The Kalam Cosmological Argument for God's Existence

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INTRODUCTION

Bertrand Russell famously quipped, "The universe is just there, and that's all." He saw the universe as a brute fact that had no need of explanation. This sort of response may be reasonable given the presumption that the universe is eternal, but it is preposterous if the universe had a beginning. While I would argue that even an eternal universe requires a cause,[1] the need for causal explanation becomes all the more apparent if the universe began to exist in the finite past.

If the universe began to exist, it must have been caused to exist by something external to the universe because it is rationally preposterous to think something can begin to exist uncaused from nothing. This is the conclusion of an argument for God's existence known as the kalam cosmological argument (KCA).[2] It can be stated in the following syllogism:

Premise 1 (P1): Whatever begins to exist must have an external cause
Premise 2 (P2): The universe began to exist

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Conclusion (C): Therefore the universe has an external cause

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[1]If the universe is contingent rather than necessary, then it would require a cause even if it is eternal. The contingency argument for God's existence argues that the universe is contingent, and as such, it requires a causal explanation. That explanation would not be temporally prior to the universe, but logically and explanatorily prior to it. To terminate an infinite regress of causal explanation, there must exist a necessary being that explains the existence of all other contingent beings. That necessary being is God. For more information on the contingency argument, see https://thinkingtobelieve.com/2013/04/23/contingency-argument-for-gods-existence/.

Both the contingency argument (CA) and the KCA are cosmological arguments. How do they differ from one another? The CA argues that contingent beings require an external cause. The universe is a contingent being, so even if the universe were eternal, it requires a cause. Since there cannot be an infinite regress of contingent causes, the universe can only be explained by a self-existing, necessary being like God. This argument holds whether the universe is eternal or temporally finite.

In contrast, the KCA argues that God brought the universe into being a finite time ago. Things can't come into being uncaused, so there must be an immaterial, spaceless, eternal cause that brought the material, spatial, temporal universe into being. That cause is a perfect description of God. This argument only works if the universe has a beginning.

[2]The KCA has a long history. It was first articulated by the Christian Alexandrian philosopher, John Philoponus (A.D. 490-570), in his book *Against Proclus* (A.D. 529). When the Muslims conquered northern Africa in the 7th century, they absorbed Philopnus' argument and developed it further. Al Ghazali was an 11th century Muslim who wrote *The Incoherence of the Philosophers*, showing that Greek philosophy is logically incoherent in affirming an eternal universe. He argued that the universe must be temporally finite, and caused to exist by God. Jews picked the argument up from the Muslims in Spain, and then Christians picked it back up from the Jews. It has been re-popularized in the late 20th century through the work of William Lane Craig, who did his doctoral dissertation on the argument and has continued to popularize it through books and debates.

As you'll notice, the word "God" is not found in the conclusion. How, then, does the KCA serve as an argument for God's existence? It does so based on a logical assessment of the necessary properties of the cause. A logical analysis of the cause requires that it be immaterial, non-spatial, eternal, powerful, intelligent, and personal in nature. These are the basic properties of the theistic God, and as such, the KCA is an argument for theism. If the argument proves successful, it would demonstrate the existence of a theistic being who is the personal creator of the universe.

The KCA has a long history.[3] In modern times, however, its greatest advocate, defender, and popularizer is William Lane Craig (WLC). It was the topic of his doctoral dissertation, and he has continued to refine the argument through many books and articles since then. Given the voluminous nature of Craig's work on this argument, I will be citing him liberally throughout this paper.

I will begin by examining the objective of the KCA, followed by a brief formulation of the argument. Then, I'll identify the key ideas the KCA trades on and explore important concepts that must be understood to make sense of the argument. Next, I will launch an in-depth argument for the KCA, focusing on the evidence for each premise and responding to objections raised against those premises. Once the conclusion has been firmly established by demonstrating the truth of the premises, I will make the case that the cause is best identified as the God of theism. This will be followed by tactics and tips for sharing the argument with others. Finally, I will conclude the paper by exploring a number of objections that have been raised against the KCA.

OBJECTIVE OF THE ARGUMENT

The objective of the KCA is to prove the existence of an eternal, immaterial, non-spatial, personal, intelligent, and powerful creator who caused the universe to come into being in the finite past.

KEYS TO THE ARGUMENT

The first key to the KCA is the causal principle – the notion that all effects require an efficient cause. The second key to the KCA is a demonstration that the universe began to exist a finite time ago.

CONCEPTS TO UNDERSTAND

To understand the KCA, one needs to understand a couple of key concepts. The first is efficient causation. Efficient causation refers to any *p* that produces some *r* or explains why *r* exists. It is a relation between two or more events in which one event produces or explains the other. Efficient causation involves the notion of agency. Some external agent acts in such a way to cause some effect. That agent could be personal or impersonal in nature.

The second concept to understand is infinity. Infinity is a mathematical concept. Mathematicians distinguish between two types of infinity: potential infinity and actual infinity. An actual infinity refers to a set whose number exceeds any natural number and can be divided into subsets where each subset is

[3]"Kalam" is an Arabic word meaning "word" or "speech." It came to denote Islamic doctrinal theology, and finally to characterize the whole scholastic theological movement in the Medieval ages. Because of the Muslim development of the argument in question, William Lane Craig dubbed it the kalam cosmological argument.

equal in size to the whole set.[4] An actual infinity is boundless. In contrast, a potential infinity refers to a set whose members keep growing larger and larger with infinity as a limit, but never approaches an actual infinity. A potential infinity is said to be indefinite.

THE KCA IN A NUTSHELL

Before we examine the KCA in detail, it may help to lay out the argument in a simplified fashion. This will help us keep sight of the forest once we focus in on the trees.

Stated briefly, the KCA argues that science highly suggests and philosophy demands that the universe came into being a finite time ago. Since everything that comes into being requires a cause, the universe must have been caused to come into being.

What caused the universe? Since the coming into being of the universe marks the absolute origin of space, time, and matter, the cause of space, time, and matter cannot itself be spatial, temporal, and material because you cannot bring into existence something that already exists. That means the cause of the universe must be eternal, non-spatial, and immaterial. It must be powerful and intelligent as well to explain the origin and order of massive amounts of energy.

Additionally, the cause must be personal for at least two reasons. First, only a personal agent can explain how the cause of the universe can be eternal and yet the effect came into being a finite time ago. When a cause is present, its effect immediately follows. There can be no temporal gap between a cause and its effect. An eternal, impersonal cause would have brought the universe into being an eternity ago. The only way the cause could be eternal but the effect temporal is if the cause is a personal agent who exercised His volitional powers a finite time ago to bring the universe into being. Only personal agents have the power to delay a cause.

Another reason for thinking the cause is personal is the fact that there are only two kinds of efficient causes (material events, personal agents), and the cause of the universe could not have been a material event by definition. The coming into being of the universe marks the first material event. By definition, it is impossible for there to be an event prior to the *first* event. The only possible cause that remains is a personal agent. A personal, eternal, non-spatial, and immaterial cause of the universe is a perfect description of the Christian God. God must have created the universe.

A DETAILED ARGUMENT FOR THE KCA

The KCA can be stated as follows:

P1 Anything that begins to exist[5] requires a cause
P2 The universe began to exist

C Thus, the universe requires a cause

[4]Euclid's maxim that the whole is greater than its parts does not hold for transfinite arithmetic.

[5]WLC makes the point that a thing does not need a beginning *point* to begin to exist. All that needs to be true is that the thing exist at time *t1*, and there is no time *t** prior to *t1* when the thing exists. Another way of expressing this is to say that we can know something began to exist if for any measurement of its existence, there are only a finite number of equal measurements prior to it.

In what follows, I will present the evidence for each premise followed by responses to objections raised against each premise. Then, I will demonstrate how God is identified as the cause of the universe and respond to various objections raised against this conclusion.

Support for Premise 1

Premise one asserts that anything which begins to exist must have a cause. Is this premise true? Remember, to be considered true, a premise only needs to be more likely than its negation. What is more likely to be true: that anything which begins to exist requires a cause, or that anything which begins to exist does not require a cause? I think it is intuitively obvious that the former is more likely to be true, but I will provide four reasons to justify this rational intuition.

First, the law of causality is the most fundamental law of the universe. It is continually confirmed by our experience. Everything we are acquainted with that has a beginning also has a cause. Even when we do not know the cause of something, we assume there is one. We know of no exceptions to the law, and as such we should accept that it also applies to the origin of the universe.

Second, a denial of premise 1 is anti-science. The entire scientific enterprise is based on the law of causality. It is assumed that every effect has a cause, and the goal of science is to identify those causes. A denial of the truth of premise 1 would undermine the rationality of the whole scientific enterprise.

Third, this premise is based on an obvious and inescapable metaphysical intuition.[6] It goes without saying that being only comes *from* being, and being is only caused *by* being.[7] Things cannot pop into existence uncaused from nothing. Why, then, would we abandon this intuition when it comes to the universe?[8] If both our modal intuitions and our uniform experience tells us that every contingent being[9] must be caused to come into being, on what grounds does one think the negation of premise 1 is just as plausible as the premise itself? It can't be on empirical grounds, for this supports premise 1. And given the fact that the causal principle is one of the most basic of our modal intuitions, I fail to see how they could appeal to our modal intuitions either.

Fourth, if premise 1 is false, then it is possible for something to come from nothing. If this is possible, however, why is it that no one has ever observed it happening? If things can pop into existence uncaused from nothing, why doesn't anything and everything do so?[10] As Alexander Pruss noted, "For if the PSR [principle of sufficient reason] is false, then surely things can come into existence for no reason

[6]If someone says they don't believe in the law of causality ask them, "What caused you to believe that?"

[7]Wes Morriston (Christian philosopher) thinks that this is just a restatement of the premise, and as such it does not provide justification for the premise. William Lane Craig agrees that it is a restatement of sorts, but in a way that makes the premise more obvious.

[8]Given our universal experience of causation as it relates to contingent things, why be skeptical that the universe itself requires a cause? If both our modal intuitions and our uniform experience tells us that every contingent being must be caused to come into being, on what grounds an one think the negation of premise 1 is just as plausible as the premise itself? It can't be on empirical grounds, for this supports premise 1. And given the fact that the causal principle is one of the most basic of our modal intuitions, I fail to see how they could appeal to our modal intuitions either.

[9]"Being" often connotes consciousness in modern parlance. That's not what philosophers have in mind when they speak of contingent beings. The term could just as easily be expressed as "contingent thing."

[10]This argument is credited to Jonathan Edwards.

at all and can likewise pop out of existence for no reason at all."[11] And yet no one worries that a horse will materialize out of nothing in the midst of their living room. No wife, when finding a pair of women's underwear in her husband's car, has ever accepted the explanation that they must have popped into existence from nothing.

One might reply that things cannot pop into existence from nothing *within* the universe, but whole universes themselves can pop into existence uncaused from nothing. But why should we think only universes can pop into existence uncaused from nothing? It can't be due to the nature of nothingness because nothingness has no nature to constrain it. There are no physical, metaphysical, or logical constraints on what could pop into being from nothing if it's possible at all for something to come from nothing. A universe, a dog, or a piece of cheese are all equally probable if we start with nothingness. As WLC has written:

> If originally absolutely nothing existed, then why should it be spacetime that springs spontaneously out of the void, rather than, say, hydrogen atoms or even rabbits? How can one talk about the probability of any particular thing's popping into being out of nothing? … It is futile to say it somehow belongs to the nature of spacetime to do so, for if there were absolutely nothing then there would have been no nature to determine that spacetime should spring into being.[12]

Paul Davies suggests that the laws of physics are the controlling factor which determines what may leap uncaused into being. But if we start with nothing, there are no laws of physics either. Physics are the result of the creation, not the director of it.

At the end of the day, we must choose which is more reasonable to believe: that someone created something out of nothing, or no one created something out of nothing.[13] As Davies wrote: "What caused the big bang? … One might consider some supernatural force…or one might prefer to regard the big

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[11]Alexander R. Pruss, "Leibnizian Cosmological Arguments" in *Blackwell Companion to Natural Theology*. Chapter available via pdf at http://bearspace.baylor.edu/Alexander_Pruss/www/papers/LCA.html; Internet; accessed 15 July 2011.

[12]William Lane Craig, "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 02 May 2009.

[13]Stephen Hawking was asked by ABC's Diane Sawyer about the greatest mystery he would like to see solved. His answer: "I want to know why the universe exists, why there is something rather than nothing." This is cognitive dissonance. On the one hand he denies the existence of anything outside of the material world, but on the other hand he is looking for something that can explain why the material world exists. He's looking for something outside of everything to explain everything. There cannot be something that exists outside the whole of reality. If all that exists is the material universe, it is pointless to think there is any reality/reason that can explain why it exists, or why it exists the way it does. The only rational explanation is the existence of some being who transcends physical reality, who is metaphysically necessary. That would be God, but Hawking considered the option of a personal God to be "most impossible." While Hawking may have denied the existence of any reality outside the contingent universe, he could not escape the intuition that there is some cause/reason for the universe, and hence something that exists beyond the universe. I think this just goes to show that while one can deny the existence of God, just like Paul said, they cannot escape the knowledge of God. They simply suppress it, leading to the cognitive dissonance so evident in Hawking *et al*.

New Scientist magazine asked physicist Brian Greene, "Is there any question that keeps you up at night?" Brian Greene responded: "I wish it was just one. There are two, that if I allow myself to think about them, make my heart sink. Why is there something rather than nothing? It's a simple question that's been asked for so long, and the idea of nothing seems to me logically sensible. But when I truly imagine nothingness, well, I find it scary. Why isn't there nothing?" (the other issue was the nature of time)

bang as an event without a cause. It seems to me that we don't have too much choice. Either …something outside of the physical world…or an event without a cause."[14] Given the truth of premise 1, the universe cannot be uncaused. It must have been caused to come into being by something else. It could not have simply materialized out of nothing without a cause because out of nothing, nothing comes.[15]

Objections to Premise 1

The truth of premise 1 is so intuitively obvious that if the KCA did not involve theistic implications, I doubt that anyone would ever question its veracity.[16] However, some have raised objections to this premise that need to be answered.

I will examine objections to various elements of the KCA throughout this paper. It takes up a considerable amount of space. I realize that some readers may wish to skip this material and focus on the positive case for the KCA. For the sake of those readers, I am identifying the objections sections with blue font to make it easily identifiable and skippable.

Objection #1: *Causes necessarily precede their effects in time. First there is a cause, then there is an effect. In the case of the universe, time itself is the effect. Nothing can be temporally prior to the beginning of time itself, and thus there can be no cause for the universe since causes are temporally prior to their effects. While everything in the universe may require a cause, the universe itself cannot be caused.*

Response #1: This objection is best expressed by the late Stephen Hawking:

> [D]o we need a God to set it all up so a Big Bang can bang? … Our everyday experience makes us convinced that everything that happens must be caused by something that occurred earlier in time. So it's natural for us to assume that something – perhaps God – must have caused the universe to come into existence. But when we're talking about the universe as a whole, that isn't necessarily so.
> …
> The role played by time at the beginning of the universe is, I believe, the final key to removing the need for a Grand Designer, and revealing how the universe created itself. … Time itself must come to a stop [at the singularity]. You can't get to a time before the big bang, because there was no time before the big bang. We have finally found something that does not have a cause because there was no time for a cause to exist in. For me this means there is no possibility of a creator because there is no time for a creator to have existed. Since time itself began at the moment of the Big Bang, it was an event that could not have been caused or created by anyone or anything. … So when people ask me if a god created the universe, I tell them the question itself makes no sense. Time didn't exist before the Big Bang, so there is no time for

[14]Paul Davies, "The Birth of the Cosmos," in *God, Cosmos, Nature and Creativity,* ed. Jill Gready (Edinburgh: Scottish Academic Press, 1995), pp. 8–9.

[15]Some might object that we cannot know something can't come from nothing since we've never experience nothing to know what it is like and what is possible. See https://thinkingtobelieve.com/2012/07/17/how-can-we-know-something-cant-come-from-nothing-if-weve-never-experienced-nothing/ for my response.

[16]See http://thinkingtobelieve.com/2010/12/08/unwarranted-skepticisim-of-premises-in-theisti-arguments/ for a further development of this idea.

> God to make the universe in. It's like asking for directions to the edge of the Earth. The Earth is a sphere. It does not have an edge, so looking for it is a futile exercise."[17]

Expressed in deductive form, Hawking's core argument is as follows:

P1 Causes must precede their effects in time
P2 There is no time prior to the origin of the universe
C1 Therefore, the universe cannot have a cause
P3 Theism requires that God cause the universe to exist
C2 Therefore, theism is false

If Hawking is right that the causal principle cannot apply to the origin of the universe, then he not only disproved the KCA, but he also demonstrated that a creator God is impossible. But Hawking is wrong. Premises 1 and 2 of his argument are false.

Temporality is not necessary for causation

Hawking's first premise is that causes must precede their effects in time. Said another way, causal relationships necessarily entail temporality. If true, then by definition the universe cannot have a cause because there is no time "before" the beginning of the universe in which a cause could operate. However, I think there are good reasons to conclude that this premise is false. While temporal priority may be a common property of causation – and common to our ordinary experience of causation – it is not a necessary feature of causation as Hawking assumes.

Causes can be prior to their effects in one of two ways: temporally or logically. Logically prior causes precede their effects logically, but not temporally. As an example of logical causal priority, Immanuel Kant invited us to imagine a heavy ball resting on a cushion from eternity past. The physical proximity of the ball and cushion form a concave depression (indentation) in the cushion that is coeternal with the ball and cushion themselves. One might rightly wonder what caused the concavity in the cushion. If Hawking is right, there is no cause for the concavity in the cushion because neither the ball nor the cushion enjoys temporal priority over the other. The ball never began to rest on the cushion and the cushion never existed apart from the ball's resting on it. Surely this is absurd! As a contingent property, the concavity of the cushion begs for a causal explanation, and it's obvious that the weight of the ball resting on the cushion is the cause (surely the concavity of the cushion does not cause the sphericity of the ball). The cause (the ball) does not precede its effect in time, but logically. The ball is logically prior to the concavity, though not temporally prior to it.

Imagine a chandelier hanging from a ceiling by a chain from eternity past. Is the ceiling being held up by the chandelier and chain, or is the chandelier being held up by the ceiling and chain? Since they have been connected to each other from eternity past, we would have to conclude that neither causes the other given Hawking's view. However, we all know that the ceiling supports the chandelier and not the other way around. The ceiling is logically prior to the chandelier, and thus serves as the logically prior explanation.

[17]Stephen Hawking, in episode 1 of the Discovery Channel series titled *Curiosity*. Available from https://www.youtube.com/watch?v=rEBUIRbagAo. See 32:45—33:09 and 37:25—41:17.

Another example of logical causal priority is an analytical philosophical argument. An argument consists of at least two premises followed by a conclusion. There is a causal relationship between the premises and the conclusion (the premises cause the conclusion to be true), but the premises do not precede the conclusion temporally.[18] There is no physical or temporal relationship between the premises and the conclusion. The premises precede the conclusion logically. The premises cause the conclusion to be true – not in a temporal manner, but in a logical manner. As Frank Turek notes, "[I]f the law of causality only applied to physical things, then no argument would work because premises and conclusions are not physical things. For any argument to work – including arguments against God – the law of causality must apply to the immaterial realm because the components of arguments are immaterial."[19]

Since there are two types of causal relationships, and only one requires temporal priority, Hawking's first premise is false and his argument fails. The absence of time "prior to" the origin of the universe does not exclude the universe from being caused. Philosopher, Alexander Pruss, says it is "dubious" to suppose that causation requires temporal priority because "apart from full or partial reductions of the notion of causation to something like Humean regularity and temporal precedence…there is [not] much reason to suppose that the cause of a temporal effect must even be in time."[20]

The principle of sufficient reason holds that all contingent beings require an explanation for their existence in some external being. The universe is a contingent being, and as such, it requires a causal explanation in some being external to itself. If that cause cannot be temporally prior to the universe, then it must be logically prior to the universe. Either way, there is no basis for thinking the universe is uncaused.

Did time begin with the universe?

While the falsity of premise 1 is enough to refute Hawking's argument, let us proceed on to examine his second premise. Is it true that there was no time prior to the origin of the universe? Possibly. Big Bang cosmology holds that the origin of our universe marks origin of the existence of time, space, and matter. However, it is also possible that there is a difference between physical time and metaphysical time, and the origin of the universe only marks the origin of physical time.

What is metaphysical time? It is the kind of time one may experience in the absence of physical objects to measure the passage of time. For example, we can imagine God existing alone prior to the universe – in the absence of matter, space, and physical time – counting down to the moment of creation in His mind: "3, 2, 1, Let there be!" Any sequence of mental events requires the existence of time, so it's possible that metaphysical time existed prior to creation. Perhaps God is essentially a temporal being that has endured through infinite time from eternity past, and His creation of time (with the universe) marked the beginning of physical time only. If so, then time exists prior to the universe, and God's causal

[18]Our reading of the argument may be in a temporal succession of first premise, second premise, followed by the conclusion, but that does not entail that the relationships between premises and conclusion is a temporal relationship.

[19]Frank Turek, "Does Causality Apply Outside of Space and Time?"; available from http://crossexamined.org/causality-apply-outside-space-time/; Internet; accessed 4 March 2015.

[20]Alexander R. Pruss, "Leibnizian Cosmological Arguments" in *Blackwell Companion to Natural Theology*. Chapter available via pdf at http://bearspace.baylor.edu/Alexander_Pruss/www/papers/LCA.html; Internet; accessed 15 July 2011.

activity to create the universe would be temporally prior to the universe. Unless Hawking could disprove the possibility of metaphysical time, his second premise dubious as well.

Time is incidental to the causal relationship

A moment's reflection on the nature of time and causation should make it clear that causal relationships do not entail temporality. Time doesn't cause anything to happen. While our experience of cause and effect may occur within a temporal framework, time itself is not involved in producing the effect. Time is not part of the causal equation, if you will. Time is incidental to cause and effect, not essential to it. If time is not part of the causal equation, how could the absence of time make causation impossible? The only relationship required between cause and effect is one of explanatory or logical priority.

Are causes temporally prior to their effects?

We might even question the assumption that causes necessarily precede their effects in time *even within the temporal framework of the universe*. It may be the case that some – if not all – causes are temporally simultaneous with their effect. As WLC points out:

> Imagine C and E are the cause and the effect. If C were to vanish before the time at which E is produced, would E nevertheless come into being? Surely not! But if time is continuous, then no matter how close to E's appearance C's disappearance takes place, there will always be an interval of time between C's disappearance and E's appearance. But then why or how E came into being when it does seems utterly mysterious, for there is no cause at that moment to produce it."[21]

I think an apt analogy to WLC's point is a relay race. When the first runner passes off the baton to the second runner, there is a moment where runner 1 and runner 2 are both holding the baton. If runner 1 let go of the baton before runner two grasped it, the baton would fall to the ground. Likewise, unless there is a time at which both the cause and effect exist simultaneous with one another, there could be no effect. The causal relationship does not allow for a temporal gap between cause and effect. As such, all causes must be simultaneous to their effects.

One might counter that while there must be at least one moment where both the cause and effect coexist simultaneously, the cause itself may be present for many moments prior to the first emergence of the effect. Perhaps the cause endured for five moments (t1 through t5), with the effect beginning at moment five and persisting thereafter.[22] So even though there is a moment where the cause and effect coexist simultaneously, the cause can still be said to precede the effect in time. I agree that in cases where a cause occurs over a series of moments, the cause can be characterized as both temporally prior to and temporally simultaneous with the effect (at different stages); however, that only demonstrates that effects can have causes that are both simultaneous and temporally prior. To produce an effect, however, only a simultaneous cause is necessary. Even if we assume that physical time is the only time that exists, God could have caused the universe to exist so long as His causal influence was wholly instantiated in a single moment.

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[21]William Lane Craig, "Causation and Spacetime"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=7935; Internet; accessed 17 December 2010.

[22]Likewise, the effect existed simultaneously at t5, and then alone at t6—>.

Arguably all causal relationships entail some sense of simultaneity between cause and effect. If that is so, then it is perfectly rational to understand God's causing the universe to come into being as occurring simultaneous to the universe's coming into being. God's causal act of creation constituted the first moment of time, being simultaneous to the effect of the universe coming into being.[23] So even if there was no metaphysical time prior to the universe, it is still perfectly logical to think of God exerting causal powers to bring the universe into being.

Hawking's argument proves too much

Hawking argues that "since time itself began at the moment of the Big Bang, it was an event that could not have been caused or created by anyone or *anything*." Anything, however, would also include the laws of nature, and yet on Hawking's view, the law of gravity is the cause of the universe. For the law of gravity to cause the universe to exist, it would have to exist prior to the universe and exert causal influence temporally prior to the universe coming into being.[24] And yet Hawking says there is no time before the universe for any causes to operate. Hawking's argument simply proves too much. Not only would it eliminate any causal space for God to operate in, but it would also eliminate any causal space for the law of gravity to operate in. As such, Hawking is left without any explanation for why the universe began to exist. He has to commit himself to the notion that something came from nothing without a cause. Such an affirmation violates the metaphysical principles that being can only come from being, that effects require causes, and contingent beings require an external cause. If your view of the world requires you to deny such fundamental metaphysical intuitions, you are skating on thin metaphysical ice and ought to recognize that that there is something rationally amiss with your view.

Objection #2: *The premise involves an equivocation on "begins to exist." Adolf Grunbaum claims that "begins to exist" refers to transforming existing matter into another form of matter in premise one, whereas "begins to exist" refers to bringing matter into being* ex nihilo *in the conclusion.*

Response #2: William Lane Craig (WLC) responds to this objection by noting that

> the univocal concept of "cause" employed in premiss and conclusion alike is the concept of efficient causality, that is to say, something which produces or brings into being its effects. Whether such production involves transformation of previously existing materials or creation ex nihilo is completely incidental. That this is so is evident from the fact that the proponent of the argument must confront and deal with the objection that the first cause may not have created ex nihilo, but instead transformed an eternal, quiescent universe into a universe in change (Goetz [1989]). So the argument is clearly not equivocal.[25]

Premise 1 should not be understood in the narrow sense of something coming into being from absolutely nothing, or in the narrow sense of transforming matter from one form to another. It refers to

[23]See Jason Dulle, "Creation was a Temporal Act"; available from https://thinkingtobelieve.com/2009/07/09/creation-was-a-temporal-act/; Internet; accessed 26 June 2010.

[24]The notion that the laws of physics pre-exist the universe is a common understanding in the scientific community, but it is based on a category error. Natural laws are not things that exist in any abstract or concrete realm, but human mathematical descriptions of the way nature normally operates. That means there can be no laws of nature without nature itself. There can be no laws of nature prior to the origin of the universe. As such, the laws of nature cannot be the cause of the universe.

[25]William Lane Craig, "The Origin and Creation of the Universe: A Response to Adolf Grünbaum"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=5176; Internet; accessed 16 June 2015.

any and all kinds of efficient causation. It refers to any *x* that exists as *x* at time *t2*, but did not exist as *x* at time *t1*. WLC defines "coming into being" even more precisely: "For an entity *e* and time *t*, *e* comes into being at t if and only if (i) *e* exists at *t*, (ii) *t* is the first time at which *e* exists, (iii) there is no state of affairs in the actual world in which *e* exists timelessly, and (iv) *e*'s existing at *t* is a tensed fact."[26]

"Begins to exist" is a temporal concept that is wholly indifferent to the material source of the entity in question. Something which begins to exist includes any entity that is temporally finite, regardless of that entity's material source (or to couch this in Aristotelian language, the "material cause") or lack thereof. So long as the entity in question is not eternal, then it "begin to exist."

Objection #3: *The only thing that has ever come into being is the universe itself. Every other effect we see in the universe is just an example of existing matter being transformed from one form into another. As such, appeals to science and our empirical experience cannot be used to justify premise one because we have no experience of anything coming into being to draw from.*

Response #3: This objection fails to distinguish between a thing itself, and the matter of which it is composed. Just because the matter of which *x* is made was already in existence does not mean *x* already existed and cannot be said to come into being. I, for example, exist as a concrete entity today, but did not exist as a concrete entity in 1970. That means I began to exist. WLC speaks in the same vein:

> [T]he more fundamental confusion is obviously the conflation of a thing with the material out of which the thing is made. Because the atoms currently composing my body have always existed, have I always existed? Did I exist during the Jurassic Age and the era of galaxy formation? If such a conclusion is not evidently absurd, reflect: I have certain essential properties, properties without which I could not exist. For example, it is essential to me that I am a human being. But my atoms prior to my conception were not a human being. Therefore, they were not I. Moreover, medical science tells us that every seven years the material constituents of my body are almost completely replaced by new constituents. So prior to my conception which set of constituents that have formed my body over my lifetime were me? The… suggestion that nothing has come into existence is therefore ludicrous.[27]

All of the physical stuff of which a car is composed has existed in various forms for billions of years, but would anyone say the car has existed for billions of years? Of course not. The car began to exist when the form of those elements were reshaped and assembled into a unique, distinct form. So whether we are talking about things coming into being from absolutely nothing or existing things changing their material form, both can be said to come into being. And if both are aptly described as coming into being, then both require a cause.

Does the fact that we have only experienced existing matter being transformed into other forms of matter mean our understanding of cause and effect may not apply to things coming into being *ex nihilo*? No. It's like claiming that a cause is required to transform a pile of metal into a car, but no cause is required to bring a car into existence from nothing. This is obviously false. If we cannot obviate the need for a causal entity to bring about a new form of matter by re-arranging existing matter, then how much more can we not obviate the need for a causal entity to bring a new material entity into existence from no existing materials! If the principle of causation applies to the less difficult (creation out of

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[26]William Lane Craig, "Beginning to Exist"; available from https://www.reasonablefaith.org/writings/question-answer/beginning-to-exist; Internet; accessed 07 July 2010.

[27]See "Youtube Takes Out the Cosmological Argument" at http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=6515

something), then this is good reason to think it applies to the more difficult (creation out of nothing) as well. If something cannot become something else without an efficient cause, then surely we have more reason to think nothing cannot become something without an efficient cause.

If things that come into existence within the universe must have both a material and efficient cause (meaning they are created from something and by something), why think the universe itself requires neither? Obviously there can't be a material cause to the universe since matter came into being concomitant with the universe. It's hard enough to conceive of how matter could come into being without a material cause (source), but it is beyond ludicrous to think matter could come into being without an efficient cause. WLC says this is worse than believing in magic, because at least when a magician pulls a rabbit from his hat, he starts with a hat. Those who think it's possible for the universe to pop into existence uncaused from nothing lack both the hat (the material cause) and the magician (efficient cause)! Whence, then, comes the universe?

Objection #4: *This premise is a generalization based on inductive reasoning. Inductive reasoning can never produce certainty, but only probability. Just because we may not be aware of any effects without a prior cause does not mean there aren't any. Perhaps, if we encountered a larger collection of effects, we would find some for which there is no cause (such as the beginning of the universe).*

Response #4: This objection assumes that the principle in question is an empirical principle formulated by inductive observations of a large collection of somethings (*a posteriori*): After observing time and again that something only comes from something, we conclude that something can only come from something and that it's impossible for something to come from nothing. Not so. It is an *a priori* metaphysical principle whose truth is wholly independent of our experience. A mere reflection on the notions of "nothing" and "something" makes it clear that something cannot come from nothing. Nothing is the absence of any and all things: no matter, no energy, no substance, and no potential. For something to come into being, it has to at least have the potential to do so. Since nothingness lacks any and all potentiality, it is metaphysically impossible for something to come into being from absolutely nothing. This knowledge is based on metaphysical intuitions, not empirical observations – although it is surely confirmed by empirical observations as well.

Objection #5: *For the conclusion of the KCA to be true (the universe requires a cause), the "anything" of premise 1 must include both (1) the transformation of existing matter from one form into another as well as (2) the origin of matter ex nihilo. While we have experience of (1), we have no experience of (2). As such, we can certainly agree that changes in matter require a cause, but whether the absolute origin of matter itself requires a cause cannot be known. We have never experienced nothingness to know whether or not it is possible for something to come from nothing, and thus we could never rule out the possibility that something can come from nothing uncaused.*

Response #5: This objection fails because it assumes the only way we can know something is by experiencing it. This is patently false. I know square circles cannot exist – not because I have experienced them – but because it is logically absurd. Metaphysics and metaphysical intuitions can also tell us what is possible and what is not.

What if we applied the objector's logic to our own existence? What if I said "I exist" and someone asked me how I know that? I would respond as Renee Descartes did by pointing out that if I didn't exist, I would not be able to contemplate the question. Since I am contemplating my existence, I must exist. What if the person responded to my reasoning by saying, "You have never experienced non-existence to

know whether or not it is possible to contemplate the status of your existence if you do not exist, so you can't claim that you must exist in order to contemplate your own existence"?[28] We would rightly deem his response to be foolish. It's an obvious metaphysical truth that we must exist to contemplate the question of our existence, not a conclusion reached through an inductive, empirical process. We know the truth that something can't come from nothing in the same manner. These are obvious rational intuitions that are known immediately apart from experience and should not be doubted unless we have overwhelming reasons to do so.

Objection #6: *Quantum mechanics demonstrates that things can come into being uncaused. Virtual particles come into being without cause. Physicist, Paul Davies, claims a quantum theory of gravity "would allow spacetime to be created and destroyed spontaneously and uncaused in the same way that particles are created and destroyed spontaneously and uncaused."*[29]

Response #6: There are multiple problems with this objection.

Assumes an indeterministic interpretation of quantum mechanics

There are at least ten different physical interpretations of the mathematical core of quantum theory. Not all interpretations of the math are indeterministic. Some interpretations are entirely deterministic, such as that of David Bone. As Tim Maudlin notes:

> The problem is that quantum mechanics was developed as a mathematical tool. Physicists understood how to use it as a tool for making predictions, but without an agreement or understanding about what it was telling us about the physical world. And that's very clear when you look at any of the foundational discussions. This is what Einstein was upset about; this is what Schrodinger was upset about. Quantum mechanics was merely a calculational technique that was not well understood as a physical theory.[30]

This objection has to assume that the indeterministic interpretations are correct. That cannot be known at this point in our scientific understanding.

It only exacerbates the problem

If this indeterministic interpretation of the quantum mechanics behind virtual particle-pair production turns out to be true, it could potentially count against the first premise (more to be said about this momentarily), but it would do nothing to solve the logical question of how the universe could come into being uncaused from nothing. Pointing to trillions of other examples of something coming into being from nothing (virtual particles) does nothing to explain how the universe does so, or how it is intelligible. Thinking you have solved one problem by pointing to the existence of innumerable instances of the same inexplicable problem does not get you one step closer to actually solving the problem![31] It would only prove that the problem is worse than originally conceived. Pointing to virtual particles does nothing

[28]I credit this analogy to Greg Koukl, but have no specific source to cite.

[29]Paul Davies, *God and the New Physics* (New York: Simon & Schuster, 1983), p. 215.

[30]Tim Maudlin, "What Happened Before the Big Bang? The New Philosophy of Cosmology"; available from http://www.theatlantic.com/technology/archive/2012/01/what-happened-before-the-big-bang-the-new-philosophy-of-cosmology/251608/; Internet; accessed 11 March 2016.

[31]Thinking it does so is like the student who does not know the answer to a complex geometry problem, so he creates hundreds of other examples of complex geometry questions he cannot solve, and expects to receive an A+ for his observational efforts.

to *explain* how something can come from nothing. At best, it just demonstrates how ubiquitous and intractable the problem of creation *ex nihilo* is for science to explain.

But I would not want to grant too much ground to the objector. I don't think it is scientifically accurate to say that virtual particles are examples of something coming into being from nothing. Nor do I think it is possible for a scientist to affirm that virtual particle-pair production has no cause. Let me start with the first claim.

Virtual particles do not come from nothing

Virtual particles do not come into being from nothing. They emerge within the quantum vacuum, which is anything but nothing. Alexander Vilenkin writes: "A vacuum is ordinarily thought of as empty space, but according to modern particle physics what is empty is not nothing. The vacuum is a physical object, endowed with energy density and pressure. It can be in a number of different states, or vacua. The properties and types of elementary particles differ from one vacuum to another."[32] German philosopher of science Bernulf Kanitscheider describes the creation of quantum particles as "a causal process leading from a primordial substratum with a rich physical structure to a materialized substratum of the vacuum. Admittedly this process is not deterministic, it includes that weak kind of causal dependence peculiar to every quantum mechanical process."[33] Virtual particle-pair production is not the creation of something out of nothing, but a conversion of energy into matter. WLC writes:

> Now in fact particle pair production furnishes no analogy for this radical *ex nihilo* becoming…. This quantum phenomenon, even if an exception to the principle that every event has a cause, provides no analogy to something's coming into being out of nothing. Though physicists speak of this as particle pair creation and annihilation, such terms are philosophically misleading, for all that actually occurs is conversion of energy into matter or vice versa. As [Paul] Davies admits, "The processes described here do not represent the creation of matter out of nothing, but the conversion of pre-existing energy into material form. We still have to account for where the energy came from in the first place. This surely requires a supernatural explanation?"[34]

And again WLC writes:

> [V]irtual particles do not come into existence uncaused from nothing; they are *caused* by the quantum vacuum, which is not *nothing*! So saying, "virtual particles pop into being uncaused from nothing," is simply inaccurate. Lastly, it would appear that such an objection is also question-begging. For since the quantum vacuum is not nothing – it being, rather, an active sea of fluctuating energy that is subject to physical and natural laws – the question of where the vacuum came from can always be asked, and so postulating such an entity merely pushes the issue of creation back further.[35]

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[32]Alexander Vilenkin, "The Beginning of the Universe"; available from http://inference-review.com/article/the-beginning-of-the-universe; Internet; accessed 15 June 2018.

[33]Bernulf Kanitscheider, "Does Physical Cosmology Transcend the Limits of Naturalistic Reasoning?" in *Studies on Mario Bunge's "Treatise,"* ed. Weingartner and G. J. W. Doen (Amsterdam: Rodopi, 1990), pp. 346-74.

[34]William Lane Craig, "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 02 May 2009. Davies' quote from Paul Davies, *God & the New Physics* (New York: Simon & Schuster, 1983), 31.

[35]Berry Chaucer, "Most of William Lane Craig's Kalam Cosmological Argument"; available from http://www.tektonics.org/guest/kalamber.html; Internet; accessed 20 December 2005.

Neil Shenvi, who knows a thing or two about quantum mechanics, notes that "even the 'quantum vacuum,' which people sometimes confuse with 'nothing,' actually refers to an entity with real properties, the most obvious of which is a zero-point energy that has measurable effects on experiments."[36]

Stephen Barr provides a helpful analogy to understand the quantum vacuum. He says the quantum vacuum is analogous to an empty bank account. Even a bank account with $0 in it is not nothing. The account itself exists, as does the bank that houses the account, and the account carries within it the potential for money to emerge within it. In the case of the quantum vacuum, however, the balance is not $0 since the vacuum is filled with energy.

It's unscientific to claim that virtual particles have no cause

We've established that virtual particles at least have a material cause, and thus do not come into being from nothing. Virtual particle-pair production is a yet another example of something coming into being from something else. But what about the second claim that these particles come into being uncaused? Is there any scientific basis on which to conclude that there is no efficient cause to particle-pair production? No.

The claim that virtual particles are uncaused is not a scientific claim, nor a scientifically testable claim. While scientists may not be able to identify any specific cause for virtual particles, it would be a mistake in reasoning to conclude that, therefore, they have no cause. Ignorance is not an explanation, and the absence of evidence is not evidence of absence. At best, scientists could say that they have not identified any cause for this effect. Their ignorance, however, does not prove that there is no cause.

Science cannot, in principle, ever identify an uncaused effect, and thus it is never reasonable to conclude on the basis of science that something exists for which there is no cause. Science contributes to our knowledge of reality by making observations about physical things. If they are able to directly or indirectly observe some *x*, then we have good grounds for adding *x* to our ontology. For example, when scientists detect a new particle such as the neutrino, we add neutrinos to our list of things that exist. While science can identify what exists by what it observes, *science cannot identify what does not exist by what it fails to observe*. If science cannot identify what does not exist by what it fails to observe, then the failure to observe a cause for particle pair production does not entail the absence of a cause.

Imagine for a moment that a scientist is barbequing some steaks in his backyard. While he is cooking, a piece of chicken suddenly appears on the grill. Strangely enough, it only appears for a brief moment before disappearing again. This happens multiple times. Quickly, the scientist grabs his instruments in hopes of detecting what is causing the chicken to appear on his grill. Despite all attempts to detect the cause, however, he finds nothing. Does this mean there is no cause? No, it just means he has failed to detect the presence of a cause. Perhaps the cause is too small or operates too quickly to be detected by his instruments. While he cannot rule out the possibility that the chicken's appearance was uncaused, as a scientist he knows his failure to detect a cause is not proof that there is no cause. Absence of evidence for a causal entity is not evidence for the absence of a causal entity.

[36]Neil Shenvi, "Do Quantum Fluctuations Show that Something can Come from Nothing?"; available from http://www.shenvi.org/Essays/QuantumFluctuations.htm; Internet; accessed 20 January 2016.

In a similar way, while scientists may not be able to detect a cause for the appearance of virtual particles in the vacuum, the inability to identify a cause is not itself evidence for the absence of a cause. It is beyond the scope of the scientific method to make conclusions about what does not exist. If there is such a thing as an uncaused entity, it would be impossible to identify it scientifically because science is based on observation and induction. It is impossible to *observe* the absence of something, and thus it is impossible to discover an uncaused entity by scientific methods. If uncaused entities exist, they must be identified philosophically, not empirically/scientifically.

Virtual particles are not analogous to the coming into being of the universe

A further problem with this objection is that virtual particle-pair production is not analogous to the origin of the universe. As noted previously, virtual particles come into being within the quantum vacuum. Prior to the beginning of the universe, however, there was no quantum vacuum. So even if virtual particles can come into being uncaused within the vacuum, there is no reason to think the universe could come into being uncaused since the universe is not emerging from within the quantum vacuum. There are no quanta before the origin of physical reality. Quantum mechanics only applies once physical reality comes into being, so even if it were true that quantum mechanics demonstrated the reality of uncaused events within the quantum vacuum, that tells us nothing about causation in the absence of the vacuum.

When we are talking about the origin of the universe, we are talking about a "time" before quantum entities existed. That is why philosopher of science, Robert Deltete, says "there is no basis in ordinary quantum theory for the claim that the universe itself is uncaused, much less for the claim that it sprang into being uncaused from literally nothing."[37]

What is possible for particles may not be possible for macroscopic objects

Even if we agreed that quantum events such as virtual particle-pair production are uncaused, there is no reason to think this means the same is possible for macroscopic objects like the universe. While theoretically possible, we would never expect something like a dog to spontaneously come into and then spontaneously go out of existence because it would require an enormous number of improbable quantum events all occurring simultaneously, in the same location of the quantum vacuum, and in a precise arrangement. If a small macroscopic object such as a dog cannot come into existence via virtual particle creation, then surely entire universes cannot come into existence either (yet alone continue to exist for 13.8 billion years). There is no reason to think the way matter behaves at the quantum level applies to the way matter behaves at the macroscopic level, so there is no reason to think that the universe could be the result of quantum fluctuations or that the universe is uncaused.[38]

Grasping at straws

The mere possibility of uncaused events based on speculative physics is not enough to override our basic metaphysical intuitions that being only comes from being, and effects need causes – an intuition that undergirds all of science. Why should the universe be the one exception? I see no reason to prefer

[37]Quoted in William Lane Craig and William Sinnott Armstrong, *God? A Debate Between a Christian and an Atheist* (Oxford: Oxford University Press, 2003), 6.

[38]Rich Deem, "Why is There Something Rather than Nothing?; available from http://www.godandscience.org/apologetics/why_is_there_something.html; accessed 26 January 2022.

an uncaused universe to a caused one unless one is predisposed to materialism and against theism. Otherwise, theism is clearly the more rational of the two options.

The first premise would permit uncaused events

The first premise does not hold that every event has a cause, but rather that everything that comes into being has a cause. One could cede that quantum events are causally indeterminate without denying the first premise.[39]

Objection #7: *Heisenberg's Uncertainty Principle of quantum mechanics shows that things can be uncaused.*

Response #7: Heisenberg's Uncertainty Principle pertains to predictability (of the location and momentum of subatomic particles), not causality. "The mere fact that we can't predict something doesn't mean that something has no cause."[40] And as noted in response #6, the failure to detect a cause does not mean there is no cause.

Objection #8: *The indeterminate nature of radioactive decay shows that some things are uncaused.*

Response #8: George Mason University physicist, Robert Oerter, provides an example of this objection:

> [O]ver the last hundred years, physicists have discovered systems that change from one state to another without any apparent physical "trigger." These systems are described by quantum mechanics.
> The simplest such system is the hydrogen atom. It's just an electron bound to a proton. Two particles - that's about as simple as you can get. According to QM, the electron can occupy one of a discrete set of energy levels. The electron can be excited to a higher energy level by absorbing a photon.
> When the electron drops from a higher energy level to a lower level, it emits a photon: a quantum of light. Quantum mechanics describes this process beautifully, but it only predicts the *average* time the electron will stay in the higher energy level. It doesn't give any clue as to the specific time the electron will drop to the lower level. More precisely, the transition rate (the probability of a transition per unit time) is constant: it doesn't matter how long it has been since the atom was excited, the transition rate stays the same.
> …
> When you first encounter this, you can't quite wrap your brain around it. Surely there must be some internal mechanism, some kind of clock, that ticks along and finally "goes off," causing the transition! But no such mechanism has ever been found. QM has had an unexcelled record of accurate predictions, without any need for such a mechanism.[41]

Philosopher, Edward Feser, responded to Oerter by noting that:

> [N]one of this is even a *prima facie* counterexample to the principle of causality. From:
> 1. QM describes the transition of the electron without making reference to a cause.

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[39]See William Lane Craig, "Objections to the Causal Principle"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=7279; Internet; accessed 10 December 2010.

[40]Norman Geisler and Frank Turek, *I Don't Have Enough Faith to Be an Atheist* (Wheaton, IL: Crossway Books, 2004), 87.

[41]Robert Oerter, "Physics > Metaphysics"; available from http://somewhatabnormal.blogspot.com/2012/05/physics-metaphysics.html; Internet; accessed 04 February 2013.

> it simply does not follow that:
> 2. QM shows that the transition of the electron has no cause.
> Such an inference would be no better than:
> 3. Kepler's laws describe the orbits of the planets without making reference to any cause of those orbits, so
> 4. Kepler's laws show that the orbits of the planets have no cause.
> Even if for some reason you think that the orbits have no cause, *Kepler's laws* give you no reason to doubt that they have one. And even if you think the transition of the electron has no cause, *QM* gives you no reason to doubt that it does.[42]

Again Feser writes:

> What's really doing the work is the ton of philosophical baggage that the critics unreflectively bring to bear on the subject – the assumptions they read into the physics and then read back out again, thinking they've raised a "scientific" objection when what they've really done is raised a question-begging philosophical objection disguised as a scientific objection. … They are essentially making a metaphysics out of physics. Only physics *can* tell us anything about the nature of physical reality (so the critic supposes), so any claim about the nature of physical reality is *implicitly*, even if not explicitly, a claim of physics. As we will see below, this cannot possibly be right. Physics cannot even *in principle* tell us *everything* there is to know about physical reality (let alone reality more generally).
> …
> For it is also simply false to say that "Quantum mechanics has undermined the principle of causality." It has done no such thing. The most that one can say is that some people have been led by their *metaphysical speculations about* quantum mechanics to wonder whether metaphysics might be rewritten in a way that does without the principle of causality. But metaphysicians who have independent grounds to think that the principle of causality cannot be false have no reason to take these speculations very seriously or to respond in detail to them when going about *their* ordinary work.[43]

Quantum mechanics has not identified causeless effects or invalidated the causal principle. For any event to occur it must first have the potential to occur, and then have that potential actualized. If that potential is actualized, it "must be actualized by something already actual,"[44] and that something is what we identify as the cause.

Radioactive decay occurs because some atoms contain either too many or too few neutrons compared to the number of protons. "Although we cannot predict exactly when any *particular* atom will decay, we can predict very accurately an average rate of decay for any macroscopic sample of such atoms."[45] This gives us good reason to think that there is a natural cause for this effect.

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[42]Edward Feser, "Oerter on Universals and Causality"; available from http://edwardfeser.blogspot.com/2012/05/oerter-on-universals-and-causality.html; Internet; accessed 21 May 2012.

[43]Edward Feser, "Causality and Radioactive Decay"; available from http://edwardfeser.blogspot.com/2014/12/causality-and-radioactive-decay.html; Internet; accessed 25 February 2016.

[44]Edward Feser, "Oerter on Universals and Causality"; available from http://edwardfeser.blogspot.com/2012/05/oerter-on-universals-and-causality.html; Internet; accessed 21 May 2012.

[45]Rich Deem, "Why is There Something Rather than Nothing?; available from http://www.godandscience.org/apologetics/why_is_there_something.html; accessed 26 January 2022.

Objection #9: *David Hume destroyed all causal arguments.*

Response #9: Hume's criticisms of causation concerned our ability to identify causes (an epistemological concern), not whether there were such things as causes (an ontological concern). He himself clarified his position by saying "I never asserted so absurd a Proposition as that any thing might arise without a Cause: I only maintain'd, that our Certainty of the Falshood of that Proposition proceeded neither from Intuition nor Demonstration; but from another Source."[46]

Objection #10: *It doesn't make any sense to speak of efficient causation in the absence of material causation. We have experience of agents acting on (efficient causation) one physical object (material causation) to transform it into some other physical object. But in the case of creation, there is no material cause for an efficient cause (God) to act on. How is it even intelligible to speak of God bringing the universe into being from nothing? How can God act on nothingness in such a way as to bring about something?*

Response #10: I agree that it is hard to conceive of an effect without both an efficient and material cause since every effect we are familiar with in the created realm involves both. However, if one finds it hard to believe that an effect can come into being with an efficient cause alone, how much more unbelievable ought it to be to think an effect can come into being without any cause at all? And yet this is what some atheists maintain – that the universe came into being entirely uncaused. On theism, at least there is an efficient cause (God) of the universe. On atheism/naturalism there is neither a material cause nor an efficient cause.[47] Surely theism is more reasonable than atheism for this reason alone.

But is it true that we don't have any experience of efficient causation in the absence of material causation? No. WLC cites a number of examples where efficient causation alone produces an effect:

> Why think that efficient causation without material causation is impossible? … [T]here has to be some sort of cause of the thing that begins, but there's no reason to think that it must be a material cause. … [While] our normal experience of … efficient causes [sees them] acting in tandem with material causes…why think that this common concatenation must always be the case?
> Perhaps it would be helpful here to think of cases where we could have efficient causation without material causation. I've been working heavily on the topic of abstract objects like numbers, sets, propositions, and so on. Many philosophers believe that these immaterial objects exist necessarily and eternally. But there are many abstract objects which seem to exist contingently and non-eternally, for example, the equator, the center of mass of the solar system, Beethoven's Fifth Symphony, Leo Tolstoy's *Anna Karenina*, and so forth. None of these is a physical object. Tolstoy's novel, for example, is not identical to any of its printed exemplars, for these could all be destroyed and replaced by new books. Nor can Beethoven's Fifth be identified with any particular series of ink marks or any performance of the symphony. Now these things all began to exist: the equator, for example, didn't exist before the earth did. But if they began to exist, did they have a cause or did they come into being out of just nothing? (Notice that it makes sense to ask this question even though these entities are immaterial and so have no material cause.) Many philosophers would say that they did indeed have a cause: it was Tolstoy, for example, who created *Anna Karenina*. So in cases such as these (and they are legion), we do, indeed, have instances of efficient causation without material causation. You may not agree that such abstract objects

[46]Letter from David Hume to John Stuart, February 1754, in *The Letters of David Hume*, ed. J.Y.T. Greig (Oxford: Clarendon Press, 1932), 1:187.

[47]See https://thinkingtobelieve.com/2011/01/31/does-it-make-sense-to-have-an-efficient-cause-without-a-material-cause/ for further reading.

> really exist; but I think we have to say that the view defended by our philosophical colleagues is a coherent one."[48]

It is not true, then, that the concept of efficient causation without material causation is incoherent.

Having examined the evidence for premise 1 of the KCA and having answered the most pertinent objections against this premise, I think we have sufficiently established the veracity of premise 1: Things which begin to exist require a cause. Now, we turn our attention to premise 2.

Support for Premise 2

Premise two of the KCA holds that the universe had a beginning. The evidence for this premise can be divided between the empirical (scientific) and the philosophical. I'll begin with the scientific evidence.

Scientific evidence[49]

[48]William Lane Craig, "Causal Premiss of the Kalam Argument: available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=5705; Internet; accessed 18 June 2007.

[49]The discipline of science is equipped to investigate the material world, not the immaterial, and thus science cannot prove or disprove the existence of God (see https://thinkingtobelieve.com/2014/04/16/science-alone-can-never-justify-materialism). Scientific findings, however, can be used to support premises in an argument whose conclusion has theistic implications. Such is the case with the kalam cosmological argument. Scientific findings do not prove God, but they do support the premise that the universe began to exist, which is part of an argument that concludes God exists.

While scientific evidence can support both premises of the kalam cosmological argument, it cannot inveigh against either. It cannot inveigh against the first premise (causal principle) because science cannot observe the absence of a cause, and it cannot inveigh against the second premise (temporally finite universe) because it cannot prove the existence of infinities. Let me explain.

Regarding the causal principle, science cannot, in principle, identify an uncaused effect, and thus it is never reasonable to conclude on the basis of science that something exists for which there is no cause. While science can identify what exists by what it observes, science cannot identify what does not exist by what it fails to observe. Absence of evidence for a causal entity is not evidence for the absence of a causal entity. It is beyond the scope of the scientific method to make conclusions about what does not exist. If there is such a thing as an uncaused entity, it would be impossible to identify it scientifically because science is based on observation and induction. It is impossible to *observe* the absence of something, and thus it is impossible to discover an uncaused entity by scientific methods. If uncaused entities exist, they must be identified philosophically, not empirically/scientifically.

Regarding the temporally finite universe, science is an empirical discipline based on what can be observed and quantified. For science to prove that the universe is eternal it would have to do so empirically, but this is impossible. An eternal past cannot be observed or quantified. Just like one could never determine if a staircase were just really large or infinite by walking it (no matter how long they climbed, they would never know whether the last step might be just beyond their observational horizon), scientists could never empirically confirm the universe to be eternal.

Science can only speak to what it has observed, and since it is impossible to observe an infinite number of past moments, science is incapable of verifying that the universe has existed from eternity past. And if science is incapable of verifying that the universe is eternal, scientific objections against the second premise of the KCA are dead in the water. Only philosophy is equipped to answer questions about the existence of infinites. See https://thinkingtobelieve.com/2013/01/04/the-kalam-cosmological-argument-is-impervious-to-scientific-refutation/ for further reading.

Most religions and philosophers assumed the universe was eternal. For example, Aristotle thought the universe must be eternal because a temporally finite universe entailed a contradiction. He viewed time as a series of interconnected moments. Each moment had a beginning and ending, and the ending of one moment connected to the beginning of the next. So for any moment in the past, there had to be an earlier moment.[50] Prior to the mid-1900s, many scientists presumed the universe was eternal.[51] This allowed them to avoid the God question. Beginning in the 1920s, however, the evidence began to mount for a finite universe.

There are three lines of scientific evidence for the beginning of the universe: (1) radioactive decay; (2) the Second Law of Thermodynamics; and (3) Big Bang cosmology. I'll address each in turn.

Radioactive decay

Radioactive elements have a half-life. A half-life refers to the amount of time it takes for half of the atomic nuclei to decay into some other substance, such as lead. If the universe were infinitely old, all radioactive elements would have fully decayed an infinite time ago. Radioactive isotopes still contain some of their original atomic nuclei, however, therefore the universe cannot be eternal.

Thermodynamic properties of universe

The First Law of Thermodynamics holds energy is neither being created or destroyed, and that the universe only contains a finite amount of energy. The Second Law of Thermodynamics holds that in a closed system, usable energy will be used up (disorder will increase as energy is depleted). The universe is winding down. It is running out of gas, if you will. Together, these thermodynamic laws demonstrate that the universe is not past eternal.

Since the universe only contains a finite amount of energy, and that energy is being used up over time, given enough time the universe will run out of all usable energy. Scientists call such a state "universal heat death." Matter will be reduced to an ultra-thin gas of radiation and elementary particles. There will be no movement, no heat, and no energy – just stagnation.

It's similar to a car. The universe has a finite amount of gas (1st law) and that gas will eventually run out (2nd law). If your car had been moving from eternity past, it would have run out of gas an infinite time ago. If you still have gas in your tank, however, you know your car has only existed a finite amount of time. The same is true of the universe. If the universe has existed forever, it would be in a state of heat death right now; i.e. it would have run out of energy an eternity ago. Since there is still usable energy in the universe, it follows that the universe must have come into being a finite time ago.[52] Physicist Paul

[50]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 69.

[51]Eternal = Never began to exist, and will never cease to exist. Infinite = immeasurable, boundless, limitless, innumerable.

[52]Some speculate that there have been an eternal number of universes prior to ours (such as in chaotic inflationary models of a multiverse) to avoid this problem, but the laws of thermodynamics will not allow it. The First Law would hold for the multiverse as well. Each prior universe would use up energy, so when it spawns a new universe, the new universe will only have a fraction of the energy of its "parent" universe. If this process was going on infinitely throughout the past, then all of the usable energy should be gone and we should be observing a "child" universe that has no usable energy. And yet we don't, which again proves that the universe/multiverse is

Davies reached the same conclusion, noting the implications of the Second Law for both the past and future of the universe: "The first [implication] is that the universe will eventually die, wallowing, as it were, in its own entropy. This is known among physicists as the 'heat death' of the universe. The second is that the universe cannot have existed forever, otherwise it would have reached its equilibrium end state an infinite time ago. Conclusion: the universe did not always exist."[53]

The Second Law is a bedrock of science. Arthur Eddington wrote, "The Law that entropy increases – the Second Law of Thermodynamics – holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations – then so much for Maxwell's equations. If it is found to be contradicted by observation – well, these experiments do bungle things sometimes. But if your theory is found to be against the Second Law of Thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation."[54] While we can conceive of the possibility of the Big Bang theory being overturned in the future, the Second Law will still hold. The temporal finitude of the universe is firmly established by the Second Law alone.

Big Bang cosmology

The scientific consensus on the eternality of the universe began to change in early 20th century with the introduction of Einstein's theory of general relativity. This ultimately led to the development of the Big Bang theory of the origin of the universe, which came to be accepted as the standard cosmogenic model by 1970. On this model, the universe had an absolute beginning in the finite past. A brief history of this major ideological development is in order.

History

In 1912, Vesto Slipher observed that the absorption lines in the spectra of light from distant nebulae was shifted to the red end (longer wavelengths) of the light spectrum, similar to the Doppler effect in which sounds moving away from the hearer have a longer wavelength than sounds moving toward the hearer because the wavelength is being stretched.[55] Some nebulae were shifted more to the red end of the spectrum than others. This suggested that these nebulae were not static, but moving away from us at different speeds.[56]

In 1917, Einstein applied his gravitational theory (general relativity) to cosmology.[57] This is represented by Einstein's "field equations." The field equations represent the volume and curvature of the space in the universe as a function of the mass-energy density within space. He discovered that his equations implied that the universe was either expanding or collapsing. He knew that if massive objects curve space, given an eternal past, space should curve in on itself, resulting in the compaction of all matter.

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not past eternal. The universe/multiverse began to exist, and thus we must confront the problem of a beginning to physical reality and the causal predecessor that implies.

[53]Paul Davies, *God and the New Physics* (New York: Simon & Schuster, 1983), 11.

[54]Quoted in Paul Davies, *The Cosmic Blueprint* (New York: Simon & Shuster, 1988, 20, quoted in Norman Geisler and Frank Turek, *I Don't Have Enough Faith to Be an Atheist* (Wheaton, IL: Crossway Books, 2004), 78.

[55]This observation was first made by William and Margaret Huggins in 1868.

[56]Slipher only reported his discovery at an obscure astronomy meeting. That meeting was attended by Edwin Hubble, who would later build on Slipher's discovery.

[57]General relativity is the idea that gravity is caused by the curvature of space and time, and this curvature changes in response to matter and energy.

Since that hasn't happened, he reasoned there must be some repulsive force in the universe as well to counteract the force of gravity, which he dubbed the cosmological constant.[58] If the cosmological constant were stronger than gravity, then the universe would be in a state of expansion. Einstein believed the universe was eternal and unchanging, so he set the value of the cosmological constant precisely so that it would perfectly balance out the gravitational force, keeping the universe at a constant, perfect balance for all eternity. It's important to note that the value he assigned to the constant was not based on empirical evidence, but purely on Einstein's philosophical presuppositions about the eternality of the universe.[59]

Other scientists began to work on Einstein's field equations as well. In 1922, Russian Mathematician Alexander Friedmann solved the equations in such a way that it allowed for three types of universes: a static, expanding, or collapsing universe. Although he didn't take a position on the issue, most of his calculations resulted in a dynamic rather than static universe.[60] Friedmann's solutions demonstrated that Einstein's value for the cosmological constant was unnecessary, and the assumption of a static, eternal universe was not required by general relativity.

On January 1, 1925 Edwin Hubble proved that nebulae were outside of our galaxy, and represented independent galaxies in their own right. By 1929, he was able to provide precise measurements for the distance of these nebulae, and together with Slipher's light spectrum measurements, discovered what has come to be known as Hubble's Law: There is an inverse relationship between distance and recessional velocity aptly expressed as "the farther, the faster." The farther a galaxy is from us, the faster it is moving away from us (its light is shifted further to the red end of the spectrum). Slipher's discovery of the red shift only demonstrated that galaxies were moving around within the universe. Hubble's discovery that this movement was directly related to distance demonstrated that there was a specific direction to this movement. It was a Belgian physicist, however, who would connect the dots by tying this observation to Einstein's theory of general relativity and concluding that the galaxies moving away from us because space itself is expanding.

In 1927, Belgian astronomer and physicist, Georges Lemaitre, a Catholic priest, independently calculated Einstein's field equations, coming up with the same solutions that Friedman had come up with in 1922. Lemaitre, however, added data from Vesto Slipher regarding the redshift of light from distant nebulae and independently discovered Hubble's Law before Hubble.[61] By combining both mathematical solutions with observational data, Lemaitre was able to make a compelling case that the universe was expanding.[62]

In 1931, Lemaitre expanded his model even further. He argued that if you trace the expansion back in time, the universe becomes denser and denser until it reaches an incredibly small, dense point of

[58]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 91.

[59]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 91.

[60]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 92-3.

[61]Lemaitre discovered Hubble's Law two years before Hubble, but published it in an obscure science journal.

[62]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 93-4.

matter. He called this the "primeval atom."[63] In other words, play the tape of the universe backward and eventually the universe will collapse into a singularity a finite time ago.[64] The universe cannot be eternal. There had to be a beginning – a "day with no yesterday." Thus began the Big Bang theory.

Einstein initially rejected Lemaitre's proposal. He said it was "inspired by the Christian dogma of creation, and totally unjustified from the physical point of view."[65] In a personal comment to Lemaitre, Einstein asserted that "your math is correct, but your physics is abominable." In 1931, however, Einstein observed the redshift himself through Hubble's telescope and publicly acknowledged that this implies the universe had a beginning.[66] This is when Einstein realized that an initial explosion would be sufficient to keep the gravity in the universe from causing the universe to collapse in on itself, and thus the value for his cosmological constant was not necessary[67] (interestingly, when it was discovered that the universe is accelerating in its expansion, dark energy was invoked to explain it. This is the new cosmological constant[68]). He later admitted that adding the cosmological constant was the biggest blunder of his career.

The Theory

Now that we know a bit about the historical development of the theory, let's look more closely at the contours of the theory itself. Stated briefly, the Big Bang theory holds that the universe came into being a finite time ago in a hot singularity that marks the origin of matter, space, and time. Ever since, the universe has been expanding and evolving as energy is converted into various forms of matter.[69]

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[63]It was only later, in 1949, when Fred Hoyle derisively described the theory as a "Big Bang" that "Big Bang" came to characterize the theory.

[64]While Friedmann and Lemaitre's equations suggested the universe began with an actual singularity, they assumed that this may have simply been an artifact of their assumption that matter was perfectly homogenous (evenly distributed throughout the universe). If matter was not perfectly homogenous in the universe, then perhaps the singularity would disappear. But in the early 1970s, Stephen Hawking, Roger Penrose, and George Ellis demonstrated that the singularity emerges even without the assumption of homogeneity.

[65]Jean-Pierre Luminet, "Lematrie's Big Bang." Lecture given at "Frontiers of Fundamental Physics 14," Aix Marseille University, Marseille, France, July 15-18, 2014; available from https://arxiv.org/ftp/arxiv/papers/1503/1503.08304.pdf, page 10, as quoted in Stephen Meyer, *Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 95.

[66]He probably came to this opinion earlier, since Lemaitre shared it with him in 1927 and Sir Arthur Eddington showed him Hubble's 1929 paper in 1930. His public acknowledgement, however, came in 1931.

[67]Rob, "A Nobel Prize in Physics for What?"; available from http://procrustes.blogtownhall.com/2011/10/05/a_nobel_prize_in_physics_for_what.thtml; Internet; accessed 06 October 2011.

[68]Einstein's constant was a repulsive force, and hence on the left side of his general relativity equation (representing the curvature of the universe). Today, we put it on the right side which represents the density of all matter and energy.

[69]According to David Berlinski, at 10^{-43} seconds after the Bang, matter and primarily radiation fill the void. Matter consists of neutrinos, photons, electrons, positrons, protons, and neutrons, but neutrinos quickly disintegrate. 3 ½ seconds later positrons follow the neutrinos into the void. After three minutes neutrons and protons form helium. After 400K years matter has taken control over radiation. This begins the era of recombination. Light separates from matter, allowing galaxies to form.

Physical reality itself came into existence at the Big Bang. The Big Bang was not the effect of some prior physical state, but the absolute origin of time, space, and matter.[70] British physicist, Paul Davies, wrote, "The coming-into-being of the universe as discussed in modern science…is not just a matter of imposing some sort of organization or structure upon a previous incoherent state, but literally the coming-into-being of all physical things from nothing."[71] Physicists John Barrow and Frank Tipler affirm that "[l]iterally nothing existed before the singularity, so, if the Universe originated at such a singularity, we would truly have a creation *ex nihilo*."[72]

Physical time had its origin in the Big Bang. The universe did not come into being *in* time, but *with* time. There was no time prior to the singularity.[73] Likewise, the Big Bang did not occur within some pre-existing empty space, but was the creation of space itself. That space has been expanding ever since. "The Big Bang was not an event taking place at a time or in a place. Space and time were themselves created by the Big Bang, the measure along with the measured."[74] As for matter, there was no matter present immediately after the Bang. There was just energy, but later some of that energy was converted to matter.

Scientists Affirm

There is a scientific consensus regarding the reality of the Big Bang.[75] Here are quotes from a number of prominent scientists affirming the historical reality of the Big Bang.

Paul Davies:

> If we extrapolate this prediction to its extreme we reach a point when all distances in the universe have shrunk to zero. An initial cosmological singularity, therefore, forms a past temporal extremity to the universe. We cannot continue physical reasoning, or even the concept of space-time through such an extremity. For this reason, most cosmologists think of the initial singularity as the beginning of the universe. On this view, the Big Bang represents the creation event—the creation not only of all the matter and energy in the universe, but also of space-time itself.[76]

[70]The Standard Model does not just predict the beginning of our universe, but the absolute origin of matter, space, and time from absolutely nothing. In other words, on Big Bang Cosmology there is no "before" the Big Bang.

[71]Paul Davies, during an interview with Phillip Adam for the 1995 TV series, The Big Questions.

[72]John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (Oxford: Clarendon, 1986), 442, quoted in J.P. Moreland and William Lane Craig, *Philosophical Foundations for a Christian Worldview* (Downers Grove, IL: InterVarsity Press, 2003), 558.

[73]The singularity is not chronologically prior to the universe, but logically and causally prior to the universe. It is the boundary of time, not the first instant of time. See William Lane Craig, "God and the Beginning of Time"; available from http://www.leaderu.com/offices/billcraig/docs/time.html; Internet; accessed 03 March 2005.

[74]David Berlinski, "Was there a Big Bang?", Commentary, 1998, p. 29.

[75]There is a growing number of scientists who do not believe that the Big Bang represents the origin of physical reality, but simply the origin of our universe. They think there may be an infinite number of universes, each with their own Big Bang. Even these scientists agree, however, that the Big Bang happened because of the many lines of evidence supporting the theory.

[76]As quoted by Craig in his lecture on "God, Time, and Creation" at Biola University. Disc 8:12.

And again:

> Clearly, if the universe is growing bigger, it must have been smaller in the past. We can imagine running the great cosmic movie backwards until all the galaxies are squashed together. This compressed state corresponds to the time of the big bang, and in a certain sense the expansion of the universe can be considered as a vestige of that initial explosion.
> Today it is normal for cosmologists to claim that the universe *began* with the big bang. This weighty conclusion follows if you trace the expansion back in time to some idealized point of origin at which all the matter of the universe is concentrated in one place. Such a state of infinite density represents an infinite gravitational field and infinite spacetime curvature – i.e., a singularity. … As it is not possible to extend space and time through such a singularity, it follows that the big bang must be the origin of *time itself*. People, especially journalists who get angry about scientists explaining everything, often ask: What happened before the big bang? If this theory is correct, the answer is simple: *nothing*. If time itself began with the big bang, there was no "before" for anything to happen in. Although the concept of time being abruptly "switched on" at some singular first event is a hard one to grasp, it is by no means new. Already in the fifth century, Augustine proclaimed that: "The world was made, not in time, but simultaneously with time." Keen to counter jibes about what God was doing before he made the universe, Augustine placed God outside of time altogether, making him the creator of time itself. ... the idea of time coming into being with the universe therefore fits very naturally into Christian theology. ... [W]e shall see that recent ideas in quantum physics have changed our picture of the origin of time somewhat, but the essential conclusion remains the same: time did not exist before the big bang.[77]

J. Richard Gott, James E. Gunn, David N. Schramm, and Beatrice M. Tinsley write:

> The universe began from a state of infinite density about one Hubble time ago. Space and time were created in that event and so was all the matter in the universe. It is not meaningful to ask what happened before the big bang; it is somewhat like asking what is north of the North Pole. Similarly, it is not sensible to ask where the big bang took place. The point-universe was not an object isolated in space; it was the entire universe, and so the only answer can be that the big bang happened everywhere.[78]

Physicists John Barrow and Frank Tipler wrote, "At this singularity, space and time came into existence; literally nothing existed before the singularity, so, if the Universe originated at such a singularity, we would truly have a creation *ex nihilo*."[79]

Significance of the Theory

How significant is the Big Bang theory? Very significant! It changed the entire trajectory of scientific thought regarding the history of the universe. Gregory Naber noted that up until the Friedmann-Lemaitre model, the notion of an expanding universe "was absolutely beyond comprehension. Throughout all of human history the universe was regarded as fixed and immutable and the idea that it might be actually changing was inconceivable."[80] Physicist John Wheeler wrote, "Of all the great

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[77]Paul Davies, *About Time: Einstein's Unfinished Revolution* (Penguin Books: London, 1995), 131-132.

[78]Richard Gott III, James E. Gunn, David N. Schramm, and Beatrice M. Tinsley, "Will the Universe Expand Forever?" Scientific American [March 1976], p. 65

[79]John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (Oxford: Clarendon, 1986), 442, quoted in J.P. Moreland and William Lane Craig, *Philosophical Foundations for a Christian Worldview* (Downers Grove, IL: InterVarsity Press, 2003), 558.

[80]Gregory L. Naber, *Spacetime and Singularities: An Introduction* (Cambridge: Cambridge University Press, 1988), 126-7, available from http://books.google.com/books?id=Wfjd-

predictions that science has ever made over the centuries was there ever one greater than this, to predict, and predict correctly, and predict against all expectation, a phenomenon so fantastic as the expansion of the universe.[81]

The Singularity and Nothingness

The past physical boundary of the universe is called a singularity.[82] But what exactly is a singularity? Scientists describe it as a point of infinite density, meaning the mass over volume is zero. Since zero mass and zero volume is the absence of all mass and volume, the singularity is a fancy mathematical way of describing nothingness.[83] Some scientists, however, treat the singularity as if it were something – and

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xNUvDoC&pg=PA127&lpg=PA127&dq=%22the+universe+was+regarded+as+fixed%22&source=web&ots=9DSkg-tQxa&sig=xXy6esV9WurY07RwKTLlGO39N9M&hl=en#PPP1,M1; Internet; accessed 02 April 2008.

[81]John A. Wheeler, "Beyond the Hole," in *Some Strangeness in the Proportion*, ed. Harry Woolf (Reading, MA: Addison-Wesley, 1980), 354, as found in

[82]The singularity is the boundary of time, not the first instant of time. See William Lane Craig, "God and the Beginning of Time"; available from http://www.leaderu.com/offices/billcraig/docs/time.html; Internet; accessed 03 March 2005.

Some have proposed that the singularity itself existed eternally. As I'll argued in the next footnote, the singularity is mathematical idealization, not a physical entity. It represents the boundary between the non-existence and the existence of the universe. If it is not a real entity, then clearly it cannot exist eternally. But what if I am wrong and the singularity is an ontological reality? Could it be eternal? No. William Lane Craig's insights are instructive here: "Given my metaphysical commitments concerning time, I do not think that the initial cosmological singularity, if it exists at all, exists timelessly or never began to exist. It exists outside of physical time (time as defined in the General Theory of Relativity) because it is a boundary point of spacetime rather than a point in or of spacetime. Notwithstanding, it is clearly in metaphysical time, since it is evanescent, coming into and going out of being. Accordingly, it requires a cause for its origination." And again, "The sense in which the singularity is 'timeless' … is a highly technical sense in that in the General Theory of Relativity, it is not a point *in* spacetime. Rather it is a point on the boundary of spacetime. But it is not eternal in the ordinary sense of the term, namely, it is not permanent. On the contrary, it is fleetingly evanescent. It is therefore temporal and began to exist and therefore requires a cause." (William Lane Craig, "Must the Cause of the Universe Be Personal, Redux"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=8457; Internet; accessed 25 October 2010.)

[83]There is debate over the ontological nature of the singularity. Does this refer to a real entity or is it just a idealization to describe nothingness in mathematical terms? My view is that it is just a mathematical idealization and not a physical reality based on its characteristics. The singularity is variously described as heat without motion, curvature without dimensions, zero mass, and zero volume. These are physically absurd characterizations. Something whose mass over volume equals zero is indistinguishable from nothing at all. Quentin Smith argues that the singularity could not have existed

> because the definition of a singularity is of a self-contradictory entity. The singularity is supposed to be a zero-dimensional point. It's a spatial point, it doesn't have height, it doesn't have width, it doesn't have depth. It doesn't have 3 dimensions, 2 dimensions or 1 dimensions. It has zero dimensions! … So how could something with 3 dimensions fit inside something with zero dimensions? … And this zero-dimensional point is supposed to be infinitely curved. Well, how could something that has no radius or size at all be curved whatsoever? It would be meaningless. You have to have sides to be curved in some way. But a zero-dimensional point has no sides. … [T]he Big Bang singularity is metaphorically said that if it did exist, it would have infinite temperature. It would be infinitely hot. But temperature is the motion of molecules, or particles against each other. But the Big Bang singularity is a single zero-dimensional point. Nothing is moving. So it can't have infinite temperature. Temperature doesn't apply to it at all. And this zero-dimensional point is supposed to be infinitely dense. Well, it can't be infinitely dense, because it's

not just something, but the source from which the universe emerged. This is a mistake. The singularity is not a positive reality, but the absence of being. It is a way of describing nothingness. The universe did not emerge *from* the singularity since the singularity is not a space, but the absence of space. The singularity is not the cause the universe coming into being either since the singularity refers to nothingness, and nothingness cannot stand in a causal relationship to anything.

What it means to say the universe began with a singularity is that the matter, space, and time had an absolute origin, before which there was nothing physical. As a mathematical idealization of nothingness, the singularity represents the boundary of the universe – the point at which the universe disappears when you rewind the expansion backwards. When physical reality came into being at time t=0 (the furthest we can go back in time is to the Planck time which is 10^{-43} seconds after the universe began), it didn't come into being as a singularity, but as the smallest space physically possible (the Planck length, which is 10^{-35} meters), dense with energy (1,094 grams per cubic centimeter). If we had a recording of the history of the universe and rewound the tape, what would we see at the beginning of the film? We wouldn't see a singularity. What we would see is a gradual condensing of space and matter until it reached a state beyond which it could physically condense no further (the Planck length). One frame beyond that point and the universe would simply disappear into nothingness. Once the universes reaches its smallest physically possible size, there is nowhere else for it to go except out of existence. The point at which it goes out of existence is the singularity.

It's important that we have a clear understanding of what "nothing" is.[84] There is no *thing* called "nothing." Nothing refers to the absence of any and every thing. It is a term of universal negation, not a term of reference. It's like the word "no one." We don't mean there is someone who is referred to as "no one," but rather "not anyone." If someone asks you what you had for lunch and you respond by saying, "nothing," you are not claiming that you ate something and that something was nothing, but rather that you did not eat anything.

Sometimes we envision nothingness as empty space, but nothingness is "not even space." So to say the universe comes from nothing does not mean there is a thing called nothing from which the universe

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got no matter in it. It's just a point. It's really nothing. (Quentin Smith, in a debate with William Lane Craig on the topic "Does God Exist?", April 2003 at the Harvard Science Center, Harvard University.)

As a mathematical idealization with no instantiation in reality, we should understand the singularity to represent the boundary of the universe – the point at which the universe disappears when you rewind the expansion backwards. When physical reality came into being at time t=0 (the furthest we can go back in time is to the Planck time which is 10^{-43} seconds after the universe began), it didn't come into being as a singularity, but as the smallest space physically possible (the Planck length, which is 10^{-35} meters), dense with energy (1,094 grams per cubic centimeter).

If we had a recording of the life of the universe and rewound it, what would we see at the beginning of the film? We wouldn't see a singularity. What we would see is a gradual condensing of space and matter until it reached a state beyond which it could physically condense no further (the Planck length). One frame beyond that point and the universe would simply disappear into nothingness. Once the universes reaches its smallest physically possible size, there is nowhere else for it to go except out of existence. When it goes out of existence, that is the singularity.

[84]See my four-part blog series on nothing:
https://thinkingtobelieve.com/2010/06/02/thinking-about-a-whole-lotta-nothing-part-1/
https://thinkingtobelieve.com/2010/06/03/thinking-about-a-whole-lotta-nothing-part-2/
https://thinkingtobelieve.com/2010/06/09/thinking-about-a-whole-lotta-nothing-part-3/
https://thinkingtobelieve.com/2010/06/10/2171/

emerges, or that the universe displaced nothingness. That treats nothingness as if it were something – a reification of nothing (or as I like to say, a somethifying of nothing).[85] It's not that something caused the universe and that something is nothing. Nothingness does not cause anything.

What we mean when we say the universe came into being "from nothing" is that the universe did not originate from some pre-existent material source.[86] A number of scientists have come to use the term differently, however. For Stephen Hawking, Victor Stenger, and Lawrence Krauss[87], "nothing" does not mean "non-being" but "the quantum vacuum." As we've already seen, the quantum vacuum is not nothing. It's a physical object that can be in a number of different states, endowed with energy density and pressure. So when scientists who call the quantum vacuum "nothing" attempt to answer the perennial philosophical question of why there is something rather than nothing, they are actually answering the question of why something came from something. The royal astronomer, Martin Rees, writes, "Cosmologests sometimes claim that the universe can arise 'from nothing.' But they should watch their language especially when addressing philosophers. We've realised ever since Einstein that empty space can have a structure such that it can be warped and distorted. Even if shrunk to a point it is latent with particles and forces – still a far richer construct then the philosopher's 'nothing.'"[88]

It's no surprise that when one redefines "nothing" to mean "something" it's easy to explain where the universe came from, but can scientists explain where the universe came from given the actual definition of nothing (non-being)? Luke A. Barnes, a specialist in astrophysics and researcher at the Sydney Institute for Astronomy, University of Sydney, has an excellent response to those who claim it's possible that the universe could have come into being from nothing:

> The claim regarding a universe coming from nothing is either nonsensical or a non-explanation. If we use the dictionary definition of "nothing" – not anything – then a universe coming from nothing is as impossible as a universe created by a married bachelor. Nothing is not a type of thing, and thus has no properties. If you're talking about something from which a universe can come, then you aren't talking about nothing. "Nothing" has no charge in the same sense that the C-major scale has no charge – it doesn't have the property at all. Alternatively, one could claim that the universe could have come from nothing by creatively redefining "nothing." "Nothing" must become a type of something, a something with the rather spectacular property of being able to create the entire known universe. It's an odd thing to call "nothing" – I wouldn't complain if I got one for Christmas.[89]

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[85]Bede Rundell argues that since nothingness is not a state of existence, it could not "precede" the universe. Without time, there is no antecedent state in which something does not exist (See http://www.closertotruth.com/video-profile/Why-is-There-Something-Rather-than-Nothing-Bede-Rundle-/368). He is right to warn against talking about nothing as if it were something, but I think it is accurate to say there was nothing prior to the universe coming into being. Even though nothing is not a thing in itself, and even though it does not precede something, nevertheless there was no material reality without the universe and that is aptly described as nothing.

[86]This does not preclude the existence of some prior non-physical reality such as God.

[87]See my review of Krauss' book *A Universe from Nothing*: "What I've Been Reading: A Universe from Nothing"; available from https://thinkingtobelieve.com/2013/10/23/what-ive-been-reading-a-universe-from-nothing/; Internet; accessed 23 October 2013.

[88]Martin Rees, *Just Six Numbers* (New York, Basic Books, 2000), 131.

[89]Luke A. Barnes, "The Fine-Tuning of the Universe for Intelligent Life," 21 December 2011; available from http://arxiv.org/abs/1112.4647; Internet; accessed 16 April 2012; page 67.

Clearly, it is impossible for the universe to just pop into existence from absolutely nothing.[90] How does nothing become something by means of no one? There are no physics of non-being, so any attempt to give a scientific explanation for how something could come into being from absolutely nothing is doomed to failure from the start. John Locke wrote, "It is as impossible to conceive that ever pure incognitive matter should produce a thinking intelligent Being, as that nothing should of itself produce Matter."[91]

Evidence for the Big Bang

Now that we've covered the history and substance of the Big Bang theory, why should we think it's true? What is the evidence for the Big Bang? There are four major lines of evidence in support of the theory.

1. Explains the origin, number, and ratio of elements

The Big Bang theory predicted that the heavier elements were cooked up in stars that began forming a few hundred million years after the singularity, which means if we look back far enough in time we should find parts of space that only contain the hydrogen and helium present at the Big Bang. Indeed, we do! The absorption lines from distant light only indicates the presence of hydrogen and deuterium. In 2013, scientists discovered two clouds of pristine gas (gas without elements heavier than hydrogen and helium) in the universe when they analyzed the light from distant quasars (2 billion years after the Big Bang).[92]

The Big Bang theory also correctly predicted the ratio of elements we should find in our present universe.

2. Cosmic background radiation

In 1948, George Gamov predicted that if the universe began in a dense state, it began in a hot state. That means light photons would be unable to escape until after the universe had sufficiently cooled. In the beginning, photons were obstructed by electrons, but about 100,000 years after the Big Bang, when space had expanded and cooled to about 3,000 degrees Kelvin, hydrogen nuclei (protons) were able to

[90]Melanie Phillips interviewed Richard Dawkins after his October 21, 2008 debate with John Lennox at Oxford's Natural History Museum. She recounts asking him how he manages to believe something came from nothing: "For example, I put to him that, since he is prepared to believe that the origin of all matter was an entirely spontaneous event, he therefore believes that something can be created out of nothing – and that since such a belief runs counter to the very scientific principles of verifiable evidence which he tells us should govern all our thinking, this is itself precisely the kind of irrationality, or 'magic,' which he scorns. In reply he said that, although he agreed this was a problematic position, he did indeed believe that the first particle arose spontaneously from nothing, because the alternative explanation – God – was more incredible." See Melanie Phillips, "Is Richard Dawkins Still Evolving?"; available from http://www.spectator.co.uk/melaniephillips/2543431/is-richard-dawkins-still-evolving.thtml; Internet; accessed 10 November 2008.

[91]John Lock, Essay Concerning Human Understanding (1690) IV, x, 10.

[92]Michele Fumagalli, John M. O'meara, J. Xavier Prochaska, "Detection of Pristine Gas Two Billion Years After the Big Bang," Science, November 10 2011 DOI: 10.1126/science.1213581, discussed in *Science Daily*, "Astronomers Find Clouds of Primordial Gas from the Early Universe, Just Moments After Big Bang"; available from http://www.sciencedaily.com/releases/2011/11/111110142050.htm; Internet; accessed 25 October 2013.

capture electrons (recombination), allowing all the photons to escape and visible light to appear and move about freely in the universe.

Gamov predicted that we should be able to observe this first light in the form of cosmic microwave background (CMB) radiation. He accurately predicted the temperature of this radiation as well. He reasoned that the light would cool as the universe expands. When the universe doubles in size, the temperature of the photons would drop by half. Since the universe has expanded 1000 times in size since recombination, the CMB should only be 3 Kelvin today.

In 1964, Arno Penzias and Robert Wilson of Bell Laboratories discovered the CMB by pure accident. It permeates space, and its temperature is 2.7 Kelvin – almost exactly as predicted. This discovery was so persuasive that the last holdouts finally came to accept the fact that the theory had been empirically verified.

3. Ripples in the radiation

Scientists predicted that there should be ripples in the CMB radiation that would later coagulate into matter and give rise to galaxies. In 1992, the COBE satellite discovered these ripples. The ripples were fine-tuned to 1 in 100,000, which was strong enough to allow matter to coagulate, but not so strong that the matter would collapse back in on itself. The director of the project, George Smoot, said, "If you are religious, it's like looking at God." These findings were later confirmed and refined by the WAP satellite in 2003.

4. Distance and density

The Big Bang is also confirmed by the fact that distant galaxies appear closer together in proportion to their distance from us (which is what we would expect given the smaller size of the universe in the distant past), and distant stars and galaxies appear younger in proportion to their distance from us.[93]

Theistic Implications of the Big Bang Theory

The discipline of science is limited to a study of the physical realm. Whatever caused the beginning of the physical realm could not itself be physical, so science cannot, even in principle, account for the cause of the universe. If there is a cause of the universe, science could never tell us what it was. It's not a scientific question. Even atheist philosopher, Thomas Nagel, recognizes this:

> The existence of our universe might be explained by scientific cosmology, but such an explanation would still have to refer to features of some larger reality that contained or gave rise to it. A scientific explanation of the Big Bang would not be an explanation of why there was something rather than nothing, because it would have to refer to something from which that event arose. This something, or anything else cited in a further scientific explanation of it, would then have to be included in the universe whose existence we are looking for an explanation of when we ask why there is anything at all. This is a question that remains after all possible scientific questions have been answered.[94]

[93]Hugh Ross, *A Matter of Days: Resolving a Creation Controversy* (Colorado Springs, CO: NavPress, 2004), 145.

[94]Thomas Nagel, "Why is there anything?" in Secular Philosophy and the Religious Temperament (Oxford University Press: 2009), 28.

Nobel laureate physicist, Leon Lederman, echoed these sentiments in *The God Particle*:

> In the very beginning, there was a void, a curious form of vacuum, a nothingness containing no space, no time, no matter, no light, no sound. Yet the laws of nature were in place and this curious vacuum held potential. A story logically begins at the beginning, but this story is about the universe and unfortunately there are no data for the very beginnings – none, zero. We don't know anything about the universe until it reaches the mature age of a billion of a trillionth of a second. That is, some very short time after creation in the big bang. When you read or hear anything about the birth of the universe, someone is making it up – we are in the realm of philosophy. Only God knows what happened at the very beginning.[95]

Since the universe encompasses all physical reality, the cause of the universe must transcend physical reality. By definition the cause must be *super*natural; i.e. something outside of this natural world. Robert Jastrow, founder of NASA's Goddard Institute of Space Studies, who sat in Edwin Hubble's chair at the Mount Wilson observatory, wrote in *God and the Astronomers*: "Now we see how the astronomical evidence leads to a biblical view of the origin of the world. The details differ, but the essential elements in the astronomical and biblical accounts of Genesis are the same: the chain of events leading to man commenced suddenly and sharply at a definite moment in time, in a flash of light and energy."[96] In an interview Jastrow said:

> Astronomers now find they have painted themselves into a corner because they have proven, by their own methods, that the world began abruptly in an act of creation to which you can trace the seeds of every star, every planet, every living thing in this cosmos and on the earth. And they have found that all this happened as a product of forces they cannot hope to discover. … That there are what I or anyone would call supernatural forces at work is no, I think, a scientifically proven fact.[97]

Even physicist, Sir Arthur Eddington, admitted that "the beginning seems to present insuperable difficulties unless we agree to look on it as frankly supernatural."[98]

Opposition to the Big Bang Theory

The theistic implications of The Big Bang model were recognized instantly. If the universe began to exist, it seemed to require a supernatural cause for its origin. That's why it was immediately met with fierce opposition and why it took several decades and many lines of empirical confirmation to become the reigning paradigm that it eventually became. Many scientists were wont to reject the theory due to its theistic implications, and only came to accept it begrudgingly because they felt forced to do so on pain of the evidence.

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[95]Quoted in Henry F. Schaefer III, "Stephen Hawking, the Big Bang, and God"; available from http://www.leaderu.com/real/ri9404/bigbang.html; Internet; accessed 18 October 2007.

[96]Robert Jastrow, *God and the Astronomers* (New York: Norton, 1978), 14, quoted in Norman Geisler and Frank Turek, *I Don't Have Enough Faith to Be an Atheist* (Wheaton, IL: Crossway Books, 2004), 84.

[97]"A Scientists Caught Between Two Faiths: Interview with Robert Jastrow," *Christianity Today*, August 6, 1982, quoted in Norman Geisler and Frank Turek, *I Don't Have Enough Faith to Be an Atheist* (Wheaton, IL: Crossway Books, 2004), 84-5.

[98]Arthur Eddington, *The Expanding Universe* (New York: Macmillan, 1933), 178, as quoted in *Naturalism: A Critical Analysis*, eds. William Lane Craig and J.P. Moreland (n.c.: Routledge, 2000), 16, as found at http://books.google.com/books?id=_7zhXEMmcvQC&pg=PA216&lpg=PA216&dq=%22the+universe+was+regarded+as+fixed%22&source=web&ots=nokGB2mxl2&sig=HvclUjdOqFm9Dq31j-4Rmdp2m0Q&hl=en; Internet; accessed 02 April 2008.

British physicist and cosmologist, Arthur Eddington, was the first to confirm the universe had a beginning in 1919. He later wrote, "Philosophically, the notion of a beginning of the present order of nature is repugnant to me. …. I should like to find a genuine loophole. I simply do not believe the present order of things started off with a bang. The expanding Universe is preposterous…. It leaves me cold."[99] And again, "I feel almost an indignation that anyone should believe in it, except myself."[100]

In 1996 Stephen Hawking wrote, "Many people do not like the idea that time has a beginning, probably because it smacks of divine intervention. ... There were therefore a number of attempts to avoid the conclusion that there had been a big bang."[101] Fred Hoyle, who famously opposed the Big Bang theory and formulated the alternative Steady State theory, wrote: "To many people this thought process seems highly satisfactory, because a something outside physics can then be introduced at t=0. By a semantic manoeuvre, the word 'something' is then replaced by 'god,' except that the first letter becomes a capital, 'God,' in order to warn us that we must not carry the inquiry any further."[102] Hoyle also realized that the theory's claim that the universe popped into existence from nothing was philosophically unsatisfactory: "This most peculiar situation is taken by many astronomers to represent the origin of the universe. The universe is supposed to have begun at this particular time. From where? The usual answer, surely an unsatisfactory one, is: from nothing."[103]

Cosmologist Christopher Isham says that "perhaps the best argument in favor of the thesis that the Big Bang supports theism is the obvious unease with which it is greeted by some atheist physicists. At times this has led to scientific ideas, such as continuous creation or an oscillating universe, being advanced with a tenacity which so exceeds their intrinsic worth that one can only suspect the operation of psychological forces lying very much deeper than the usual academic desire of a theorist to support his/her theory.[104] Astronomer Royal, Martin Rees, recalls his mentor's (Dennis Sciama) dogged commitment to an eternal universe, no-Big Bang model: "For him, as for its inventors, it had a deep philosophical appeal – the universe existed, from everlasting to everlasting, in a uniquely self-consistent state. When conflicting evidence emerged, Sciama therefore sought a loophole (even an unlikely seeming one) rather as a defense lawyer clutches at any argument to rebut the prosecution case.[105] Similarly, Frank Tipler recalls: "When I was a student at MIT in the late 1960s, I audited a course in cosmology from the physics Nobelist Steven Weinberg. He told his class that of the theories of cosmology, he preferred the Steady State Theory because 'it least resembled the account in Genesis.'"

Robert Jastrow also observed scientists' uneasiness with the theistic implications of the Big Bang model:

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[99]Arthur Eddington, "The end of the world: from the standpoint of mathematical physics." *Nature* 127:447-453, 1931.

[100]Arthur Eddington, *The Expanding Universe* (New York: Macmillan, 1933), 124.

[101]Quoted in Denyse O'Leary, "Big Bang Exterminator Wanted, Will Train," available from http://www.evolutionnews.org/2013/10/big_bang_exterm077961.html; Internet; accessed 29 October 2013.

[102]Fred Hoyle, *Astronomy and Cosmology: A Modern Course* (San Francisco: W. H. Freeman, 1975), 684-5, as quoted in William Lane Craig and Quentin Smith, *Theism, Atheism, and Big Bang Cosmology* (Oxford: Clarendon Press, 1993), 46.

[103]Fred Hoyle, *Astronomy Today* (London: Heinemann, 1975), 165.

[104]Christopher Isham, "Creation of the Universe as a Quantum Process," in *Physics, Philosophy and Theology: A Common Quest for Understanding* (ed. R. J. Russell, W. R. Stoeger, and G. V. Coyne; Vatican City: Vatican Observatory, 1988), 378.

[105]Quoted in Denyse O'Leary, "Big Bang Exterminator Wanted, Will Train," available from http://www.evolutionnews.org/2013/10/big_bang_exterm077961.html; Internet; accessed 29 October 2013.

> Theologians generally are delighted with the proof that the Universe had a beginning, but astronomers are curiously upset. Their reactions provide an interesting demonstration of the response of the scientific mind – supposedly a very objective mind – when evidence uncovered by science itself leads to a conflict with the articles of faith in our profession. It turns out that the scientist behaves the way the rest of us do when our beliefs are in conflict with the evidence. We become irritated, we pretend the conflict does not exist, or we paper it over with meaningless phrases.[106]

Initially, scientists just denied the universe needed a cause. That same line of thinking fuels those who oppose premise 1 of the KCA so vehemently today. But the causal principle is one of the most basic intuitions we have. Things don't just pop into existence uncaused from nothing, so why think the universe did? If everything that begins to exist has a sufficient cause, on what grounds is the universe excepted?

If one excepts it on the basis that it is impossible to have a cause prior to the first event, they are guilty of begging the question in favor of atheism because they are assuming that physical reality is the only reality, and thus the only possible cause of the Big Bang must be a physical cause. But it is entirely plausible that the cause of the Big Bang was an eternal, non-physical reality. The only way to demonstrate that the universe cannot have a cause, then, is to demonstrate that the existence of an eternal, non-physical reality like God is impossible. But the very beginning of the universe is an argument for such a being's existence!

While I have heretofore focused on *scientists* who objected to the Big Bang model, I would be amiss if I did not address the opposition many *Christians* have raised against the model, even to the present day. Some Christians oppose the Big Bang theory because it entails that the universe is billions of years old as opposed to thousands of years old as the Bible seems to indicate (based on their interpretation of Genesis 1-2). Others oppose the Big Bang theory because they see it as the atheist's creation narrative – a God substitute if you will.

Addressing the concern regarding the age of the universe is beyond the scope of this paper, however, I will say a brief word about the second concern. While the Standard Model identifies the Big Bang as the point of creation, the theory does not purport to explain how the universe came into being. The Big Bang is not the cause of creation, but the effect. The theory makes no attempt to explain what caused the bang. In fact, it's impotent to explain the cause. Ironically, Christians have the answer to this question. A Big Bang requires a Big Banger![107]

Far from being anti-Christian, the Big Bang model fully accords with a Biblical worldview, namely that there was a beginning to physical reality. That's why many scientists opposed it so vehemently. The theistic implications of this discovery made many scientists reluctant to accept it. That's why I find it so strange that Christians are also reluctant to accept it. The Bible affirms that:

- The universe began to exist (Genesis 1:1; 2:4; Isaiah 42:5)
- The universe was not made from preexisting matter – creation *ex nihilo* (Genesis 1:1; Psalm 33:6; Proverbs 3:19; Jeremiah 32:17; Romans 4:17; Colossians 1:16; Hebrews 11:3; Revelation 4:11)
- Time had a beginning (2 Timothy 1:9; Titus 1:2; Jude 25)

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[106]Robert Jastrow, *God and the Astronomers* (New York: Norton, 1978), 16, quoted in Norman Geisler and Frank Turek, *I Don't Have Enough Faith to Be an Atheist* (Wheaton, IL: Crossway Books, 2004), 88.

[107]Greg Koukl is famous for this pithy way of putting the argument.

- The universe is expanding (Job 9:8; 26:7; Psalm 104:2; Isaiah 40:22; 42:5; 44:24; 45:12; 48:13; 51:13; Jeremiah 10:12; 51:15; Zechariah 12:1)[108]

The Big Bang theory comports well with the Biblical data. It is a confirmation of what the Bible has affirmed for thousands of years. Coupled with the sound empirical evidence for the theory, Christians ought to embrace the theory. Even if Christians are reluctant to do so because of the conflict the Big Bang model poses to their interpretation of Biblical chronology, they can at least appeal to the theory as scientific support for the Bible's affirmation that the universe had a beginning.

Acceptance of the Big Bang Theory

Despite their philosophical reservations to the Big Bang theory, most scientists came to accept the model due to the mounting empirical evidence. Today it is called the Standard Model of cosmology. A host of scientists have said as much:

- Martin Rees: "Fifty years ago we all thought of the Big Bang as very speculative. Now the Big Bang from one millisecond onward is as well established as anything about the early history of Earth."[109]
- Stephen Hawking: "Almost everyone now believes that the universe and time itself had a beginning at the Big Bang."[110]
- Victor Stenger: "The data from cosmological observations, which has improved enormously in just the last few years, has left no doubt among current working cosmologists that the big bang happened. The remaining holdouts are a few older astronomers who are gradually dying out. They are like some nineteenth century chemists and physicists who refused to accept the atomic theory to their dying days. … I caution atheists not to argue against theism by saying the big bang did not occur. It very definitely did."[111]
- Ethan Siegal: "[E]verything lines up so incredibly well, between the theory of what we should observe just three-to-four minutes after the Big Bang and the observations we make billions of years later, that it can only be considered a remarkable confirmation of the most successful theory of the Universe ever. From the smallest, subatomic particles to the largest cosmic scales and structures, the Big Bang explains an enormous suite of phenomena that no other alternative can touch. If you ever want to replace the Big Bang, you're going to have to explain some tremendously disparate observations, from the cosmic microwave background to Hubble expansion to the first atoms in the Universe. The Big Bang is the only theory that can get us all three…."[112]

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[108]Four passages make it sound like this is a past completed action (Isaiah 45:12; 48:13; Jeremiah 10:12; 51:15), whereas seven make it sound like it is a continuous action (Job 9:8; Psalm 104:2; Isaiah 40:22; 42:5; 44:24; 51:13; Zechariah 12:1). Christians even debate whether or not such descriptions should be understood literally or figuratively.

[109]Tim Folger, "Science's Alternative to an Intelligent Creator: the Multiverse Theory" in Discover magazine; available from http://discovermagazine.com/2008/dec/10-sciences-alternative-to-an-intelligent-creator/article_view?b_start:int=2&-C=; Internet; accessed 11 November 2008.

[110]Stephen Hawking, *The Nature of Space and Time* (Princeton University Press, 1996), 20.

[111]Victor Stenger, "How to Answer Theist Arguments"; available from http://www.colorado.edu/philosophy/vstenger/how.html; Internet; accessed 28 January 2011.

[112]Ethan Siegal, "Big Bang Confirmed Again, This Time By The Universe's First Atoms"; available from https://www.forbes.com/sites/startswithabang/2017/07/11/big-bang-confirmed-again-this-time-by-the-universes-first-atoms/#1b18971879c2; Internet; accessed 11 June 2018.

- Lawrence Krauss: "I should stress that the Big Bang picture is too firmly grounded in data from every area to be proved invalid in its general features."[113]

Challenges

Despite the success of the Big Bang model, it has been viewed as a necessary evil by some scientists due to its philosophical and religious implications. As a result, they have sought out alternative models of the universe that do not require a temporal beginning. Most of these models do not deny that our universe began with the Big Bang, but rather deny that physical reality started with our Big Bang. They postulate that our Big Bang was just one physical event in an eternal line of physical events stretching back into eternity past.

For an in-depth review and critique of these cosmological alternatives, see the appendix, but here is a summary of what is wrong with these various alternative models:

- None are based on new empirical findings. Many are little more than exercises in metaphysical speculation, incapable of both verification and falsification.[114]
- Even those that do rely on some empirical data have not yet risen to the level of empirical confirmation garnered for the Standard Model. They are simply trying to account for the data in a new way.
- Some models rely on outright mathematical fictions, such as Hawking's quantum fluctuation model which employs imaginary numbers.
- Some models, such as the Ekpyrotic model (brane cosmology) are based on string theory. String theory is highly speculative. In fact, all of the equations to the theory haven't even been formulated, yet alone solved! So it's a bit premature to think that models built on string theory can unseat the Standard Model.
- We must distinguish between a model that is logically possible and one that is physically possible. We must also distinguish between models that are physically possible and those that are physically probable. To prove any of these theories, one needs to do more than just show that the math works on paper or that it entails a coherent concept. We need empirical evidence.
- Even if the math works on paper, one would have to verify the mathematical model empirically. The problem is that it is impossible to empirically verify the existence of an infinite. That means science could never prove the universe to be past-eternal. To see why, imagine trying to verify the existence of an infinite staircase through empirical means. To determine if it was infinite, you would have to walk it. Even if you had been walking the stairs for a trillion years, you couldn't conclude that it was infinite because for all you know the last step could be just a year ahead of you. You would have to keep walking on and on and on. You would never reach a point at which you could conclude that the stair must be infinite. That's why no cosmological model that purports to show an eternal universe/multiverse could ever be verified scientifically. Only philosophy can determine if the infinite is possible, and the philosophical arguments against the possibility of the existence of an infinite are overwhelmingly opposed to it (we'll examine those arguments shortly).
- All of the evidence points to the fact that physical reality had a beginning, no matter what model you employ. Even if the Big Bang doesn't mark the origin of physical reality, physical reality had

[113]Lawrence M. Krauss, *A Universe from Nothing: Why There is Something Rather than Nothing* (New York: Atria Paperback, 2012), 210.

[114]See https://thinkingtobelieve.com/2008/11/18/big-bang-cosmology-and-atheism-go-together-like-peas-in-a-blender/.

> to have a beginning at some point in the finite past. In 2013, Alexander Vilenkin said: "There are no models at this time that provide a satisfactory model for a universe without a beginning."[115] In 2017 Vilenkin wrote, "Many people once again hoped that maybe on a far greater scale the universe is indeed eternal--with ancestor bubbles nucleating ad infinitum into the past. Now, however, we know that this is not possible. And once again, the beginning of the universe must be tackled head on."[116]

We need to elaborate on this last point. None of the alternative cosmogenic models entail an eternal past. Even those that claim to do so do not, in fact, do so when they are examined more closely. Wholly apart from the details of any particular model, there is an overriding reason to conclude that no realistic cosmogenic models can entail an eternal past: the Borde-Guth-Vilenkin theorems.

Inflationary theory holds that inflation will continue forever into the future. In 1994, cosmologists Arvind Borde and Alexander Vilenkin set out to answer the question of whether inflation could be extended into the infinite past. They developed a theorem demonstrating that inflation cannot, in fact, be extended into the infinite past. While inflation may have an infinite future, it can only have a finite past. They write, "A physically reasonable spacetime that is eternally inflating to the future must possess an initial singularity…. The fact that inflationary spacetimes are past incomplete forces one to address the question of what, if anything, came before."[117] And again, a "universe…in a state of eternal inflation without a beginning…is in fact not possible in future-eternal inflationary spacetimes as long as they obey some reasonable physical conditions."[118]

In 2003, Vilenkin and Borde developed an additional theorem with Alan Guth, demonstrating that any universe that has been, on average, expanding throughout its history must have a finite beginning in the past. Vilenkin writes: "Loosely speaking, our theorem states that if the universe is, on average, expanding, then its history cannot be indefinitely continued into the past. More precisely, if the average expansion rate is positive along a given world line, or geodesic, then this geodesic must terminate after a finite amount of time. Different geodesics, different times. The important point is that the past history of the universe cannot be complete."[119]

The important point to observe about the BGV theorems is their sweeping applicability. They apply to multiverse inflationary theories as well as models based on string theory. In other words, it covers all current cosmological models. This caused Vilenkin to conclude: "It is said that an argument is what convinces reasonable men and a proof is what it takes to convince even an unreasonable man. With the proof now in place, cosmologists can no longer hide behind the possibility of a past-eternal universe. There is no escape, they have to face the problem of a cosmic beginning."[120]

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[115]Alexander Vilenkin, "Did the universe have a beginning?"; available from http://www.youtube.com/watch?v=NXCQelhKJ7A; Internet; accessed 01 July 2021.

[116]Delia Perlov and Alexander Vilenkin, *Cosmology for the Curious* (Cham, Switzerland: Springer, 2017), pp. 330-31; cf. p. 333.

[117]Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review Letters* 72 (1994): 3305, 3307.

[118]Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review* Letters 72 [1994]: 3305, 3307. Available at http://arxiv.org/pdf/gr-qc/9312022.pdf.

[119]Alexander Vilenkin, "The Beginning of the Universe," available from http://inference-review.com/article/the-beginning-of-the-universe; Internet; accessed 31 May 2018.

[120]Alexander Vilenkin, *Many Worlds in One* (New York: Hill and Wang, 2006] 176.

Some claim that Vilenkin has denied that the BGV theorem proves there is a beginning to physical reality. Given the importance of this theorem to cosmological models, I think it is worth our time to explore this issue a bit more.

Victor Stenger wrote a letter to Vilenkin asking him if the BGV theorem proves the universe must have had a beginning. Vilenkin responded, "No. But it proves that the expansion of the universe must have had a beginning. You can evade the theorem by postulating that the universe was contracting prior to some time. This sounds as if there is nothing wrong with having a contraction prior to expansion. But the problem is that a contracting universe is highly unstable. Small perturbations would cause it to develop all sorts of messy singularities, so it would never make it to the expanding phase."[121] In other words, a universe that existed in a steady state or contracting state prior to the expansion state we see today could evade the BGV theorem, but we have no reason to believe that our universe ever existed in a steady or contracting state. Models that propose such a universe encounter physical problems, such that they are unrealistic. Physically realistic models of the universe cannot evade the theorem. That's why Vilenkin has stated unequivocally that "we have no viable models of an eternal universe. The BGV theorem gives reason to believe that such models simply cannot be constructed."[122]

In a separate correspondence to an atheist named Ken, Vilenkin notes, "If someone asked me whether or not the theorem I proved with Borde and Guth implies that the universe had a beginning, I would say that the short answer is 'yes.' If you are willing to get into subtleties then the answer is 'No, but….' So, there are ways to get around having a beginning, but then you are forced to have something nearly as special as a beginning."[123]

Lawrence Krauss also had some email correspondence with Vilenkin regarding the implications of his theorem. Here is how Vilenkin responded:

> Any theorem is only as good as its assumptions. The BGV theorem says that if the universe is on average expanding along a given worldline, this worldline cannot be infinite to the past. A possible loophole is that there might be an epoch of contraction prior to the expansion. Models of this sort have been discussed by Aguirre & Gratton and by Carroll & Chen. They had to assume though that the minimum of entropy was reached at the bounce and offered no mechanism to enforce this condition. It seems to me that it is essentially equivalent to a beginning. On the other hand, Jaume Garriga and I are now exploring a picture of the multiverse where the BGV theorem may not apply. In bubbles of negative vacuum energy, expansion is followed by cocntraction [sic], and it is usually assumed that this ends in a big crunch singularity. However, it is conceivable (and many people think likely) that singularities will be resolved in the theory of quantum gravity, so the internal collapse of the bubbles will be followed by an expansion. In this scenario, a typical worldline will go through a succession of expanding and contracting regions, and it is not at all clear that the BGV assumption (expansion on average) will be satisfied. I suspect that the theorem can be extended to this case, maybe with some additional assumptions. But of course there is no such thing as absolute certainty in science, especially in matters like the creation of the universe. Note for

[121]Quoted in Arizona Atheist, "William Lane Craig's Arguments for God Refuted"; available from http://arizonaatheist.blogspot.com/2010/05/william-lane-craigs-arguments-for-god.html; Internet; accessed 25 February 2016.

[122]Alexander Vilenkin, "The Beginning of the Universe," *Inference: International Review of Science* 1/4 (Oct. 23, 2015), http://inference-review.com/article/the-beginning-of-the-universe.

[123]Quoted in Arizona Atheist, "William Lane Craig's Arguments for God Refuted"; available from http://arizonaatheist.blogspot.com/2010/05/william-lane-craigs-arguments-for-god.html; Internet; accessed 25 February 2016.

> example that the BGV theorem uses a classical picture of spacetime. In the regime where gravity becomes essentially quantum, we may not even know the right questions to ask.[124]

WLC was confused by some of Vilenkin's statements to Krauss (largely because Krauss had edited out some important clarifications that Vilenkin had written before sharing Vilenkin's response with WLC), so WLC reached out to Vilenkin for clarification. Craig offered the following interpretation of Vilenkin to Vilenkin for Vilenkin to comment on:

> A "classical picture of spacetime" should not be equated with general relativistic spacetime. For special relativistic spacetime, for example, also is a classical picture of spacetime. So the theorem does not presuppose general relativistic spacetime but simply a spacetime that is classical in the sense that it is linearly ordered temporally and so can be said to be expanding in the "later than" direction. In any such spacetime a universe that is, on average, in a state of expansion can't be past-eternal. But in a quantum gravity regime, if the linear ordering of time is abolished, then it is impossible to speak of expanding, and so the theorem's one condition isn't met. The question, then, is not one's gravitational theory, but whether time exists in one's model. Quantum gravity theories that do feature a linear temporal ordering fall under the theorem and so will not be past-eternal.[125]

Vilenkin responded to WLC by saying:

> The question of whether or not the universe had a beginning assumes a classical spacetime, in which the notions of time and causality can be defined. On very small time and length scales, quantum fluctuations in the structure of spacetime could be so large that these classical concepts become totally inapplicable. Then we do not really have a language to describe what is happening, because all our physics concepts are deeply rooted in the concepts of space and time. This is what I mean when I say that we do not even know what the right questions are.[126]

Vilenkin also confirmed that WLC has correctly understood the BGV theorem, but Vilenkin does not agree that this necessarily leads to the conclusion that God exists:

> I think you represented what I wrote about the BGV theorem in my papers and to you personally very accurately. This is not to say that you represented my views as to what this implies regarding the existence of God. Which is OK, since I have no special expertise to issue such judgements. Whatever it's [sic] worth, my view is that the BGV theorem does not say anything about the existence of God one way or the other. In particular, the beginning of the universe could be a natural event, described by quantum cosmology.[127]

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[124]William Lane Craig, "'Honesty, Transparency, Full Disclosure' and the Borde-Guth-Vilenkin Theorem"; available from http://www.reasonablefaith.org/honesty-transparency-full-disclosure-and-bgv-theorem; Internet; accessed 26 October 2013.

[125]William Lane Craig, "'Honesty, Transparency, Full Disclosure' and the Borde-Guth-Vilenkin Theorem"; available from http://www.reasonablefaith.org/honesty-transparency-full-disclosure-and-bgv-theorem; Internet; accessed 26 October 2013.

[126]William Lane Craig, "'Honesty, Transparency, Full Disclosure' and the Borde-Guth-Vilenkin Theorem"; available from http://www.reasonablefaith.org/honesty-transparency-full-disclosure-and-bgv-theorem; Internet; accessed 26 October 2013.

[127]William Lane Craig, "'Honesty, Transparency, Full Disclosure' and the Borde-Guth-Vilenkin Theorem"; available from http://www.reasonablefaith.org/honesty-transparency-full-disclosure-and-bgv-theorem; Internet; accessed 26 October 2013.

So there you have it. Vilenkin is quite clear that realistic models of the universe cannot evade his theorem. Physical reality had a beginning. Everyone, including scientists, must face the fact that physical reality cannot be past eternal. It came into being in the finite past. And if it came into being, it needs a cause and that cause cannot be something physical.

Objections to the scientific evidence for premise 2

Objection #1: *The Big Bang contradicts the First Law of Thermodynamics. Matter cannot be created or destroyed.*

Response #1: Natural laws do not dictate what must occur, but are inductive observations about how the universe normally operates. Even Victor Stenger recognizes this. He says the laws of nature "are not necessarily rules that govern the universe, that sit out there in some kind of Platonic reality," but are just "descriptions we have made of observations" that "describe aspects of reality."[128]

More importantly, the laws of nature only apply once there is a natural world to apply them to. You can't have physical laws before you have a physical universe any more than you can have rules of grammar prior to language. Since the laws of physics came into existence concomitantly with the universe, there was never a time when they were violated.

Objection #2: *We can't be sure that our universe started with a singularity since the singularity theorems are based on general relativity, and general relativity breaks down at the Plank length. Quantum mechanics would govern the universe prior to the Plank length (between 10^{-33} and 10^{-12} of a centimeter), but we have no theory of quantum gravity to know how the universe would behave at that size. That means our knowledge of physics does not allow us to say the universe began in a singularity.*

A number of people have articulated this argument. These are representative:

- Mark I. Vuletic: "[T]he universe is expanding. Using the general theory of relativity, we can therefore infer from this data that the universe should be smaller and smaller as one looks back into the past. However, this works only up to a point. There is a point in time called the 'Planck time' (after the late physicist Max Planck, one of the pioneers of quantum mechanics) before which our ability to infer the behavior of the universe on the basis of general relativity alone is destroyed. The problem is that prior to the Planck time, the universe is so small that quantum mechanical effects become very important. Therefore, a correct description of the behavior of the universe prior to the Planck time requires a synthesis of quantum mechanics and general relativity – a theory of quantum gravity, in other words. And to this date, no full theory of quantum gravity has been developed, much less attained the consensus status that post-Planck-time Big Bang theory enjoys. Without such a theory, we cannot draw from cosmology any conclusions about whether the universe had a beginning or not."[129]
- Sean Carroll: "The success of primordial nucleosynthesis gives us confidence that we understand what the universe was doing about one second after the Big Bang, but anything before that is necessarily speculative. Even the formulation 'one second after the Big Bang' should really be

[128]Where did those aspects of reality come from? Stenger responds, "Why did they have to come from anything?" See Victor Stenger, "How to Answer Theist Arguments"; available from http://www.colorado.edu/philosophy/vstenger/how.html; Internet; accessed 28 January 2011.

[129]See Mark I. Vuletic, "Does Big Bang Cosmology Prove the Universe Had a Beginning?"; available from http://www.infidels.org/library/modern/mark_vuletic/bigbang.html; Internet; accessed 28 January 2011.

> interpreted as 'one second after what would be the moment of infinite curvature in the most straightforward extrapolation to earlier times.'
> …
> The singularity at the Big Bang doesn't indicate a beginning to the universe, only an end to our theoretical comprehension. It may be that this moment does indeed correspond to a beginning, and a complete theory of quantum gravity will eventually explain how the universe started at approximately this time. But it is equally plausible that what we think of as the Big Bang is merely a phase in the history of the universe, which stretches long before that time – perhaps infinitely far in the past. The present state of the art is simply insufficient to decide between these alternatives; to do so, we will need to formulate and test a working theory of quantum gravity."[130]

Response #2: It's true that the general theory of relativity breaks down at the Plank length, but the Borde-Guth-Vilenkin theorem is independent of the physics describing the era prior to the Planck length. It's based on geometric arguments and special relativity, and so its prediction of an absolute beginning to physical reality is unaffected by this uncertainty. As Vilenkin explains:

> A remarkable thing about this theorem is its sweeping generality. We made no assumptions about the material content of the universe. We did not even assume that gravity is described by Einstein's equations. So, if Einstein's gravity requires some modification, our conclusion will still hold. The only assumption that we made was that the expansion rate of the universe never gets below some nonzero value, no matter how small. This assumption should certainly be satisfied in the inflating false vacuum. The conclusion is that past-eternal inflation without a beginning is impossible.[131]

Besides, the universe did not have to begin with a singularity to have a beginning. The theologically significant point is that physical reality is temporally finite, not that the universe began from a singularity.

Objection #3: *The claim that the universe began to exist assumes an A-Theory of time in which temporal becoming is an objective feature of reality. If the B-Theory of time is correct, then temporal becoming is not an objective feature of reality. All points of time exist simultaneously in a static, block universe. The block may have a temporal boundary or edge (the Big Bang), but the block itself has existed from eternity past, similar to how* Moby Dick *would have a beginning and end to the story even if the story itself had been written from eternity past.*

Response #3: Settling the question of the nature of time is beyond the scope of this paper. I will simply say that the A-theory of time is the ordinary understanding of time, and this understanding is confirmed by our experience of time. If you wish to explore this issue in further detail, see William Lane Craig's *Time and Eternity: Exploring God's Relationship to Time*. He makes powerful arguments for the A-theory and against the B-theory of time.

That said, I'm not convinced the B-theory of time necessarily undermines the KCA. It only undermines the KCA if we have reason to believe that the block universe (which contains a temporal edge) has existed for eternity. If, however, the block universe came into being, it would require a cause and the

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[130]Sean Carroll, "Does the Universe Need God?"; available from http://preposterousuniverse.com/writings/dtung/; Internet; accessed 28 April 2011.

[131]Alexander Vilenkin, Many Worlds in One (New York: Hill and Wang, 2006), 175.

KCA would apply.[132] Andrew Ter Ern Loke and Curtis John Metcalfe have provided reasons for thinking that the block universe has not existed from eternity past, but came into existence.[133] The objector would have to provide reasons for thinking the block universe has existed from eternity past.

Objection #4: *Science is always progressing, so maybe we'll find evidence of a beginningless universe in the future.*

Response #4: This isn't so much of an objection as it is an expression of faith and hope. The fact of the matter is that our assessment of what is true must be based on existing evidence, not evidence we hope may arise in the future. And the existing evidence all points to the fact that physical reality had a beginning. Furthermore, the BGV theorems have rendered the possibility of any past-eternal models of the universe virtually nil.

Philosophical evidence

Now that we've explored the scientific evidence in favor of premise 2, let's look at the philosophical evidence for the beginning of the universe.[134] Personally, I find the philosophical evidence to be the stronger of the two forms of evidence. Scientific theories and scientific knowledge are in constant flux. We could imagine a day in which the Big Bang model is overthrown or scientists discover a flaw in the BGV theorems, but it is much more difficult to imagine a day in which the philosophical arguments for the finitude of the universe are shown to be false since they are based on deductive rather than inductive or abductive reasoning.

Here are four philosophical arguments against an infinite past:

Actual Infinities Cannot be Instantiated in Reality

The first philosophical argument for the finitude of the past is that an actual infinite cannot be instantiated in reality. The argument could be stated as follows:

P1 If the universe is eternal, then the number of past events would be infinite
P2 Infinities are impossible to instantiate in reality

_____

C Therefore the universe is not past eternal

[132]Curtis John Metcalfe, "A Defense of the *Kalam* Cosmological Argument and the B-Theory of Time" (master's thesis, University of Missouri—St. Louis, 2013), 13. Quoted in Rad Miksa, "Deny the *Kalam's* Causal Principle, Embrace Absurdity," *Philosophia Christi* (Vol. 22, No. 2, 2020), 239-255, 253.

[133]See Andrew Ter Ern Loke, *God and Ultimate Origins: A Novel Cosmological Argument* (Cham: Palgrave Macmillan, 2017 and Curtis John Metcalfe, "A Defense of the *Kalam* Cosmological Argument and the B-Theory of Time" (master's thesis, University of Missouri—St. Louis, 2013).

[134]People who want to discount the value of philosophy and uphold science as the only way we can know things prove too much since philosophy is the discipline that deals with logic and reason. These are indispensable to science, yet not justified by science. Indeed, one must use these aspects of philosophy in order to make the statement that only scientific knowledge is legitimate in the first place. There are philosophical questions about the very nature of science that must be presumed as well, such as what demarcates science from non-science, whether scientific theories should be understood as approximations of reality or reality itself, etc.

Obviously, the key premise is premise 2. We'll get to that in a moment, but what about premise 1? Premise 1 is obvious on its face once one understands all of the terms, and frankly it doesn't need much defending. Events are changes over time. If the universe is past eternal, there would be an infinite number of past events.

Support for Premise 2

Why should we believe that premise 2 is true? Why think infinities can't be instantiated in reality? Notice the words "in reality." Premise two is not arguing that the concept of infinity is logically incoherent. Nor is it a rejection of the legitimacy and utility of transfinite arithmetic (which employs the concept of sets with an infinite number of members). The axioms of transfinite arithmetic are internally consistent and coherent, but that doesn't mean it has any applicability to the real world. Mathematics belongs to the realm of ideas, not physical reality. Premise two is a claim about what is possible to instantiate in the physical world. I will argue that it is not possible to instantiate the infinite in reality because it leads to physical impossibilities and absurdities. I will demonstrate this with the use of four illustrations.

First, consider the orbits of Earth and Jupiter. The Earth orbits the sun 12 times for every one orbit of Jupiter. The disparity between the revolutions grows larger and larger over time. And yet, if both existed from eternity past, we would have to say that they both orbited around the sun an equal number of times (an infinite number of times each). Given an infinite past, it wouldn't even make sense to ask if the number of Earth's revolutions is odd or even because such questions cannot be asked of infinities.[135]

Second, consider the temporal distance to events. If the past were infinite, then the number of years from eternity past to the Revolutionary War are no more than the number of years from eternity past to the present day because both have been preceded by an infinite number of years. And yet, we know the number of years is not the same. There is a greater number of years leading up to the present day.

Third, consider the interesting story of the fictional character Tristram Shandy. Novelist Laurence Sterne published his story of Tristram Shandy in nine volumes. It was written as a pseudo-biography of sorts, in which Shandy is supposedly writing his own autobiography. However, he goes off on many rabbit trails and adds so much detail that it takes him three volumes just to get to his birth story! Imagine if it took Shandy one year to record the activities of just one day of his life. If Shandy lived for an infinite amount of time, would he ever complete his biography? No. For every year he writes, he would fall further and further behind. After one year, he would be 364 days behind. After two years, he would be 728 days behind, etc. After 50 years, he will have completed writing 50 days' worth of his autobiography, but be 18,200 days behind. And yet, if infinities exist, given an infinite amount of time, we must believe that Shandy will have finished his biography. That is absurd and counter-intuitive. If Shandy lived for an infinite amount of time, he should be infinitely behind on his writing.

The scenario gets even weirder. If Shandy had been writing for an infinite number of days, he would have finished his biography an infinite time ago. If so, why didn't he finish it yesterday since an infinite number of days preceded yesterday as well? Why not the day before yesterday for the same reason? Why not the day before that, *ad infinitum*? It would seem that no matter what day you pick, Tristram Shandy could have completed his biography on that day, and yet he didn't. No matter how far back you

[135]William Lane Craig, *Reasonable Faith: Christian Truth and Apologetics*, 3rd edition (Wheaton: Crossway, 2008), 96-7.

go in time, you'll never actually come to the day that Tristram Shandy finishes his biography. This has the absurd conclusion that you can never find a day in the infinite past in which Tristram Shandy is writing his autobiography.[136]

Not only does the notion of infinity lead to logical absurdities, but it leads to contradictions as well. In infinite set theory, you can subtract identical quantities from identical quantities and get non-identical results. For example, if you subtract the infinite number of odd numbers from all the natural numbers in an infinite set, you'll be left with the same number of members as before, but if you subtract all the numbers greater than 5, you'll be left with 5 numbers, and the infinite will be transformed into the finite. In both cases identical quantities were subtracted from identical quantities, and yet the result was different. That's why subtraction is prohibited in transfinite arithmetic. It leads to contradictions. Inverse operations like subtraction can yield results anywhere between 0 and infinity (A_0).

To illustrate the contradictions, consider our fourth and final illustration: Hilbert's Hotel. WLC provides the most succinct version of this illustration:

> Let us imagine a hotel with a finite number of rooms. Suppose, furthermore, that *all the rooms are full*. When a new guest arrives asking for a room, the proprietor apologizes, "Sorry, all the rooms are full." But now let us imagine a hotel with an infinite number of rooms and suppose once more that all the rooms are full. There is not a single vacant room throughout the entire infinite hotel. Now suppose a new guest shows up, asking for a room. "But of course!" says the proprietor, and he immediately shifts the person in room #1 into room #2, the person in room #2 into room #3, the person in room #3 into room #4 and so on, out to infinity. As a result of these room changes, room #1 now becomes vacant and the new guest gratefully checks in. But remember, before he arrived, all the rooms were full! Equally curious, according to the mathematicians, there are now no more persons in the hotel than there were before: the number is just infinite. But how can this be? The proprietor just added the new guest's name to the register and gave him his keys — how can there not be one more person in the hotel than before? But the situation becomes even stranger. For suppose an infinity of new guests show up [at] the desk, asking for a room. "Of course, of course!" says the proprietor, and he proceeds to shift the person in room #1 into room #2, the person in room #2 into room #4, the person in room #3 into room #6, and so on out to infinity, always putting each former occupant into the room number twice his own. As a result, all the odd numbered rooms become vacant, and the infinity of new guests is easily accommodated. And yet, before they came, all the rooms were full! And again, strangely enough, the number of guests in the hotel is the same after the infinity of new guests check in as before, even though there were as many new guests as old guests. In fact, the proprietor could repeat this process *infinitely many times* and yet there would never be one single person more in the hotel than before.
>
> But Hilbert's Hotel is even stranger than the German mathematician gave it out to be. For suppose some of the guests start to check out. Suppose the guest in room #1 departs. Is there not now one less person in the hotel? Not according to the mathematicians—but just ask the woman who makes the beds! Suppose the guests in room numbers 1, 3, 5, . . . check out. In this case an infinite number of people have left the hotel, but according to the mathematicians there are no less people in the hotel—but don't talk to that laundry woman! In fact, we could have every other guest check out of the hotel and repeat this process infinitely many times, and yet there would never be any less people in the hotel. But suppose instead the persons in room number 4, 5, 6, . . . checked out. At a single stroke the hotel would be virtually emptied, the guest register reduced to three names, and the infinite converted to finitude. And

[136]See William Lane Craig, "Wallace Matson and the Crude Cosmological Argument"; available from http://www.reasonablefaith.org/wallace-matson-and-the-crude-cosmological-argument; Internet; accessed 26 February 2016. See also William Lane Craig, "A Swift and Simple Refutation of the Kalam Cosmological Argument?"; available from http://www.reasonablefaith.org/a-swift-and-simple-refutation-of-the-kalam-cosmological-argument; Internet; accessed 26 February 2016.

> yet it would remain true that the *same number* of guests checked out this time as when the guests in room numbers 1, 3, 5, . . . checked out. Can anyone sincerely believe that such a hotel could exist in reality?"[137]

It is for reasons such as these that the mathematician, David Hilbert, concluded that "the infinite is nowhere to be found in reality. It neither exists in nature nor provides a legitimate basis for rational thought. … The role that remains for the infinite to play is solely that of an idea."[138]

Objections to Premise 2

Not all agree that infinities are impossible to instantiate in reality. Here are a number of objections to premise 2.

Objection #1: *Infinite Set Theory shows that an actually infinite number of things can exist.*

Response #1: The use of the mathematical infinite in transfinite arithmetic doesn't imply that infinities can exist in the real world. While the math may work as an idea or on paper, that does not mean it can be instantiated in reality. Math is not ontologically significant. There are a good number of mathematical devices that have no correlate to the real world, such as the use of imaginary numbers.

An actual infinity leads to logical absurdities when applied to the real world. Think of Hilbert's Hotel. In infinite set theory you cannot subtract, but clearly this is an ad hoc restraint that will not work in reality. You cannot prevent guests from leaving.

Objection #2: *Infinities exist everywhere in reality. We can always divide something infinitely.*

Response #2: This confuses a potential infinite with an actual infinite.[139] Any number of divisions you might perform will be a finite number. Also, while one may be able to complete a potentially infinite number of divisions mentally, they cannot do so in reality. Physical reality can only be divided so far. Once you reach the Planck length, physical reality cannot be divided further. There is only a finite number of divisions one could complete in the real world.

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[137]William Lane Craig, "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 02 May 2009. For a great visual illustration of the argument, see Willian Lane Craig's video "Kalam Cosmological Argument – Part 2: Philosophical"; available from https://www.youtube.com/watch?v=vybNvc6mxMo; Internet; accessed 08 February 2022. A couple of other great videos on Hilbert's Hotel include https://www.youtube.com/watch?v=OxGsU8oIWjY and https://www.youtube.com/watch?v=Uj3_KqkI9Zo.

[138]David Hilbert, "On the Infinite," in *Philosophy of Mathematics*, ed. with an introduction by Paul Benacerraf and Hilary Putnam (Prentice-Hall, 1964), 151.

[139]Some will cite Zeno's paradox of motion. Zeno said for Achilles to cross the stadium he would have to cross halfway, but before he could cross halfway he would have to cross a quarter of the way, ad infinitum. As such, Achilles would never cross the stadium. Motion is impossible. While he was referring to potential infinity of unequal parts, when it comes to time we are talking about an actual infinity with equal parts. Additionally, the sum total of the infinite divisions of the stadium add up to a finite distance, whereas the sum total of temporal instants must add up to an actual infinitely long time. See William Lane Craig and J. P. Moreland, *Philosophical Foundations for a Christian Worldview* (Downers Grove, IL: InterVarsity Press, 2003), 475.

Objection #3: *Isn't God said to be infinite? If infinities cannot exist in the real world, then God cannot exist either.*

Objection #3: Yes, God is traditionally described as being infinite, but two things should be noted. First, infinity is not understood as an attribute of God, but as a way of referring to the fact that all of God's attributes are maximally excellent. For example, God has maximum knowledge. This does not mean God knows an infinite number of things because there are not an infinite number of things to be known. Granted, the number is exceptionally large – so much so that we could not comprehend the size of that number – but it is still finite nonetheless.

Secondly, when Christian's describe God as infinite, they are referring to infinity in a qualitative rather than quantitative sense. The logical absurdities involving the infinite only pertain to the quantitative infinite.

Objection #4: *Theists claim that God is omniscient. If God knows all things, then He must know an infinite number of propositions. If so, then infinities are possible.*

Response #4: As noted in response #3, there aren't an actually infinite number of propositions for God to know. But for the sake of argument, let's suppose that there were an infinite number of propositions. Could God know them? Yes. As I'll argue momentarily, an infinity could exist if it was formed all at once rather than successively over time. God does not gain knowledge one proposition at a time. Most theists do not think God even thinks propositionally. He simply has the innate property of knowing all truths in a single, undivided intuition. We may express what God knows by breaking it up into propositional bits ("God knows *p*"), but this just expresses *what* God knows, not the *means* by which He knows it. Since God knows all truths in a single, undivided intuition, and since God did not come to know these truths sequentially over time, God could know an infinite number of truths.

In contrast, the past is formed by successively adding one moment to the next, and thus the past cannot be infinite.

Actual Infinities are Logically Impossible

Philosopher, Alexander Pruss, has come up with an interesting paradox that demonstrates the logical impossibility of an infinite series of past causes that he calls the Grim Reaper Paradox.[140] Let's say a man named Fred goes to bed at 10:00 p.m. Unbeknownst to Fred, a grim reaper (GR) is tasked with killing Fred at midnight if Fred is still alive at that time. But unbeknownst to the GR, there is another grim reaper tasked with killing Fred at 11:30. Let's call the grim reaper with the midnight shift GR1, and the 11:30 grim reaper GR2. If GR2 does his job as scheduled, GR1 will discover that Fred is already dead at midnight and get the night off. Here's where the story gets interesting.

Death Incorporated – the business that hires grim reapers – wants to be absolutely sure that Fred dies by midnight, so they secretly hire an infinite number of GRs to kill Fred. Each GR is scheduled to kill Fred at half the time of the next GR (between 11:00 and midnight):

- GR1 is scheduled to kill Fred at 12:00
- GR2 is scheduled to kill Fred at 11:30

[140]The version of the story that I offer here is faithful to Pruss' version, but I have taken some creative license with the details to make it more interesting and clear.

- GR3 is scheduled to kill Fred at 11:15
- GR4 is scheduled to kill Fred at 11:07:30
- GR5 is scheduled to kill Fred at 11:03:45
- GR6 is scheduled to kill Fred at 11:01:52.5
- GR7 is scheduled to kill Fred at 11:00:56.25
- GR8 is scheduled to kill Fred at 11:00:28.125
- …*ad infinitum*

With an infinite number of GRs tasked with killing Fred, surely Fred will not survive past midnight. So which GR killed Fred, and when did he die? Was it GR1 at midnight? No, because GR2 would have beat him to the task at 11:30. When GR1 observed Fred at midnight, Fred would have already been dead.[141] It must have been GR2, then, right? No, because before GR2 could kill Fred at 11:30, GR3 would have beat him to the task at 11:15. When GR2 observed Fred at 11:30, Fred would have already been dead. So did GR3 kill Fred? No, because before GR3 could kill Fred at 11:15, GR4 would have already done so at 11:07:30. You could repeat this process *ad infinitum* and you would never be able to identify the GR who killed Fred because every GR would be preceded by another GR that was scheduled to kill Fred at an earlier time. And yet, every GR would observe Fred dead at their appointed time. And herein lies the logical contradiction: Every GR would find Fred dead when they arrived at their appointed time, and yet you could not identify any particular GR who killed Fred. It cannot be true that Fred was both (1) dead and (2) that no GR killed Fred. Since an infinite number of causal entities leads to logical contradictions, there cannot be an infinite number of past causes. There must be a first cause.

Actual Infinities Cannot be Created via Successive Addition

The third philosophical argument for the finitude of the past is that infinities cannot be created by successive addition; i.e. by adding one member to another over time. Consider counting. Numbers are indefinite, not infinite. While there is no upper limit to how big a number might be, there is no such thing as an infinite number. Numbers are potentially infinite only. That's why you could never count to infinity by adding one number to the next.[142] Counting to infinity is logically impossible because you would have to complete and incompletable series of numbers, which is a contradiction. No matter how long you count, you will always be contemplating a finite number. No matter how large the number may be, you can always add more numbers and it would become larger still. While natural numbers are potentially infinite, they can never be actually infinite. You will never reach a point in your count at which the finite will be converted into the infinite. Anything that starts out finite will always be finite, no matter how many members you add to it.

If an infinite collection of things cannot be created by successively adding one member to another, then anything which has parts and was formed by successively adding one part to another cannot be infinite. Infinites, if they exist at all, would have to be produced all at once in one fell swoop.[143] The inability to

[141]If Fred was not dead at midnight, then GR1 would have killed him as tasked. Since GR1 did not kill Fred, Fred must have already been dead. The same could be said of every other GR. If Fred was not dead at 11:03:45, GR5 would have killed him. Since GR5 did not kill Fred at 11:03:45, Fred was already dead at 11:03:45. And so on.

[142]Infinity is not a number, but a mathematical concept indicating unboundedness. There is no such thing as an "infinite number" (nonsensical term).

[143]For example, it is conceivable that space could be infinite in size because space is the kind of thing that exists all at once (although we know that space is not infinite). However, time is not the kind of thing that can exist all at once. It exists in bits we call moments. Since the past is formed by adding one moment to the next instead of one fell swoop, the past could never be infinite.

create an infinity through successive addition is not a problem of time, but a problem with the nature of infinity itself.

How does this demonstrate the impossibility of an infinite past? The past did not pop into existence as a whole. It was formed by successively adding one moment/event to another. If you can't create an infinite through successive addition, and the past is created by a successive addition of moments, then the past cannot be actually infinite. In syllogistic form, the argument is as follows:

P1 A collection formed by successive addition cannot be actually infinite
P2 A temporal series of events is a collection formed by successive addition
_____
C Therefore a temporal series of events cannot be actually infinite

As David Hume noted, "An infinite number of real parts of time passing in succession...appears so evident a contradiction that no man whose judgment is not corrupted...would ever be able to admit of it."[144]

It is Impossible to Traverse an Actual Infinite

The fourth and final philosophical argument for the finitude of the past is the impossibility of traversing an actual infinite. Imagine that you were tasked with climbing an infinite staircase. Would you ever complete this task? Would you ever reach the top? No. No matter how long you had climbed, and no matter how many steps you had traversed, there would always be an infinite number of steps left to traverse. You would never reach the top. Or, consider an infinite pit. If you were pushed into an infinite pit, how long would it take to hit the bottom? No matter how long you were falling, and no matter how many miles you traversed, you would never reach the bottom because it is infinitely deep. It is impossible to traverse an actual infinite. Or, consider counting down an infinite number of negative numbers. Would you ever arrive at zero? No, because no matter how long you had been counting, you would always have an infinite number of negative numbers left to count.[145] For good measure, consider one final analogy. Imagine you were tasked with reading a book with an infinite number of pages. When would you complete the book? Never.

This logical impossibility reveals why an infinite past is impossible. If the universe is eternal, then an infinite number of past events preceded the present moment. But to arrive at the present moment, one would have to traverse an infinite number of prior moments. Since it is impossible to traverse an infinity, that means it would be impossible to arrive at the present moment. And yet here we are in the present moment, therefore it follows that there have not been an infinite number of moments before the present. Here is the argument in syllogistic form:

[144]David Hume, Enquiry, xii, Vol. 2, 125.

[145]Even if one could traverse the entire series of negative numbers to finally arrive at zero, this would lead to other logical problems. If they finished their count today, we should rightly ask them why they finished today rather than yesterday. After all, yesterday was preceded by an infinite amount of time. If an infinite number of negative numbers could be counted in an infinite time, and an infinite amount of time had passed by yesterday, then they should have completed their count yesterday. But since an infinite amount of time had also passed by the year 1903, then surely they should have completed their count by 1903. Why, then, did they finish today? For any point of time you pick in the past, that moment was preceded by an infinite amount of time, and thus they should have finished their count an infinite time ago. No matter how far you go back in the past, you should never observe them still counting because they would have finished the count infinitely earlier in time.

P1 An actually infinite number of moments has no terminus
P2 Today is the terminus of history

_____

C Therefore today was not preceded by an actually infinite number of moments

Kirk Durston writes:

> The fatal flaw in invoking mathematical models and theorems that describe a universe with an infinite past, where time *t* actually proceeds from minus infinity toward plus infinity, is that when applied to reality, every second of that actual countable infinite series must have actually occurred before we get to this particular time *t now*. No matter how long we counted down from *t minus infinity*, there would *always* be an infinite number of seconds still to go before we got to *t now*. In other words, the problem with an eternal past is that there would always be an infinite number of seconds to actually elapse before any particular historical event could occur, so it would never, ever occur. … The bottom line is that although we can construct all sorts of mathematical models of imaginary universes with an infinite past, they cannot work when applied to physical reality if we are to treat time as "real."[146]

J. L. Mackie objects to this argument on the grounds that an infinite can be divided into segments, and each segment can be traversed. If you add up each segment, the whole infinite will have been traversed. This objection misses the point on multiple levels. First, traversing any finite segment of an infinite set is not the issue. The issue is traversing the entire set.

Second, in an infinite set, there would be an infinite number of segments. It would not be possible to traverse an infinite number of segments.

Third, Mackie commits the fallacy of composition. This fallacy infers that an attribute properly belonging to the part also belongs to the whole. This fallacy is committed when one reasons that because every part of the elephant is light in weight, the whole elephant is light in weight.

In summary, then, the philosophical evidence strongly supports premise 2 that the universe began to exist. Coupled with the scientific evidence, the truth of premise 2 is firmly established.[147]

IDENTIFYING THE CAUSE: LOGICAL INFERENCES

Given the truth of premises 1 and 2, it follows logically that the universe has a cause (what we might call the "first cause"). This conclusion, however, does not include the word "God." How, then, is the KCA an argument for God's existence? Are we just arbitrarily assuming that God is the cause of the universe?

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[146]Kirk Durston, "Is Sean Carroll's Eternal Universe Actually Possible?"; available from http://p2c.com/students/blogs/kirk-durston/2014/04/sean-carrolls-eternal-universe-actually-possible; Internet; accessed 18 June 2014.

[147]It also rules out any religion or worldview that includes belief in an eternal universe, such as Hinduism and Buddhism. The Dalai Lama himself noted the difficulty this poses for Buddhism: "From the Buddhist perspective, the idea that there is a definite beginning is highly problematic. If there were such an absolute beginning, logically speaking, this leaves only two options. One is theism, which proposes that the universe is created by an intelligence that is totally transcendent, and therefore outside the laws of cause and effect. The second option is that the universe came into being from no cause at all. Buddhism rejects both these options." — Dalai Lama, *The Universe in a Single Atom* (Harmony, 2006), 82.

No. This conclusion follows from a logical analysis of the necessary properties the cause must possess to produce the universe.

Causes must be adequate to explain the effect in question.[148] Imagine if you heard a loud thump in a distant part of your house, and when you ask your son what happened, he responds, "I dropped a feather." You would immediately know he was lying because a feather is not adequate to produce the effect in question (thumping sound). Whatever caused the universe, then, must be adequate to explain the effect.

One way to discover the sorts of properties the cause must possess is by engaging in effects-to-cause reasoning. We start with the effects in need of explanation, and then ask ourselves what sort of properties the cause must possess to produce those effects. Minimally, the effects in question are the origin of time, space, and matter. If these properties originated with the universe, the cause of these properties cannot itself contain these properties. Whatever caused time to exist cannot itself be temporal. It must be eternal. Whatever caused space to exist cannot itself be spatial. It must be spaceless. Whatever caused matter to exist cannot itself be material. It must be immaterial. Minimally, then, the cause of the universe must be eternal, spaceless, and immaterial. In addition to these three properties, we can infer that the cause must also be powerful to explain the origin of massive amounts infused into the new universe.

None of these properties are unique to personal agents or minds, so they do not necessarily point to God as the cause of the universe. There are, however, two additional properties that need to be ascribed to this cause that are unique to personal agents: intelligence, volition. I will argue for these two attributes momentarily, but to give non-theistic causal options a fair shake, I don't want to foreclose on non-theistic causes just yet. So let's look at a number of non-theistic causes that have been proposed to explain the origin of the universe to see how well they match the properties we have discovered thus far. We'll examine each proposal for its causal adequacy, logical consistency, and/or plausibility.

Physical Object?

Could the cause of the universe be some prior physical object? No, for the simple reason that you can't have a material object prior to the origin of material reality. Atheist, Quentin Smith, agrees that there can be no natural, physical cause to the Big Bang because "it belongs analytically to the concept of the cosmological singularity that it is not the effect of prior physical events. The definition of a singularity...entails that it is impossible to extend the spacetime manifold beyond the singularity. … This rules out the idea that the singularity is an effect of some prior natural process."[149]

How does this option comport with the attributes necessary to the first cause? Not well. While the material object could plausibly be timeless and powerful, it could be neither immaterial (by definition) nor spaceless (since all physical objects are spatial in nature).

[148]Effect-to-cause reasoning is what philosophers call *demonstratio quia*: proof that proceeds from consequence to ground.

[149]Quentin Smith, "The Uncaused Beginning of the Universe," in *Theism, Atheism and Big Bang Cosmology,* by William Lane Craig and Quentin Smith (Oxford: Clarendon, 1993), 120, quoted in J.P. Moreland and William Lane Craig, *Philosophical Foundations for a Christian Worldview* (Downers Grove, IL: InterVarsity Press, 2003), 477.

Natural Law?

Could the cause of the universe be some sort of Platonic natural law? No, for at least three reasons. First, natural laws are not "things" that exist in some Platonic realm, but descriptions of the way nature normally behaves. They describe regularities and patterns of matter we observe in the physical world. We observe that B follows A once, B follows A again, and again, and again, etc., and from this we infer a law that whenever B, then A. While we may call such regularities "laws" because there are no exceptions to this behavior, we commit the error of reification if we assume that these laws exist as actual entities in the abstract or concrete worlds and are exerting causal influence on physical reality. Natural laws exist as mental concepts, but there is no reason to assume that they have mind-independent existence. Even the atheist Victor Stenger recognized this. He said the laws of nature "are not necessarily rules that govern the universe, that sit out there in some kind of Platonic reality," but "descriptions we have made of observations" that "describe aspects of reality."[150]

Second, natural laws originated concomitantly with the universe. Since natural laws are just descriptions of the way nature regularly behaves, natural laws cannot "exist" until the natural world exists. As such, natural laws would be part of the effect that needs to be explained, and thus cannot be the cause of that effect.

Third, even if natural laws are conceived of as independently existing immaterial realities that pre-exist the universe, this is also problematic. If they exist as some sort of abstract objects, they could not cause the universe since the defining feature of abstract objects is that they do not stand in causal relationships to concrete objects. If they exist as immaterial concrete objects, then the atheist must explain where such immaterial realities came from. He must also demonstrate that they are metaphysically necessary beings rather than contingent beings. Otherwise, the natural laws themselves would require a cause.

How does this option comport with the attributes necessary to the first cause? Since natural laws have no ontological basis in reality, no properties can be ascribed to it at all.

Self-caused?

Many thinkers have claimed that the universe caused itself to exist.

- Atheist philosopher, Daniel Dennett, agrees with both premises and the conclusion of the KCA, but says the cause of the universe is itself. The universe brings itself into existence. He writes: "What does need its origin explained is the concrete Universe itself, and as Hume…long ago asked: Why not stop at the material world? It…does perform a version of the ultimate bootstrapping trick; it creates itself *ex nihilo*. Or at any rate out of something that is well-night indistinguishable from nothing at all."[151]

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[150]Victor Stenger, "How to Answer Theist Arguments"; available from http://www.colorado.edu/philosophy/vstenger/how.html; Internet; accessed 28 January 2011.

[151]See Daniel Dennett, *Breaking the Spell: Religion as a Natural Phenomenon* (New York: Viking, 2006), 244. Willian Lane Craig pointed out in a debate with Dennett that the universe would have to exist before it existed. Dennett responded by saying this shows when you have plausible premises leading to an implausible conclusion, then we have to go back and deny one of the premises after all. The audio of the debate can be purchased at http://www.watchman.org/store/index.cfm?fuseaction=category.display&category_id=108.

- Stephen Hawking made a similar claim: "Spontaneous creation is the reason there is something rather than nothing, why the universe exists, why we exist. It is not necessary to invoke God to light the blue touch paper and set the universe going."[152]
- James Schombert, an observation astronomer at the University of Oregon, writes: "One thing is clear in our framing of questions such as `How did the Universe get started?' is that the Universe was self-creating. This is not a statement on a `cause' behind the origin of the Universe, nor is it a statement on a lack of purpose or destiny. It is simply a statement that the Universe was emergent, that the actual of the Universe probably derived from an indeterminate sea of potentiality that we call the quantum vacuum, whose properties may always remain beyond our understanding."[153]
- Atheist philosopher, Quentin Smith, writes: "The traditional atheist response is that the universe does not need an explanation of why it exists and therefore does not need a divine Creator to give an explanation. I reject this since I think the universe's existence does need and does have an explanation. The universe created itself."[154]

Despite the popularity of this view, it is logically absurd. For the universe to cause itself to exist, it would have to exist before it existed. That's like saying I gave birth to myself. This idea commits the bootstrapping fallacy. A person cannot pull himself up by his own bootstraps. Likewise, the universe cannot bring itself into existence. Keith Ward responds to this proposal by saying, "Between the hypothesis of God and the hypothesis of a cosmic bootstrap, there is no competition. We were always right to think that persons, or universes, who seek to pull themselves up by their own bootstraps are forever doomed to failure."[155]

How does this option comport with the attributes necessary to the first cause? Not at all. Even if the universe could cause itself, the cause would be material, spatial, and temporal. At best, one might conceivably ascribe power to the universe since the universe contains power.

Human Observers Create the Universe?

New Scientist editor, Amanda Gefter, thinks it is possible that human observers create the universe. She claims that humans "endow the universe with certain features by the mere act of observation. … [O]bservers are creating the universe and its entire history right now. If we in some sense create the universe, it is not surprising that the universe is well suited to us."[156]

This is philosophically absurd for many reasons. First, it would require backward-causation in which present causes (our observations) produce effects in the past. What philosophical or scientific reason is

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[152]Stephen Hawking and Leonard Mlodinow, *The Grand Design.*

[153]James Schombert, available from http://abyss.uoregon.edu/~js/21st_century_science/lectures/lec24.html; Internet; accessed 5 August 2008.

[154]Quentin Smith, in a debate with William Lane Craig on the topic "Does God Exist?", April 2003 at the Harvard Science Center, Harvard University.

[155]Keith Ward, *God, Chance and Necessity* (Oxford: One World Publications, 1996) 49. See https://thinkingtobelieve.com/2009/02/02/quentin-smith%e2%80%99s-version-of-the-self-caused-universe-as-a-response-to-the-kalam-cosmological-argument/ for my refutation of Smith's view.

[156]Amanda Gefter, "It Isn't as Simple as God vs the Multiverse," *New Scientists*, Issue 2685 (?), December 6, 2008; available from http://www.newscientist.com/article/mg20026852.500-why-its-not-as-simple-as-god-vs-the-multiverse.html; Internet; accessed 09 January 2009.

there to believe this is plausible, yet alone possible? We know the arrow of time only goes in one direction. Causes produce effects in the present, not the past.

Second, on presentism, only the present moment exists. The past once existed when it was the present, but it no longer exists. The future will exist when it becomes the present, but it does not yet exist. If the past no longer exists, how could the present affect it? You can't produce an effect in the past if the past does not exist.

Third, it is circular. Human observers were caused to exist by a long line of events that preceded us. The existence of the universe precedes its observers both logically and temporally. If observers caused the universe to exist, but the universe caused observers to exist, then observers must exist prior to existing. That is circular and incoherent.

Fourth, if our act of observation is the cause of the universe's existence, then prior to our observation (the cause) there was no universe (effect). If there was no universe, then what were we observers existing in to make our observations and what were we observing?

Fifth, if observers endow the universe with certain features by their act of observation, and observers observe different (and sometimes conflicting) things, why isn't the universe endowed with different laws and a different history simultaneously?

How does this option comport with the attributes necessary to the first cause? Not well. The cause would be material, spatial, and temporal. The only property the cause would possess is power, but the powers possessed by the cause are inadequate to produce the effect in question.

Mathematical Laws?

Paul Davies claims that "there's no need to invoke anything supernatural in the origins of the universe or of life. I have never liked the idea of divine tinkering: for me it is much more inspiring to believe that a set of mathematical laws can be so clever as to bring all these things into being."[157] It may be more inspiring to believe that, but it's not more rational. As John Lennox points out, mathematical laws cannot cause anything:

> However, in the world in which most of us live the simple law of arithmetic, 1+1 = 2, never brought anything into being by itself. It certainly has never put any money into my bank account. If I first put £1,000 into the bank and then later another £1,000, the laws of arithmetic will rationally explain how it is that I now have £2,000 in the bank. But if I never put any money into the bank myself and simply leave it to the laws of arithmetic to bring money into being in my bank account, I shall remain permanently bankrupt.[158]

If mathematical laws do not stand in causal relations to anything, then they cannot cause the universe to exist.

Also, it is a dubious claim that mathematical laws exist. If they exist, they would exist as abstract objects in some sort of Platonic realm. The existence of mathematical laws, then, depends on the truth of

[157]Interviewed by Clive Cookson, "Scientists who glimpsed God," *Financial Times*, April 29, 1995, p. 20.

[158]John Lennox, "Stephen Hawking and God"; available from http://www.rzim.eu/stephen-hawking-and-god; Internet; accessed 12 March 2011.

Platonism. I think there are very good reasons to conclude that Platonism is false and abstract objects do not exist, therefore I have reason to think mathematical laws do not exist. They only exist as mental concepts, so if mathematical laws were responsible for creating the universe, this would point us to a creative mind.

How does this option comport with the attributes necessary to the first cause? Since mathematical laws have no ontological basis in reality, no properties can be ascribed to it at all. If, however, mathematical laws exist as abstract objects they would be immaterial, spaceless, and eternal. There is no basis for ascribing power to them, however. Indeed, the *sine qua non* of abstract objects is their causal impotence; i.e. they do not stand in causal relationships to anything else including concrete objects such as the universe.

Abstract Object?

Could the cause of the universe be an abstract object that exists in some sort of Platonic realm? No. As just noted in reference to mathematical laws, there is good reason to doubt that Platonism is true. Even if it were true, the defining feature of abstract objects is their causal impotence. The number three, for example, cannot cause anything. If abstract objects cannot stand in causal relations, they cannot cause the universe to exist.

How does this option comport with the attributes necessary to the first cause? Since abstract objects do not exist, no properties can be ascribed to them. If, however, abstract objects did exist, they would be immaterial, spaceless, and eternal, but not powerful since they have no causal powers.

An As-of-Yet Unidentified Cause?

Some take a more agnostic approach to this question. They see the problems with all of the suggested causes, and recognize that none of them are adequate to produce the effect. However, they remain committed to a non-theistic cause and thus hold out hopes that though we may not be able to identify the cause yet, one day we will be able to do so.

I think this is an exercise in a misguided faith. Thinking that we might eventually identify a natural explanation for the universe's existence is like thinking that we'll eventually be able to explain how a person can give birth to himself. There can be no natural explanation for the beginning of the universe because the universe entails all physical reality. You can't have physical causes in operation prior to the beginning of physical reality. That's why science can never, even in principle, identify the cause of the physical universe. The domain of science is limited to the physical, and the physical only comes into existence with the universe. It belongs to the realm of philosophy and religion to give us insights about what caused the universe to exist.

God?

Having examined all of the non-theistic options and finding them wanting, we finally arrive at the theistic option: God caused the universe to exist. Obviously, theism does not win by default. We must have good reasons to think God is the causal entity that brought the universe into being. Does God have the necessary attributes we previously determined the first cause must have? Yes. A theistic being is immaterial, eternal, spaceless, and powerful. Additionally, He has two other attributes that are necessary to the first cause that require the first cause to be some sort of personal agent. I previously

identified these attributes as intelligence and volition. Now, I will demonstrate why these attributes are necessary to the first cause.

The universe exhibits an exquisite amount of fine-tuning and complexity. Not only are the values of the physical constants exquisitely fine-tuned for a life-permitting universe, but the initial conditions of the universe exhibit a level of fine-tuning that defies comprehension. Whatever caused such fine-tuning in the physical world must be extremely intelligent. Intelligence is a feature of mind, and thus it follows that the first cause must be a personal agent.

Volition

The first cause must possess the property of volition as well. To understand why, consider the nature of cause and effect.[159] When a cause is present the effect follows immediately. The moment the sufficient and necessary conditions are present (the cause), the effect will come into being. Consider a match. The moment you strike the match against an abrasive surface (the necessary and sufficient causal conditions), fire will emerge from the match (the effect). There is no temporal gap between the presence of the cause and the emergence of the effect. Imagine, then, a match that was struck an eternity ago. When would the match have lit? An eternity ago. It would be impossible to strike the match an eternity ago but the match to remain unlit until a finite time ago. Effects cannot be delayed. Once the cause is present, the effect immediately follows.

What about the universe, then? If the cause of the universe were eternal, then the effect (the universe) would also be eternal since a cause cannot exist without its corresponding effect. But we know the universe began to exist a finite time ago, so the cause of the universe must have been present only a finite time ago. This seems to contradict our earlier finding that the first cause must be eternal. What is the solution, then?

There is only one plausible scenario wherein the cause is eternal but the effect is temporal: an act of volition by a personal agent. Personal agents endowed with volitional powers exist prior to exercising their causal powers to bring about a specific effect. Personal agents can simply decide when to cause something without any prior determining conditions. As an eternal being, God has always existed. However, He "delayed" the exercise of His volitional powers to create the universe until such a time that it pleased Him to do so. As WLC observes:

> [I]f the cause of the universe were an impersonal set of necessary and sufficient conditions, it could not exist without its effect. The only way for the cause to be timeless and changeless but for its effect to originate *de novo* a finite time ago is for the cause to be a personal agent who freely chooses to bring about an effect without antecedent determining conditions."[160]

The cause that brought the universe into being was a specific act of volition made by an eternal agent, God. We can distinguish, then, because the *cause* and the *causer*. The *causer* of the universe is eternal, but the *cause* of the universe – God's act of willing the universe into being – occurred a finite time ago. An eternal agent, God, exercised His volitional powers a finite time ago to bring the finite universe into being. God's intention to create the universe was eternal, but He did not exercise His volitional powers

[159]This could be called an argument from the concurrence of cause and effect.

[160]William Lane Craig, "Beyond the Big Bang"; available from http://www.bethinking.org/viewall.php?ID=51; accessed 22 November 2008.

to act on that intention until the moment of creation. That volitional act constituted the first moment of time. As WLC writes:

> As a free agent God is able to exercise His causal power without any antecedent determining conditions. That is what differentiates a personal agent from an impersonal cause. Such an exercise is a change in God which plausibly draws Him into time at that moment. Thus, the moment of God's creating the universe is the moment at which the universe begins to exist. So God exists changelessly (though not immutably) without creation with a timeless intention that a world with a beginning exist, and by exercising His causal power brings such a world into being at the first moment of time. Of course, it makes no sense to ask why God didn't exercise His causal power sooner, since there was no "sooner"![161]

If volition is a necessary property of the first cause, and volition is a feature of the mind, then it follows that the first cause must be an unembodied, personal mind.

Event Causes vs. Agent Causes

There is yet one more reason to think the first cause must be a personal agent. There are only two types of causes: event causes, agent causes.[162] Either an event causes an effect, or a personal agent causes an effect.

What is an event cause? Event causes are impersonal causes dictated by the laws of physics. One physical event can start an unbroken causal chain of physical causes and physical effects. For example, the moving of tectonic plates causes the ground to shake, and the shaking ground causes the tree to fall, and the falling tree causes the roof to collapse, etc. One event causes another, and that effect becomes the cause of the next event. In contrast, an agent cause involves a personal agent (mind) who freely exercise his volitional powers to begin a new causal series or to interrupt an existing causal series. He simply decides to act. You might say an event cause describes "a what" whereas an agent cause describes "a who."

To illustrate the difference between these two types of causes, consider dominos. Imagine a line of dominos arranged vertically, standing in close proximity to each other. Now, imagine watching the dominos falling one by one, each domino pushing over the next. What caused each domino to fall? You can explain why the last domino fell by appealing to the domino before it, and you can explain why that domino fell by appealing to the domino before it. Event causes can explain why nearly every domino in the line fell, but eventually you will arrive at a domino for which there is no prior domino to explain why it fell. To explain why that first domino fell, you must appeal to a personal agent who knocked over the domino, beginning the whole causal chain.

Like dominos, every event requires a prior cause. What is the cause of the universe? It could not be a prior event because the coming into being of the universe is the first event. It's logically impossible to have an event prior to the *first* event. It follows, then, that the cause of the universe must be a personal agent.

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[161]William Lane Craig, "Wes Morriston on Divine Creation"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=7001; Internet; accessed 03 January 2011.

[162]Wes Morriston (Christian philosopher) agrees that cause has to be immaterial, timeless, non-spatial, but doesn't think it has to be personal. But he gives no third alternative as a possible cause, so why think there is any other option other than abstract object or personal mind?

Unlike event causes, agent causes do not require a prior cause or event to explain them because the nature of agents is that they start new causal chains. Agents simply decide. While we have reasons for doing things, they influence our acts of volition rather than determining them. A deciding will can move itself. Something else does not have to move it.

Since an eternal, spaceless, immaterial, intelligent, powerful, personal mind is what theists mean by "God," it is best to conclude that God is the cause of the universe.

Which God or Gods?

The conclusion that God caused the universe to exist is a monumental conclusion, but additional questions can still be asked regarding the identity of this God:

1. Is there only one God or many?
2. Is this God the God of theism (as I have heretofore assumed) or a lesser, finite god(s) worshipped by some other religion?
3. If it is the God of theism, is it the God worshipped by Muslims, Jews, or Christians?

Let's look at each question in turn:

(1) Is there only one God or many? While there is good reason to think there is only one *creator* God, that doesn't necessarily exclude the possibility that there are other gods. Let me explain. Since only one cause is needed for any single effect, it follows that there need only be one God to cause one universe. However, from this observation it doesn't follow that there cannot be more than one god. While only one god would be required to create the universe, there could be other gods who existed prior to that God (but have since ceased to exist), or other gods who existed alongside of the creator God who were not involved in the creation of the universe.

Is there any way to know, then, how many gods there are? Yes. I think two arguments can be made for monotheism. The first is based on the principle of parsimony (Occam's Razor): We should not multiply entities beyond what is needed to adequately explain the effect in question. Since only one God is needed to explain the origin of the universe, there is no reason to believe there is more than one God. The mere logical possibility that there could be other gods does not give us reason to think there are. The burden of proof would be on anyone wanting to postulate the existence of more than one God to explain why we should think polytheism is true.

While the principle of parsimony is instructive and highly directional, it alone is unable to eliminate polytheism and establish monotheism because it is based on probability rather than logical necessity. While one God may be sufficient to explain reality, that doesn't necessarily exclude the possibility that there are other gods. After all, only one human is needed to explain how a sandwich got made, but the fact of the matter is that many other humans exist besides the sandwich maker. Are there any arguments that would logically require the existence of only one God?

Some have argued for monotheism on the basis of divine omnipotence. Theists ascribe omnipotence to God because God is the greatest being possible. As the greatest being, He must possess the greatest amount of power possible. Omnipotence cannot belong to more than one being because omnipotence entails having "all power." If there was more than one god – and thus more than one omnipotent being – no one god would have all power. Power would have to be distributed among them.

The problem with this argument is that it falsely construes power as a substance. Power is not a substance that can be divided up and distributed. Power is simply the ability do some particular thing. If power were a substance, and if God has all power, then no one else could have any power whatsoever, including human beings. Clearly we have a limited amount of power, so clearly power cannot be a substance. To say a being is omnipotent is only to say that such a being possesses the ability to do anything that is logically possible to do.

There is another formulation of the argument from omnipotence that does not construe power as a substance. Any being who possesses the property of omnipotence must possess the ability to destroy other beings. What would happen, then, if there were two omnipotent beings? Let's call them Omnipotent Being A (OBA) and Omnipotent Being B (OBB). Could OBA destroy OBB (or vice-versa)? No, because OBB has the power to sustain His own existence. OBA, then, would lack the ability to destroy OBB. Since omnipotence requires that one be able to do all things that are logically possible, and it's logically possible to destroy OBB, OBA must not be omnipotent after all. The same would be true of OBB, leaving us without a being that is truly omnipotent. Since the property of omnipotence can only obtain in a world in which a single being possesses such a property, there can only be one divine being.

Does this formulation fare any better? No. It fails to take into account the fact that God is a metaphysically necessary being. Metaphysical necessity means a being cannot not exist. It must exist. If OBA and OBB are both God, then both are metaphysically necessary beings. It is metaphysically and logically impossible for either to cease to exist. Since omnipotence is the power to do what's logically possible and it's not logically possible to destroy a metaphysically necessary being, the fact that OBA could not destroy OBB does not count against OBA's omnipotence. This argument fails as well.

There is yet one more formulation of the argument from omnipotence that, I believe, proves successful in demonstrating monotheism. This formulation focuses on the power of volition more generally. An omnipotent being (OB) has power over everything. For any *x* that comes into being, it is either caused to exist by OB or passively allowed to come into being by OB. For example, OB may actively cause the creation of human beings, but passively allow human beings to create other things like cars and computers. If there were two omnipotent beings – OBA and OBB – for one being to act the other would have to passively allow him to do so. If OBA wanted to exercise his volitional power to cause *x*, OBB would have to allow OBA to do so. But what if OBB was not willing for OBA to cause *x*? There are only two possibilities: (1) OBA would be unable to cause *x*, or (2) OBA would cause *x*. Both scenarios are impossible if there were two OBs. If OBB could prevent OBA from causing *x*, then OBA is not truly omnipotent because he was unable to exercise his power in a logically possible manner. If, on the other hand, OBA was able to cause *x* despite the fact that OBB acted to prevent him from doing so, then clearly OBA's power is superior to OBB's, and thus it follows that OBB is not omnipotent after all. Only OBA is omnipotent, and thus only OBA is truly God. It seems, then, that it is not possible for more than one being to possess omnipotence, and thus there can only be one God.[163]

[163]The only way to escape the logic of this argument is to argue that there could never be a conflict of will between OBA and OBB or to argue that all conflicts of will would always be resolvable. I have never encountered an argument for either of these propositions, however, and I find it difficult to conceive how such an argument could be made. In the absence of any argument for either assertion, it stands to reason that the inevitable conflict of wills between two omnipotent beings makes it logically impossible for there to be more than one omnipotent being, and thus logically impossible for there to be more than one God.

(2) Is this one God the God of theism or a lesser, finite god(s)? If the creator God were a finite being without the perfections of the theistic God, then He would be a contingent being. Contingent beings require external causes, so there would have to be a second god that explains the existence of the creator God. There are two problems with this. First, we have already established that there is only one God, so there cannot be a second god to explain the existence of the finite creator God. It follows, then, that the creator God could not be a finite god. Second, this would invite an infinite regress because the second finite god would require an explanation in a third finite god, and the third finite god would require an explanation in a fourth finite god, *ad infinitum*. We've already established than in infinite regress is impossible, therefore the creator God cannot be finite. He must be the greatest conceivable being of theism who is metaphysically necessary and requires no causal explanation.[164]

(3) Now that we've established that the creator God is the God of theism, is He the God as represented by Islam, Judaism, or Christianity? Some may take this to be a meaningless question because it is assumed that all three religions have the same conception of God. This is not true given the fact that mainstream Christianity views God as a Trinity of persons whereas Muslims and Jews hold to strict monotheism. At best, one might think that Muslims and Jews worship the same God, but even this is highly debatable since each religion describes God's attributes, character, and activity differently.

Given the differences in each religion's conception of the creator God, which one truly represents Him? Even if we were unable to answer this question and narrow down the identity of God to one particular religion, the fact that we've been able to narrow it down to just three religions is itself impressive! In one fell swoop, all other religions and philosophical worldviews have been eliminated:

- A theistic cause rules out atheism and philosophical naturalism
- A personal cause rules out Christian Science, New Age beliefs, and Hinduism
- A monotheistic cause rules out all polytheistic religions such as Hinduism, animism, and Mormonism
- A transcendent cause for the universe rules out pantheism (the idea that God *is* the universe) and panentheism (the idea that God is *contained within* the universe)
- An eternal cause rules out temporally finite gods such the God of Mormonism.
- A finite universe rules out all religions and philosophies holding to an eternal universe such as Hinduism and Buddhism.

However, I do think it is possible to narrow it down to a single religion. A full case would require a separate research paper. For our purposes here, let me offer just one piece of evidence that I think forecloses on Christianity as being the one true religion: the resurrection of Jesus.

Jesus taught many things concerning God's identity and will. Some considered His teachings to be blasphemous, and executed Jesus on that basis. If Jesus was teaching false things about God, then Jesus deserved his fate. However, God raised Jesus from the dead. In doing so, God vindicated Jesus' teachings and claims. That means we can trust that Jesus' religious perspective was correct. Since Jesus' teachings differed from both Judaism and Islam, those religions cannot represent the most accurate view of God. Christianity alone tells us what the creator God is like.

[164]This trades on the contingency argument for God's existence. For a brief introduction, see https://thinkingtobelieve.com/2012/06/21/even-if-the-universe-is-eternal-it-still-needs-a-cause/ and https://thinkingtobelieve.com/2013/04/23/contingency-argument-for-gods-existence/.

The million dollar question, of course, is why we should believe Jesus rose from the dead. Answering that question is beyond the scope of this paper, but I have detailed the evidence elsewhere and refer you to those resources for more information (see the footnote for references).[165]

Could I be wrong? Could it be that the God of Christianity is not the cause of the universe? Given my fallibility as a human being, of course that is a possibility. However, possibilities come cheap. If you are disposed do disagree with the KCA or the logical inferences of the KCA, you can't just dismiss the argument based on some possibility or based on arguments from ignorance. You must demonstrate where it errs and provide good reasons to think the universe is past infinite, or that the universe just popped into existence out of nothing without a cause. That's a pretty tall order since both positions violate basic metaphysical intuitions, philosophical reasoning, and the best scientific evidence. Even if you think it's *possible* that the universe just popped into existence uncaused from nowhere, is that more reasonable to believe than the God hypothesis? If you had to bet your life on it, surely the safer bet is on something coming from something rather than something coming from nothing. Surely the safer bet is on the universe being caused rather than uncaused. And of all the causal options, none matches the explanatory scope and power of theism. Remember, you are betting your life on this!

TIPS AND TACTICS FOR PRESENTING THE KCA

It's one thing to know the ins-and-outs of the KCA, but an entirely different matter to be able to communicate the argument in a way that people can quickly and easily grasp. Here are some tips and tactics for presenting the KCA to others.

First, try to keep it brief and simple. I would suggest learning the brief form of the argument as I presented it in the beginning of this paper.

Second, try to keep it informal. I would not advise presenting the KCA in its syllogistic form. Most people will get lost as soon as you start speaking of "premises." Find a way of restating the argument in an informal way. For example, you might say: "We all know that if something began to exist, it had to be caused to exist by something else. And since we know from science and philosophy that the universe began to exist, that means the universe had to be caused by something else too." Then, show how the properties of that cause match the description of God:

- The cause must be eternal, non-spatial, and immaterial to cause time, space, and matter to come into existence.
- The cause must be powerful to bring a universe full of energy into being.
- The cause must be intelligent to explain the fine-tuning of the initial conditions and physical constants of the universe.
- And finally, the cause must be personal to explain how the effect could be delayed in time.

Third, prime the pump. You don't have dive straight into the argument right out of the gate. Start by asking a series of questions that tap into the keys to the KCA. For example, someone must embrace the causal principle to be persuaded by the KCA, so you might ask them "Do you believe there can be effects without causes?" or "Do you believe you can get something from nothing?" If they answer in the

[165]For a short case, see https://thinkingtobelieve.com/2019/04/21/the-historical-evidence-for-the-resurrection-of-jesus-a-short-case-2/. For a fuller treatment, see http://onenesspentecostal.com/resurrection.htm.

affirmative, this commits them to the principle of causality and will make their acceptance of premise 1 more likely when it is presented to them later.

A more lighthearted way to communicate the causal principle is to use analogies. You could ask, "Do you think I would be rational if I maintained that books come into being uncaused without authors?" or "Do you think I would be rational if, upon hearing a knock on the door, I claimed that the door knocked itself?"

You can also prime the pump for premise 2 by talking about the Big Bang. Make it clear that the Big Bang predicts an absolute origin of time, space, and matter, and stress that this is the Standard Model of cosmology accepted by virtually all cosmologists. If they agree, it leaves less room for objections to premise 2 of the KCA when you present it to them later.

OBJECTIONS TO THE CONCLUSION OF THE KCA[166]

It should be no surprise that not everyone is willing to accept the premises or conclusion of the KCA. There are a number of objections raised against it. Before we engage those objections, it should be noted that one cannot simply dismiss the argument. They must demonstrate how one or both of the premises are mistaken, or show why God is not the best causal explanation for the universe. It is intellectually dishonest to simply reject the conclusion of the argument generally, or the logical inference to God more specifically, without offering a better alternative. With that said, let's review the objections.

Objection #1: *If everything needs a cause, then who or what caused God? If you say God has no cause, then why couldn't the same be true of the universe?*

Response #1: This is, by far, the most common objection to the KCA. Many have raised it:

- Carl Sagan: "If we say that God has always been, why not save a step and conclude that the universe has always been?"[167]
- Paul Davies: "Dumping the problem in the lap of a pre-existing designer is no explanation at all, as it merely begs the question of who designed the designer."[168]
- Bertrand Russell: "I may say that when I was a young man, and was debating these questions very seriously in my mind, I for a long time accepted the argument of the First Cause, until one day, at the age of eighteen, I read John Stuart Mill's Autobiography, and I there found this sentence: "My father taught me that the question, Who made me? cannot be answered, since it immediately suggests the further question, Who made God?" That very simple sentence showed me, as I still think, the fallacy in the argument of the First Cause. If everything must have a cause, then God must have a cause. If there can be anything without a cause, it may just as well be the world as God, so that there cannot be any validity in that argument.[169]

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[166]See https://thinkingtobelieve.com/2010/12/08/unwarranted-skepticisim-of-premises-in-theistic-arguments/ for a discussion regarding unwarranted skepticism regarding theistic arguments.

[167]Carl Sagan, *Cosmos* (New York: Random House, 1980), 257.

[168]Paul Davies, "Yes, the universe looks like a fix. But that doesn't mean that a god fixed It"; available from http://www.guardian.co.uk/comment/story/0,,2111345,00.html; Internet; accessed 29 June 2007.

[169]Bertrand Russell, "Why I Am Not a Christian," Haldeman-Julius Publications, Girard, Kansas, 1929 as quoted in Scott Pruett, "Who Made God?"; available from

- Richard Lewontin: “God, the Bible, and religion in general are not mentioned in the doctrine of ID. Rather, it is claimed that an objective examination of the facts of life makes it clear that organisms are too complex to have arisen by a process of the accumulation of naturally selected chance mutations and so must have been purposefully created by an unspecified intelligent designer. An alien from outer space? But the theory of ID is a transparent subterfuge. The problem is that if the living world is too complex to have arisen without an intelligent designer, then where did the intelligent designer come from? After all, she must have been as complex as the things she designed. If not, then we have evolution! Otherwise we must postulate an intelligent designer who designed the intelligent designer who..., back to the original one who must have been around forever. And who might that be? Like the ancient Hebrews the ID designers fear to pronounce Her name lest they be destroyed, but Her initials are clearly YWH.”[170]
- Richard Dawkins: “To explain the origin of the DNA/protein machine by invoking a supernatural Designer is to explain precisely nothing, for it leaves unexplained the origin of the Designer. You have to say something like 'God was always there', and if you allow yourself that kind of lazy way out, you might as well just say 'DNA was always there', or 'Life was always there', and be done with it.”[171]
- Richard Dawkins again: “Most of the traditional arguments for God’s existence, from Aquinas on, are easily demolished. Several of them, such as the First Cause argument, work by setting up an infinite regress which God is wheeled out to terminate. But we are never told why God is magically able to terminate regresses while needing no explanation himself.”[172]
- Lawrence Krauss: “[T]he declaration of a First Cause still leaves open the question, ‘Who created the Creator?’ After all, what is the difference between arguing in favor of an eternally existing creator versus an eternally existing universe without one?”[173]
- Steven Pinker: “Nor is there a more abstract role for God to play as the ultimate first cause. This trick simply replaces the puzzle of ‘Where did the universe come from?’ with the equivalent puzzle ‘Where did God come from?’”[174]
- John Horgan: “If life didn’t begin here, how did it begin out there? Creationists are no doubt thrilled that origin-of-life research has reached such an impasse, but they shouldn't be. Their explanations suffer from the same flaw: What created the divine Creator?”[175]

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http://www.lifeway.com/lwc/article_main_page/0%2C1703%2CA%253D158622%2526M%253D200169%2C00.html; Internet; accessed 30 March 2005.

[170]Richard Lewontin, “The Wars Over Evolution” in New York Review of Books, Vol. 52, Num. 16, October 20, 2005, reviewing Michael Ruse’s *The Evolution-Creation Struggle*, Harvard University Press. Available from http://www.nybooks.com/articles/18363; Internet; accessed 03 October 2005.

[171] Richard Dawkins, *The Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe Without Design* (W.W. Norton & Co: New York NY, 1986), 141.

[172]Richard Dawkins, “Richard Dawkins Explains His Latest Book” available from http://richarddawkins.net/mainPage.php?bodyPage=article_body.php&id=170 as of 9/20/06, but subsequently removed on 9/23/06. It was reproduced at http://id-idea.blogspot.com/2006/09/richard-dawkins-explains-his-latest.html; Internet; accessed 03 October 2006.

[173]Lawrence Krauss, *A Universe from Nothing: Why There is Something Rather than Nothing* (New York: Simon & Schuster Inc., 2012), xii.

[174]http://www.templeton.org/belief/

[175]John Horgan, “Pssst! Don't tell the creationists, but scientists don't have a clue how life began”; available from http://www.scientificamerican.com/blog/post.cfm?id=pssst-dont-tell-the-creationists-bu-2011-02-28; Internet; accessed 15 March 2011.

- Rebecca Goldstein: “Who caused God? The Cosmological Argument a prime example of the Fallacy of Passing the Buck: invoking God to solve some problem, but then leaving unanswered that very same problem when applied to God himself. The proponent of the Cosmological Argument must admit a contradiction to either his first premise — and say that though God exists, he doesn't have a cause — or else a contradiction to his third premise — and say that God is self-caused. Either way, the theist is saying that his premises have at least one exception, but is not explaining why God must be the unique exception, otherwise than asserting his unique mystery (the Fallacy of Using One Mystery To Pseudo-Explain Another). Once you admit of exceptions, you can ask why the universe itself, which is also unique, can't be the exception. The universe itself can either exist without a cause, or else can be self-caused. Since the buck has to stop somewhere, why not with the universe?”[176]

Given the atheist’s confidence that this objection is a one-punch knockout of both the KCA and the notion of theism itself, they might be surprised to discover that it is multiply flawed.

First, even if theists agreed that the creator God also had to be caused, it would do nothing to invalidate the conclusion of the KCA. It if fallacious to assume that one must know the cause of *x* to know that *x* caused *y*. I don’t know who my great grandparents are, and thus I don’t know who caused my grandparents to exist, but that does nothing to negate the fact that I know my grandparents caused me to exist (via my parents) and my great grandparents caused my grandparents to exist. Assuming that God had a cause, the fact that theists could not identify who or what caused God does not argue against identifying God as the cause of the universe. You don’t have to know the cause of the cause to know that the latter caused effect *y.* As WLC writes:

> In order to recognize an explanation as the best, one needn't have an explanation of the explanation. This is an elementary point concerning inference to the best explanation as practiced in the philosophy of science. If archaeologists digging in the earth were to discover things looking like arrowheads and hatchet heads and pottery shards, they would be justified in inferring that these artifacts are not the chance result of sedimentation and metamorphosis, but products of some unknown group of people, even though they had no explanation of who these people were or where they came from. Similarly, if astronauts were to come upon a pile of machinery on the back side of the moon, they would be justified in inferring that it was the product of intelligent, extra-terrestrial agents, even if they had no idea whatsoever who these extra-terrestrial agents were or how they got there. In order to recognize an explanation as the best, one needn't be able to explain the explanation. In fact, so requiring would lead to an infinite regress of explanations, so that nothing could ever be explained and science would be destroyed.[177]

Even atheist, Luke Muehlhauser, recognizes that it is fallacious to require an explanation of the explanation before accepting the validity of the immediate explanation at hand. He writes:

> I *agree* that “God did it” is generally a terrible, horrible, no good, very bad “explanation” for complexity or, well, pretty much anything. “God did it” *does* generally fail as an explanation. But it does *not* fail merely because the theist has no explanation for his explanation (God). That is *not* the problem with offering “God did it” as an explanation. The problem with offering “God did it” as an explanation is that such an explanation has low plausibility, is not testable, has poor consistency with background

[176]Rebecca Goldstein, “36 Arguments for the Existence of God”; available from https://www.edge.org/conversation/36-arguments-for-the-existence-of-god; Internet; accessed 03 February 2022.

[177]William Lane Craig, "What do you think of Richard Dawkins' argument for atheism in The God Delusion?"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=5493; Internet; accessed 27 April 2007.

> knowledge, comes from a tradition (supernaturalism) with extreme explanatory failure, lacks simplicity, offers no predictive novelty, and has poor explanatory scope. It fails to provide almost everything philosophers and scientists look for in a successful explanation. *That* is why "God did it" is generally a horrible explanation, *not* because it leaves the explanation itself (God) unexplained. Let us ask ourselves what would happen if we required that a successful explanation must itself be explained.
> This would lead immediately to an infinite regress of explanations. We would need to have an explanation of the explanation, and an explanation of the explanation of the explanation, and an explanation of the explanation of the explanation of the explanation… on into infinity. And thus, we would never be able to explain *anything*. Moreover, this is not how science works. Examples from physics are the most obvious. In order to explain certain quantum phenomena, scientists have posited the existence of dozens of invisible particles with very particular properties that yield predictable results. These have been some of the *most* successful explanations in all of scientific history, yielding the *most* accurate experimental results we have ever achieved. And yet we have *no explanations whatsoever* for the particles that we have offered as explanations for the quantum phenomena.
> …
> It doesn't *matter* that we have no explanation whatsoever for the explanations themselves. … So the problem with the atheist sacred cow of "Who designed the designer?" is that it misses the point. "God did it" *is* a horrible explanation, but *not* because theists can't tell us what the explanation for the designer is. There are *other* reasons why "God did it" is generally a horrible explanation, and *that* is what atheists should be trying to communicate. … When a believer offers "God did it" as the best explanation for something, our question should *not* be "Well then who designed the designer?" but instead "Why is God the best explanation for that? Will you explain, please?"[178]

Second, it fails to understand premise 1 of the KCA. The claim is not that *everything* requires a cause, but rather that things which *begin to exist* require a cause. If everything requires a cause it would lead to an infinite regress, which is philosophically impossible. Premise 1 clearly allows for things that never began to exist (eternal things) to be uncaused. Indeed, something must be eternal and uncaused because if there was ever a time when nothing existed, there would be nothing still. Since there is something now, something must have always existed. That something cannot be the universe since we know the universe has a finite past, so it must be something beyond the universe.[179]

Third, the objection is a straw man. Theists hold that God is eternal and uncaused. As an eternal being, God needs no cause.[180] It does not make any sense, then, to ask what caused an uncaused being. By definition, He has no cause.

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[178]Luke Muehlhauser, "Who Designed the Designer?"; available from http://commonsenseatheism.com/?p=6113; Internet; accessed 21 October 2011.

[179]See https://thinkingtobelieve.com/2023/09/08/theistic-arguments-2-the-impossibility-of-nothingness/ for my theistic argument based on the impossibility of nothingness.

[180]Notice I said "as an eternal being, God *needs* no cause." I did not say God *cannot* be caused. I raise this issue because some theists have misunderstood premise 1 of the KCA. They have reasoned that if things which begin to exist must be caused, then the negation of premise 1 is also true, namely that things which do not begin to exist cannot be caused. This commits the fallacy of denying the antecedent, which takes the following form:

P1 If A, then B
P2 Not A
_____
C Therefore not B

Applied to God, the argument would look like this:

P1 Anything that begins to exist must be caused
P2 Some *x* did not begin to exist
_____

Given the theistic conception of God, it is meaningless for the atheist to ask the theist what caused God.[181] However, it does make sense to ask what caused the universe because the universe is a contingent being. It does not have to exist, and indeed, has not always existed. I find it interesting that when atheists thought the universe was eternal, they assumed it was uncaused and needed no

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C Therefore some *x* did must not be caused

To help you see the error in this reasoning, let's substitute God and causes for Bono and citizenship:

P1 If Bono is an American citizen, then he is a human being

P2 Bono is not an American citizen

C Therefore Bono is not a human being

While it's true that things which begin to exist must have a cause, it does not follow that all eternal things are uncaused merely in virtue of being eternal. As I established earlier with the ball and cushion thought experiment, even eternal things can be caused. Any contingent being, whether temporally finite or eternal in nature, requires a cause. Only metaphysically necessary beings are uncaused. To conclude that God cannot be caused, then, one must demonstrate both that (1) God is eternal and (2) God is a metaphysically necessary being. I think Christians have successfully argued for the truth of both propositions. Here are four reasons to think God cannot be caused:

The first reason is the truth of monotheism. If there is only one God, then God cannot be caused for the simple fact that there is nothing available to serve as His cause. Prior to the creation of finite spiritual beings and the physical universe, God existed alone.

Second, we have good reasons to think that God is metaphysically necessary. I've already argued that an infinite regress is philosophically impossible. Contingent beings require causes, so if everything that exists is a contingent being, we would have an infinite regress of causes. The only way to terminate an infinite regress of causes is with a metaphysically necessary being who serves as the first, uncaused cause. In other words, to terminate the regress, the causal chain must terminate with a necessary being who has no chronologically or logically prior cause, that serves as the cause for all other beings.

Third, given Occam's Razor, there is no reason to think the cause of the universe has a logically prior cause apart from some argument for that conclusion.

Fourth, successful versions of the ontological argument can demonstrate that God is uncaused. If God is the greatest conceivable being, and if it is greater to have being within oneself rather than to derive it from some external source, then God must be an uncaused, necessary being.

[181]There is a difference between causes and explanations. As Edward Feser explains, "Causation is a metaphysical notion, having to do with the source from which a thing derives some aspect of its being. But explanation is a logical notion, having to do with the way in which we understand or make sense of some aspect of a thing's being." Something may be in need of an explanation without it requiring a causal explanation. Though God has no cause, we may still wonder why He exists. Given the principle of sufficient reason, surely there must be an explanation for why God exists.

The principle of sufficient reason holds that everything which exists has a reason why it exists, either in a necessity of its own nature (it's the nature of *x* that *x* must exist, and cannot not exist = necessary being) or in an external cause (contingent being). Contingent beings have both an explanation and a cause for their existence (the cause is the explanation for why they exist), whereas necessary beings only have explanations (since eternal beings have no cause). God did not come into being so he has no cause, but he does have an explanation: He exists because His very nature requires that He exist (as the greatest conceivable being, He must exist since it is greater to have one's existence necessarily than it is to have one's existence contingently). He is a metaphysically necessary being who cannot not exist. He is the ground of all being.

Again, Feser explains: "We cannot coherently say that a thing derives its existence from itself or its nature, for that would entail, absurdly, that the thing or its nature exists prior to itself, in an ontological sense even if not a temporal sense. But we can coherently say that a thing's existence can be made sense of in terms of its nature, for that has to do, not with where a thing 'gets' its existence from — an absolutely necessary being doesn't get it from anywhere — but rather with how we can make intelligible or understand its existence." See https://thinkingtobelieve.com/2010/10/28/causes-vs-explanations/ for more information.

explanation. But the moment one postulates the existence of an eternal God, they immediately object that God would need a cause as well. If they did not think an eternal universe needed a cause, why think an eternal God needs one?

Objection #2: *God is more complex than what needs to be explained. As such, God is not a good explanation for the origin of the universe.*

Response #2: John Lennox has pointed out that if an explanation cannot be more complex than what needs to be explained, then we can't conclude that a human person is the explanation for the contents of a book since a human being is much more complex than the book.

Granted, a complex being cannot be the ultimate reality because any being composed of parts needs a cause that explains how those parts were assembled. But God is not a being consisting of discrete, physical parts. He is an unembodied, immaterial mind. There is a distinction between a complexity of structure and a complexity of function. God is simple in regards to the former, and only complex in regards to the latter.

Besides, since causes must be greater than their effects, if God had a cause, it is reasonable to assume that His cause would be more complex than Him. The further you go down the causal chain, the more complex of a cause you would need. Given the fact that we know an infinite regress is impossible, and given the principle of parsimony, there is no reason to posit causal entities beyond God.

Objection #3: *The principle of parsimony (Occam's Razor) holds that we should prefer the simpler explanation. Trying to account for the origin of the universe by positing an eternal, infinite, complex being is the most complex explanation imaginable. We should prefer a simpler, natural explanation.*

Response #3: The principle of parsimony does not claim that the explanation with the fewest causal entities is to be preferred, but rather that the explanation that posits the fewest causal entities *capable of explaining the effect* in question is to be preferred. As WLC writes:

> Ockham's Razor tells us not to posit causes beyond necessity. That is to say, we are justified in postulating only such causes as are necessary to explain the effect; any more would be gratuitous. In the case of the universe, Ockham's Razor shaves away polytheistic explanations of the origin of the universe, since only one transcendent, personal Creator is necessary. On atheism there just is no explanation of the origin of the universe. And no explanation is not a simpler explanation.[182]

We've already shown that there can be no natural explanation for the origin of physical reality because there is no natural world prior to the origin of the natural world. To prefer a natural explanation, then, would be to prefer no explanation. How can the absence of any causal entity explain an effect? While postulating the absence of a causal entity is simpler than postulating the presence of a casual entity, it cannot be considered a more parsimonious explanation because it fails to explain the effect in question. At least one causal entity is required to explain any given effect. While Occam's Razor can be invoked to argue for monotheism against polytheism, it makes no sense to invoke the Razor on behalf of atheism.

[182]William Lane Craig, "Time and the Kalam Cosmological Argument"; available from http://www.reasonablefaith.org/time-and-the-kalam-cosmological-argument; Internet; accessed 11 May 2012.

To those who wish to apply the principle of parsimony to the origin of the world and claim that it is simpler if we say the universe popped into existence uncaused from absolutely nothing than to postulate an even more complex being who caused it to exist, we could say of their writings: "Yes, we could postulate an author to explain the origin of these specified and complex encoded markings, but that would be to add an extremely complex entity into the picture to explain a less complex entity. The principle of parsimony demands, therefore, that it is more reasonable to believe the book wrote itself."

Objection #4: *Whether one chooses to terminate the regress with God or the universe, it is arbitrary.*

Response #4: The universe is an effect, so you cannot terminate the causal string with the universe. A causal string can only be terminated in a cause. In the case of ultimate causation, the regress can only be terminated in an uncaused, first cause.

Furthermore, the universe is a contingent being. As such, it requires an external cause for its existence. Only a metaphysically necessary being such as God can terminate the causal regress since metaphysically necessary beings exist by a necessity of their own nature.

Objection #5: *The universe does not need a cause because the universe is not something, but nothing. The negative energy associated with the gravitational field cancels out the positive force associated with matter, with a net energy of zero. Just as zero is the sum of all negative and positive numbers, nothing is the sum of all positive and negative energy. If the universe is really nothing, then nothing came into being and therefore needs no cause.*

Response #5: Edward Tryon was the physicist who first suggested that the universe could come from nothing because the net energy of the universe is almost zero when you add up the energy of gravitational attraction (negative) with the mass of the universe (positive).[183] Others have followed suit. John Gribbin claims that since the positive energy associated with mass is offset by the negative energy associated with gravitation, the origin of the universe is not getting "something for nothing" but "*nothing* for nothing."[184] Physicist, Victor Stenger, tried to avert a cause for the universe by saying there is a "close balance between positive and negative energy" so that "the total energy of the universe is zero."[185] And again Stenger writes:

> Prior to the twentieth century, the simple fact that the universe contains matter also provided strong evidence for a creation. At the time it was believed that matter was conserved, and so the matter of the universe had to come from somewhere. In 1905 Einstein showed that matter could be created from energy. But where did that energy come from? This remained unanswered for almost another century until accurate observations with telescopes determined that an exact balance exists between the positive

[183]Antony Flew and Roy Abraham Varghese, *There is a God: How the World's Most Notorious Atheist Changed His Mind* (New York: Harper One, 2007), 170.

[184]John Gribbin, *In Search of the Big Bang* (New York: Bantam Books, 1986), 374, as quoted in *Naturalism: A Critical Analysis*, eds. William Lane Craig and J.P. Moreland (n.c.: Routledge, 2000), 236, as found at http://books.google.com/books?id=_7zhXEMmcvQC&pg=PA216&lpg=PA216&dq=%22the+universe+was+regarded+as+fixed%22&source=web&ots=nokGB2mxl2&sig=HvclUjdOqFm9Dq31j-4Rmdp2m0Q&hl=en; Internet; accessed 02 April 2008.

[185]From David Ludden's April 4, 2007 review of Victor Stenger's new book, *God: The Failed Hypothesis*, for Skeptic magazine's e-zine.

> energy of matter and the negative energy of gravity. So, no energy was required to produce the universe. The universe could have come from nothing.[186]

Alexander Vilenkin suggests same thing:

> Modern physics can describe the emergence of the universe as a physical process that does not require a cause. Nothing can be created from nothing, says Lucretius, if only because the conservation of energy makes it impossible to create nothing [sic; something?] from nothing. ... There is a loophole in this reasoning. The energy of the gravitational field is negative; it is conceivable that this negative energy could compensate for the positive energy of matter, making the total energy of the cosmos equal to zero. In fact, this is precisely what happens in a closed universe, in which the space closes on itself, like the surface of a sphere. It follows from the laws of general relativity that the total energy of such a universe is necessarily equal to zero. ... If all the conserved numbers of a closed universe are equal to zero, then there is nothing to prevent such a universe from being spontaneously created out of nothing. And according to quantum mechanics, any process which is not strictly forbidden by the conservation laws will happen with some probability. ... What causes the universe to pop out of nothing? No cause is needed."[187]

Stephen Hawking chimed in as well:

> We were taught that you never get something for nothing, but now, after a lifetime of work, I think that, in fact, you can get a whole universe for free. The great mystery at the heart of the Big Bang is to explain how an entire, fantastically enormous universe of space and energy can materialize out of nothing. The secret lies in one of the strangest facts about our cosmos. The laws of physics demand the existence of something called negative energy. … Imagine a man wants to build a hill on a flat piece of land. The hill will represent the universe. To make this hill he digs a hole in the ground, and uses that soil to build his hill. But of course, he's not just making a hill. He's also making a hole. In effect, a negative version of the hill. The stuff that was in the hole has now become the hill, so it all perfectly balances out. This is the principle behind what happened right at the beginning of the universe. When the BB [Big Bang] produced a vast amount of positive energy, it simultaneously produced the same amount of negative energy. In this way, the positive and the negative add up to zero, always. … So where is all this negative energy today? It's in the third ingredient in our cosmic cookbook: It's in space. This may sound odd, but according to the laws of nature concerning gravity and motion…space itself is a vast store of negative energy, enough to ensure that everything adds up to zero. I'll admit that unless mathematics is your thing, this is hard to grasp, but it's true. The endless web of billions upon billions of galaxies—each pulling on one another by the force of gravity – acts like a giant storage device. … So what does that mean on our quest to find out if there is a God? It means that if the universe adds up to nothing, then you don't need a God to create it. The universe is the ultimate free lunch.[188]

There are at least two problems with this objection. First, it would commit us to the absurd position that nothing exists – not in the sense that no thing exists, but in the sense that there is something that exists which is called nothing. If the universe were truly nothing it would be non-existent. There would be no matter and no gravity.

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[186] http://www.templeton.org/belief/

[187] Alexander Vilenkin, "The Beginning of the Universe," *Inference: International Review of Science* 1/ 4 (Oct. 23, 2015), http://inference-review.com/article/the-beginning-of-the-universe, as quoted in William Lane Craig, "Vilenkin on the Universe's Coming into Being without a Cause"; available from http://www.reasonablefaith.org/vilenkin-on-the-universes-coming-into-being-without-a-cause#ixzz4pfX0kc7n; Internet; accessed 13 August 2017.

[188] http://www.youtube.com/watch?v=fmYlbqtAYOQ&feature=player_embedded, 24:40—29:00

Second, this objection employs a simple bookkeeping trick. The sum total of positive numbers may be equal to the sum total of negative numbers, such that they equal exactly zero, but this is not nothing. You still have a collection of positive numbers, a collection of negative numbers, and the operation that adds them together.

The reasoning behind this objection is similar to reasoning that because the weight of the person on one side of a teeter-totter is exactly equal to the person on the other side of the teeter-totter, the persons are nothing and do not require a cause. Even if the negative energy associated with the gravity contained in space is equal to the positive energy contained in matter – such that the two are in perfect balance – the fact of the matter is that both gravity and matter are existents. They don't cancel themselves out in the sense that they annihilate themselves like anti-matter does when it encounters matter. The gravitational force is something, and matter is something. Neither is nothing. Both are something, and thus need a cause. "In the case of the universe, you still need a cause to explain the origin of the positive and the negative energy in the first place, even if when summed together their net balance is zero."[189]

Objection #6: *The KCA may be sound, but it does not give you a good, loving, omniscient God who hears your prayers, knows your thoughts, and forgives sins.*

Response #6: It's true that the KCA does not and cannot provide evidence for every property of the Christian God, but that is not its aim and, therefore, not a liability to the argument. The aim of the argument is to demonstrate the existence of a personal creator God who is powerful, intelligent, eternal, and immaterial. Other theistic arguments aim to demonstrate other theistic properties such as love and goodness. For example, the moral argument demonstrates that God is good while the ontological argument demonstrates that God is omnibenevolent. Only when you combine the conclusions of the various theistic arguments do you get a full-orbed view of God.

Also, this is an odd objection when coming from an atheist. If the KCA is sound, then it demonstrates the existence of some sort of deity, even if it's not the Christian God. As such, the KCA disproves atheism. An atheist who is not willing to embrace the God of Christianity, but is willing to accept that there is a personal, eternal, immaterial, spaceless, intelligent god of some sort is surely making progress! That's a giant leap away from atheism, but only a small step away from Christianity.

Objection #7: *True nothingness (the absence of being) has no properties, and thus no potentiality. As such, God cannot cause something to come into being from nothingness. Even if it was possible to exert a causal influence on nothing, something would never emerge from nothing because nothing has no potential to become something.*

Response #7: I agree that (1) nothingness has no potential to become something and (2) that it is impossible to exert causal influence on nothingness (i.e. something cannot stand in a causal relationship to nothingness); however, this does not preclude God from creating the universe out of nothing. The objector misunderstands what theists mean when we say God created the universe out of nothing (*ex nihilo*). We do not mean God's causal powers were directed at some *x* (nothing) to transform it into *y* (the universe). What theists mean when we say God created the universe *ex nihilo* is that God acted to

[189]William Lane Craig, "Hawking's Curious Objections to Divine Creation"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=8987; Internet; accessed 16 August 2011.

bring something into existence that had not previously existed. God did not use any pre-existing materials to create the universe, but simply willed for the universe to come into being. God's causal powers were not directed *at* anything, but rather *for* something. He simply willed that a universe to come into being (the cause), and it did (the effect). The causal relation is two-steps (God > universe), not three (God > nothing > universe).

The objector may also be presuming that an effect requires both an efficient and material cause. While most effects we are familiar with do have a material cause, not all do. When Charles Schultz created Snoopy, he did not create him out of a material substance. He brought him into being by willing him into being in his mind (and then, only later, transferring the newly created Snoopy to the material world via material mediums such as pencil and paper). Snoopy had an efficient cause (Schultz), but not a material cause.

Objection #8: *If God exists, He would be an unembodied mind. The notion of an unembodied mind is too abstract to be taken seriously. We are well acquainted with physical brains, but not immaterial minds. It doesn't even make any sense to speak of an unembodied mind.*

Response #8: There are at least three reasons to reject this line of thinking. First, there is nothing logically incoherent about a disembodied mind. The notion may not be familiar to our experience, but we ought not confuse familiarity with plausibility. A person raised in the remote parts of the jungle has never seen ice, but his lack of familiarity with ice does not mean the existence of ice is implausible. Neither would his unfamiliarity with ice constitute good grounds for rejecting the evidence for ice that is presented to him. Likewise, just because we are not personally acquainted with the idea of an unembodied mind does not mean an unembodied mind does not, or cannot exist. Neither does our unfamiliarity constitute good grounds on which to reject the evidence being presented for the existence of such a mind. The KCA provides good warrant for believing that such a mind actually does exist, and thus we should accept this despite its queerness.

Second, even if we are not personally familiar with *unembodied* minds, we are very familiar with the concept of *embodied* minds and its causal powers because each of us has a mind. In other words, even if the specific *form* of the mind in question is unfamiliar to us, the *function* of a mind very familiar to us: minds exercise causal agency. And I see no reason to think this capacity is dependent on our mind being embodied. The property of causal agency belongs to the mind, not the body, so there is no reason to think an unembodied mind cannot exercise its powers to cause the universe.

A case could even be made that human minds do not have to be embodied, and indeed, become disembodied upon death. I am thinking in particular of empirical studies of near-death experiences (NDEs). While many claims of an NDE are unverifiable, a small minority are veridical and have been documented in the medical literature. NDEs demonstrate that consciousness continues beyond death and independent of the brain.[190] So I don't think the idea of an unembodied mind is abstract or that we have no acquaintance with this concept. Even if most of us are unacquainted with it experientially, we are acquainted with the concept, and there is nothing incoherent about the concept. Strange, maybe, but incoherent, no.

[190]In some cases, the person is conscious of things happening outside of the room where their body was lying (things they could not have possibly known, even if their body were functioning normally). See Gary Habermas and J. P. Moreland's book *Beyond Death* for additional information regarding research into NDEs.

Finally, if one wishes to dismiss the possibility of an unembodied personal mind creating the universe on the basis that it is too weird to be true, they need to offer a more plausible alternative. Given the properties required of the first cause, I cannot fathom what alternative they could suggest. We have already examined all of the known possibilities and found each of them severely wanting. Absent a better explanation, the atheist is left with having to embrace the notion that the universe popped into existence uncased from nothing. Given the fact that the causal principle is one of the strongest metaphysical intuitions and enjoys undisputed empirical confirmation, this will not do.

Objection #9: *There is no way for an immaterial mind to cause effects in the physical realm, yet alone to cause physical reality to come into being.*

Response #9: This objection presumes that immaterial agents cannot product material effects. I have no reason to believe this is true, especially when the immaterial agent is an omnipotent being. As a proof of concept, consider human souls/minds. If humans have souls (and I believe the empirical evidence for the existence of the soul in the form of medically-documented near-death experiences, as well as the philosophical evidence, is beyond compelling), our souls interact with the physical world all the time – particularly our physical bodies. If immaterial human souls can interact with the physical world, there is no reason to think God would be unable to do so.

Objection #10: *The KCA commits the fallacy of composition by assuming that since everything within the universe has a cause, the universe as a whole must have a cause as well.*

Response #10: The KCA does not argue that since everything within the universe has a cause, therefore the universe must have a cause. Rather, the KCA argues that everything that comes into being requires a cause. If that premise is true, it applies equally to things within the universe as well as the universe as a whole. In other words, the KCA is grounded in the causal principle which says effects must have a corresponding cause. If the universe is an effect, then it would also have to have a corresponding cause.

Additionally, advocates of the KCA would point out that the universe, like everything within the universe, is a contingent being. Since contingent beings require external causes, the universe itself requires an external cause.

Objection #11: *The existence of God is so extraordinary that while uncased effects are unlikely, they are more likely than the existence of God.*

Response #11: Is the existence of God more extraordinary than uncaused effects? While it is extraordinary to think that the causal principle fails with respect to the origin of physical reality (given the uniformity of our experience of this causal principle and the irrationality of something coming into being from absolutely nothing without a sufficient reason), why should we think the existence of a transcendent, perfect being is extraordinary? Or perhaps the better question is why a perfect transcendent being should be thought of as more extraordinary than an uncaused effect?

While one might argue that what makes God extraordinary is that we have never encountered anything like Him in our ordinary experience, surely that is not as extraordinary as the idea of an uncaused effect or something coming from nothing. These violate our metaphysical intuitions, whereas God does not. Surely something that violates our uniform experience and basic metaphysical intuitions should be thought more incredible than something we merely have no experience of (although billions of people have claimed to have experiences of God).

Objection #12: *Immateriality, spacelessness, and timelessness are negative attributes. They tell you what something is not – not what something is. These negative attributes, then, describe nothing. A being who is defined by such negative attributes is indistinguishable from nothing. If the first cause has no positive properties, then the first cause does not exist. "God" is just a semantic reification of nothingness.*

Response #12: We have already demonstrated the positive existence of the first cause, so it cannot follow from the observation that immateriality, spacelessness, and timelessness are negative attributes that the first cause has a negative existence; i.e. does not exist. We know there is a first cause. All that remains to be determined is what this first cause is like.

Even negative properties are informative. By telling you what something is not like, it gives you a better understanding of what they are like. For example, let's say I am describing my friend to you. Let' call him Tom. You do not know anything about Tom, other than the fact that Tom exists. If I told you Tom is uneducated and penniless, I would only be telling you what Tom is not, but in so doing, you gain more knowledge about Tom than you had before, namely that Tom is not smart or wealthy. As WLC noted, "[T]he attribution of negative predicates like timelessness, changelessness, spacelessness, and so on to this entity is enormously informative and metaphysically significant. From its timelessness and immateriality we can deduce its personhood…. This is a positive property of great significance and utterly unlike nothingness."[191]

Secondly, negative properties such as immateriality, spacelessness, and timelessness are not the only properties we discovered for the first cause. We also determined the first cause must be powerful, intelligent, personal, and possess the powers of volition. These are undoubtedly positive properties, thereby undoubtedly establishing a positive ontology for the first cause.

Objection #13: *The KCA is only persuasive to those who already believe in God.*

Response #13: While theists will surely be more welcoming of the conclusion to the KCA than atheists since it fits within the theists' current worldview but not the atheists', both can be and should be equally persuaded.[192] The cogency of any philosophical argument depends on the veracity of its premises. Not only are both premises more plausible than their negations, but we have good reasons for thinking that both of them are true with a high degree of certainty.

Second, neither of the premises of the KCA require religious commitments or presuppositions. The first premise is rooted in metaphysical intuitions that few would deny (being only comes from being, and effects require causes), and even fewer would claim is less plausible than its contradictory. The second premise is confirmed by multiple points of empirical science as well as multiple philosophical arguments. It follows from these religiously-neutral premises that the universe requires a cause. This conclusion

[191]William Lane Craig, "Objections So Bad I Couldn't Have Made Them Up (or, the World's Ten Worst Objections to the *Kalam* Cosmological Argument)"; unpublished paper as of 13 March 2011.

[192]For materialists, matter is the metaphysical ultimate. As such, the materialist would prefer to believe that matter has always existed, for if matter had a beginning, it invites the question of where matter came from and calls into question the belief that matter is the metaphysical ultimate. The materialist understands that a metaphysical ultimate should be something eternal, not something temporal. It's much more difficult to believe that materialism is true if material reality had a beginning.

follows from an exercise of rationality, not religious presuppositions or religious authorities such as the Bible. It's true that the conclusion has theistic implications when you consider what kind of cause would be required to bring the universe into being, but the KCA itself is religiously neutral.

One can't admit that the premises of the KCA are true and that the conclusion follows from those premises while at the same time dismissing God as the cause of the universe unless they have good reasons to doubt the logical analysis concerning the nature of the first cause. Absent good reasons to doubt that analysis, and in the absence of any superior alternative, there is no reason to doubt the conclusion – atheist, theist, or otherwise.

Objection #14: *Why can't we just admit that we don't know what caused the universe? Perhaps the cause will be discovered some day, but we just don't know right now.*

Response #14: The objector wants to plead ignorance, but it's simply not true that we don't know what the cause of the universe is. When we perform a logical analysis on the necessary properties of the cause, it leads to a list of attributes that perfectly describe the God of theism. The reason we can't just admit that we don't know what caused the universe, then, is that this would be a false statement. We do know. The evidence clearly favors the theistic hypothesis.

In my estimation, the objector wants to plead ignorance for one of two reasons. Either (1) he is limiting the causal hypotheses to scientific or naturalistic hypotheses, or (2) he does not like where the evidence points to. Regarding (1), it is true that we currently have no good naturalistic/scientific explanations for what caused the universe; however, it would be pointless to hold out hope that such an explanation will be discovered in the future. As discussed previously, it is impossible, in principle, for science to explain what caused the universe because the cause must be supernatural in nature. There can be no natural cause to the origin of the natural world in the same way you cannot cause your own birth.

Regarding (2), the objector must come to terms with the fact that there can be no naturalistic explanation for the origin of the universe, and that the evidence overwhelmingly points to God as the cause. We do know what caused the universe, and the what is a who. He may not like the metaphysical or moral implications of this conclusion, but reality does not change to fit our desires and preferences. We live in a world created by God, and the sooner we come to terms with that the better.

Appendix

ALTERNATIVE EXPLANATIONS FOR THE ORIGIN OF THE UNIVERSE

To avoid the singularity of the Standard Model with its theistic implications, cosmologists in the latter half of the 20th century began proposing a spate of alternative models. These models were put forward – not because the Standard Model failed to account for the evidence – but for philosophical and religious reasons: Scientists wanted to avoid the theistic implications entailed by an absolute beginning of physical reality.

Each of these alternative models are wrought with problems. Some have been roundly disconfirmed by the physical evidence (Steady State Theory, oscillating universe, etc.). Other models are little more than exercises in metaphysical cosmology, not empirical science. As David Berlinski writes: "Until recently, the great physicists have been scrupulous about honoring the terms of their contract. They have attempted with dignity to respect the distinction between what is known and what is not. … This scrupulousness has lately been compromised. The result has been the calculated or careless erasure of the line separating disciplined physical inquiry from speculative metaphysics. Contemporary cosmologists feel free to say anything that pops into their heads."[193] Even the great physicist, John Polkinghorne, agrees: "Let us recognise these speculations for what they are. They are not physics, but in the strictest sense, metaphysics. There is no purely scientific reason to believe in an ensemble of universes. By construction these other worlds are unknowable by us."[194]

Some of these models have no empirical evidence in their favor. Even those that do fail to rise to the level of confirmation garnered for the Standard Model. Other models rely on mathematical fictions (Hawking's quantum gravity theory, quantum fluctuation models). Some of the mathematics used in these models, such as string theory, haven't even had all their equations formulated yet, yet alone worked out. Leonard Susskind, a leading string theorist, noted in *The Cosmic Landscape* that "one might facetiously say that String Theory is the ultimate epitome of elegance. With all the years that String Theory has been studied, no one has ever found a single defining equation! The number at present count is zero. We know neither what the fundamental equations of the theory are or even if it has any."[195] Steven Weinberg concurs:

> String theory is attractive because it incorporates gravitation, it contains no infinities, and its structure is tightly constrained by conditions of mathematical consistency, so apparently there is just one string theory. Unfortunately, although we do not yet know the exact underlying equations of string theory, there are reasons to believe that whatever these equations are, they have a vast number of solutions. I have been a fan of string theory, but it is disappointing that no one so far has succeeded in finding a solution that corresponds to the world we observe.[196]

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[193]David Berlinski, "Was there a Big Bang?", Commentary, 1998, p. 29.

[194]John Polkinghorne, *One World* (London, SPCK, 1986) 80.

[195]Leonard Susskind, *The Cosmic Landscape* (New York: Little, Brown and Company, 2006), 204.

[196]Steven Weinberg, "Physics: What We Do and Don't Know" in *The New York Review of Books*; available from http://www.nybooks.com/articles/archives/2013/nov/07/physics-what-we-do-and-dont-know/; Internet; accessed 04 November 2013.

Given the current state of string theory, it's a bit premature to pretend that cosmogenic models of the universe based on string theory can compete with the Standard Model. It's one thing to talk about what is logically possible, but quite another to prove that this is physical possible, yet alone physical reality.

It is not enough to say the universe is past infinite because the equations in some mathematical model of an eternal universe are internally consistent. What works on paper doesn't necessarily work in reality. After all, we can tell lies with math. Physicist, Stephen Barr, writes:

> Physics scenarios and theories are merely mathematical stories. They may be fictional or describe some reality. And just as the words of a book by themselves can't tell you whether it's fact or fiction—let alone have the power to make the world they describe real—so with the equations of a physics scenario. …[E]quations may turn out to be an accurate description of some reality, but cannot not confer reality on the things they describe.[197]

Tim Maudlin agrees: "I myself think that…people have just been misled, largely by mistaking the mathematics they use to describe reality for reality itself."[198] One may be able to write a consistent mathematical formula to describe an eternal universe, but that does not prove that such an equation represents reality.

Another problem with these alternative models that purport to restore an eternal universe is that they can never be confirmed empirically. How so? For the simple reason that it is impossible to empirically verify the existence of any infinite, yet alone an infinite past. To see why, imagine trying to verify the existence of an infinite staircase through empirical means. To determine if it were infinite, you would have to walk the stairs. Even if you had been walking the stairs for a trillion years, you couldn't conclude that it was infinite because for all you know the last step could be just a year ahead of you. You would have to keep walking on and on and on. You would never reach a point at which you could conclude that the stairs is infinite. That's why no cosmogenic model that purports to show an eternal universe/multiverse could ever be verified scientifically. Only philosophy can determine if the infinite is possible, and the philosophical arguments against the possibility of the existence of an infinite are overwhelmingly opposed to it. That means any mathematical equations describing an eternal universe can't represent reality. It's just a mathematical fiction.

A final point to make is that none of the alternative models, even if true, actually avoid an ultimate beginning to physical reality. As Alexander Vilenkin said, "The answer to the question, 'Did the universe have a beginning?' is, 'It probably did.' We have no viable models of an eternal universe. The BGV theorem gives us reason to believe that such models simply cannot be constructed."[199]

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[197]Stephen Barr, "Much Ado About "Nothing": Stephen Hawking and the Self-Creating Universe"; available from http://www.firstthings.com/onthesquare/2010/09/much-ado-about-ldquonothingrdquo-stephen-hawking-and-the-self-creating-universe; Internet; accessed 09 September 2010.

[198]Tim Maudlin, "What Happened Before the Big Bang? The New Philosophy of Cosmology"; available from http://www.theatlantic.com/technology/archive/2012/01/what-happened-before-the-big-bang-the-new-philosophy-of-cosmology/251608/; Internet; accessed 11 March 2016.

[199]Alexander Vilenkin, "The Beginning of the Universe," available from http://inference-review.com/article/the-beginning-of-the-universe; Internet; accessed 31 May 2018.

With that as an introduction, let's look in more detail at each of the most prominent alternative models.[200]

Steady State Theory

The Steady State Theory (SST) was developed by Fred Hoyle, Hermann Bondi, and Thomas Gold in 1948 as a direct competitor to the Standard Model. On the SST, the universe is eternal but expanding. As the universe expands, new matter is drawn into being *ex nihilo* in the void left by the galactic recession. Hoyle explained where the new matter came from by positing a C-field (creation field) of negative energy. He arbitrarily asserted that the density of the universe must remain constant.[201] The obvious advantage to the SST is that if there was no beginning to the universe, a cause would seem to be unnecessary.

Hoyle had metaphysical reasons for wanting to find an alternative to the Standard Model: "This most peculiar situation is taken by many astronomers to represent the origin of the universe. The universe is supposed to have begun at this particular time. From where? The usual answer, surely an unsatisfactory one, is: from nothing."[202] And again he writes, "To many people this thought process seems highly satisfactory, because a something outside physics can then be introduced at t=0. By a semantic manoeuvre, the word 'something' is then replaced by 'god,' except that the first letter becomes a capital, 'God,' in order to warn us that we must not carry the inquiry any further."[203] Hoyle would rather have matter continually being created from nothing than for all matter to be created at once by a divine being. Surely the former is more unbelievable than the latter!

There are multiple problems with the SST:

1. It violates the First Law of Thermodynamics which holds that matter is not being created.
2. There was little empirical support for the theory other than the data that the universe was expanding.
3. The discovery that more radio galaxies existed in the past than the present showed that the universe was different in the past than it is today.
4. The SST predicted the existence of very young galaxies, but none were found.[204]
5. Light elements like helium, hydrogen, and deuterium could only be formed (nucleosynthesis) under the extreme, hot conditions of the Big Bang (not stars). The SST did not have a good mechanism for creating these elements.

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[200]I am heavily indebted to William Lane Craig's analysis in "Beyond the Big Bang"; available from http://www.bethinking.org/viewall.php?ID=51; accessed 22 November 2008. For a more detailed look at the alternative models and what is wrong with them, see William Lane Craig's collaboration with physicist James Sinclair in *The Blackwell Companion to Natural Theology* (eds. William Lane Craig and J. P. Moreland).

[201]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 98-9.

[202]Fred Hoyle, *Astronomy Today* (London: Heinemann, 1975), 165.

[203]Fred Hoyle, *Astronomy and Cosmology: A Modern Course* (San Francisco: W. H. Freeman, 1975), 684-5, as quoted in William Lane Craig and Quentin Smith, *Theism, Atheism, and Big Bang Cosmology* (Oxford: Clarendon Press, 1993), 46.

[204]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 104-5.

6. The discovery of the cosmic background radiation showed that the universe once existed in a hot state, and thus was different then than it is today. Penzias and Wilson, the co-discoverers of the CBR were once SST advocates, but changed their mind upon their discovery.

Hoyle was eventually forced to give up his own theory by the force of the data, saying, "I philosophically liked the Steady State. And clearly I've had to give that up."[205]

Oscillating Models

Oscillating models of the universe were developed in the 1960s and 1970s. It suggests that the universe has undergone an infinite series of expansions and contractions. Each expansion will contract back in on itself and result in another Big Bang. You might call this the Big Bang Bang Bang Bang *ad infinitum* theory.

The force of gravity is said to overtake the expansion of the universe, causing it to contract. The oscillating theory denied that matter is homogenous (evenly distributed throughout the universe) and isotropic (the same in every direction), so when the universe collapses back in on itself it will not collapse into a singularity. Some matter will pass by the collapse, causing the next bang. This process has been going on forever.

There are a number of problems with the oscillating model:

1. Entropy is preserved from cycle to cycle

Because entropy would be preserved from cycle to cycle, the maximum radius of the universe would increase each cycle. If we rewound the tape, the radius of the universe would get smaller. Eventually, you would end up with a singularity.

2. There is a limit to the number of oscillations due to entropy

Even if the universe were oscillating in a series of bangs and crunches, it is not physically possible to have more than 100 such oscillations due to the entropy limits of the universe. WLC writes:

> But even if we … suppose that the universe does oscillate, the fact is that the thermodynamic properties of this model imply the very beginning of the universe which its proponents seek to avoid. For the thermodynamic properties of an oscillating model are such that the universe expands farther and farther with each successive cycle. Therefore, as one traces the expansions back in time, they grow smaller and smaller. As one scientific team explains, "The effect of entropy production will be to enlarge the cosmic scale, from cycle to cycle. ... Thus, looking back in time, each cycle generated less entropy, had a smaller cycle time, and had a smaller cycle expansion factor than the cycle that followed it." Novikov and Zeldovich of the Institute of Applied Mathematics of the USSR Academy of Sciences therefore conclude, "The multicycle model has an infinite future, but only a finite past." As another writer points out, the oscillating model of the universe thus still requires an origin of the universe prior to the smallest cycle.[206]

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[205]Quoted in Fred Hareen, *Show Me* God (Wheeling, IL: Daystar, 2000), 157, quoted in Norman Geisler and Frank Turek, *I Don't Have Enough Faith to Be an Atheist* (Wheaton, IL: Crossway Books, 2004), 85.

[206]William Lane Craig, "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 26 February 2016.

Just like a ball, the universe can only "bang" so many times before it would fizzle out and lay dormant. That means the universe cannot be eternal, even if it oscillates.

3. There is not enough density to reverse the collapse into a new expansion.

As the late Professor Tinsley of Yale explains, in oscillating models "even though the mathematics say that the universe oscillates, there is no known physics to reverse the collapse and bounce back to a new expansion. The physics seems to say that those models start from the Big Bang, expand, collapse, then end."[207] The universe's observed density is at most only half of what is needed to force a collapse (to overcome the force of gravity). WLC writes:

> [T]he density of the universe appears to be insufficient for the re-contraction of the universe. For the oscillating model to be even possible, it is necessary that the universe be sufficiently dense such that gravity can overcome the force of the expansion and pull the universe back together again. However, according to the best estimates, if one takes into account both luminous matter and non-luminous matter (found in galactic halos) as well as any possible contribution of neutrino particles to total mass, the universe is still only about one-half that needed for re-contraction. Moreover, recent work on calculating the speed and deceleration of the expansion confirms that the universe is expanding at, so to speak, "escape velocity" and will not therefore re-contract. According to Sandage and Tammann, "Hence, we are forced to decide that ... it seems inevitable that the Universe will expand forever"; they conclude, therefore, that "the Universe has happened only once."[208]

4. The oscillating model contradicts the homogeneity of matter distribution throughout the universe.

5. Even if the matter in the universe were inhomogeneous and non-isotropic, the Hawking-Penrose theorems predict that a singularity will still emerge through which nothing can pass.[209] WLC writes:

> [T]he observed homogeneity of matter distribution throughout the universe seems unaccountable on an oscillating model. During the contraction phase of such a model, black holes begin to gobble up surrounding matter, resulting in an inhomogeneous distribution of matter. But there is no known mechanism to iron out these inhomogeneities during the ensuing expansion phase. Thus, the homogeneity of matter observed throughout the universe would remain unexplained.[210]

6. It was discovered in 1998 that the expansion is accelerating (dark energy, cosmological constant), not decelerating, making a recontraction impossible.[211]

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[207]Personal letter to William Lane Craig. Quoted in "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 26 February 2016.

[208]William Lane Craig, "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 26 February 2016.

[209]See their paper at http://en.wikipedia.org/wiki/Penrose%E2%80%93Hawking_singularity_theorems.

[210]William Lane Craig, "The Existence of God and the Beginning of the Universe"; available from http://www.leaderu.com/truth/3truth11.html; Internet; accessed 26 February 2016.

[211]Dark energy finally overcome the gravitational pull that was slowing down the expansion until 7 billion years after creation. Once the universe became large enough, the space-energy density came to predominate.

7. An infinite number of past bangs is philosophically impossible. There must be a first bang, and scientists would have to tell us what caused that first bang.

Inflationary Multiverse

Alexander Vilenkin has suggested an inflationary multiverse theory in which an infinite number of universes exist, each caused by rapid inflation from a false vacuum high energy density state to a true vacuum low density state. This process goes on infinitely into the future, although it began a finite time ago. WLC describes the theory as follows:

> In order to ensure everlasting inflation, Vilenkin hypothesizes that the scalar fields determining the energy density and evolution of the false vacuum state were characterized by a certain slope which issued in a false vacuum expanding so rapidly that, as it decays into pockets of true vacuum, the "island universes" thereby generated in this sea of false vacuum, though themselves expanding at enormous rates, cannot keep up with the expansion of the false vacuum and so find themselves increasingly separated with time. New pockets of true vacuum will continue to form in the gaps between the island universes and become themselves isolated worlds. Moreover, each island is subdivided into subdomains which Vilenkin calls O-regions, each constituting an observable universe bounded by an event horizon. Despite the fact that the multiverse is finite and geometrically closed, Vilenkin claims that the false vacuum will go on expanding forever, constantly generating new worlds. At this point Vilenkin executes a nifty piece of legerdemain. As the island universes expand, their central regions eventually grow dark and barren in accordance with the second law of thermodynamics, while stars are constantly forming at their ever-expanding perimeters. We should think of the decay of false vacuum to true vacuum going on at the islands' expanding perimeters as multiple Big Bangs. From the global perspective of the inflating multiverse, these Big Bangs occur successively over time, as the island boundaries grow with time. In the global time of the multiverse, each island is at any time finite in extent though growing."[212]

Here are some problems with Vilenkin's model:

1. It depends on a B-theory of time.

All "past" and "future" big bangs exist in a timeless state in the static block multiverse. But if an A-theory of time is correct, then even if there will be an infinite number of universes forming in the future, there is not an infinite number right now (the number formed since the beginning).

2. It violates thermodynamic laws.

Eternal inflation would require an infinite amount of energy (in violation of the first law of thermodynamics) or an eternal amount of finite energy that is never used up (in violation of the second law of thermodynamics).

3. There is no evidence for primordial scalar fields.

Primordial scalar fields are postulated to govern the inflation into the infinite future, but there is no evidence for the existence of scalar fields. Vilenkin admits as much: "Another important question is

[212]William Lane Craig, "Multiverse and the Design Argument"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=5741; Internet; accessed 20 August 2008.

whether or not such scalar fields really exist in nature. Unfortunately, we don't know. There is no direct evidence for their existence."[213]

4. The universe is too big.

WLC explains:

> Wholly apart from its speculative nature, however, the multiverse hypothesis faces a potentially lethal problem, which Vilenkin doesn't even mention. Simply stated, if our universe is but one member of an infinite collection of randomly varying universes, then it's overwhelmingly more probable that we should be observing a much different universe than that which we in fact observe. … Roger Penrose of Oxford University has calculated that the odds of our universe's low entropy condition obtaining by chance alone are on the order of $1:10^{10(123)}$, an inconceivable number. If our universe were but one member of a multiverse of randomly ordered worlds, then it is vastly more probable that we should be observing a much smaller universe. For example, the odds of our solar system's being formed instantly by the random collision of particles is about $1:10^{10(60)}$, a vast number, but inconceivably smaller than $10^{10(123)}$. (Penrose calls it "utter chicken feed" by comparison [*The Road to Reality* (Knopf, 2005), pp. 762-5]).[214]

5. It can't avoid an initial singularity in light of the BGV theorems.

Vilenkin, along with Arvind Borde, recognizes that it's impossible to avoid an initial singularity, and hence a beginning to physical reality. Regarding inflationary models, they write: "A physically reasonable spacetime that is eternally inflating to the future must possess an initial singularity…. The fact that inflationary spacetimes are past incomplete forces one to address the question of what, if anything, came before."[215] And again, a "universe…in a state of eternal inflation without a beginning…is in fact not possible in future-eternal inflationary spacetimes as long as they obey some reasonable physical conditions."[216]

Vilenkin himself writes: "Loosely speaking, our theorem [the Borde-Guth-Vilenkin theorem] states that if the universe is, on average, expanding, then its history cannot be indefinitely continued into the past. More precisely, if the average expansion rate is positive along a given world line, or geodesic, then this geodesic must terminate after a finite amount of time. Different geodesics, different times. The important point is that the past history of the universe cannot be complete."[217] And again: "It is said that an argument is what convinces reasonable men and a proof is what it takes to convince even an unreasonable man. With the proof now in place, cosmologists can no longer hide behind the possibility of a past-eternal universe. There is no escape, they have to face the problem of a cosmic beginning."[218]

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[213]William Lane Craig, "Vilenkin's Cosmic Vision: A Review Essay on *Many Worlds in One*," in *Philosophia Christi*, Vol. 11, Number 1, 2009, p. 232-3.

[214]William Lane Craig, "Multiverse and the Design Argument"; available from http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=5741; Internet; accessed 20 August 2008.

[215]Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review Letters* 72 (1994): 3305, 3307.

[216]Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review* Letters 72 [1994]: 3305, 3307. Available at http://arxiv.org/pdf/gr-qc/9312022.pdf.

[217]Alexander Vilenkin, "The Beginning of the Universe," available from http://inference-review.com/article/the-beginning-of-the-universe; Internet; accessed 31 May 2018.

[218]Alexander Vilenkin, *Many Worlds in One* (New York: Hill and Wang, 2006), 176.

The beauty of the BGV theorem is that it holds true even apart from a specific theory of quantum gravity. Vilenkin explains:

> A remarkable thing about this theorem is its sweeping generality. We made no assumptions about the material content of the universe. We did not even assume that gravity is described by Einstein's equations. So, if Einstein's gravity requires some modification, our conclusion will still hold. The only assumption that we made was that the expansion rate of the universe never gets below some nonzero value, no matter how small. This assumption should certainly be satisfied in the inflating false vacuum. The conclusion is that past-eternal inflation without a beginning is impossible.[219]

Chaotic Inflation

Andrei Linde has proposed that the universe exists in an eternal state of inflation. As it inflates, there are regions within the Universe where inflation ends, causing mini-universes to begin within the larger Universe. Each mini-universe has its own Big Bang, just like ours. This process has been going on from eternity past and will continue into the infinite future. Alexander Vilenkin does a good job of explaining this model:

> Inflation is a period of super-fast, accelerated expansion in early cosmic history. It is so fast that in a fraction of a second a tiny subatomic speck of space is blown to dimensions much greater than the entire currently observable region. At the end of inflation, the energy that drove the expansion ignites a hot fireball of particles and radiation. This is what we call the big bang.
> The end of inflation is triggered by quantum, probabilistic processes and does not occur everywhere at once. In our cosmic neighborhood, inflation ended 13.7 billion years ago, but it still continues in remote parts of the universe, and other "normal" regions like ours are constantly being formed. The new regions appear as tiny, microscopic bubbles and immediately start to grow. The bubbles keep growing without bound; in the meantime they are driven apart by the inflationary expansion, making room for more bubbles to form. This never-ending process is called eternal inflation. We live in one of the bubbles and can observe only a small part of it. No matter how fast we travel, we cannot catch up with the expanding boundaries of our bubble, so for all practical purposes we live in a self-contained bubble universe.[220]

Sean Carroll, a theoretical physicist at Caltech, adds some important details as well:

> Inflation was conceived in 1980 by MIT physicist Alan Guth to explain why the observable universe is so flat and smooth, with galaxies distributed evenly throughout space and with almost exactly the right amount of mass to balance out its expansion. The idea is that immediately after the Big Bang, the universe was trapped in a state called a false vacuum, in which empty space was filled with an incredible amount of energy. The false vacuum was unstable, like a radioactive atom waiting to decay. Eventually it broke down into the ordinary vacuum of space as we know it, releasing tremendous amounts of matter and radiation. In the process, an extremely small patch of space inflated to enormous size, evening out any irregularities and giving rise to the universe we see today.
> But unlike a radioactive atom, which either decays or doesn't, the false vacuum can decay in some places but not in others. That means there can be regions where inflation continues forever. Suppose a tiny inflating region grows to tremendous size, and 90 percent of it converts into matter and radiation. The remaining 10 percent then grows to an even bigger size; 90 percent of that decays, and the cycle repeats

[219]Alexander Vilenkin, Many Worlds in One (New York: Hill and Wang, 2006), 175.

[220]Alexander Vilenkin, "The Case for Parallel Universes," *Scientific American*, posted 19 July 2011; available from http://www.scientificamerican.com/article.cfm?id=multiverse-the-case-for-parallel-universe; Internet; accessed 08 November 2011.

> indefinitely. There are regions like our own, where inflation has long since ended, but also places where inflation is still going on, creating yet more regions, each forming a pocket universe.
> That's where the multiverse comes from. It is not that cosmologists are so fond of all those universes; it's that we are fond of inflation, because inflation explains the observed properties of the cosmos with great precision. But many versions of inflation theory also predict an infinite number of universes, like it or not.[221]

But all is not well in the land of chaotic inflation. Here are a few problems facing this theory:

1. It cannot avoid a beginning.

Arvind Borde and Alexander Vilenkin demonstrated that while a chaotic inflationary model may have an infinite future, it cannot have an infinite past: "A physically reasonable spacetime that is eternally inflating to the future must possess an initial singularity…. The fact that inflationary spacetimes are past incomplete forces one to address the question of what, if anything, came before."[222] And again, a "universe…in a state of eternal inflation without a beginning…is in fact not possible in future-eternal inflationary spacetimes as long as they obey some reasonable physical conditions."[223]

Lisa Grossman writes: "But in 2003, a team including Vilenkin and Guth considered what eternal inflation would mean for the Hubble constant, which describes mathematically the expansion of the universe. They found that the equations didn't work (Physical Review Letters, DOI: 10.1103/physrevlett.90.151301). 'You can't construct a space-time with this property,' says Vilenkin. It turns out that the constant has a lower limit that prevents inflation in both time directions. 'It can't possibly be eternal in the past,' says Vilenkin. 'There must be some kind of boundary.'"[224]

Andrei Linde eventually conceded that his theory cannot avoid a beginning to physical reality.[225]

2. Inflation is not well-defined or tested.

Cosmologist, George Ellis, writes:

> A multiverse is implied by some forms of inflation but not others. Inflation is not yet a well defined theory and chaotic inflation is just one variant of it. … [T]he key physics involved in chaotic inflation (Coleman-de Luccia tunnelling) is extrapolated from known and tested physics to quite different regimes; that extrapolation is unverified and indeed unverifiable. The physics is hypothetical rather than tested. We are being told that what we have is "known physics > multiverse." But the real situation is "known physics >

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[221]Sean Carroll, "Welcome to the Multiverse," *Discover Magazine*, October 2011; available from http://discovermagazine.com/2011/oct/18-out-there-welcome-to-the-multiverse; Internet; published 10 October 2011; accessed 08 November 2011.

[222]Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review* Letters 72 [1994]: 3307. Available at http://arxiv.org/pdf/gr-qc/9312022.pdf.

[223]Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review* Letters 72 [1994]: 3305, 3307. Available at http://arxiv.org/pdf/gr-qc/9312022.pdf.

[224]Lisa Grossman, "Why physicists can't avoid a creation event," *Scientist*, January 11, 2012. Available from https://www.newscientist.com/article/mg21328474.400-why-physicists-cant-avoid-a-creation-event; Internet; accessed 28 March 2017.

[225]Andrei Linde, Dmitri Linde, and Arthur Mezhlumian, "From the Big Bang Theory to the Theory of a Stationary Universe," *Physical Review D* 49 (1994): 1783 – 1826. Cited in Arvind Borde and Alexander Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review* Letters 72 [1994]: 3305, 3307.

> hypothetical physics > multiverse" and the first step involves a major extrapolation which may or may not be correct."[226]

Astrophysicist, Luke Barnes, agrees:

> Inflation is a wonderful idea; in many ways it seems irresistible (Liddle, 1995). However, we do not have a physical model, and even we had such a model, "although inflationary models may alleviate the "fine tuning" in the choice of initial conditions, the models themselves create new "fine tuning" issues with regard to the properties of the scalar field" (Hollands & Wald, 2002b). To pretend that the mere mention of inflation makes a life-permitting universe "100 percent" inevitable [Foft 245] is naive in the extreme, a cane toad solution.[227]

3. The model requires the existence of a number of theoretical entities and processes, each of which must be fine-tuned:
    a. There must be an inflation field
    b. Inflation must start
    c. Inflation must last.
    d. Inflation must end in the right way
    e. Inflation must set up the right density perturbations.

Quantum Gravity models

Stephen Hawking famously developed the singularity theorems that helped cement the Big Bang model as the Standard Model and demonstrate that our universe had an absolute beginning. However, Hawking was not satisfied with this conclusion for, what seems to be, theological reasons. He wrote: "The idea that space and time may form a closed surface without boundary has profound implications for the role of God in the affairs of the universe. So long as the universe had a beginning we could suppose it had a creator, but if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end. What place, then, for a creator?"[228]

Hawking knew there was some wiggle room to avoid the implications of his own theorems since they were based on general relativity and general relativity only applied to the universe once it reached the size of the Planck Length (10^{-35} meters). Prior to that, the universe would be governed by quantum gravity. Perhaps the universe would behave differently at the quantum level, thereby evading a singularity.

Hawking went on to develop a model of the universe based on a quantum theory of gravity with James Hartle (Alexander Vilenkin developed a similar model as well). In these models, the point of the singularity is "rounded off" so that there is no initial point to the universe. Instead, it's like the rounded edge of a badminton birdie. In this way, Hawking claims to evade an absolute beginning to the universe.

Despite the popularity of Hawking's model, it is fraught with problems:

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[226]B. J. Carr and George Ellis, *Astronomy & Geophysics*, 2008; 2.29, page 49, as quoted in Luke A. Barnes, "The Fine-Tuning of the Universe for Intelligent Life," 21 December 2011; available from http://arxiv.org/abs/1112.4647; Internet; accessed 16 April 2012; page 57.

[227]Luke A. Barnes, "The Fine-Tuning of the Universe for Intelligent Life," 21 December 2011; available from http://arxiv.org/abs/1112.4647; Internet; accessed 16 April 2012; pages 27-28,31.

[228]Stephen Hawking, *A Brief History of Time* (New York: Bantam Books, 1988), 140-141.

1. The model cannot avoid a beginning

Hawking's model of the universe does not have an infinite past. It entails a finite past just like the Standard Model. It only differs in the fact that it lacks an initial singularity, and thus the laws of physics never break down at the beginning of the universe.[229] While Hawking eliminated a specific beginning *point*, he did not eliminate a beginning.

2. Hawking did not think this model represented the real world.

Hawking admitted as much when he wrote, "I'm a positivist. I don't demand that a theory correspond to reality because I don't know what it is."[230] And again, "I take the positivist viewpoint that a physical theory is just a mathematical model, and that it is meaningless to ask whether it corresponds with reality."[231] As noted earlier, the ability to formulate an internally consistent mathematical model of the universe in no way proves that it represents what physical reality is like.

3. Hawking's model employs a mathematical trick.

The Hartle-Hawking model only works by invoking imaginary numbers for the time coordinate prior to the Planck time, in which time is made indistinguishable from space. But this is metaphysically absurd. Time and space are not the same thing. Time is characterized by "earlier than" and "later than" relations, and these have no resemblance to spatial properties. WLC explains:

> Construed realistically, this is just bad metaphysics. Space is a dimension ordered by a relation of *betweeness:* for three successive points *x, y,* and *z* on a spatial line, *y* is between *x* and *z*. But time is ordered in addition by a unique relation of *earlier/later than*: for two successive moments *t*1 and *t*2 in time, *t*1 is earlier than *t*2 , and *t*2 is later than *t*1. While spatial points are not ordered by any such relation, this relation is essential to the nature of time…. It is thus metaphysically impossible for time to be a dimension of space.[232]

Imaginary numbers are just that: imaginary. They have no correlate to the real world. They are simply a mathematical device for making computations simpler. When you re-convert the imaginary numbers of Hawking's theory back into real numbers, the singularity re-emerges. They were just concealed by a mathematical redescription. Hawking admits as much: "Only if we could picture the universe in terms of imaginary time would there be no singularities. When one goes back to the real time in which we live, however, there would still appear to be singularities."[233]

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[229]William Lane Craig, "Much Ado about Nothing: A Review Essay on *The Grand Design*," *Philosophical Christi*, Vol. 12, Number 2, 2010, p. 416.

[230]Stephen Hawking and Roger Penrose, *Nature of Space and Time* (Princeton, NJ: Princeton University Press, 2000), 121.

[231]Stephen Hawking and Roger Penrose, *Nature of Space and Time* (Princeton, NJ: Princeton University Press, 2000), 3-4.

[232]William Lane Craig, "The Caused Beginning of the Universe: A Response to Quentin Smith; available from http://www.reasonablefaith.org/the-caused-beginning-of-the-universe-a-response-to-quentin-smith; Internet; accessed 10 October 2012.

[233]Stephen Hawking, *A Brief History of Time* (New York: Bantam Dell Publishing Group, 1988), 138-9.

4. It is not an example of something coming from nothing.

Vilenkin's model entails something called quantum tunneling. This is sometimes characterized as something coming into being from nothing. Vilenkin, however, recognizes that this is not necessarily the case. He writes, "I understand that a universe of zero radius is not necessarily the same thing as no universe at all."[234] He also realizes that quantum tunneling requires the pre-existence of the laws of nature. He asks, "Does this mean that the laws are not mere descriptions of reality and can have an independent existence of their own? In the absence of space, time, and matter, what tablets could they be written upon? The laws are expressed in the form of mathematical equations. If the medium of mathematics is the mind, does this mean that mind should predate the universe?"[235] Ironically, he never answered his own question. The answer, however, implies theism.

In reality, the quantum tunneling of Vilenkin's model only happens once the universe has come into existence. As such, it does not explain the origin of the universe. It merely presumes it.[236]

Vacuum Fluctuation Models

The first vacuum fluctuation model was put forward by Edward Tryon in 1973. He proposed that prior to the rapid inflationary period 10^{-35} to 10^{-33} second after the Big Bang, the universe was not expanding but existed in an eternal quantum vacuum state, containing zero point energy. The quantum vacuum can produce extremely short-lived particle pairs called virtual particles. Our universe is a long-lived virtual particle, produced by a fluctuation in the quantum vacuum known as a phase transition. It was not the only universe created through such vacuum fluctuations. There can be an infinite number of such fluctuations in the vacuum, resulting in an infinite number of universes.

Victor Stenger explains:

> In general relativity, spacetime can be empty of matter or radiation and still contain energy stored in its curvature [vacuum]. Uncaused, random quantum fluctuations in a flat, empty, featureless spacetime can produce local regions with positive or negative curvature. This is called the "spacetime foam" and the regions are called "bubbles of false vacuum." Wherever the curvature is positive a bubble of false vacuum will, according to Einstein's equations, exponentially inflate. In 10^{-42} seconds the bubble will expand to the size of a proton and the energy within will be sufficient to produce all the mass of the universe.
> The bubbles start out with no matter, radiation, or force fields and maximum entropy. They contain energy in their curvature, and so are a "false vacuum." As they expand, the energy within increases exponentially. This does not violate energy conservation since the false vacuum has a negative pressure (believe me, this is all follows from the equations that Einstein wrote down in 1916) so the expanding bubble does work on itself.
> As the bubble universe expands, a kind of friction occurs in which energy is converted into particles. The temperature then drops and a series of spontaneous symmetry breaking processes occurs, as in a magnet cooled below the Curie point and a essentially random structure of the particles and forces appears. Inflation stops and we move into the more familiar big bang.

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[234]Personal letter to James Sinclair, 23 October 2006. Quoted in William Lane Craig and James D. Sinclair, "The *Kalam* Cosmological Argument," *The Blackwell Companion to Natural Theology*, William Lane Craig and J. P. Moreland, eds. (West Sussex, UK: Blackwell Publishing Ltd., 2012), 177.

[235]Alexander Vilenkin, *Many Worlds in One: The Search for Other Universes* (New York: Hill and Wang, 2006), 205, quoted in 373.

[236]Stephen C. Meyer, *The Return of the God Hypothesis: Three Scientific Discoveries that Reveal the Mind Behind the Universe* (New York: HarperOne, 2021), 376.

> The forces and particles that appear are more-or-less random, governed only by symmetry principles (like the conservation principles of energy and momentum) that are also not the product of design but exactly what one has in the absence of design.
> The so-called "anthropic coincidences," in which the particles and forces of physics seem to be "fine-tuned" for the production of Carbon-based life are explained by the fact that the spacetime foam has an infinite number of universes popping off, each different. We just happen to be in the one where the forces and particles lent themselves to the generation of carbon and other atoms with the complexity necessary to evolve living and thinking organisms.[237]

With all this talk of quantum fluctuations, it might help to explain this phenomena a bit more. Neil Shenvi, a quantum physicist, writes:

> The term "quantum fluctuation" is used to describe a number of phenomena in quantum mechanics: the correlation of electrons in atoms and molecules, the zero-point energy of harmonic oscillators, the effects of tunneling, the spontaneous appearance of matter-antimatter particle pairs, etc. What all of these phenomena have in common is the existence of what is known as a "superposition state." In quantum mechanics, particles and fields can exist in two or more different states at the same time. When one of the states predominates, the remaining state is often referred to as a "quantum fluctuation." For example, if we imagine a quantum mechanical coin that can exist in the single state "heads" or the single state "tails," a superposition might consist of the state 99% "heads" and 1% "tails," where the small 1% contribution of the tails state could be seen as a quantum fluctuation. A "quantum fluctuation" can be either dynamic or static. A dynamic (or time-dependent) "quantum fluctuation" refers to the emergence of a superposition state as time progresses. A static (or time-independent) "quantum fluctuation" refers to the fact that the wavefunction exists in a superposition state at some particular instant of time.[238]

There are at least six problems with vacuum fluctuation models, causing these models to become passé by the late 1980s:

1. There is no empirical support for the theory.
2. It is based on quantum gravity, but as of yet we have no single theory of quantum gravity.
3. It requires the use of imaginary numbers, and such numbers have no correspondence to the real world.
4. It does not explain the origin of the vacuum.

The vacuum fluctuation model starts out with a quantum vacuum containing a sea of energy. Where did that vacuum filled with energy come from? The theory never explains it, and thus it makes no attempt to explain the origin of all physical reality. Alexander Vilenkin recognizes this: "A more fundamental problem is that Tryon's scenario does not really explain the origin of the universe. A quantum fluctuation of the vacuum assumes that there was a vacuum of some pre-existing space. And we now know that 'vacuum' is very different from 'nothing.' Vacuum, or empty space, has energy and tension, it can bend and warp, so it is unquestionably something."[239] While it's true that once you have a quantum vacuum imbued with energy a small fluctuation can convert that energy into matter, the real issue is where that sea of energy came from.

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[237]Victor Stenger, "Inflation and Creation"; available from www.colorado.edu/philosophy/vstenger/Cosmo/inflat.html; Internet; accessed 28 January 2011.

[238]Neil Shenvi, "Do Quantum Fluctuations Show that Something can Come from Nothing?"; available from http://www.shenvi.org/Essays/QuantumFluctuations.htm; Internet; accessed 20 January 2016.

[239]Alexander Vilenkin, *Many Worlds in One* (New York: Hill and Wang, 2006] 185.

5. If quantum fluctuations are descriptions of the non-predominating superposition state of a wavefunction, and a wavefunction is something, then it is false to say a quantum fluctuation is an example of something coming from nothing.

As Neil Shenvi writes, "If a 'quantum fluctuation' necessitates the existence of a wavefunction which describes 'something,' then it cannot provide an instance of 'something' emerging from 'nothing.'"[240] The quantum fluctuation comes from the wavefunction, and the wavefunction comes from the quantum vacuum, which again, is something. There is no example in quantum mechanics of something coming from nothing.

6. Given an infinite amount of time, a mini-universe should have been spawned at every point in the quantum vacuum.

If each new universe expands, and this has been happening for an infinite time, each universe should have collided with the others to coalesce into one single universe an infinity ago. But by observation we know that our universe is not infinitely old.

Eternal Cosmic Egg

Cosmologist, George Ellis, has proposed that the universe existed forever in an extremely small and fixed state (a cosmic egg), but then began to expand a finite time ago in an event we call the Big Bang. The Big Bang is not a singularity, but merely the expansion phase of an eternal universe.

The glaring problem with this theory is that the tiny cosmic egg would eventually collapse into nothingness due to a quantum fluctuation. Lisa Grossman writes: "Vilenkin and graduate student Audrey Mithani showed that the [cosmic] egg could not have existed forever after all, as quantum instabilities would force it to collapse after a finite amount of time (arxiv.org/abs/1110.4096). If it cracked instead, leading to the big bang, then this must have happened before it collapsed – and therefore also after a finite amount of time."[241] In Vilenkin's own words: "A static universe is unstable with respect to quantum collapse. It may be stable by the laws of classical physics, but in quantum physics a static universe might make a sudden transition to a state of vanishing size and infinite density. No matter how small the probability of collapse, the universe could not have existed for an infinite amount of time before the onset of inflation."[242]

Cyclic Ekpyrotic Scenario

The Cyclic Ekpyrotic Scenario postulates that there are two, 3-dimensional membranes that exist in five dimensions of spacetime. One of those "branes" is our universe. These two branes exist in an eternal cycle of collision and retreat, causing an infinite number of expansions and contractions of our universe.

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[240]Neil Shenvi, "Do Quantum Fluctuations Show that Something can Come from Nothing?"; available from http://www.shenvi.org/Essays/QuantumFluctuations.htm; Internet; accessed 20 January 2016.

[241]Lisa Grossman, "Why physicists can't avoid a creation event," *Scientist*, January 11, 2012. Available from https://www.newscientist.com/article/mg21328474.400-why-physicists-cant-avoid-a-creation-event; Internet; accessed 28 March 2017.

[242]Alexander Vilenkin, "The Beginning of the Universe"; available from http://inference-review.com/article/the-beginning-of-the-universe; Internet; accessed 15 June 2018.

This is an updated version of the oscillating models of the universe, but this time based on string theory. String theory holds that fundamental reality is not made up of particles, but tiny vibrating strings of energy.

There a number of problems that plague this scenario:

1. String theory is not a well-developed theory.

Neil Turok, who developed the Ekpyrotic Scenario with Paul Steinhardt, himself recognizes the tenuous nature of string theory:

> I think what people are sort of expressing is that we haven't had a big revolution in physics. String theory was hoped for to be that revolution in the 1980s but it hasn't really panned out in the sense that it hasn't given a single prediction. Instead it's given us a huge collection of theories where, if you like, there's no overarching theory to tell which particular version of string theory is the one that describes the world. It's almost self-destructed, I would say because it turned out to be not just one theory but this vast collection of theories which could all give different descriptions of the world.
> Theorists invented grand unified theories, which had hundreds of new particles, which have never been observed — supersymmetry, string theory with extra dimensions, multiverse theories. People just basically kept on going inventing stuff. No observational evidence has emerged for any of it.[243]

WLC writes:

> Given its dependence on string theory, the Ekpyrotic Scenario is only as strong as string theory itself, and string theory is not well-established. It is not yet a complete scientific theory. All of its equations have not yet been stated, yet alone solved, so it's a bit premature to be building cosmogenic models of the universe on the basis of string theory. Cosmologist, George Ellis, a staunch critic of string theory, writes, "String theory has moved from being a theory that explains everything to a theory where almost anything is possible. … But string theory is not a tried-and-tested theory; it is not even a complete theory."[244]

2. String theory is not testable.

Not only is string theory an incomplete theory, but it is also untestable, meaning all cosmogenic models based on string theory are also untestable. Victor Stenger writes, "M-theory… [and] string theory [have not] come close to being testable in the laboratory, not only in the present but perhaps in the foreseeable future…."[245] Paul Davies says M-theory "is not testable, not even in any foreseeable future."[246] Even Lawrence Krauss agrees:

> [I]f one thing has become clear in the past twenty-five years, it is that what was formerly called string theory is clearly something much more elaborate and complicated, and something whose fundamental nature and makeup is still a mystery. We still have no idea if this remarkable theoretical edifice actually

[243]Quoted in Erik Vance, "A Mirror Image of Our Universe May Have Existed Before the Big Bang"; available from https://www.livescience.com/64470-universe-has-mirror-image-universe.html; Internet; accessed 3 February 2019.

[244]George F. R. Ellis, "Does the Multiverse Really Exist?", *Scientific American*, August 2011, 38-43, 42.

[245]Victor Stenger, "The Grand Accident: A Review of *The Grand Design* by Stephen Hawking and Leonard Mlodinow"; available from http://www.colorado.edu/philosophy/vstenger/Cosmo/TheGrandAccident.pdf; Internet; accessed 28 January 2011.

[246]Paul Davies, "Hannah Devlin," *The Times*, 4 Sept. 2010.

> has anything to do with the real world. Nevertheless, perhaps no theoretical picture has ever so successfully permeated the consciousness of the physics community without having yet demonstrated its ability to successfully resolve a single experimental mystery about nature. … I think it is simply important to cut through the popular hype for a reality check.[247] … Alas, the intervening twenty-five years or so have not been kind to string theory."[248]

3. String theory contradicts what we know about dark energy

Harvard physicist, Cumrun Vafa, led a study that concluded most (if not all) of the 10^{500} possible universes predicted by string theory aren't actually possible because they are mathematically inconsistent.[249] Most, if not all of the universes that string theory makes possible do not allow for a positive, constant/stable amount of dark energy (cosmological constant, de Sitter universe). They require a negative value or a diminishing value (anti-de Sitter universes). So you have to choose: Do I go with what we know to be true about dark energy and dismiss string theory, or do I affirm string theory and dismiss dark energy? Most scientists go with dark energy.

Some string theorists opt for an alternative to dark energy called quintessence. Rather than the void of space being permeated by the cosmological constant, it's said to be permeated by quintessence – which is an evolving field (not a constant) that diminishes in value. However, all the physical evidence supports the existence of the cosmological constant rather than quintessence. When there is zero empirical evidence for string theory and zero evidence for quintessence, but positive evidence for the cosmological constant, it's not looking good for string theory.

4. The brane we live in has the wrong tension

The scenario is based on the Horava-Witten version of string theory, which would require that the brane we live in to have a positive tension. And yet, the Ekpyrotic Scenario holds that the brane we live in has a negative tension.[250]

5. The scenario requires a lot of unexplained fine-tuning.

WLC writes: "[T]he two branes have to be so perfectly aligned that even at a distance of 10^{30} greater than the space between them, they cannot deviate from being parallel by more than 10^{-60}."[251]

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[247]Lawrence Krauss, *A Universe from Nothing*, 130-1.

[248]Lawrence Krauss, *A Universe from Nothing*, 132-3.

[249]See Natalie Wolchover, "Dark Energy May Be Incompatible With String Theory"; available from https://www.quantamagazine.org/dark-energy-may-be-incompatible-with-string-theory-20180809/; Internet; accessed 13 May 2019. See also Clara Moskowitz and Lee Billings, "String Theory May Create Far Fewer Universes Than Thought"; available from https://www.scientificamerican.com/article/string-theory-may-create-far-fewer-universes-than-thought/; Internet; accessed 13 May 2019. The two papers are as follows: **On the Cosmological Implications of the String Swampland.** Prateek Agrawal, Georges Obied, Paul J. Steinhard and Cumrun Vafa in *Physics Letters B*, Vol. 784, pages 271–276; September 10, 2018. **De Sitter Space and the Swampland,** Georges Obied, Hirosi Ooguri, Lev Spodyneiko, Cumrun Vafa, available from https://arxiv.org/abs/1806.08362; June 21, 2018

[250]William Lane Craig, "Beyond the Big Bang"; available from http://www.bethinking.org/viewall.php?ID=51; accessed 22 November 2008.

[251]William Lane Craig, "Beyond the Big Bang"; available from http://www.bethinking.org/viewall.php?ID=51; accessed 22 November 2008.

6. It cannot avoid a beginning

In 2001, Borde and Vilenkin generalized their work on inflationary models to accommodate brane cosmology. They write, "Our argument can be straightforwardly extended to cosmology in higher dimensions. For example,…brane worlds are created in collisions of bubbles nucleating in an inflating higher-dimensional bulk spacetime. Our analysis implies that the inflating bulk cannot be past-complete."[252] Vilenkin concludes, "It follows from our theorem that the cyclic universe is past-incomplete."[253]

Physicists Will Kinney and Nina Stein also showed how the BGV theorem applies to the Ekpyrotic model, thus invalidating it as a past eternal model of the universe. They write in their abstract, "We show that any bouncing universe which uses growth of the scale factor to dissipate entropy must necessarily be geodesically past-incomplete, and therefore cannot be truly cyclic in time."[254] And from their paper: "In this paper, we use the BGV theorem to demonstrate that growth in the scale factor inevitably means that the spacetime is geodesically pastincomplete. … This result is completely general: any bouncing spacetime which obeys the condition for entropy dissipation and the Null Energy Condition outside the bounce must be geodesically incomplete. This is consistent with the BGV theorem, which shows that any spacetime for which the average Hubble parameter is positive must be similarly geodesically incomplete. The IS [Ijjas-Steinhardt] cosmology satisfies this condition and therefore cannot be past eternal, independent of the details of the dynamics."[255]

Steinhardt and Turok admit that their scenario is not past eternal:

> The most likely story is that cycling was preceded by some singular beginning. Consider a universe that settles into cycling beginning from some flat slice in the distant past many bounces ago. Any particles produced before cycling must travel through an exponentially large number of bounces, each of which is a caustic surface with a high density of matter and radiation at rest with respect to the flat spatial slices. Any particle attempting this trip will be scattered or annihilated and its information will be thermalized before reaching a present-day observer. Consequently, the observer is effectively insulated from what preceded the cycling phase, and there are no measurements that can be made to determine how many cycles have taken place. Even though the space is formally geodesically incomplete, it is as if, for all practical purposes, the universe has been cycling forever.[256]

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[252]Arvinde Borde, Alan Guth, and Alexander Vilenkin, "Inflationary spacetimes are not past-complete"; available from https://www.arxiv-vanity.com/papers/gr-qc/0110012/; Internet; accessed 15 February 2022.

[253]Personal communication to William Lane Craig, quoted in William Lane Craig, *Reasonable Faith: Christian Truth and Apologetics*, 3rd edition (Wheaton: Crossway, 2008), 139.

[254]Will Kinney and Nina Stein, "Cyclic cosmology and geodesic completeness", *Journal of Cosmology and Astroparticle Physics*, Volume 2022, published 10 June 2022; available from https://iopscience.iop.org/article/10.1088/1475-7516/2022/06/011; accessed 14 January 2023.

[255]Will Kinney and Nina Stein, "Cyclic cosmology and geodesic completeness", *Journal of Cosmology and Astroparticle Physics*, Volume 2022, published 10 June 2022; available from https://iopscience.iop.org/article/10.1088/1475-7516/2022/06/011; accessed 14 January 2023.

[256]Originally from Paul Steinhardt's website, available at http://wwwphy.princeton.edu/~steinh/cyclicFAQs/index.html#eternal. The site is no longer available. This is quoted in *The Blackwell Companion to Natural Theology* (West Sussex, UK: Wiley-Blackwell, 2009), 168.

Conformal Cyclic Cosmology

Roger Penrose has speculated that the universe exists in cycles of time.[257] He notes how the Big Bang was dominated by photons, and the end of our universe will also be dominated by photons. Our universe will end in a whimper (not a crunch) because the amount of matter in the universe is insufficient to stop the expansion. All matter will eventually be swallowed up into black holes, and then those black holes will evaporate into photons via Hawking radiation. When the last hole evaporates, there will be no matter left in the universe to get an accurate spatial scale. It will all be ratios. We'll be left with a very dense concentration of photons just like at the Big Bang. Penrose writes, "Since photons are travelling at the speed of light, they experience no time. They are timeless. Well, if you are timeless and moving, then you are spaceless too."[258]

Physicist Robert Sheldon explains Penrose's view in more detail, as well as what is wrong with it:

> Penrose… suggests that when the last black hole vanishes, the universe will have no measuring sticks, no matter in it. At this point it is ruled completely by the laws of electromagnetics and therefore will spontaneously shrink 50 orders of magnitude until it generates matter again, at which point it will look exactly the same as the Big Bang looked at 10^-34 seconds – hot and seething with energy and creative potential. And you thought the Phoenix was a silly Greek myth?
> Presumably, the signature of this shrinking will be a gravity wave set up in the fabric of space-time, such that the resulting Big Bang is the second event of creation. Thus we can look at the distribution of Cosmic Microwave Background and see an echo of the first event. Since Penrose is a theorist, he hired an experimentalist to do the data mining in the CMB data set, and the arXive paper supposedly finds a ring of brighter CMB that Penrose attributes to this effect. So, is this a classic "hypothesis – prediction – validation" paper?
> I doubt it, for the following reasons:
> – Penrose's theory is so vague in particulars that it can be used to fit any set of data.
> – The ring that is observed looks too "perfect," which suggests it is an artifact of the data processing.
> – The processing of the CMB data also involves a "ring" type of comparison to remove the "noise" in the detector. Basically the CMB signal is about 2 orders of magnitude below the noise of stars, nebula, dust, etc., and it takes a huge amount of data processing to extract it. So I think this paper simply magnifies some of the deficiencies of the data collection.
> – I really hate to say this, but the paper never made it out of the arXiv server and into the peer-reviewed literature. So I would imagine that my criticisms were also made of the paper, and the authors either couldn't respond to them, or the effect went away when they did.
> – Inasmuch as Sir Roger's theory is particular, it makes certain predictions about reality that don't seem to work too well in the present. This "evaporation" of matter into photons, for example, was a common theory for thirty years about the instability of the proton. Sir Fred Hoyle wanted protons to spontaneously appear, which means they also spontaneously disappear. So if you can collect some 10^32 protons in one place and look for 10^8 seconds, one can put a rather strict upper limit on this "evaporation" likelihood. This was done in a detector in Japan, and no protons were ever seen to decay. This means we need to invoke a second, "cloaking tooth fairy" to cover the first, and the theory starts to look more and more like the pathology of Darwinism.

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[257]2010 arXive paper by Roger Penrose and V.G. Gurzadyan, "Concentric circles in WMAP data may provide evidence of violent pre-Big-Bang activity"

[258]Rob, "Mr Hoyle, call your office"; available from http://procrustes.blogtownhall.com/2010/11/01/mr_hoyle,_call_your_office.thtml; Internet; accessed 02 November 2010.

Ethan Siegel also critiques Penrose's model, saying:

> The biggest predictive difference is that the CCC pretty much requires that an imprint of "the Universe before the Big Bang" show itself in both the Universe's large-scale structure and in the cosmic microwave background: the Big Bang's leftover glow. … The observations — first from COBE and WMAP, and more recently, from Planck — definitively place enormously tight constraints (to the limits of the data that exists) on any such structures. There are no bruises on our Universe; no repeating patterns; no concentric circles of irregular fluctuations; no Hawking points. When one analyzes the data properly, it is overwhelmingly clear that inflation is consistent with the data, and the CCC is quite clearly not. … Although…Penrose isn't alone in his assertions, the data is overwhelmingly opposed to what he contends. The predictions that he's made are refuted by the data, and his claims to see these effects are only reproducible if one analyzes the data in a scientifically unsound and illegitimate fashion.[259]

Conclusion

While the models we have examined do not exhaust the number that have been put forward, this sampling demonstrates that none of these alternative models have matched the empirical verification of the Standard Model. None of them have been able to successfully demonstrate a universe that is past eternal. Philosophically and scientifically, it is clear that physical reality had a beginning.

[259]Ethan Siegel, "No, Roger Penrose, We See No Evidence Of A 'Universe Before The Big Bang'"; available from https://www.forbes.com/sites/startswithabang/2020/10/08/no-roger-penrose-we-see-no-evidence-of-a-universe-before-the-big-bang/?sh=73ddcca27a0f; Internet; accessed 16 January 2023.