Does the Universe Have a Cause? Yes!

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1.   Introduction

Causation is one of the most fundamental building blocks of metaphysics, the "cement of the universe," as J. L. Mackie once put it. Consequently, I don't have a definition to offer, but we can say this much: when we discover the causes of something, we are in a position to *explain* it. Since explanations cannot be circular, neither can be causation itself.

Causation is a kind of relation, but what kind of things does it relate? What are its relata? Some suggest that the relata are states of affairs, others facts, others events, and still others fundamental truths (i.e., the truth of certain fundamental propositions). I will take no position here on this question, but for the sake of simplifying the exposition, I will speak of states of affairs, understanding by this something like David M. Armstrong's conception,[1] according to which an actual *state of affairs* is something that actually exists and that actually combines certain entities and properties into a fact-like complex, corresponding to a simple, atomic proposition. In addition, I will argue (in section 2) that we must take *pluralities* of these states of affairs as potential joint causes and effects, rather than focusing exclusively on individual ones.

I argue in section 2 that not everything has a cause. First, I offer two arguments there against the possibility of an infinite causal regress. I also argue that the plurality of all states of affairs

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[1] David M. Armstrong, *A World of States of Affairs* (Cambridge: Cambridge University Press, 1997).

("Reality") must be uncaused. So, there is at least one uncaused thing (or plurality of things). In section 3, I provide a set of epistemological arguments for thinking that we must know *a priori* a principle that successfully draws the line between the caused and uncaused things. I apply this principle in section 4 to the universe, with the result that the universe (properly defined) falls within the class of caused things. In section 5, I offer three sets of supplemental arguments for the conclusion that the universe has a cause.

2.   Does everything have a cause?

Does absolutely everything have a cause? By 'everything', I mean everything, and all pluralities of things, in the appropriate ontological category. If the causal relata are states of affairs or situations, then Causal Universalism would be the thesis that all states of affairs, both individually and in all combinations, have causes. If we think instead in terms of causal explanation as a relation between ontologically fundamental truths, then the thesis would be that all such truths and all pluralities of such truths have causal explanations. For the sake of simplicity of exposition, I will assume that the basic relata of causation are states of affairs, but all of my arguments would apply with equal force on the alternatives.

Causal Universalism invites assent because of its simplicity. However, there are two considerations that provide grounds for denying it. First, there are good reasons to embrace Causal Finitism, the thesis that all causal chains are finite in length, ruling out all causal cycles and infinite causal regresses. Second, the ban on causal circularity also rules out infinite

regresses. Finally, if we assume that self-causation is impossible, then Causal Universalism leads to a contradiction when it is applied to the totality of all states of affairs.

A.   Causal finitism.

In some important recent work,[2] Alexander Pruss has defended the thesis of Causal Finitism, the thesis that any state of affairs can have only a finite number of causes in a well-founded network. This entails that there can be no cycles or infinite regresses, which in turn entails that Causal Universalism false, since every casual network must terminate in one or more uncaused nodes.

One argument for Causal Finitism relies on a family of hypothetical "super tasks," such as the Grim Reaper paradox of Jóse Benardete.[3] Benardete asks us to imagine a victim, Fred, who is assailed by an infinite phalanx of would-be executioners, the Grim Reapers. Each Grim Reaper is assigned a deadline between midnight and 12:01 AM: if the Reaper finds Fred alive at its assigned moment (because no earlier Reaper has killed him), then it kills Fred. If an earlier Reaper has already killed Fred, it does nothing. The Reapers' assigned deadlines are arranged in the following way: for Reaper #1, the deadline is 12:01 AM; for Reaper #2, it is 30 seconds after midnight; for Reaper #3, it is 15 seconds after midnight; and so on, ad infinitum. There is no first Reaper (in the order of time): in order to survive any finite period after midnight, Fred must escape an infinite number of earlier deadlines (which is, per hypothesis, impossible).

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[2]Alexander R. Pruss, *Infinity, Causation, and Paradox* (Oxford: Oxford University Press, forthcoming).
[3]José A. Benardete, *Infinity: An Essay in Metaphysics* (Oxford: Oxford University Press, 1964).

The story leads quickly to a contradiction, on the assumption that Fred does not die unless one of the Reapers kills him. At least one Grim Reaper must act, since if all of the Reapers whose numbers are greater than 1 do nothing, then Reaper #1 will act. However, it is impossible for any Grim Reaper to act, since, for any n, Grim Reaper #n cannot do so unless Fred survives until its assigned deadline at $1/2^n$ seconds after midnight. It is impossible for Fred to survive that long, since Fred's surviving until Reaper #n's deadline entails that no Grim Reaper with a number larger than $(n+2)$ has acted, but, in that case, Reaper #$(n+1)$ must have acted.

Let's modify Benardete's Grim Reaper scenario in order to eliminate extraneous elements for our purposes. All we need is an infinite series of Signalers, each of which is capable of receiving a signal (in the form of a finite number) from its predecessor at a pre-assigned deadline and of sending an appropriate signal in time to its successor. Each Signaler is assigned a number, from 1 to infinity. Signaler #n acts according to the following rule: (i) if it receives a signal in the form of a number $m > n$ from its predecessor, then it passes this number along to its successor, and (ii) if it does not receive such a signal from its predecessor, then it sends the number n as a signal to its successor. It is easy to prove that at least one Signaler will send its number to its successor: for example, if no Signaler with a number greater than 1 does so, Signaler #1 will. However, it is also impossible that any Signaler send its number to its successor. Suppose, for contradiction, that Signaler #n does so. This means that it did not receive any number greater than n from its predecessor, but this is impossible. If Signaler #$(n+1)$ did not receive any number m greater than $(n+1)$ from its predecessor, it would have sent $(n+1)$ to Signaler #n.

When a story like this yields a contradiction, we can use this contradiction as a way to falsify at least one of the presuppositions that led us initially to the necessarily false conclusion that the story was possible. I will argue that the presupposition of the story that we should reject is the assumption that it is possible for an event to have an infinite causal history. The story clearly assumes this, since each Signaler's action or inaction at the moment of its assigned deadline depends on an infinite number of prior events (the signals created or transmitted by each of the preceding signalers). If no event can have an infinite causal history, then Causal Finitism must be necessarily true.

I have two arguments for this verdict. First, we can appeal to a version of what David Lewis called "Patchwork Principles." A patchwork principle is a principle that guides us in making judgments about what is metaphysically possible. The principle relies on two assumptions. First, we assume that some particular, localized situation, S, is metaphysically possible (and so contained in some possible world w_1). Second, we assume that there is a second possible world w_2 with a spatiotemporal or causal structure that provides enough "room" for S to be repeated κ (where κ is a cardinal number, either finite or infinite). On these two assumptions, the patchwork principle licenses us to conclude that there is third possible world, w_3, in which a situation intrinsically identical to S has been repeated κ times (in the arrangement corresponding to the structure of w_2). The picture is that w_2 provides the frame, w_1 the sample patch, and w_3 the completed quilt.

As Lewis argued, patchwork principles are quite plausible. We seem to make use of such principles whenever we infer in everyday life that some situation that has never before occurred

in exactly the way we envisage is nevertheless really possible. We take elements drawn from the actual world and arrange them hypothetically in a structure also drawn from the actual world.

If Causal Finitism is not necessarily true, then there is a possible world w_2 in which an infinite number of situations are arranged in an infinite causal regress, with each situation causally dependent in some respect on its predecessor. We have good reason to believe that an individual Signaler scenario is possible (contained in some world w_1): it is trivial to describe, for each number n, a simple electrical circuit that will do the job. Consequently, the patchwork principle entails that there must be a possible world w_3 in which the infinite Signaler scenario is realized. We know, by logic alone, that this is false. Hence, Causal Finitism must be necessarily true.

My second argument for Causal Finitism, also drawing on Pruss's work, is an inference to the best explanation. There are, in fact, a large number of paradoxes involving super tasks of various kinds. For example, Pruss has recently shown[4] that, if Causal Finitism is false, it would be possible to construct an *infinite fair lottery*, a lottery in which an infinite number of outcomes are possible with exactly the same probability. For example, suppose that it were possible to flip a coin an infinite number of times (with each flip assigned its own, unique natural number) and to assemble all the results in a single announcement. If so, it would be metaphysically possible for all but one of the flips to come out Heads, in which case the sole Tails result would pick out the corresponding natural number as the winner. This would be an infinite fair lottery, since each number would have (by symmetry considerations) an equal chance of being the "winner".

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[4] Pruss, *Infinity, Causation, and Paradox*.

However, this is metaphysically impossible, since if it were to occur, it would force us to violate principles of rationality that are both fundamental and essential. Suppose, for example, that you and I both ran such lotteries and in both cases there was a winner. No matter how large my number is, I should assign a probability of 1 (or some number infinitely close to 1) that any other natural number selected in another infinite fair lottery is larger than mine, since there will be only finitely many numbers smaller and infinitely many greater. If we each prefer to "own" the larger number, then I have an overwhelmingly strong reason to prefer your unknown number to mine. But, you would have an equally strong reason to prefer my unknown number to yours, for the same reasons. In such a situation, we could both be exploited by a third party who is completely ignorant of both numbers, who could induce each of us to bet against his or her own number as the greater.

B.   Non-circularity rules out regresses

As Alex Pruss has pointed out,[5] there is a connection between the prohibition of circular explanations and the prohibition of causal regresses. Suppose that there is a causal regress of the form: S_1, S_2, S_3, etc. ad infinitum, with each S_i caused by S_{i+1}. Now consider the existence of the even-numbered situations (call this fact or plurality E) and the existence of the odd-numbered situations, O. Clearly, E is causally explained by O, since every member of E is immediately caused by a member of O. But, for exactly similar reasons, O is causally explained by E. Since such circular explanation is impossible, so must be infinite causal regresses.

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[5] Alexander R. Pruss, "The Hume-Edwards principle and the cosmological argument," *International Journal for Philosophy of Religion* 43 (1998):149-165.

C.   Pluralization

Causation cannot be circular. If every state of affairs and every plurality of state of affairs had a cause, the totality of *all* states of affairs (the maximum plurality) would have to have a cause. Causes are real things, so the cause of Reality itself (if we let 'Reality' be the name of the plurality of all actual states of affairs) would have to be an actual state of affairs or a plurality of actual states of affairs, and so would have to be a part or a sub-plurality of Reality. This would mean that the whole of Reality would be caused by a part, a violation of non-circularity.

Is it reasonable to suppose that, not only individual states of affairs but also pluralities of states of affairs are in the category of possible relata of causation? Yes, because we often do seek and find causes of such pluralities. For example, we might seek the cause (or causes) of the American Civil War, or of the existence of the solar system, or of the existence of the four fundamental forces. In addition, we often seek causal explanations for correlations and coincidences. In each of these cases, we are looking for the cause or causes of a plurality of states of affairs.

In his *Dialogues Concerning Natural Religion*, David Hume objects to the assumption that a plurality of things must have its cause in some distinct and separate plurality. We can, Hume argues, fully explain the plurality by explaining each of its parts, even if each of those parts is explained by another part of the same plurality.[6] If we accept Hume's principle, then we should say that Reality is causally explained so long as each state of affairs within it is explained by another state of affairs within it. However, Hume's claim is obviously wrong-headed. I cannot

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[6] David Hume, *Dialogues Concerning Natural Religion*, ed. Martin Bell (London: Penguin Books, 1990), Part IX, page 101.

causally explain the Civil War (which is a plurality) by explaining each part of that War by reference to another part. Alexander Pruss illustrates this response well by means of his cannonball example.[7] The path of a cannonball (from cannon to destination) can be divided into an infinite number of segments in such a way that there is no earliest segment. For example, we could divide it into the second half of the movement, the second half of the first half, the second half of the first quarter, etc. ad infinitum. We can now explain each part of the path causally by referring to earlier parts, and yet we clearly have not thereby explained the cannonball's path as a whole.

3.   Is there a principle of causation?

From section 2, we can conclude that there is at least one state of affairs or plurality of state of affairs that is uncaused. We can take for granted that some states of affairs do have causes (I will set aside causal nihilism or global causal skepticism as obviously unacceptable). Is there a principled distinction between those pluralities that do and those that do not have causes? If there were no principle at all, not even a defeasible or presumptive one, then we would have to take seriously the possibility that any given situation or plurality of situations might be uncaused. Such openness to the absence of causation would lead inexorably to global skepticism about empirical or a posteriori knowledge (as well as to any a priori knowledge that depends on intuition or the intellectual appearance of truth).

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[7]Alexander R. Pruss (2006), *The Principle of Sufficient Reason: A Reassessment* (Cambridge: Cambridge University Press, 2006), 44-46.

All of our empirical knowledge depends on our being able to presume, with good reason, that our experiences, both sensory and mnemonic (memory-related), and all of the other natural facts that interpose causally between those experiences and the facts that they seem to represent have been caused (and caused in the appropriate way). If we had to take seriously the possibility that they were uncaused, we would face a situation very similar to that faced by Descartes in the *First Meditation*,[8] in which Descartes has to take seriously the possibility that all of his present experiences have been caused by a powerful demon, bent on deceiving him. If we suppose instead that there is no demon but that all our present experiences have come into existence without cause, then we are no better off, since there could be no reliable correlation between uncaused experiences and the putative facts they present to us.

Without *a priori* knowledge of a causal principle, we would also be unable to have knowledge of the future or of any prospective future, since we could never rule out the possibility that some uncaused state of affairs could appear and influence the future in unpredictable ways.

In the absence of a causal principle, we could not even say that uncaused events are improbable. An event is improbable only if its potential causes are such as to produce the event in question only in exceptional cases. To assign an objective probability to an event is to ascribe a certain kind of cause to it, and, as a result of de Finetti's theorem (as explained by Brian Skyrms[9]), it is impossible to assign subjective probabilities coherently without a tacit commitment to objective probabilities.

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[8] René Descartes, "Meditations on First Philosophy," in *Descartes: Philosophical Writings*, eds. Elizabeth Anscombe and Peter Geach (Indianapolis: Bobbs-Merrill, 1971), 61-65.
[9] Brian Skyrms (1984), *Pragmatics and Empiricism* (New Haven: Yale University Press), 37-62.

Moreover, we need not only a known causal principle but also a causal principle that can be known *a priori* (prior to and independent of all empirical knowledge). Since all of our empirical, *a posteriori* knowledge presupposes our rational certainty in commitment to some causal principle, that principle must be knowable *a priori*. Our belief in a causal principle must be constitutive of being reasonable.

In addition, the *a priori* causal principle must be in the form of a conditional whose antecedent is itself applicable on *a priori* grounds to all of our empirical data. If the applicability depended on empirical knowledge, this would make the justification of our empirical knowledge viciously circular.[10] Therefore, what's needed is a principle that is itself *a priori* knowable and that can be applied to particular situations with *a priori* confidence. Such *a priori* knowledge is possible only in the case of *necessary truths*. Thus, it should apply equally to worlds that are "small" (relative to our world) and those that are large.

There are only four conditions that will meet all of these requirements. The conditions are (1) a plurality of states of affairs each of which is wholly metaphysically contingent, (2) a plurality of states of affairs each of which is possibly wholly temporal,[11] (3) a plurality of state of affairs each of which is such that it is possible that an intrinsic duplicate of it have a cause, and (4) a plurality of state of affairs each of which is measurably finite (one that attributes only finite

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[10] Robert C. Koons, "Epistemological Foundations for the Cosmological Argument," *Oxford Studies in the Philosophy of Religion* 1(2008):105-33.
[11] By *possibly wholly temporal* I mean a state of affairs that could wholly begin or cease to obtain in time. Something that in fact exists at all times might nonetheless be involved in a state of affairs that is possibly wholly temporal.

degrees of any quality or quantity to entities). I claim (without argument here, due to lack of space) that these conditions are closely related: (1) entails (2), (2) entails (3), and (3) entails (4). Thus, (4) has the widest scope and is therefore the strongest principle. I will focus here on the weakest causal principles, (1) and (2), which claim that all possibly contingent and possibly temporal pluralities have causes.

(**Causal Principle 1**) All pluralities of states of affairs each of which is wholly contingent have
   joint causes.
(**Causal Principle 2**) All pluralities of states of affairs each of which is possibly wholly temporal
   (locatable in time) have joint causes.

Accepting the *a priori* knowability of any of these causal principles is sufficient to avert the threat of global skepticism. We can know *a priori* that all of our sensory and mnemonic experiences and appearances are contingent and temporal in character. We can also know this *a priori* about any body of conceivable scientific data, including all experimental results, observations, traces, remnants, and fossils.

In contrast, here are some failed candidates of adequate causal principles:

(5) Every plurality of non-first events (events preceded in time by other events) has a cause.[12]

(6) Every plurality of situations not including an infinite causal regress has a cause.

(7) Every plurality of situations that is not both cosmic in scale and low in entropy has a cause.

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[12] A principle recommended by Graham Oppy (in conversation).

Each of these three principles fails to dispel the threat of Cartesian skepticism. For all I can know *a priori*, it might be that the states of affairs making up my present state of consciousness are all first events. I cannot know the reality of the past *a priori* and without any tacit appeal to causation. Similarly, the events making up my consciousness over a very short period might contain one or more infinite causal regresses, similar to the cannonball regress discussed by Pruss[13] (2006, 44-46). Finally, it might well be (for all I can know *a priori*) that my present state of consciousness is the whole of the cosmos. I also cannot know a priori that its entropy is very high. Thus, I cannot know *a priori* on the basis of (5), (6), or (7) that my present state of consciousness has any cause whatsoever, much less that it has the sort of cause needed for me to have any empirical knowledge.

4.   Does the universe have a cause?

We're finally in a position to answer the main question: does the universe have a cause? To begin with, what is *the universe*? We could simply define the universe as the complete plurality of all states of affairs that are possibly wholly temporal or wholly contingent. Defined in such a way, the universe would obviously fall within the scope of causal principles (1) or (2). Since causation is non-circular, we can infer the existence of at least one necessary and eternal (i.e., not possibly temporal) state of affairs. We can say that the cause of the universe is simply the plurality of necessary, eternal states of affairs that are, individually or collectively, causes of some constituent of the universe. So defined, there is a unique cause of the universe.

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[13] Pruss, *The Principle of Sufficient Reason*, 44-46.

Do we have any reason to think that there is a single necessary and eternal state of affairs that is the cause of the universe? First, compositional universalism seems plausible in the case of states of affairs, in which case the plurality of all necessary or eternal states of affairs would together compose a single state. Second, Ockham's Razor (the rule of thumb that recommends against "multiplying entities needlessly") would suggest that we prefer the hypothesis that there is just one such state of affairs. In addition, the apparent unity of the universe, both in terms of its having a single origin event (the Big Bang) and its being governed by a consistent and relatively simple set of natural laws, supports the singular-cause hypothesis.

Here's the argument so far, in a nutshell:

1. Human beings have empirical knowledge.
2. Human empirical knowledge requires that we have *a priori* knowledge that our empirical data has been caused (in the appropriate way).
3. In order to have empirical knowledge that our data have causes, it must be that there is some property *F* such that (a) we have *a priori* knowledge of some causal principle of the form, *All pluralities of F's have causes*, and (b) we have *a priori* knowledge that all of our empirical data has *F*.
4. For any *F* satisfying these two conditions, the world is a plurality of such *F*'s.
5. Therefore, the world has a cause (an extra-cosmic state of affairs or plurality of such states of affairs).

The argument is clearly valid, and premises 1 through 3 strike me as virtually undeniable. So, it is premise 4 that requires the most scrutiny. Since the causal principle is a priori knowable, we can assume that it is also metaphysically necessary. A metaphysically necessary principle ought to be *anthropically neutral*: it shouldn't be in any way biased toward the causation of states of affairs simply because those states of affairs are or would be somehow relevant to us. To think otherwise would be to introduce an unacceptable element of anthropocentricity into our metaphysics (something that should be, in particular, anathema to those naturalistically inclined). In addition, the property F should be essential to any state of affairs that has it: the F-ness of the state of affairs should be necessary consequence of the canonical description of the state of affairs in terms of its constituent entities and properties. This means that the applicability of a causal principle shouldn't depend on its spatiotemporal location (relative to other states of affairs) or its contingent effects or consequences.

Suppose, for *reductio ad absurdum*, that premise 4 is false, in which case there is a scenario s_1 that is consistent with our *a priori* knowledge and in which part (a sub-plurality) of the universe is uncaused (because outside the scope of the F's). Now consider a scenario s_2 that is like s_1 except that the uncaused sub-plurality of the universe in s_1 has been replaced by a plurality of state of affairs that are perfect duplicates of the present contents of my mind. Since the causal principle is anthropically neutral, s_2 is as consistent with our a priori knowledge as s_1 is. So, it is *a priori* conceivable that a mental state just like my current one be uncaused, and, since the causal principle is indifferent to the spatiotemporal location of a state of affairs, I cannot know *a priori* that my current state has any cause, leading to global skepticism. If global skepticism is false, premise 4 must be true.

5.   Supplemental argument: The Kalām argument

Benardete's Grim Reaper paradox can also be used as an argument for the finitude of the past.[14] (see Koons 2014). To reach this conclusion, we must simply replace the causal-network patchwork principle with a temporal patchwork principle: if a scenario (described in wholly intrinsic terms) S is possible (included in a possible world w_1), and there is a second world w_2 containing an infinite number of disjoint temporal regions stretching infinitely far in the past, with each region large enough to accommodate S, then there is a third possible world w_3 in which S is repeated an infinite number of times, stretching infinitely far into the past.

If we take the Grim Signaler scenario and try to build a world in which an infinite number of Signalers have existed, each with a deadline at the beginning of an infinite number of years stretching into the past. Given the temporal patchwork principle, we must conclude that no possible world can accommodate such an infinite past, and so such an infinite past is metaphysically impossible.

From the fact that the past is finite we can infer that every temporal being has begun to exist at some point in the past. Causal Finitism entails that there can be no infinite causal regress of temporal beginnings. Hence, there must be some temporal beginnings that are not caused by other temporal beings. To reach the conclusion these original temporal beings have been caused to exist by some eternal (non-temporally located being), we can assume a much weaker causal

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[14] Robert C. Koons, "A New Kalam Argument: Revenge of the Grim Reaper," *Noûs* 48 (2014):256-267.

principle, namely, the Kalām causal principle (after the medieval Islamic tradition, including al-Kindi and al-Gazzali, that championed this principle):

(**Kalām Causal Principle**) Everything that begins to exist (in time) has a cause.

Denying the Kalām Causal Principle would be both highly implausible and very costly in epistemological terms. We would have to take seriously the possibility that any origin event might occur uncaused at any time.

There is a second variant on the Kalām, one that does not depend on the using a temporal patchwork principle and a supertask to establish the finitude of the past. Instead, we can argue for the finitude of the past given just Causal Finitism. Suppose, for a proof by contradiction, that the past is infinite in extent even though every state of affairs has only finitely many causes. In such a case, we would eventually reach an *infinite simple past*, that is, an era of time infinite in duration (in the direction of the past) consisting entirely of uncaused states of affairs. If we assume again the Kalam Causal Principle, none of these uncaused states of affairs could have had a beginning to their existence. Hence, each must be infinitely old. Let *S* be one of these uncaused, beginningless, and infinitely old states of affairs. *S* persists throughout some infinitely long, beginningless duration *T*.

At this point, I can introduce a dilemma: either time itself is self-measuring, or not. A period of time is self-measuring if it contains sub-periods with definite duration even in the absence of any events occurring during the period, that is, if empty time can have duration. If time can be self-

measuring in this sense, then time itself divides *S* into an infinite number of sub-events, each corresponding to to the existence of some persisting entity in each of the infinitely many sub-periods of *T*. In this case, there is an infinite causal regress, as each sub-event of *S* is caused by the immediately preceding sub-event, in contradiction to Causal Finitism. If time is not self-measuring, then it is impossible for *T* to have any temporal measure, since there have occurred with *T* no beginning or endings from which any temporal measure could be derived.

There is a third variant of the Kalām tradition (inspired by an idea of Joshua Rasmussen's[15]), one that does not even require a proof that the world has a finite past. It is sufficient if it is *possible* that the universe (defined as the plurality of wholly contingent states of affairs) have a finite past. If we assume that the Kalām Causal Principle is necessarily true, then we can infer that in any possible world *w* in which the totality of wholly contingent states of affairs has a beginning in time, it must have a cause in *w*. The only possible cause of such a totality would have to be a necessary state of affairs. By S5, it would follow that this necessary state of affairs (capable of causing the universe) also exists in the actual world. If we add a very weak causal principle—one to the effect that, if there exists something with the power to cause totality of wholly contingent states of affairs, then that totality probably has an actual cause—we could infer the existence of an actual cause of the universe.

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[15] Joshua Rasmussen, "A New Argument for a Necessary Being," *Australasian Journal of Philosophy* 89(2011):351-356