1 Robert Garcia (2014) calls this particular defense of physicalism the "Exclusion Argument". For more detailed iterations of this physicalist argument, see David Papineau (2007), Andrew Melnyk (2003), and Jaegwon Kim (2007).

2 To take one example, it is plausible to credit my mental picture of a relaxing beach in Hawaii with *causing* me to start planning an actual vacation to Hawaii. However, if all physical effects have a physical cause, then my (very physical) trip to Hawaii must have a physical cause.

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CC is an important claim with wide-reaching implications within the philosophy of mind, philosophy of religion, and more (see Corry 2013). Whether on its own, or as a piece of the argument for physicalism, causal closure stands against hylomorphic accounts of causation, supernatural theistic accounts of divine causation, and dualistic accounts of mental causation, or Platonic accounts of formal causation.

CC is the sort of principle that many philosophers find overwhelmingly plausible. As Barbara Montero (2003) rightly points out, some philosophers "have a vague nagging feeling that rejecting CC is somehow being antiscientific." Is there any substance to this nagging feeling?

The scope of this paper is not to discuss physicalism in general but causal closure and its relation to physicalism. Are those who reject causal closure guilty of some rational malpractice? I shall argue that they are not. There are no good arguments for CC. Even if my argument holds, it does not follow that the cosmos is causally open. Rather, one is rationally allowed to consider alternatives: some may reject CC, others accept it as a mere hypothesis, while still others may simply remain agnostic. But, importantly, if there are no good arguments for CC, then those who do adopt CC as a mere hypothesis should not pressure others to do the same, as if allegiance to CC was a matter of loyalty to the scientific worldview.

Section 2 surveys a litany of attempts to articulate CC with adequate precision, while Section 3 shows the inadequacy of conservation arguments. Section 4 exposes the chief difficulty of deductive, a priori arguments on behalf of CC. Sections 5, 6, and and 7 expose the weaknesses of inductive and abductive (i.e., inference to the best explanation) arguments. Section 8 ventures an opinionated characterization of CC as an "attitude" or temperament which has become a misguided symbol of one's allegiance to the scientific world picture.

2 Formulating CC

One of the problems for causal closure advocates is articulating precisely what the claim is (Bishop 2005). There is no shortage of attempts. Each has its respective problems.[3] Before considering arguments on behalf of CC, I shall survey a few major attempts to formulate it.

3 Compare: "… every physical event has a physical explanation." (Davidson); "Anything having physical effects must itself be physical" (Papineau 2002); "All physical effects are fully determined by fundamental laws and prior physical events … " (Bishop 2005). What each of these formulations shares with the others is that they posit a relation between a physical cause and its effect such that the cause is physical. Even so, ambiguities remain.

The rough formulation we used above (CC1: Every physical effect has a physical cause) will not do; it does not account for the possibility that some physical effects (such as the Big Bang or a quantum fluctuation) might have no *physical cause* at all.

Try CC2: "Every physical effect which has a cause has a sufficient physical cause" (Lowe 2000).

The inadequacy of CC2 turns on Robert K. Garcia's (2014, 99) distinction between the "proximal and distal" causes of an event. He points out that a given physical event might have both a distal (non-immediate) mental cause *and* a proximal (immediate) physical cause. The notion that physical events have both mental and physical causes violates the spirit of causal closure. Let's try another formulation:

(CC3): Every physical effect which has a cause has an immediate physical sufficient cause.

CC3 is closer but still not quite right. For there is a distinction between being a "physical sufficient cause" and a "physically-sufficient" cause (Garcia 2014, 99). Perhaps a physical event (such as a facial grimace) has an immediate, physical, sufficient cause (some brain event) but lacks a physically-sufficient cause since the ultimate distal cause was a simultaneous non-physical cause such as a mental pain-event.

Accounting for the above exception forces us to consider yet another formulation:

CC4: "For every physical effect E, a direct cause C brings about E entirely in virtue of C's physical properties" (Garcia 2014, 101).

Garcia further notes that even CC4 admits of a distinction between "level" and "domain" versions of the same formulation. The "level" version specifies that micro-level (say, atomic or quantum level) effects require that their causes impinge at the same micro-level.

Garcia offers a "level" version in CC5: "For every phi-level physical effect, there is a direct cause which brings about the effect entirely in virtue of the cause's phi-level physical properties" (Garcia 2014, 105).

The level version is more stringent but it's not obvious that the domain version runs afoul of physicalism. By contrast, the domain version allows that higher level causes can have lower level effects, so long as both belong to a physical domain. A higher level physical entity might have irreducible causal powers, i.e., perhaps baseball bats have the capacity to cause baseballs to soar through the air, but not to send quantum particles through the air. Though both levels are in the physical domain, it's not obvious that there is a *causal* relation between baseballs and their constituent atoms and quantum particles.

While this discussion how more precisely to articulate CC could continue, my purpose is to consider arguments on behalf of CC. The above discussion should show, however, a general moral that will become more vivid below: it is difficult even to formulate CC adequately without begging the question in favor of physicalism. The more precise the formulation is, the more likely it is to transform into metaphysical claim amounting to physicalism itself. If stating causal closure (with sufficient precision) were equivalent to simply asserting physicalism, then causal closure could no longer function as a premise in an argument for physicalism. On the other hand, the less precise the formulation is, the more likely it is to be compatible with causal openness.

3 Argument from Conservation

We now turn to positive arguments on behalf of Causal Closure. The first argument on behalf of causal closure, which I take to be an instance of a priori, deductive arguments, builds on conservation laws from modern physics (see Papineau 2002 and Vicente 2019).

Conservation laws indicate that while certain variables may be reconfigured within a physical system over time, they are not produced or annihilated. Nonphysical causes, pace conservation, would introduce new quantities of matter and energy into the cosmos *ex nihilo*, which seems impossible.

The inference from conservation laws to causal closure is tempting but the temptation ought to be resisted. First, the scope of conservation laws cannot be taken to be universal without begging the question (Collins 2008).

A dilemma: either conservation laws from physics should be taken to make it impossible that non-physical forces should have physical effects or else such laws simply describe our observations of physical systems, without addressing what is necessary or possible. If we take the first horn and treat conservation laws as rendering all non-physical causation impossible *in principle*, then such laws simply stipulate physicalism. They are metaphysical assertions couched under scientific language. If we take the other horn and treat conservation laws as mere descriptions of our observations of physical system, then they are *in principle* compatible with the presence of mental, formal, or divine forces which we would be chary to call 'physical.' For example, conservation laws would not rule out the possibility of mental forces, say, that are convertible into more familiar forms of energy. On Newtonian physics, a Cartesian mind, say, would have psychic energy that could affect its body – perhaps by influence the *direction* of its motions rather than the speed. Furthermore, even on modern physics, the overall amount of

kinetic energy can be reduced or increased in proportion to the inverse proportional increase or decrease in potential energy. Hence, perhaps supernatural or mental agency exists in the physical cosmos in the form of latent potential energy that, when actualized, has visible, empirical effects. Lowe (2000) says that, "It won't do simply to object that energy is by definition a physical quantity, as this threatens to turn the dispute into a purely verbal one."

Another consideration tells against the appeal to conservation laws on behalf of CC. That is that our best present day observations of physical systems do not rule out future discoveries of additional fundamental forces that we currently do not acknowledge. It is at least conceivable that mental forces are in a class of basic, irreducible forces. Gravity and strong nuclear force were not well understood a thousand or even a hundred years ago; perhaps in a hundred or a thousand years we will have a deeper understanding of a wider set of irreducible forces.

In light of such reflections, Papineau (a CC defender) concedes that "the Newtonian conservation of energy does not stop deterministic vital and mental forces affecting the physical realm" (Papineau 2009, 57). As we shall see again below, the moral of the story is that the arguments of CC are either too strong (begging the question) or two weak (remaining compatible with nonphysical causation).

4 The Exclusion Principle

A second argument for CC depends on "The Exclusion Principle". This principle states quite plausibly that there is no causal over determination of physical events. As David Papineau says, "According to the causal-closure thesis, this physical effect already has a sufficient physical cause. So, on pain of deeming this effect to have two independent causes, we need somehow to collapse the non-physical cause into the physical cause" (Papineau 2009, 57). We have deep-seated intuitions that a particular event cannot be caused by two independent sufficient causes. For example, my vacation planning is not caused *both* by a physical neural event *and* by a non-physical mental event. So causal closure advocates accordingly work to show how the mental reduces to the physical, is identical to the physical, or supervenes on the physical in some non-objectionable way.

One might challenge the exclusion principle on the basis that some physical events plausibly seem to have multiple sufficient causes. One can imagine a firing squad wherein multiple executioners pull their triggers at the same moment, each dealing an independent and sufficiently fatal blow to the prisoner. In response, however, one can deny the assumption that two bullets entering the prisoner's body at the same moment counts as two separate events; if someone falls from a

great height and dies on impact with the ground, we do not separate out the impact of the legs, arms, shoulders, head, etc. as separate events but simply say that the impact was fatal.

The real flaw here is that the exclusion principle cannot successfully "exclude" non-physical causes *co-operating* alongside physical causes – unless it begs the question. Unless there is only one kind of cause, then it is metaphysically possible that two kinds of cause are simultaneously operative. To borrow an example from E.J. Lowe, we can imagine that God brings about the physical world in a particular way, including a set of natural laws governing the interaction of physical entities. In this case, the physical facts – the state of the world – would be the result of both mental causation (the divine choice) and any subsequent chains of physical causation.

The only way to block the possibility of God thus creating the physical world would be to stipulate, in advance, that there is no such person as God who might speak the world into being or that this universe arose as one quark in the multiverse. But of course *stipulating* that p is true is the same as giving up on arguing that p is true.

The same problem we noted above recurs: any attempt to deploy CC to argue for physicalism either allows the co-existence of "physical" mental or supernatural causes or else they simply assume CC as an axiomatic expression of physicalism itself. A more promising recent trend has been to appeal to inductive arguments for CC.

5 Argument from Scientific Progress

Inductive arguments for CC are less liable to beg the question because they begin with premises that are far removed from CC itself. Nevertheless, they fail along different lines. We shall consider a few specimens of inductive or a posteriori arguments from David Papineau and Andrew Melnyk.

Andrew Melnyk (2003) makes the following case:

> …contemporary physics has succeeded in finding sufficient physical causes for physical effects of very many kinds; and it has found no physical effects at all for which it is necessary (or even likely to turn out to be necessary) to invoke non-physical causes. But current physics' success to date in finding that many physical events have sufficient physical causes provides inductive evidence that all physical events, including both unexamined physical events and examined-but-as-yet-unexplained physical events, have sufficient physical causes.

Similarly, in David Papineau's (2007, 31) "Rise of Physicalism," he says this:

> A great deal became known about biochemical and neurophysiological processes, especially at the level of the cell, and none of it gave any evidence for the existence of special forces not found elsewhere in nature … Though it has not always been so, there is now good reason to believe the empirical thesis that all physical effects are due to physical causes.

Papineau's informative tour through the paradigm shifts in physical sciences provides a useful historical dimension to causal closure arguments. There, he intends to establish that we moderns have new evidence that was simply not available to our forebears. With the advance of scientific research in physiology, many hitherto hypothesized causes (like the soul and "vital forces") which pre-modern thinkers used to explain the physical processes of life and consciousness have been discarded. This pattern lends some support to the inductive inference that, in the future, more non-physical causes will be discarded.

To be clear, Papineau and Melnyk are *not* asserting that we already have ready-made physical explanations of each and every phenomenon; the origin of the first eukaryotic cell in biology, or the emergences of first-person consciousness in psychology remain mysteries. Rather, they are making an inductive generalization.

That said, just what exactly is the argument? To lay out their argument explicitly, we should distinguish between three sets of physical effects: Set A consists of physical effects whose physical cause is known and accepted without dispute. Set B consists of formerly unsolved mysteries which have turned out, under modern scientific scrutiny, to have physical causes (examples include viral explanations of sickness, etc.) Set C is consists of the remaining as-of-yet-unsolved mysteries – physical effects without a known and undisputed sufficient physical cause: miracle healings, or diseases (such as cancer) with no clear and universal causal explanation. Set B is a subset of A. The question is whether Set C is a subset of A or not. Papineau and Melnyk are arguing that it is.

A good inductive inference moves from the presence of a target property in a sample population to the presence of that property in the target population. The strength of the inference depends upon the strength of the relationship between the sample and the target populations. In the case of CC, the target property is that of *having a physical cause*. The target population is C, i.e., all of the other physical effects with as-of-yet-unknown causes. The sample population is set B, the physical effects that were once mysterious but have turned out to have physical causes. If all members of B have physical causes (and belong in Set A), then (generalizing) all members of C have physical causes (and also belong in Set A).

There are several flaws to be noted. The first is that the sample population (Set B) cannot be treated as representative of the target population (Set C) without begging the question. Papineau explicitly cites the new information acquired by *physical and*

physiological scientists while conducting empirical research. Surely it is relevant that scientists (qua physical researchers) do not bother studying possible non-physical causes. As a matter of fact, a Pew survey found that a majority of practising scientists in the U.S. *do* believe in the non-physical – that is, God or a "higher power." (Kohut et al. 2009, 36). Nevertheless, such scientists need not be concerned with non-physical causes, *at the moment of searching for physical causes*. It is simply not part of their empirical method to deny or affirm that minds, gods, ghosts, or forms might exist if their existence would nevertheless lie outside the scope of professional research (Von Wachter 2006). A mechanic who fixes cars does not, qua mechanic, need to find out which Toyota factory constructed this particular car; so an astrophysicist who studies galaxies need not, qua astrophysicist, need to find out whether a god (and which god) formed the galaxy.

A second flaw is that the 18th century enthusiasm for quasi-physical "forces" is not a good analogy to contemporary hylomorphist, dualist, or supernaturalist defense of non-physical causes. 18th century researchers like Robert Whytt hoped would account for physical phenomena of life and consciousness as a quasi-physical force, but their hypothesis was disconfirmed. By the non-physicalist's lights, Whytt and others confused the notion of a quasi-physical force with a genuinely non-physical entity, such as a form or God. They should never have gone in for such forces in the first place.

A third flaw: from the same premises, we can construct an inductive argument for causal openness with equal and opposite force. For example, if Set C were a subset of Set B, then we should have a nice bundle of good physical explanations for C's members. (How long must the hard problem of consciousness remain unsolved before we give up hope that a physicalist solution is coming?) We don't have such a set of good explanations; C is still full of mysteries. So Set C must not be a subset of B; some physical effects *will never* be shown to have physical causes. Now, such an inference would of course be hasty. The point is that it is no less hasty than the opposite, unless we are predisposed to take causal closure to be more likely from the start.

6 Appeals to Progress

A slightly different variation on the above arguments appears in Papineau's work. The variation is worth noting. He says: "Over the last hundred and fifty years a great deal has come to be known about the workings of biological systems (including brains), and there has been no indication that anything other than basic physical forces is needed to account for their operation … The result has been that

the overwhelming majority of scientists now reject vital and mental forces, and accept the causal closure of the physical realm" (Papineau 2009, 57).

The first part of this quotation is correct: we have amassed a rich and varied amount of data about the workings of brains and organic bodies. But the second part veils a couple of dubious assumptions: that some time ago, everyone was a supernaturalist and no one was a physicalist while, nowadays, every educated scientist or philosopher is a physicalist. In fact, a majority of scientists accept non-physical explanations of physical phenomena (whether or not that commitment impinges on their research); it's only philosophers for whom the majority is physicalists (Bourget and Chalmers 2014). Furthermore, ancient and medieval materialists held much the same beliefs as contemporary physicalists, so the differences should not be exaggerated. Democritus and Lucretius used strikingly similar arguments to deny a non-natural realm and non-natural causes – all without the benefit of data from modern physics or physiology.[4] If our present vantage point is superior to that of the ancients with respect to justifying causal closure, how and why could ancient physicalists could affirm virtually the same thesis?.

7 Argument from Usefulness

The final type of argument for CC is abductive in C.S. Peirce's sense, in that it begins by noting the usefulness of CC in conducting scientific research. Hence I shall call this the "argument from usefulness." We can call this line of thinking the "Argument from Methodological Naturalism" (Stoljar 2015). A specimen of this argument comes from Jaegwon Kim, who points out that ruling out possible nonphysical causes is not happenstance but a guiding presupposition of modern research. Kim says:

> Surely the working neuroscientist does not believe that to have a complete understanding of these complex processes she needs to include in her account the workings of immaterial souls and how they influence the motion of a molecule … Most physicalists … accept the causal closure of the physical not only as a fundamental metaphysical doctrine but as an indispensable methodological presupposition of the physical sciences (Kim 1996, 131).

4 Compare with Quentin Smith (2001) who argues that contemporary physicalism is continuous with the materialism defended two millennia ago, even without the benefit of modern science. "Leucippus, Democritus … etc., …. argued against the religion of their time and put a naturalist world-view in its place … The universe ("the All" or "the unlimited") is a causally deterministic, discrete, infinitely old sequence of atomic events [each of which] has its sufficient cause in the prior state of that size."

The argument runs as follows:

1. The usefulness of an assumption in productive research is best explained by the the truth of that assumption.
2. Physicists, neuroscientists, and other researchers get along quite well in making scientific discoveries while assuming ex hypothesi that there are no nonphysical causes. CC is useful.
3. The usefulness of CC is best explained by the truth of CC.

In response, we must note two points. First, whatever data is amassed *under* an assumption cannot serve as evidence *for* that assumption. The scientist's attention to only physical causes does not entail that only physical causes exist. Selective attention to X does not entail that Y does not exist. A mathematician studying mathematical problems is only interested in mathematical solutions, which does not entail that only problems within mathematical domains exist.

The second point is that when an assumption underwrites the discovery of new data, such discovery certainly does count in favor of the truth of that assumption. The assumption of causal closure might be useful because it is true, approximate to the truth, or false but coincidentally compatible with the scientific research being conducted.

Unless one already assumes causal closure to be true, we cannot infer its truth from its usefulness in scientific research, especially if there are any other competing explanations that are as plausible or nearly as plausible. And there is another plausible explanation: namely, that it is useful, in conducting research, to employ a monomaniacal focus on a single domain. To use a fanciful illustration, imagine that a mathematician methodologically assumed that all problems have mathematical solutions. She thereby makes enormous strides in her field. It would be wrong-headed of her to conclude that she has discovered a great truth – that all problems of friendship and politics have mathematical solutions. All that has happened is that she has made great progress virtue by adopting a monolithic focus within a limited domain. Similarly, we might explain the rise of modern science as the success that results from disciplined limits on research. The physicist learns more about the physical causes and effects by choosing temporarily to ignore nonphysical causes (which might after all be there) because she is a physicist.

If this explanation is logically possible, so the physicalist is not justified in simply inferring that CC is true on the basis that CC underwrites good research. Kim cannot assume causal closure is the "best" explanation without showing that the other alternatives are not as good, which he cannot do except by giving independent reason to believe physicalism is likely to be true. And causal closure was supposed to give us reason to believe physicalism is true, not the other way around.

Some physicalists might encourage us to "wait and see" just how much contemporary and future scientists can explain. But the flaw with inductive arguments for CC is not likely to be solved by more time. For the physicalist will interpret every newly discovered physical cause as justifying her hope that nonphysical causes will never "turn out to be necessary", while the non-physicalist will interpret the persisting set of unknowns as justifying her belief in causal openness. How long shall we amass more evidence? A century? A millennium?

The common theme in my criticisms of the deductive, inductive, and abductive arguments is that they are all *only compelling to those who are already physicalists* – which is to say, they are not compelling to those who are opposed or undecided.

8 Physicalism as Temperament

If there are currently no good arguments for causal closure, there may be some on the horizon. In the meantime, it might be useful to speculate on how it is that CC has become enshrined as one of the symbols of allegiance to the scientific picture of the world. Perhaps the confidence its defenders express is not rooted in the excellence of the arguments but in a physicalist disposition.[5]

In putting forward this tendentious hypothesis, I am agreeing with Alyssa Ney (2008). Ney has argued quite persuasively that physicalism is not so much a truth claim as an "attitude." Physicalism is an oath "to go in my ontology everywhere and only where physics leads me." This attitude is a blank check. Physics is not finished, so my ontology is not finished. But wherever it goes, the physicalist will follow. Groups of physicalists who adopt this attitude form an informal affiliation – a physicalist club[6] – that arises within universities, departments, and so on.

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5 Compare with Richard Leowontin's (1997) eloquent praise of materialism not as the inevitable conclusion of philosophical reflection, but as a sort of axiom: "We take the side of science in spite of the patent absurdity of some of its constructs, in spite of its failure to fulfill many of its extravagant promises of health and life, in spite of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a prior commitment, a commitment to materialism. It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated."

6 As a matter of some trivial interest, I did find some evidence of the existence of actual "physicalist club" which boasted the membership of German physicist Herman Helmholtz (Ballantyne 2008). This social club for scientists reportedly even followed something similar to Ney's oath: they promised to appeal to no forces other than physical and chemical forces within organisms.

Put differently, physicalism is what Thomas Nagel calls a "temperament." In his *Secular Philosophy and the Religious Temperament* (2009), Nagel contrasts two temperaments: the religious and the naturalist. The religious temperament may or may not find expression in a particular religious commitment. Plato, he says, had "a profoundly religious temperament, displayed not in what he said about religion, but in his philosophy" (Nagel 2009, 3). Nevertheless, the religious temperament longs to "live in harmony with the universe and not just in it" (Nagel 2009, 5). The physicalist temperament is content to live in the universe without such cosmic harmony. Hume, for example, expresses in his philosophy a "serene naturalism" that is a "deep expression of his temperament, and he obviously feels no yearning for harmony with the cosmos" (Nagel 2009, 7). The physicalist shares the "pure desire for understanding of the universe and one's place in it" but lacks the religious attitude.

These rival temperaments are difficult to resolve through argumentation alone. That is not to say that argumentation is useless: thinkers can and do change their minds in both directions on the basis of reflection and experience. But even in the time of Plato, at philosophy's nascency, the rivalry was "ancient." The characters in his *Sophist* speak about the "ancient war" between idealists and materialists, "a battle like that of the gods and the giants [arising from] their disagreement about existence" (246a). Such a rivalry is not likely to be explicated by a few contrasting syllogisms, but more likely arises from deep and perhaps pre-rational dispositions that are hard to bring to the surface.

Papineau for one disputes the notion that physicalism is merely an attitude, an "unreasoned commitment" or "ultimate decision" to remain loyal to naturalism. His reason is that "naturalist doctrines … are closely responsive to received scientific opinion about the range of causes that can have physical effects" (Papineau 2015, section 1.2). But, as I have argued above, the non-question-begging arguments for CC that are based upon received scientific opinion are no better than arguments against CC based on the same premises.

9 Conclusion

In this article, I have argued that there are no good arguments for the principle of causal closure (CC). The extant deductive, inductive, and abductive arguments fall afoul of the same dilemma, either begging the question in favor of causal closure or remaining compatible with causal openness. The upshot of my argument is that CC sceptics or agnostics are on just as good of dialectical ground as CC defenders. Some disputants may reject CC, others may remain agnostic, and others may accept CC as a hypothesis and continue to develop better arguments on its behalf.

But none should be accused of engaging in rational malpractice or demonstrating a lack of loyalty to modern physics. Instead, I have suggested that physicalist temperament more accurately explains why some philosophers find it overwhelmingly plausible to suppose that the cosmos is causally closed. Even if my criticisms of arguments for CC hold water, they do not entail that the cosmos is causally open. I have not pretended to do the positive work of defending any particular brand of non-physicalism. Nevertheless, in light of the lack of support for causal closure, it seems that the most rational — even most scientific — attitude would be to remain open to causal openness.

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