CAUSAL FINITISM AND THE KALAAM ARGUMENT

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1. Introduction

A version of the Kalaam argument[1] for the existence of God can be put as follows:

(1) There is a cause.

(2) There is no circle of causes.

(3) There is no infinite regress of causes.

(4) If (1)–(3), there is an uncaused cause.

(5) So, there is an uncaused cause.

(6) If there is an uncaused cause, God exists.

(7) So, God exists.

Here, premise (1) is widely accepted, though there are some philosophers who think that because fundamental physics can be formulated without the word "cause", we should be sceptical of whether there is causation. Premise (4) is even less controversial. If there are no uncaused causes, then every cause has a cause, and this either leads to a circle or a regress.

Premise (2) is fairly uncontroversial, although it has been proposed that the universe can be explained by circular causation (Smith 1999) or, more modestly, that the existence of closed-time solutions to Einstein's equations shows the possibility of circular causation. While there are many interesting

[1]For a survey on the Kalaam argument, see Craig (2009).

things to be said about circular causation, in this paper I will simply take it for granted that it does not in fact occur.

That leaves two highly controversial premises: (3) and (6). At least since Hume (1779), positing an infinite regress of causes has been a standard alternative to a theistic posit of an uncaused cause, and so (3) is controversial indeed.

And, regarding (6), God is not the only candidate for an uncaused cause. First, one might think that there are uncaused random quantum fluctuations all around us, none of which is God. Granted, (6) does not say that every uncaused cause is God, but if some uncaused causes are not God, then perhaps no uncaused cause is God, and there is no God (since it's very plausible that if God exists, he is an uncaused cause[2]). Second, one might think that something other than God—say, the Big Bang—could be not just an uncaused cause, but an uncaused *ultimate* cause, an uncaused cause of all other entities, or at least all other contingent and/or concrete ones.

Kalaam arguers (see Craig 2009) offer two kinds of considerations in favor of (3). One kind is empirical considerations in favor of a Big Bang cosmology with a finite past. If the past is finite, then perhaps there just was no time for an infinite causal regress.[3] Another kind is conceptual arguments against infinities, either actual infinities in general or infinite sequences of past events. After all, if there can't be an infinite sequence, there can't be an infinite regress.

[2]Though recently Pearce (forthcoming) has questioned whether God's explanatory role should count as causal.

[3]One may have some worries here, though, if time is continuous, since then there will be an infinite number of instants of time even in a finite interval of times.

In this paper, I will offer a different set of conceptual considerations in favor of (3). I won't object to the possibility of infinities as such, or even infinite past sequences. Denying the possibility of infinities would put mathematics in serious jeopardy. After all, everything can be made to follow from an impossibility, so if the axioms of mathematics entail there are infinite numbers of things—like an infinite number of primes—and infinities are impossible then *everything*, including self-contradictions, follows from these axioms. Denying the possibility of infinite past sequences is more moderate, but still may not be necessary.

Instead, I will argue for causal finitism, a family of views on which, roughly, an infinite number of things cannot be causally prior to one thing. Given causal finitism, (3) follows, since each of the infinitely many items in a causal regress would be causally prior to the item from which the regress started, contrary to causal finitism.

I won't, however, have much to say regarding (6) and the identification of God with the first cause. Premise (4) can be easily and uncontroversially strengthened to yield the conclusion that every cause has an uncaused cause in its causal history. Taking all the uncaused causes together, we get an ultimate—but perhaps plural—cause of the rest of the causal nexus. One can then argue that the elegance and unity of the observed parts of the causal nexus gives us some reason to think that the ultimate cause is singular rather than plural. One might further deploy design arguments to argue that the ultimate cause is likely to be an agent moved by good reasons (cf. Koons 1997, Section 7.1).

I find this line of thought powerful, but I won't defend it in this paper, both for the obvious reason of space, but also for a more principled reason.

I would like this paper to be an invitation to an atheist take causal finitism seriously, and hence to take seriously the existence of an ultimate uncaused—perhaps plural—cause, and then to join in a common investigation of what this ultimate uncaused cause is likely to be like.

In the next three sections, I will sketch three causal paradoxes of infinity, two of them well-known and one new, and argue that they, and others like them (there are many more!), give us good reason to accept causal finitism. The first paradox is more of a warmup than a serious paradox, but it helps clarify the line of thought.

2. Thomson's Lamp

Consider a lamp with a toggle switch. Each time you flip it, the lamp changes between being on and being off, and nothing else can affect the state of the lamp—the lamp and switch are indestructible. At 10 a.m., the lamp is off. Then at 10:30, the switch is flipped. And again at 10:45, 10:52.5, 10:56.25, and so on.

Between 10 and 11, the switch is flipped an infinite number of times. At 11, the lamp must either be on or off. But which? It's on after an odd number of flips and off after an even one. But after an infinite number? There seems to be no answer. This story is known as the Thomson's Lamp Paradox (Thomson 1953).

But where exactly is there a paradox? One could simply say that while the story tells us what happens after a finite number of switch flippings, it is simply silent on what happens after an infinite number. The story is compatible with the final state being on and it's compatible with the final state being off. It just doesn't say which (cf. Benacerraf 1962).

But while this response has a lot going for it, it may be too quick. The story specified that the only thing that can affect the state of the lamp is the flipping of the switch. The lamp's final state, thus, is either an uncaused and unexplained brute fact, or else it is an outcome of the switch flips.

Let us take the two options in turn. The Principle of Sufficient Reason (PSR) says that every contingent fact—fact that holds but does not need to hold—has an explanation. The first option implies that the final state of the lamp violates the PSR. While many contemporary philosophers deny the PSR for independent reasons, the PSR is quite intuitive, even to the point that denying it may be taken to be paradoxical.

Moreover, holding the PSR to be necessary can be argued to be important to both philosophical and scientific reasoning (see Pruss 2006 and Della Rocca 2010). For instance, a central method both in contemporary philosophy and science is Inference to Best Explanation, where we conclude that the best putative explanation of a phenomenon is likely to be the truth of the matter. But if there can be unexplained phenomena, then we always have a competing *non*-explanatory hypothesis which says that the phenomenon in question happens for no reason at all.

The only epistemically responsible way to rule out such a non-explanatory hypothesis would be to hold *a priori* that unexplained brute phenomena are *unlikely*. But contingent matters that cannot be explained also cannot be said to be either likely or unlikely, though to defend this claim in detail would take us too far afield—see Pruss (forthcoming).

Furthermore, there is something paradoxical about the idea that one can imagine what seems a perfectly deterministic situation where nonetheless the final outcome violates the PSR.

The second option is that the final outcome is the result of the switch flips. But now we have a puzzle. If we have a sequence of switch flips between 10 and 11 a.m., it shouldn't affect the causal contribution of any switch to change the times at which the flips happen, as long as the order is kept the same. If there are only three flips, at 10:15, 10:30 and 10:45, the causal contribution of each will be unchanged if I shift them respectively to 10:05, 10:50 and 10:57—the first flip will turn the lamp on, the second will turn it off and the third will turn it back on.

This should intuitively be true even if there are infinitely many flips. So, let's suppose we move the 10:30 flip to 10:45, the 10:45 flip to 10:52.5, the 10:52.5 flip to 10:56.25, and so on. That shouldn't affect the final lamp outcome. *But* this shift is equivalent to simply omitting the 10:30 flip. And, intuitively, omitting a single flip in a sequence should reverse the final outcome. So we have pretty intuitive arguments that the shift both would and would not affect the final outcome, and that is a paradox.

Still, perhaps the best bet here is to deny either the intuitive shift-invariance or the intuitive thesis that omitting a flip reverses the outcome. We could, however, suppose some sort of a messy function from infinite sequences of flip times to final outcomes, a function that doesn't satisfy shift-invariance or doesn't satisfy omission-reversal (or satisfies neither). Perhaps that function would be indeterministic. That function would have to be encoded in the laws of nature. Thus, the view would have to say that in any world where a lamp capable of an infinite number of flips can be made, there would have to be some additional law of nature specifying what happens in the case of an infinite number of flips. It is, however, implausible that such a law would have to exist.

Now, if causal finitism is true, we have a very simple solution, one that explains why the lamp situation cannot happen: it cannot happen, because it makes the final state of the lamp have an infinite number of flips in its causal history. Being able to give such a principled explanation for why a paradoxical story is impossible is evidence for causal finitism.

Nonetheless, this paradox is not particularly strong. A philosopher can, after all, deny the PSR or else posit that there would have to be some arbitrary law of nature in any world where one can make a lamp like Thomson's.

3. Grim Reapers

What the defender of causal finitism really wants is a paradox that has more paradoxical force, one where allowing infinite causal sequences leads to a contradiction or at least to a denial of an uncontroversial necessary truth. The Grim Reaper Paradox provides something of the first sort.

We have a victim, Fred, who is alive at 10 a.m. Now, a grim reaper is a machine that has a dial set for a particular time. At that time, the grim reaper wakes up and checks to see if Fred is alive. If Fred is not alive, it goes back to sleep. If Fred is alive, it instantly kills Fred.[4] Fred once dead stays dead, and cannot die except by the hand of a grim reaper.

So far there is nothing paradoxical here. But now suppose an infinite supply of grim reapers, set for different times. One is set for 10:30 a.m. The next is set for 10:15, then one for 10:07.5, and so on.

It's certain that Fred is dead at 11. After all, if he were alive then, he would have been alive at 10:30, too, and then the 10:30 reaper would have killed him. But the 10:30 reaper did not kill Fred. For the only way it could

[4]Though the killing doesn't have to be instantaneous, just fast enough to happen before the next reaper wakes up.

do that would be if Fred were alive at 10:30. But if Fred were alive at 10:30, he'd have been alive at 10:15, too, and then the 10:15 reaper would have killed him. But for exactly the same reason, the 10:15 reaper did not kill Fred, since it could only do that if Fred were alive at 10:07.5, when Fred would have fallen victim to a different reaper. This reasoning generalizes, and so (i) Fred is dead, (ii) Fred can only be dead by the hand of a reaper, but (iii) no reaper raised a hand to harm him.

This is much more of a paradox than Thomson's Lamp: we get a real contradiction rather than an indeterminacy.

It won't do to say, as Hawthorne (2000) would have it, that the mereological sum of the reapers together killed Fred. For the mereological sum of things that do nothing does nothing.[5]

It is, however, a little less clear how exactly causal finitism rules out the story, in that in the story as given none of the reapers actually do anything, and hence it seems that there are not infinitely many causes in the history of the final outcome, namely Fred's being dead at 11. There are, however, multiple ways of spelling out the details in causal finitism that allows the view to rule out the paradox—that is why I called "causal finitism" a *family* of views.

One attractive way to proceed is to say that *ensuring* an outcome counts as an interaction that falls within the causal history of an event, even if in ensuring something one in fact does nothing but observe. For instance, my wife may tell me to ensure that my son is in bed. I may tiptoe to his room, gently open the door, and notice that he is in bed. I have thereby ensured that he is in bed, even though I did nothing to him. For me to count as

[5]An organic unity may have causal powers over and beyond those of its parts. But we can specify that the reapers do not form an organic unity.

having ensured, however, I had to be disposed to bring it about that he is in bed if he weren't already in bed. We can then say that an appropriate causal finitism should also rule out infinitely many ensurings in the history of an event. But each reaper ensured Fred's being dead at 11. So the story is ruled out by an appropriate version of causal finitism.

4. Die Guessing

The Gambler's Fallacy says that the non-occurrence of an outcome in the past throws of a fair die is evidence that the outcome will occur now. This is a fallacy, because a fair die has no memory (this is a consequence of the independence of tosses, which is a part of the concept of fairness). For exactly the same reason, it would be a fallacy to think that *any* pattern of past throws of a fair die can be leveraged to gain information about a future outcome. We can call this the Generalized Gambler's Fallacy.

For the Generalized Gambler's Fallacy to be a fallacy, it is crucial that we be certain we are dealing with a *fair* die. In real life, we have no such certainty. If I roll a die ten times and each time it comes up six, I have good evidence that it's a crooked die. But if I am certain that the die is fair, then this surprising outcome should make no difference to me: the chance that the next roll will be six will still be 1/6.

Now consider the following unpleasant game. Before a fair die is tossed, you need to guess whether it will show a six—you must say "Six" or "Not six". If you're right, you get a dollar. If you're wrong, you're tortured. It is clear what the one and only best strategy for this game is: guess "Not six", and you have a 5/6 chance of avoiding torture.

Suppose the game is repeated. Assuming it's certain that the die is fair, it would be an instance of the Generalized Gambler's Fallacy to think you

can leverage information about past rolls to improve your outcome. The one rational thing to do is to guess "Not six".

But now suppose that you've played this game once a year over an infinite past, with the game coming to an end in some specific future year. It turns out that there is a strategy that when consistently applied is better than consistently guessing "Not six". Moreover, this strategy leverages information about past rolls.

Let's say that something happens "almost always" provided that there at most only finitely many exceptions, and "almost never" provided that it happens at most finitely many times. Here then is the strategy.

- If you almost always got a six, guess "Six".
- Otherwise, guess "Not six".

There are two possibilities. Either the die comes up six almost always, or it comes up non-six infinitely many times. If the die comes up non-six infinitely many times over the course of the game, then at any time at which you play the game, it will already have come up non-six infinitely many times, and so by the second rule in the strategy you will always guess "Not six". In this case, you will have exactly the same outcome as the old consistent "Not six" strategy.

But if the die comes up non-six only finitely many times over the course of the game, then the first rule of the strategy will always be triggered. And you will almost always be right when you guess "Six", so you will only be tortured finitely many times. On the other hand, if you follow the old consistent "Not six" strategy, then in this unfortunate case you will be tortured almost always. It's clearly better to be tortured almost never than to be tortured almost always.

The modified strategy is sometimes much better than the old one, and in other cases the same. So it's on balance rationally better to use. But the new strategy leverages information about past tosses, and the rejection of the Generalized Gambler's Fallacy shows that such leveraging can't help. So we have a real paradox.

This paradox is neatly ruled out by causal finitism. In order to make use of the strategy, you have to know if the count of past non-sixes was finite or infinite. Your mental state, thus, has to be influenced by infinitely many die roll events. This would involve infinitely many causal-type influences on a single present event, and causal finitism rules that out.

Perhaps, though, you're not very impressed by this paradox. After all, the improved strategy only does better in the very unlikely case (indeed, the Law of Large Numbers says that the probability of this case is zero) where the infinitely many rolls of a fair die are almost all sixes. However, Yuvay Gabay and Michael O'Connor (see Hardin and Taylor 2008) have found that by leveraging the Axiom of Choice from set theory it is possible to come up with an even better strategy. The better strategy results in one avoiding torture almost always no matter what comes up. For details of the strategy, as well as a discussion of how to causally implement the use of the Axiom of Choice, see Pruss (MS).

5. The General Argument

We can now give two different kinds of arguments for causal finitism on the basis of the above informal remarks.

5.1. **Induction.** The first is an inductive argument:

(8) Scenarios P_1, P_2 and P_3 are impossible because they are paradoxical.

(9) A single version of causal finitism gives an elegant unified explanation why P_1, P_2 and P_3 are impossible.

(10) There is no good competitor.

(11) So, probably, causal finitism is true.

When an elegant theory can give an elegant explanation of multiple phenomena, that is strong evidence for the theory. The greater the number of phenomena, and the more variety among them, the stronger the evidence. Here we considered three paradoxes, though Thomson's Lamp was more of a warmup than a really serious paradox. This argument can be significantly strengthened by giving a number of further paradoxes, and I do indeed do that in Pruss (MS).

Currently there are only two competitors to causal finitism as unified explanations of why so many paradoxical stories are impossible. The first is a version of finitism that holds that there cannot be an actual infinite number of things, where actuality is understood in such a way[6] that finitism rules out both simultaneous and past infinities. As I noted in the introduction, finitism puts mathematics in jeopardy, and that is a serious cost.

Finitism, however, is not much of a competitor to causal finitism, since it comes close to entailing causal finitism, and probably has to entail causal finitism for it to do the work that needs to be done in ruling out paradoxes.

For suppose that whatever is causally prior must be simultaneous with or in the past of what it is causally prior to. Then ruling out the possibility of a present or past infinity of things rules out infinite causal histories and yields causal finitism.

[6]I.e., one either needs eternalism or a growing block theory of time.

On the other hand, if causation doesn't have to be either simultaneous or past-to-future, then either finitism also rules out timeless and future infinite numbers of items or it does not. If it does rule them out, then it yields causal finitism.

But finitism it does not rule out timeless or future infinite numbers of items, then one can generate variant paradoxes involving, say, timeless or future-to-past causal sequences. For instance the Die Guessing paradox could easily run from the future to the past if future-to-past causation is possible. Those paradoxes would then be ruled out by causal finitism—since causal finitism only concerns the order of causation, not the order of time—but not by finitism.

The other competitor in the literature is Michael Huemer's (2016) thesis that infinite intensive magnitudes are impossible. Take a *magnitude* to be a quantity that appears in correct scientific explanations. For instance, mass or charge. Some magnitudes are defined as sums. For instance, the mass of an object might be taken to be the sum of the masses of the components. Those magnitudes are called *extensive*. All other magnitudes are *intensive*.

Huemer allows for the possibility of infinite numbers of things. Given this, it is likely that there can be infinite extensive magnitudes. For instance, if there are infinitely many planets, then the total mass of the universe is infinite. However, Huemer posits that there cannot be an infinite *intensive* magnitude, and leverages this to rule out paradoxes.

For instance, if you flipped a switch infinitely many times between 10 and 11 a.m., then the total distance moved by the switch would be infinite, so the average speed of the switch would be $\infty/1$ kilometers per second. Total

distances are extensive, but average speeds are not, and so Thomson's Lamp is ruled out.

One might even try for a similar resolution of the Grim Reaper. Each grim reaper must observe whether Fred is dead prior to the next one waking up. This requires faster and faster observations to be made by the earlier reapers. Let's suppose that observations are made by bouncing some particles off Fred. Then the total distance traveled by *all* the relevant particles will be infinite, and so the average speed of this population of particles over an hour will be infinite.

It is not clear that this kind of resolution can be made to work in the die guessing case, but Huemer can say that this is because it is not clear what exactly the physical embodiment of the die guessing situation would be, and perhaps any realistic physical embodiment would require some kind of infinite intensive magnitude.

One problem with Huemer's solution is that while velocities do enter into scientific explanations, it is not clear whether *averages* of speeds do, and hence it is not clear whether average speeds count as magnitudes.

Huemer's solution also leads to the implausible view that not only do the laws of nature prescribe a maximum speed—the speed of light—but that the laws of nature *have to* set a global speed limit (cf. Huemer 2016, p. 160). For suppose we have a universe where there is no maximum speed limit. Then we could imagine a particle that moves at one unit of speed in the first second, at two units in the second, at three in the third, and so on. The average speed of that particle would be infinity, and Huemer considers average speeds to be intensive quantities. Likewise, there has to be a maximum mass that can be contained in a set volume. Otherwise,

we could imagine an infinite number of objects of larger and larger mass arranged in a region such that the average or overall density of the region is infinite. And just as Huemer's main solution to Thomson's Lamp needs average speed to be an intensive magnitude, he also offers a solution to Laraudogoitia's Marble Paradox, not discussed in the present paper, using overall density as an example of an intensive magnitude.

Huemer, however, has some backup solutions. For instance, he thinks that the amount of friction involved in flipping a switch infinitely often would generate a black hole (Huemer 2016, p. 198), and black holes involve intensive infinite magnitudes. This line of thought highlights an what appears to be an unfortunate consequence of Huemer's view (Huemer 2016, p. 159), which Huemer himself acknowledges: it requires rejecting those aspects of the General Theory of Relativity that lead to black holes.[7]

Causal finitism is not tied to details of laws of nature in the way that Huemer's solution is, and appears on the whole superior. We can thus accept Causal Finitism as our best available unified explanation of a variety of paradoxes.

5.2. **Rearrangement.** There is a second, deductive line of argument that can be applied in the case of each paradox P_i:

(12) If causal finitism is not true, scenario P_i is possible.

(13) Scenario P_i is not possible.

(14) So, causal finitism is true.

[7]Presumably, Huemer does not dispute the well-established astronomical fact that there is something *like* a black hole at the center of the Milky Way. But he can dispute that the correct description of this object involves the kinds of singularities that its relativistic description does.

The line of thought behind (12) can be a direct intuition such as that it seems that if we can have infinite causal histories, you could know whether infinitely many non-sixes have occurred in your past die rolls.

But in some cases in addition to a bare intuition we can also offer a plausible rearrangement argument that says that the scenario P_i is just a rearrangement of an unparadoxical scenario that should be possible *if* causal finitism is false. A nice illustration of this is the Grim Reaper. Suppose that each reaper has a dial on which its activation time is set. There is no paradox if the reapers at 9 a.m. freely set their own respective dials to 10:30, 10:45, 10:52.5, and so on. *If* causal finitism is false, such settings should be possible. But if such settings are possible, surely no metaphysical force would prevent each the reapers instead freely choosing to set their respective dials to 10:30, 10:15, 10:07.5, and so on. Moreover, each particular time in this last list is a possible dial setting, and any finite subset of the reapers could set their dials to these times. So the "metaphysical force" would somehow have to prevent an infinite number of them setting their dials so but allow a finite number.

On the other hand, the causal finitist can say that there is no possibility of *any* infinite number of settings all falling within the 10–11 a.m. range, regardless of the order, since any such infinite number of settings violates the right version of causal finitism. This is much less *ad hoc* than just ruling out precisely the paradoxical settings.

6. Evaluation

We have two arguments for causal finitism: one an inductive argument to best explanation and the other a rearrangement argument in each case.

The inductive argument is stronger the more cases are explained. The deductive argument, on the other hand, requires only that one case have true premises (12) and (13). As the number of cases is multiplied, it becomes more epistemically probable that in at least one case both (12) and (13) are true, and hence that causal finitism is true.

Once we have causal finitism, then we need only one more ingredient to establish an uncaused cause: we need to rule out causal circles. Here, we can either rely on intuition, or else we can say that causal circles have enough of a structural similarity to infinite causal sequences that it is highly plausible that if infinite causal sequences are impossible, so are causal circles. For a circle generates a sequence like: $a \leftarrow b \leftarrow c \leftarrow a \leftarrow b \leftarrow c \cdots$, and the fact that entries in the sequence repeat seems to only make it *less* likely that the circle be possible.

Thus we have good reason to think there is an uncaused cause. The plurality of uncaused causes, then, can be seen as being at the head of every causal sequence. And at this point I issue an invitation to the reader, theist, pantheist, polytheist, agnostic, atheist or other: Given that there is a plurality of uncaused causes, let's investigate that plurality together. After all, the question of what that plurality is like is apt to be one of the most important explanatory questions there are.

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