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A Defense of the *Kalam* Cosmological Argument and the B-Theory of Time

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Abstract

William Lane Craig is the most recognizable contemporary defender of the *kalam* cosmological argument. The argument, in its simplest form, is that (i) Whatever begins to exist has a cause of its existence, (ii) The universe began to exist, and (iii) Therefore, the universe has a cause of its existence. In defending this argument, he claims that it presupposes the theory of time commonly referred to as the *A-theory* of time, which is roughly the view that time really does flow from the nonexistent future into the present, and then out of existence into the past. Though this may be the commonsense view of time, it is not the view held by many philosophers and physicists. Because Craig's argument relies on a controversial view of time, the argument in my view carries an unnecessary burden of proof on behalf of the *A-theory.* My thesis, then, is to argue in support of the *kalam* cosmological argument, but also to argue against Craig's claim that it must be dependent on the *A-theory* of time, the result of which will be a more general yet stronger version of the *kalam* cosmological argument for the existence of God.

Introduction

In his defense of the *kalam* cosmological argument, William Lane Craig defends the theory of time commonly referred to as the *A-theory*.[1] According to the A-theory, time exists approximately the way we experience it, with future moments constantly coming into existence and present moments always moving from existence into the past. On this view, the past no longer exists and the future does not yet exist.[2] The opposing view, the *B-theory*, holds that the whole of time exists as a totality, that the past, present and future are all equally real, and that moments in time stand in relations of earlier-than, simultaneous-with, and later-than to other moments in time.

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[1] Craig's original book-length defense of the argument is *The KALAM Cosmological Argument*, Wipf and Stock Publishers, 1979. The terminology of the A-theory and B-theory of time comes from J. Ellis McTaggart in "The Unreality of Time" *Mind*, New Series, Vol. 17, No. 68 (Oct., 1908), pp. 457-474.

[2] This description is admittedly general. I do not mean to imply that all A-theorists are also Presentists--that would probably be false. However, at least something like a weak version of presentism seems to exist in almost every version of the A-theory.

A thorough review of the literature on the *kalam* cosmological argument does not appear to uncover much on the possibility of a non-A-theory-dependent version of the argument. Yet something like the B-theory is held by many contemporary philosophers and cosmologists. I aim to defend of version of the *kalam* cosmological argument that does not depend on the A-theory, and if I am successful, then one cannot dismiss the argument on the grounds that it relies on a controversial view of time. To that end, I look at the argument as Craig defends it, including the historical medieval arguments for and against the existence of the actual infinite, and conclude that the actual infinite cannot exist. I then argue that the impossibility of an actual infinite is compatible with the B-theory of time. Lastly, I look briefly to some contemporary cosmology in light of the big bang model, and argue that the universe is not past eternal. If I can make the argument that the universe is finite in the past, and if it does not require us to to adopt an A-theory of time, then I should be able to demonstrate that the *kalam* cosmological argument can be defended on the B-theory of time.

1. The Historical Setting of the *Kalam* Cosmological Argument

Though there are many cosmological arguments for the existence of God, the *kalam* version of the argument has its roots in a specific time and place in the history of philosophy. The argument comes from the medieval Arabic *kalam* tradition. *Kalam* in Arabic means, literally, "speech," but refers in this case to the position of the Islamic speculative theologians, which is distinct from the school known as *falsafa,* or

philosophy, which was largely influenced by Aristotle and the later Aristotelians.[3] Some of the arguments against the eternity of the world given by the *kalam* thinkers come from the anti-Aristotelian Christian theologian, John Philoponus, whom they knew as Yahya al-Nahwi.[4] Although many in the medieval Arab-speaking world contributed to the *kalam* cosmological argument, Craig argues that three thinkers were the most important defenders: al-Kindi, the Jewish philosopher Saadia, and al-Ghazali. Of those, I will look only at al-Ghazali, who argues against the existence of the actual infinite. In a later section, I will consider an argument from Avicenna, (who does not dismiss the *possibility* of the existence of the actual infinite) against the possibility of the past infinity of the universe. The goal will be to show that on the arguments of either al-Ghazali or Avicenna, the universe itself is not past eternal.

Al-Ghazali represents at once both a high point in the *kalam* tradition, and a blow to the Neo-Platonic, Aristotelian synthesis found in Islamic philosophers like Avicenna.[5] Al-Ghazali's *Incoherence of the Philosophers* is a sustained argument against many of the arguments from the philosophers of the *falsafa* tradition; arguments al-Ghazali studied before ultimately rejecting them. He offers a variety of arguments to show that the universe cannot be infinitely old, and that an actual infinite cannot exist. He argues, for example, that the temporal phenomena in the world are caused by other temporal phenomena, which are caused by other temporal phenomena, and so on, *ad infinitum*,

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[3] Craig, 1979, p. 4, and McGinnis, Jon, "Arabic and Islamic Natural Philosophy and Natural Science", *The Stanford Encyclopedia of Philosophy (Spring 2012 Edition)*, Edward N. Zalta (ed.), http://plato.stanford.edu/archives/spr2012/entries/arabic-islamic-natural/.

[4] Craig, 1979, p. 8.

[5] *Ibid.,* p. 42.

unless the series stops with the eternal, that is, something outside of the series of temporal phenomena. He thinks the series of temporal causes cannot run backward into infinity, so there must be a ground of the causes, that is, the eternal.[6]

But in order to understand fully the arguments concerning whether or not the universe is past eternal, we need to get clear about the distinction between the *potential* and *actual* infinities. An actual infinite is a determined whole, a totality. An actual infinite refers to the *actualization* of a potential infinite. A potential infinite, for example, is like what we mean when we say that a distance can be divided infinitely many times. In such a case, we could never reach a point at which we had divided an actually infinite number of times, for we could always divide once more. At least conceptually, there is no smallest unit of division or last divisible part of any finite segment. Although we could (at least potentially) divide a line infinitely many times, such an accomplishment could never be completed. In the relevant sense what we mean in these cases is that the amount of possible divisions is *indefinite*. It moves constantly toward infinity without ever reaching it, since the actual infinite is not a limiting concept but a determined and completed whole. So then, according to Craig, things like tensed, dynamic moments in time or planetary rotations throughout the history of the universe are not *actually* infinite, they are *potentially* infinite at best. They progress in a linear fashion, always increasing toward infinity but never reaching a point at which they become actually infinite. So, if time is like the A-theory describes, it is merely potentially infinite--at no point does it "reach" or "achieve" the actual infinite.

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[6] *Ibid.,* p. 45. Craig argues that al-Ghazali did not believe in secondary causes, but he likely presented the argument in a way that his opponents would accept.

Al-Ghazali gives us several arguments to show that accepting the existence of the actual infinite leads to absurdities in the real world. For example, if the universe is infinitely old, then two planets that have been rotating at different rates for an infinite amount of time will both have rotated an actually infinite number of times, even if one will have completed twice or ten times as many rotations. Furthermore, the number of rotations for any of the planets will have to be either even or odd, yet an infinity is neither even nor odd. Equally strange is the idea that if the universe is infinitely old, then there will be an actual infinite number of human souls, something al-Ghazali thinks is unacceptable.[7] These type of results are absurd, so al-Ghazali thinks the universe cannot be infinitely old.

We might argue that al-Ghazali did not have the tools to understand the infinite that we do today, namely, set theory. These different "sizes" of infinities can be to a large degree explained if we understand that they possess the same cardinalities. These sets are infinite just in case they can be put in a one-to-one correspondence with each other. That is, a set and a proper subset can both be infinite, even though one seems "smaller" than the other. For example, we can see this if we match up all the natural numbers with the subset of all the even numbers:

{1, 2, 3, 4, 5,...}
{2, 4, 6, 8, 10,...}

Or, as in the case of planetary rotations, if Planet X rotates once for every 12 rotations of the Planet Y:

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[7] *Ibid.,* p. 46-47, and McGinnis, Jon "Creation and eternity in Medieval philosophy" in *Blackwell Companion to the Philosophy of Time,* eds. A. Bardon and H. Dyke, Chichester, UK: Wiley-Blackwell, 2013.

Planet X {1, 2, 3, 4, 5,…}
Planet Y {12, 24, 36, 48, 60,…}

Intuitively, the even numbers appear to be half as many as the natural numbers, and Planet Y appears to rotate 12 times more often than Planet X, but they each have the same cardinal number, and both are said to be infinite because of the one-to-one correspondence in which they can be placed. However unintuitive, there are as many in the one set as there are in the corresponding set.

But even if set theory helps us understand and use infinity in our mathematics, it does not commit us to anything in reality; the seemingly absurd results can be confined to the mathematics.[8] So al-Ghazali would presumably not feel any differently about the existence of these infinities in reality. But I am not particularly concerned with these types of paradoxes, because on the B-theory time is not formed by successive addition, and there is no real temporal regress of events that have passed from existence. On the B-theory, all of the moments of time exist tenselessly at once, so the absurdities discussed by al-Ghazali do not arise.

2. Craig's Formulation of the *Kalam* Cosmological Argument

When the *kalam* cosmological argument is discussed in a contemporary setting, it is nearly always in reference to the version advanced by William Lane Craig. He puts the argument in its simplest form into the following syllogism:

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[8] Except, perhaps on certain types of Platonism or realism about mathematical entities and abstract objects. But even then, as J.P. Moreland argues, the actual existence of numbers or abstract objects on Platonism are in a platonic realm, not here in spacetime, which is where I am arguing an actual infinite cannot exist. See Moreland, J. P. "A Response to a Platonistic and to a Set-Theoretic Objection to the Kalam Cosmological Argument" *Religious Studies,* Vol. 39, No. 4 (Dec., 2003), pp. 373-390.

1. Everything that begins to exist has a cause of its existence.
2. The universe began to exist.
3. Therefore, the universe has a cause of its existence.

Most of Craig's own writing has been committed to defending the second premise, on both scientific and philosophical grounds. This is in part because the first premise he takes to be a metaphysical principle that is either self-evident or at least much more probable than its negation. That is, we do not seem to find in our experience of the world anything that would serve as a refutation of the principle, at least in the realm of sensible objects. This argument, however, has been objected to on both metaphysical and scientific grounds, and I will return to it later.[9] And even though Craig thinks the first premise is fairly uncontroversial, I will engage it because his analysis of what it means to begin to exist is stated in terms of tensed facts, which only exist on the A-theory.

The argument's conclusion receives the least attention, primarily because it follows from the first two premises. However, it is also a premise of its own in the general argument that this cause of the universe is, in fact, God. In the form just presented, this argument only goes so far in getting us to the conclusions of any particular theism, so I will not have much to say in this project about what can be said concerning the nature of the cause of the universe, save that such a cause is what we mean when we refer to God. All that I aim to show is that the universe has a cause that is outside of the universe itself.[10]

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[9] See Morriston, Wes "Craig on the Actual Infinite" *Religious Studies* 38, pp. 147-166, 2002; and Morriston, "Beginningless Past, Endless Future, and the Actual Infinite" *Faith and Philosophy* Vol. 27, No. 4, October 2010, pp. 439-450; and "Causes and Beginnings in the *Kalam* Argument: Reply to Craig" *Faith and Philosophy* Vol. 19, No. 2, April 2002, pp. 233-244.

[10] For more on this, see Craig, William Lane "Must the Beginning of the Universe Have a Personal Cause?" *Faith and Philosophy* 19 (2002): 94-105.

3. Whatever Begins to Exist Has a Cause of Its Existence

As I previously mentioned, Craig does not spend a great deal of time on the first premise; this is largely because he thinks it is unnecessary.[11] After all, Craig argues, this does seem to be a fairly obvious principle that is constantly confirmed in our experience and never refuted, and it is certainly more plausible than its negation. Nowhere do we have experiences of physical things coming into being without causes, so most people are willing to accept this empirical generalization.[12] Indeed, in addition to the empirical confirmations, the ancient metaphysical principle *ex nihilo, nihil fit* seems nearly impossible to deny. However, not everyone is prepared to accept it uncontested, and Craig's analysis of something's beginning to exist turns out to require us to accept the A-theory, so an analysis on B-theoretic language is necessary for my argument.

> Here is Craig's analysis of "beginning to exist":[13]
>
> 1. *x* begins to exist at *t* iff *x* comes into being at *t*.
>
> 2. *x* comes into being at *t* iff (i) *x* exists at *t*, and the actual world includes no state of affairs in which *x* exists timelessly, (ii) *t* is either the first time at which *x* exists or is separated from any $t^* < t$ at which *x* existed by an interval during which *x* does not exist, and (iii) *x's* existing at *t* is a tensed fact.

Here we have a technical analysis for what it means to begin to exist, but it should be clear that this language will not do for the proponent of the B-theory of time. First, on

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[11] Craig, 1979, p. 141.

[12] Some are tempted to appeal to quantum mechanics for a quick objection to the principle, and I will respond to these concerns in a later section.

[13] Craig, William Lane and James D. Sinclair, "The *Kalam* Cosmological Argument" *The Blackwell Companion to Natural Theology*, William Lane Craig and J.P. Moreland, Eds. (Blackwell Publishing, Ltd., 2009).

this analysis, it is not immediately clear if on the B-theory time can "come into being," since the reality of temporal becoming itself is denied. However, some physicists (and presumably some B-theorists) do believe that the Big Bang model provides us with some initial state or singularity--however difficult to explain--that represents the very beginning of space and time itself. So it's possible that this is only a linguistic concern, since the Big Bang event may turn out to be the first moment of time.[14]

Second, Craig claims in (iii) that *x*'s existing at *t* has to be a tensed fact, but on the B-theory there are no tensed facts. True, there are temporally indexed facts about things existing *earlier-than* and *later-than*, but since these are tenseless, it seems we need a different notion of beginning to exist. It also seems to me that the necessity of (iii) only holds *if* one is an A-theorist about time. Otherwise, it seems to beg the question against the B-theorist about what it means for something to begin if the claim is that beginnings only happen on an A-theory. Why, for example, couldn't *x*'s existing at *t* simply be a tenseless fact temporally indexed earlier-than every other moment? That is, *x's* beginning to exist at *t* simply means that *x* exists at *t* and there is no moment $t^* < t$ at which *x* exists.

After all, even if I think the B-theory is correct, things themselves can fairly be said to begin to exist, even if their existence is ultimately tenseless. For example, there is a sense in which I have a beginning in time; I began at a time *later-than* Ronald Reagan's presidential inauguration, and *earlier-than* George H. W. Bush's. So even though the particular date of my birth is not tensed on the B-theory, it seems the *event* of my birth

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[14] I do not mean to sloppily suggest that the spacetime singularity is a sufficient explanation, but as Craig and Sinclair suggest, "It is fascinating to note that the recent history of cosmology can be mapped by attempts to overcome these singularity theorems" (2009, p. 180). That is, the singularity, though very unpopular and a matter for considerable concern, cannot be done away with easily.

can be said to begin to exist. It is not the case that there is no temporal order to the B-series. It is not as if, by being tenseless events, all of the above events surrounding my birth are *simultaneous* with one another. Indeed, certain events are earlier than others, and when they do, they *begin* earlier as well.

But none of this is exactly what Craig means by something's beginning to exist, since, according to the B-theory, it is not true *objectively* at Ronald Reagan's inauguration that *I do not exist.* The truth of that statement is perspectival to those simultaneous-with the inauguration event, but I exist tenselessly along with all other moments of time. This is part and parcel to the B-theory, so I maintain there must be something unique about a first moment of the universe that allows even a B-theorist to say "it begins."

One way to understand this might be as follows.

> 1. *x* begins to exist at *t* if (i) *x* exists at *t,* and (ii) there is no moment earlier-than *t* at which *x* exists.

Notice that clause (ii) can only be true of the first moment, because on B-time, all moments, once created, exist. That is to say, *x* can *still* begin to exist even if the moment of its beginning to exist is temporally indexed tenselessly. Another way to say this might be the way Sean Carroll has put it, that, "there was a time such that there was no earlier time."[15] Here, "there was a time" simply means that there *is an earlier time,* and need not be a tensed fact. This is of course not a very robust formulation, as Carroll suggests it in passing. But I think it actually comes somewhat close to what I want to argue, and this would be what we would consider the first moment of time (or spacetime), or the time at

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[15] Carroll, Sean, "Does the Universe Need God?" *Blackwell Companion to Science and Christianity,* ed. James B. Stump and Alan Padgett, 2012; online at http://preposterousuniverse.com/writings/dtung/dtung.pdf

which the universe begins to exist. Even if this time before which there was no time is supposed to exist tenselessly, I will show that tenseless time cannot be an actual infinite because it leads to absurdities that seem impossible to overcome. Therefore, if time and the universe are tenseless, but not infinite, they begin to exist.

I mentioned earlier that Craig insists upon the A-theory as a necessary part of the *kalam* cosmological argument. According to Craig, the argument "presupposes from start to finish an A-theory of time."[16] He claims that "the first moment of creation is not a tenseless instant at the head of a four-dimensional block but an evanescent moment that came to be and has passed away." However, tenselessness does not seem to entail timelessness if the B-series is not actually infinite in the past. Even if tense is only linguistic, it does not follow that tenseless events are not still temporally bound. We imagine, for example, the first inch of a ruler as the beginning of the ruler, and as being indexed in a before-relation to the other marks "after" it on the ruler. But strictly speaking, there is no directionality to the ruler except for the one given to it by convention. The order in this case is perhaps not unlike the order that is imposed upon the B-series by something like cosmic expansion. There is nothing ontologically different about inch 1 or inch 10, but we still claim that the ruler "begins" with the first inch for the purpose of measuring.

Craig goes on to argue that, on the B-theory,

> The universe began to exist only in the sense that the tenselessly existing block universe has a front edge... There is in the actual world no state of

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[16] Craig, William Lane, ReasonableFaith.org, Question & Answer #168, "Beginning to Exist" http://www.reasonablefaith.org/beginning-to-exist#ixzz28R3CA0JI

> affairs of God existing alone without the space-time universe. God never really brings the universe into being; as a whole it co-exists timelessly with Him.[17]

It is not clear, however, that this must be the case. Why would it be impossible for there be a state of affairs in which God exists changelessly and timelessly without the universe, and for there to be a first moment of creation in which God creates the B-series of events which include the first moment of cosmic inflation, and every other tenseless moment? If it is possible for the first moment of the B-series to exist a finite time ago in the past, then it seems we have a case for a first moment of time that is in need of a cause just as everything else which begins to exist. I am not convinced that the B-series is descriptive of a block universe that is not in need of an explanation; I am also not convinced that the universe on the B-theory can simply *exist.*

Instead, I am suggesting that there exists a universe, that time is a genuine feature of the universe, and that time is best described by the B-theory. But what I am also arguing is that the B-series is nevertheless not eternal and has only existed for a finite amount of time in the past. Even if the moment of the Big Bang exists tenseless, it need not have existed from all eternity. If that is the case, then if the first premise of the argument is true, that whatever begins to exist has a cause of its existence, and if it is not past-eternal, the B-series is also in need of a cause of its existence. In other words, each moment in time began to exist, but not as these moments became "present." Instead, they began to exist when the B-series itself began to exist. Therefore it remains true that each moment has a cause of its existence, that the universe began to exist, and that the universe has a cause of its existence, which is what we call God.

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[17] *Ibid.*

4. On Infinite Temporal Regress and Premise 2

Now, it will be helpful to see one way Craig develops the philosophical arguments for the second premise:[18]

2. The universe began to exist.
    2.1 Argument from the impossibility of an actual infinite
        2.11 An actual infinite cannot exist.
        2.12 An infinite temporal regress of events is an actual infinite.
        2.13 Therefore, an infinite temporal regress of events cannot exit.
    2.2 Argument from the impossibility of the formation of an actual infinite by successive addition
        2.21 A collection formed by successive addition cannot be an actual infinite.
        2.22 The temporal series of events is a collection formed by successive addition.
        2.23 Therefore, the temporal series of events cannot be an actual infinite.

It should be clear that at least 2.2 seems to rely on the truth of the A-theory, in that time is conceived of as a temporal series that is formed by successive addition. As such, I will not be using that line of argument, and so will not follow the exact outline. But, I will engage briefly the argument given in 2.1 in the following section.

I will grant that an actual infinite cannot exist. According to 2.12, an infinite temporal regress of events is an actual infinite, and so an infinite temporal regress cannot exist. But this warrants some discussion. Recall the difference between an actual and potential infinite. An actual infinite is a totality, a completed series to which nothing can be added. This is why, as Craig notes, a collection formed by successive addition cannot

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[18] Craig & Sinclair, 2009, pp. 103-125.

be an actual infinite. We can always add another, and we will never reach the actual infinite. What we mean in such a case is that the collection we can form by successive addition is *indefinite*.

But suppose we run the argument in the "opposite direction," that is, into the past. At what point would the temporal regress of events become infinite? The answer, of course, is that at *no* point would it become infinite. Every point in the past, no matter how far removed, would be a finite point before the present. It would be forever possible to add one more to the regress, and thus, it would never be an actual infinite. So either there are a finite number of past days, where the temporal regress comes to an end at some first day, or the temporal regress is a potential infinite, which we have said is unproblematic, even for Craig.

Now, if a B-theorist believes the universe is past-eternal, then it is obvious that for her the temporal regress of events is actually infinite. Every moment exists ontologically on par with the present moment, and *ex hypothesi* the series is beginningless, endless, and exists all at once; an actual infinite. But Craig is arguing that on the A-theory an infinite temporal regress is an actual infinite, which is asymmetrical to his claim that an infinite collection of future events is a *potential* infinite. The future is only potentially infinite because we can never count to infinity, so the best that can be said is that it will forever move closer and closer to infinity, but will never reach the actual infinite. But why isn't it the same with past events?

If we begin with the present and count backward all the past days, at no point will we find that we are an infinite number of days from the present. Indeed, every past

moment is *always* a finite number of days removed from the present, and that is just what we said constitutes a potential infinite. What we find is that, for Craig, the infinite temporal regress is an actual infinite because he includes as a part of his discussion the idea that the infinite temporal regress includes a *beginningless* series.[19] That is, the past never begins, and is therefore actually infinite, and, he says, uncontroversially so. If the number of days have been adding up from all of eternity, then it is actually infinite. But even if this is right, an infinite temporal regress, of itself, does not force us into a beginningless series, because the infinite temporal regress is only potentially infinite unless we *include* the beginninglessness of the series. Likewise, an infinite number of future days does not refer to an actual infinite because no such thing can ever be accomplished, unless we add the idea that it is somehow, in fact, an endless future. The concept of an actually endless future is not part of the concept of "infinite succession," because that succession is only potentially infinite by itself.

It appears that only with the addition of "beginningless" is it true that the temporal regress is actually infinite, but that makes it trivially true, and beginningless need not be included in the concept of an infinite temporal regress, because, as I have shown, an infinite temporal regress, by itself, is only potentially infinite. Therefore, all that 2.1 really seems to say is that either the infinite temporal regress is merely potentially infinite, and therefore not actually infinite, or one must add the concept that the past is beginningless, and we can then turn to the other arguments against such a claim, such as

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[19] Craig & Sinclair, 2009, pp. 115-17.

the inability to traverse an infinite, and the other paradoxes involved with the existence of the actual infinite in reality.

I have shown that even if an infinite temporal regress of events in not actually infinite, something like the A-theory of time does seem to be operative in Craig's analysis, since it is only on a tensed view of time that we would have a true succession (or regression) of events, which in this case would be moments of time. On the B-theory, it seems time could be infinite without worrying about these objections, because it does not become infinite by successive addition, and since we do not "move through" time, there is no temporal regress going back in time. The various moments of time simply stand in tenseless relations to all the other moments.

I still maintain, with Craig, that the universe began to exist. This claim is defended both philosophically and scientifically, the latter of which I will turn to later. Rather than rehearse Craig or al-Ghazali's many philosophical arguments against the eternality of the universe, I want to give a different sort of argument for the beginning of the universe, one that does not presuppose the A-theory, so I can show why the B-series must not be actually infinite.

5. Avicenna on the Actual Infinite

So, to show that even on a B-theory the universe cannot be infinitely old, I turn to Avicenna, who, unlike al-Ghazali, is sympathetic to the idea of the infinite and the past eternity of the universe. My argument can be summarized as follows:

> 1. Argument from Avicenna's "Actually Infinite Essentially Ordered Quantity"

1.1 Quantities that are both whole and essentially ordered cannot exist as actually infinite.
1.2 On the B-series, time meets Avicenna's wholeness and ordering conditions.
1.3 Therefore, on the B-series, time is not actually infinite.

Avicenna, unlike Aristotle, believes the actual infinite is possible, though not without conditions. For example, where the *kalam* thinkers (and Craig) believe that an infinite series cannot be traversed, Avicenna simply holds that an infinite series cannot be traversed *in a finite amount of time.*[20] That is, given an infinite amount of time, an infinite amount of moments can be traversed. But to think of the infinite in a different way, Avicenna asks us to consider two identical rigid beams, *O* and *R*, extending infinitely from Earth into space.[21] Suppose first that we remove a section from *R*, say the section from Earth to the edge of our galaxy. We can call that section *x.* So then *O* remains the same, and *R* is said to be shortened by the distance of *x.* When we compare *R* after the removal of *x* to the first beam, *O*, we find some absurd results. First, it would be absurd if the two beams are both still infinite, and *R* is not shorter than *O,* since we just said that *R* was shorter than *O* by the length of *x.* If *R* turns out to be shorter than *O,* however, then *R* is no longer infinite, but is finite. But *R* would be finite because of the removal of *x*, which is also finite, and adding *x* back to *R* would then give us another finite--not infinite--length, since it would be the combination of two finite lengths, and the addition of two finite quantities always results in something finite. Either way, we find contradictions, so Avicenna thinks the material instantiation of an actual infinite cannot exist. It is sometimes suggested that set theory can help explain the absurdities involved

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[20] McGinnis, Jon "Avicennan Infinity: A Select History of the Infinite through Avicenna" (2010) p. 212.

[21] *Ibid.,* p. 215.

with thinking about infinity, but such an understanding does not appear to help us, since neither *R* nor *x* is a proper subset of *O*.

What does this thought-experiment tell us about the possibility of an actual infinite with respect to time and the eternality of the universe? More specifically, what does this tell us must be the case if the B-theory of time is true? Are we committed to the existence of an actual infinite, according to Avicenna? Though Avicenna thinks an actual infinite can exist, he argues that the beam example shows that an "actually infinite essentially ordered magnitude" cannot exist.[22] In order to be an actually infinite essentially ordered magnitude, a magnitude would first have to be whole, existing all at once. It could not have parts of itself, or members of the set of things that make it up that have passed away or do not yet exist. So, if the A-theory is true, time would not be an actually infinite quantity, because all the parts of time do not exist at once. Some of the parts no longer exist, while others do not yet exist. On the B-theory, however, we might argue that all of the parts *do* exist. There are no objectively past, present or future moments, since those notions are relative, so there are no proper parts of time, only those given by convention. So it seems that time on the B-theory can be treated as an actually infinite magnitude.

The second condition is that the quantity must be essentially ordered. Being essentially ordered means that "Each member in the set has some well-defined position relative to the other members, such that the whole set can be called 'ordered.'"[23] As we said earlier, this is how time is understood according to the B-theory. All the moments in

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[22] *Ibid.,* p. 19.

[23] *Ibid.,* p. 20.

time (or of time) exist tenselessly all at once, and in particular relations to all the others. So we can imagine 2 identical B-series' mapped onto the 2 rigid beams, and we can see that if what we removed from beam *R* (from Earth to the edge of our galaxy) could represent some set of years, say 1-500 CE, the same contradictions arise when we imagine the now-shorter B-series either not being any shorter, or by trying to return those years and get an infinite series back. Simply mapping the years onto the beams, which we can do because they are both whole and essentially ordered, shows the contradiction in imagining an actually infinite B-series.

That is, time on the B-theory seems to be whole, existing all at once, and ordered, in set positions relative to the other moments. Thus, the B-theory of time gives us, according to Avicenna, an actual infinite. Recall, though, that *this* infinite is just what Avicenna says cannot exist. The argument we got from the beam thought-experiment was that this type of infinite gave us absurd results and had to be abandoned. So by meeting these two conditions (being whole and being ordered), B-theory time as an actual infinite simply cannot exist. Thus, though an actual infinite is possible for Avicenna, an actual infinite with these conditions is not.

6. Tenseless Existence, Timeless Existence, and Cosmic Inflation

Thus far I have given a brief treatment to the historical context and the supporting arguments concerning the actual infinite. In doing so, I have inserted the B-theory at times to suggest that it is compatible with (at least) these parts of the *kalam* cosmological argument. It would be impossible to establish fully the case for the B-theory here,

especially because so much of that case rests on a linguistic analysis about the translatability of tensed sentences to tenseless ones. However, it is important to say a bit about the B-theory and its relationship to the way we are understanding time within the larger *kalam* cosmological argument, especially since I am attempting to generalize the argument in a way that it is compatible with the B-theory.

One compelling reason we might have for accepting the B-theory and rejecting the A-theory is the implications of relativity, *viz.,* that there is no privileged "now;" no privileged present moment. Recall that the A-theory, which is roughly the idea that what exists is the present, seems to suggest that there is, in fact, some present moment that is ontologically privileged over past and future moments. The relativity found in classical physics, however, makes this a notoriously difficult position to uphold.[24] Craig has argued that we are not compelled to accept the B-theory of time as a result of Special Relativity, but his view is not the prevailing one.[25] Other problems exist for the A-theory, such as understanding the rate of the "flow" of time from each present moment to the next, and understanding what counts as truthmakers for past (and possibly future) events.[26] The goal here is not, however, to argue against the A-theory as much as it is to

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[24] See Putnam, Hilary "Time and Physical Geometry" *The Journal of Philosophy,* Vol. 64, No. 8 (Apr. 27, 1967) pp. 240-247.

[25] The details are unnecessary for this discussion, but Craig & Sinclair (2009), pp. 114-115 offer the following technical ways in which Einstein's relativity can be squared with an A-theory of time: (1) distinguish metaphysical time from physical or clock time and maintain that while the former is A-Theoretic in nature, the latter is a bare abstraction therefrom, useful for scientific purposes and quite possibly B-Theoretic in character, the element of becoming having been abstracted out; (2) relativize becoming to reference frames, just as is done with simultaneity; and (3) select a privileged reference frame to define the time in which objective becoming occurs, most plausibly the cosmic time, which serves as the time parameter for hypersurfaces of homogeneity in space-time in the General Theory of Relativity.

[26] Wahlberg, Tobias Hansson, *Objects in Time: Studies of Persistence in B-time*, Media-Tryck, Lund, 2009, pp. 22-32.

establish the general arguments of the B-theory in a way that allows us to construct the *kalam* cosmological argument on a view of time according to the B-theory.

The biggest difficulty for defending the possibility of the relationship between the B-theory and the *kalam* argument is that "beginning to exist" does not mean what we typically imagine it to mean, and I showed earlier the difficulty in constructing such an analysis. On the A-theory, "beginning to exist" is a common-language expression that claims exactly to describe the beginning of the universe. Craig describes it as a moment that comes into existence and ceases to exist like all other moments in time. On the B-theory, Craig argues, the first moment of the universe did not come to exist and then cease to exist, it is more like the front-edge of the tenselessly existing spacetime block of B-series temporal relations.

But this objection does not make it clear that the B-series involves an actual infinite, since if the series has a beginning at all, it has a limit, and is therefore not infinite. That is, if the second premise is that "the universe began to exist," and it can be defended scientifically, then perhaps such a claim is compatible with time's existing tenselessly. It appears to me that tenseless existence does not entail eternal existence. We can say that the universe began to exist, and we can do so even if the beginning is not a moment that is dynamic, but is rather the static first moment of time. In other words, to say that the universe began to exist on the B-theory is just to say that there is a time before which there is no time.[27] And if there is such a moment, then time (and the universe) began to exist at a point in time earlier-than every other moment. So then, even

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[27] Sean Carrol and William Lane Craig both talk about the alleged beginning of time this way.

if the universe and time exist tenselessly, this is not the same as to say that they exist *eternally*, and there is therefore no beginningless series implied by this view of time. As I showed in earlier sections, the addition of *beginningless existence* is, in fact, an addition to the concept of tenseless existence.

To help see why, let us think about the arrow of time. Time appears to us to flow, and our commonsense conception of time is that it really *is* like it seems. It is sometimes argued that this phenomenon is so unmistakably real that if the B-theory cannot account for it, then the B-theory must be rejected.[28] Although I do not claim to answer that question here, it is perhaps sufficient to think about the existence of cosmic inflation. The early universe is said to have undergone rapid expansion, and the Big Bang model seems to suggest that we are in an inflationary spacetime. This may or may not explain our experience, or it may be in need of further analysis, but it does give the universe a very real sort of directionality with respect to the so-called arrow of time. But before making the argument, I first want to motivate the reason it is helpful for my case.

The general form of my argument is as follows:

2. Argument from the Beginning of the B-Series
    2.1. If there is no beginning to the B-series, then an actual infinite exists.
    2.2. An actual infinite does not exist.
    2.3. Therefore, it is false that there is no beginning to the B-series.
    2.4. Therefore, there is a beginning to the B-series.

I have previously defended the notion of there being a beginning of the B-series because of (i) the impossibility of the actual infinite, and (ii) the argument given by Avicenna. I

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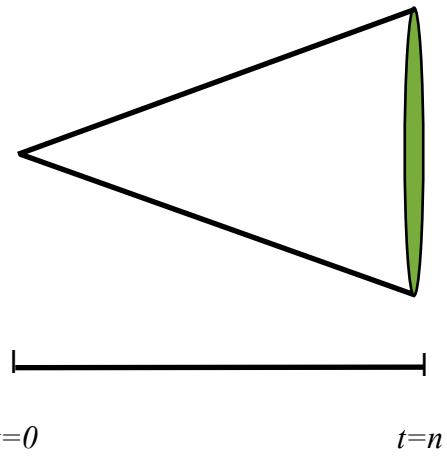
[28] One account of our experience on the B-theory can by found in Falk, Arthur "Time Plus the Whoosh and Whiz" in *Time, Tense, and Reference,* edited by Jokic, Aleksander and Smith, Quentin, MIT Press, 2003, pp. 211-250.

now want to present an argument for the beginning of the B-series based on a consideration of cosmic expansion.

It is argued that our universe is expanding.[29] If that is so, we can trace the expansion back in time (as classical physics typically does) to a point at which that expansion begins, what is known commonly as the singularity. I am not concerned here with any difficulties involved with explaining the singularity, because it seems obvious that *something* like a singularity emerges as we get back to a smallest period of expansion, and that is all I need for this argument.[30] This picture of the universe might be put this way:



That is, at *t=0*, our universe is at the lowest level of expansion, and we can map that moment onto our timeline of B-series events. So, *t=0* represents a time before which *there is no time*, and the corresponding amount of cosmic expansion represents a level of

[29] Craig, 1979, pp. 111-130.

[30] Namely, we get a state of density beyond which there is nothing greater, or a state of the cosmos' magnitude no state of which is smaller.

expansion *smaller than which there was none*. Just as there simply was no time prior to *t=0*, there was no expansion.

It should be noted that this is not designed to be a spatialization of time itself, but if space can be described as expanding, and all of the moments of time are supposed to exist at once, then we can map those moments onto the expansion and the correspondence between the two, which shows that if we can have a first point of expansion it will correspond to a first moment of time. Indeed, here time is measured against the size of the universe, and as the expansion must "run back" to some smallest point of expansion, (since it cannot have been expanding from eternity), so the spatial and temporal series cannot be past infinite. Given this correspondence, whatever is true of the one series maps onto the other. Thus, as there is a size of the universe smaller than which there is none, there is a time before which there is no time. Or, to rephrase the original argument:

2*. Argument from the Beginning of the Expansion of the Universe

> 2.1*. If there is no beginning to the expansion of the universe, then an actual infinite exists.
> 2.2*. An actual infinite does not exist.
> 2.3*. Therefore, it is false that there is no beginning to the expansion of the universe.
> 2.4.* Therefore, there is a beginning to the expansion of the universe.

7. The Borde-Guth-Vilenkin Theorem and the Expansion of the Universe

Thus far, I have primarily given reasons to suppose that the universe began because of the impossibility of the existence of an actual infinite, since an actual infinite would exist in an infinitely old universe. These sort of arguments are all that are involved

in the *kalam* tradition, as our understanding of cosmology and the Big Bang model only dates back to about the middle of the last century. So then, if our philosophical arguments are sound, and given our best understanding of Big Bang cosmology, we should expect to find scientific evidence in support of our argument that the universe began to exist.

In 2003, Arvind Borde, Alan Guth, and Alexander Vilenkin authored a paper in which they argued that any spacetime that is on average expanding is past geodesically incomplete; that is, has a beginning.[31] It is argued that our spacetime is one that is, on average, expanding, and that it therefore has a beginning. Although their analysis of the other competing theories of quantum cosmology are rather technical, they can be summarized as follows:[32] (i) Inflationary spacetimes are past incomplete, (ii) Cyclic spacetimes are either incomplete or lead to thermal death, and (iii) Asymptotically static and oscillating universes suffer from quantum instability. Therefore Vilenkin argues that, *probably*, the universe had a beginning. He also notes, however, that incompleteness theorems such as the BGV Theorem do not tell us anything about those beginnings. So, even though on their view it is not clear how to interpret the beginning, I am here less concerned with interpreting the beginning as in simply establishing the likelihood of it.

Borde, Guth, and Vilenkin argue that inflationary cosmological models are "generically eternal to the future," which I have explained is to say that they are *potentially* infinite. They ask about the symmetry of eternality into the past on an inflationary model. To arrive at their conclusion, they argue initially from only the

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[31] Borde, Arvind, Alan Guth, & Alexander Vilenkin, "Inflationary spacetimes are not past-complete" http://arxiv.org/pdf/gr-qc/0110012.pdf January 11, 2003.

[32] Vilenkin, Alex "Did the Universe Have a Beginning?" Presentation slides online at http://www.ctc.cam.ac.uk/stephen70/talks/swh70_vilenkin.pdf, in which the answer is found: "Probably yes."

following assumption, that the Hubble parameter, H, is on average greater than 0, or $H_{av} > 0$. They conclude that, "with a suitable definition of H and the region over which the average is to be taken, we will show that the averaged expansion condition implies past-incompleteness."[33]

Though extended discussion would take more space and expertise than I can offer, Craig and Sinclair offer three possibilities for interpreting quantum cosmologies generally:[34] (i) creation from nothing, (ii) universe neither created nor destroyed; timelessly subsistent, and (iii) ultimately unexplained, since the initial conditions are not properly accounted for. Problems exist for each interpretation of these models, but what do they mean for the *kalam* cosmological argument? Recall that the first premise of the argument is that whatever begins to exist has a cause of its existence, and the second premise is that the universe began to exist. Only interpretation (i) would damage our first premise, but as many have argued (and as I will show momentarily), the "creation from nothing" is not really nothing, but some state where the laws of quantum mechanics, at least, exist. Interpretation (ii) would seem to be a problem for the second premise of the *kalam* argument, but only if we take the mathematical models to be real descriptions of reality, and we have several philosophical arguments to show the impossibility of an actually infinite past. And (iii) does not suggest that the universe is past eternal, and is perhaps the most modest of the interpretations. Of course, nothing in the preceding should suggest that I am in possession of the correct interpretation of the models, or that positions have been even close to fully-outlined. But I do claim that there are compelling

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[33] Borde, et. al., 2003, p. 1.

[34] Craig & Sinclair, 2009, p. 179.

scientific reasons (at least one of which is found in the BGV Theorem) for thinking that the universe cannot, in fact, be past eternal.

8. An Objection to the Causal Principle from Quantum Theory

Without straying too far from the *kalam* cosmological argument or the B-theory of time, I want briefly to comment on what will surely seem to some an obvious objection to the causal principle. As I have presented it, there is virtually no reason to deny that whatever begins to exist has a cause of its existence. However, as I also mentioned, not everyone has been eager to accept this, and some of the arguments against it have been from quantum theory and the idea that at that level, we do not have such a firm grasp on causality. This is no doubt true, but it is also not clear that this will be a problem for the *kalam* cosmological argument.

One such doubter of the causal principle suggested above, especially as it relates to the universe and the Big Bang, is physicist Paul Davies.[35] He argues that the cause of the Big Bang is that "empty space itself exploded under the repulsive power of the quantum vacuum," which he explains is part of the inflationary theory.[36] This does not tell us where the energy in the vacuum came from, however, and Davies anticipates this objection. Understanding that a vacuum is not "nothing," he argues that:

> According to the [inflationary] theory, the universe started out with essentially zero energy, and succeeded in conjuring up the lot during the first 10^{-32} s. The key to this miracle lies with a most

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[35] Davies, Paul, "What Caused the Big Bang?" *Modern Cosmology and Philosophy*, ed. John Leslie, 1998, pp. 226-244.

[36] *Ibid.,* p. 235.

> remarkable fact about cosmology: the law of conservation of energy *fails* in its usual sense when applied to the expanding universe.[37]

There was, according to Davies, *negative* pressure in the inflationary period, causing the rapid expansion of the universe, and this is because:

> The vacuum is nature's miraculous jar of energy. There is in principle no limit to how much energy can be self-generated by inflationary expansion. It is a revolutionary result at total variance with the centuries-old tradition that 'nothing can come out of nothing,' a belief that dates at least from the time of Parmenides in the fifth century B.C.[38]

That is, very simply, the universe is the cause of itself. Davies later states that "The central feature of quantum physics is the disintegration of the cause-effect link," and that "at the atomic level matter and motion are vague and unpredictable."[39] But, as he also admits, vagueness and unpredictability are not the negation of causality. The link is less clear, but it would be a mistake to suppose that there was no causality at the atomic level. But as for the previous claims about zero energy and a self-causing universe, a few things can be said.

First, "essentially zero energy" is not "zero energy," and it would be a mistake to equivocate between those two. There is a world of difference between the universe coming to be from *nothing*, and the universe coming to be from *essentially nothing*. In other words, it is not at all clear that this view of the inflationary model constitutes a violation of Parmenides' principle that from nothing, nothing comes. Davies admits as much in the closing paragraphs of his paper:

> For the physicist, however, empty space is a far cry from nothing: it is very much part of the physical universe. If we want to answer the ultimate question of how the universe came into

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[37] *Ibid.,* p. 236.

[38] *Ibid.,* p. 237.

[39] *Ibid., p. 242.*

> existence it is not sufficient to assume that empty space was there at the outset. We have to explain where space itself came from.[40]

Davies, then, who is no A-theorist, accepts the idea that space "came into existence" at some finite time in the past, and that it is not enough to suggest that space has been there all along. And if space is not infinitely old, then I argue that neither is the universe itself, and hence, as it is typically understood, neither is time.

9. Conclusion

As I have shown, Craig's arguments assume--and sometimes depend upon--the truth of the A-theory of time. In the preceding I have argued that such a position is unnecessary. My project is important because on the version Craig advances, it seems the argument is only as strong as the arguments one can give for the A-theory. Therefore, if one is not persuaded by a tensed view of time, one has immediate grounds for rejecting an argument that might otherwise be compelling. This seems to sell the argument short, since a more general version of the argument, if successful, would make for a stronger case for this argument for the existence of God.

It also seems curious to suggest that if God created the world a finite time ago, he created the A-series *necessarily*! Does this mean that God could *not* have created a finite time ago, and yet create time on a B-series? There doesn't seem to be anything logically impossible about God creating at a finite time ago in the past, and for Him to have created time such that moments exist in tenseless relations instead of tensed ones, regardless of how difficult it might be to divorce ourselves from the perception of

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[40] *Ibid., p. 244.*

temporal becoming. If God could have created the world and the entire B-series, it seems unnecessary to restrict the argument to one view of time. If the argument is that the only way God could create a B-series is for the B-series to exist timelessly with Him, this seems to place unnecessary restraints on God's creative power, as well as misunderstand the fundamental difference between the B-series existing *tenselessly* and its existing *timelessly*, or eternally.

I have therefore offered a brief survey of the historical argument from the medieval *kalam* tradition, and have given some of Craig's recent arguments for his version of the argument in (1) and (2), respectively. I have also tried to show that an analysis of "beginning to exist" can be given on the B-theory as well as the A-theory in (3). Moving to the second premise, I gave some of the arguments for the claim that the universe began to exist, and tried to clarify Craig's discussion about the nature of an infinite temporal regress (4). I argued in (5) that Avicenna conceived of the infinite in a way that precludes time on the B-theory from being actually infinite. In (6) I gave the argument that if there is no beginning to the B-series, then an actual infinite exists, and since an actual infinite does not exist, it is false that there is no beginning to the B-series. In section (7), I showed how the Borde-Guth-Vilenkin Theorem gives us scientific evidence for the claim that the universe is not past-eternal. And finally, in (8), I briefly anticipated and rejected a type of objection to causality from quantum mechanics; namely, that according to quantum mechanics, the universe can come from nothing, or from itself.

Ultimately, I claim that the premises given in the *kalam* cosmological argument are true, and that therefore, so is the conclusion. But *contra* Craig, I claim that the premises can be defended on the B-theory of time, which strengthens the argument against the superficial dodge that if the *kalam* cosmological argument requires the A-theory, and if the A-theory is false, then the *kalam* cosmological argument is false. If I have been successful, this response will not do, and I will have given a stronger, more general argument in support of the *kalam* cosmological argument.

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