

11 Kalam Cosmological Arguments for Atheism

I. INTRODUCTION

Cosmological arguments for God's existence have two parts. The first part aims to establish that there is a cause of the universe. The second part aims to establish that this cause is God or God's act of creation. My goal is to show that this second "theistic" part is unsound and that there is a sound "atheistic" second part that shows that the universe is self-caused.

The cosmological and teleological arguments are two types of arguments for the existence of God. They are different from other types in that they are about the entire universe; the cosmological argument seeks to find a causal explanation of why some universe exists, and the teleological argument seeks to find an explanation of the designed or apparently designed nature of the universe. In this way they differ from the ontological and conceptual arguments, which are *a priori*, and from the arguments from mystical experience, moral conscience, and human consciousness. The cosmological and teleological arguments are about the empirical facts of the universe, the mystical, moral, and consciousness arguments are about empirical facts concerning humans, and the ontological and conceptualist arguments endeavor to deduce God's existence from *a priori* concepts alone, without needing any observational evidence about the universe.

The traditional cosmological arguments are of three types. One is the *Kalam* argument, which aims to establish that there is a cause of the beginning of the universe and that this cause is God. The Thomistic arguments aim to establish that there is a sustaining cause of the universe at each present time. The Leibniz cosmological argument is that the whole series of contingent beings (that make up the universe) requires an external cause that is not contingent, but necessary.

The *Kalam* cosmological argument is often stated in this manner:

1. Whatever begins to exist has a cause.
2. The universe began to exist.
3. Therefore, the universe has a cause.

Since the key element that seems to introduce the requirement of causality is something's *beginning to exist*, the argument aims to establish that the universe's beginning to exist is not uncaused. Discussions of the argument typically focus on a cause of the universe's beginning to exist. Since this is left implicit in the more or less vague way of stating the conclusion, we can make it more precise by making its meaning explicit, namely, that the universe's beginning to exist has a cause. Whether or not the universe needs a cause of its remaining in existence is not obvious one way or the other from the vague way the conclusion 3 is stated, so I concentrate on what the argument obviously implies, namely, that there is a cause of the universe's beginning to exist. This is what William Lane Craig (2002: 69) meant when he recently named the argument as "the Kalam cosmological for a First Cause of the beginning of the Universe."

The Kalam cosmological argument was first formulated in medieval Islamic scholasticism, and it was revived and has been a topic of widespread discussion since 1979, when Craig published *The Kalam Cosmological Argument*. This argument has attracted much more interest than agreement, even among theist philosophers of religion. The reason seems to be that many theists do not accept Craig's argument that the *past is necessarily finite* and therefore that the universe must begin to exist, and many theists are not as confident as Craig that the first premise is "obviously true," the first premise being "whatever begins to exist has a cause." Nonetheless, a count of the articles in the philosophy journals shows that more articles have been published about Craig's defense of the Kalam argument than have been published about any other philosopher's contemporary formulation of an argument for God's existence. Surprisingly, this even holds for Plantinga's argument for the rational acceptability of the ontological argument and Plantinga's argument that theism is a rationally acceptable basic belief. The fact that theists and atheists alike "cannot leave Craig's Kalam argument alone" suggests that it may be an argument of unusual philosophical interest or else has an attractive core of plausibility that keeps philosophers turning back to it and examining it once again.

I shall not take one of the usual routes that critics take, namely, arguing that the past can be infinite or that it is not obvious that whatever begins to exist has a cause. I have done this elsewhere (Craig and Smith 1993). Rather, I am going to accept the first half of the Kalam argument, parts (1)–(3), and disagree with the second half of it, the argument that the first cause is God. But I differ from Craig in that I accept (1)–(3) on empirical grounds rather than on a priori grounds. One version of Einstein's general theory of relativity is formulated as "big bang cosmology," which is used to explain the observations that the universe began

to exist about 15 billion years ago in an extremely small explosion of densely packed matter and energy. This matter and energy was compacted so densely that it was smaller than an electron. Due to the explosive force of the big bang explosion, the universe began to expand, and it has been expanding ever since. The pieces of matter grouped together into clumps and became stars and galaxies. The theory of this big bang explosion implies that the universe is causally determinist, that is, that each state of the universe is sufficiently caused by an earlier state. On this basis I can accept premise (1), that whatever begins to exist has a cause, on the basis of the empirical evidence for the empirical laws of nature of the so-called big bang cosmology. (Bohm's interpretation of quantum mechanics is causally determinist; since I hold this interpretation (Smith 2003), I need not worry about "uncaused quantum events.") I can also accept that the universe began to exist, because observations tell us that it did; but I do not accept Craig's a priori arguments that an actually infinite past is impossible. My goal is to show that the *cause* of the universe's beginning, which both Craig and I agree *exists*, has a *nature* different from what Craig believes it has. I argue that the cause of the universe's beginning is not God but the universe itself. More precisely, I argue that the universe's beginning to exist is *self-caused*.

It is often said that "nothing can cause itself to exist." I agree with this sentence in the sense in which it is usually used. But I disagree with this sentence if it expresses a different sense, in particular, a different sense of "cause itself to exist." In this second sense, "itself" refers to a whole of parts, not to a simple being. The elucidation of this second sense of "causes itself to exist" or "self-caused" takes up most of this chapter.

My conclusion will be that the Kalam cosmological argument, when formulated in a manner consistent with contemporary science, is not an argument for God's existence but an argument for God's nonexistence and an argument for a complete atheistic explanation of the beginning of the universe's existence. Let us call the beginning of the universe B. My Kalam cosmological argument has for its conclusion that the beginning of the universe's existence is self-caused. "B is self-caused" does not mean the same as "B causes B" but means the same as "each part of B is caused by earlier parts of B, B's existence is logically entailed by its parts' existence, and the basic laws instantiated by these parts are caused to be instantiated by earlier parts that also instantiate these laws."

2. THE BEGINNING OF THE UNIVERSE'S EXISTENCE

The physical sciences indicate that the universe began to exist with a big bang, an explosion of matter and energy that occurred about 15 billion years ago. The question that the theist and atheist are faced

with is: What is the cause of this explosion? An atheist may hold that it is uncaused, as I used to believe (Smith 1988, 1994; Smith and Craig 1993), but if the theist can formulate a compelling causal explanation of the big bang explosion, then the atheist should believe the big bang does have a cause.

According to contemporary physical science, in particular, big bang cosmology, there is no first instant $t = 0$. If there were such a first instant, the universe would exist in an impossible state at this time; the whole spatially three-dimensional universe would occupy or exist in a point that had no spatial dimensions. Such a state of affairs would be described by nonsensical mathematical statements.

For example, at $t = 0$, the density of the universe's matter would be (to give a simplified example) of the form 25 grams per zero unit of space, that is, $25/0$. But this is a mathematically nonsensical sentence, since there exists no mathematical operation of dividing by zero. The alleged fraction $25/0$ is not a number but merely marks on a page, since there is no fraction with zero for a denominator and a positive number for its numerator. The universe began to exist later than the hypothetical time $t = 0$.

An instant is a temporal point, that is, a time with no duration. An instantaneous state of the universe is a state that exists for an instant. An interval of time is a set of instants, in fact, infinitely many instants.

According to big bang cosmology, time is continuous, which means each real number (each decimal number) corresponds to a distinct instant in the interval. Intervals are demarcated into times of various lengths or durations, for example, years, hours, minutes, and seconds. A temporally extended state of the universe occupies some interval of time; for example, we can talk of the first hour-long state of the universe's existence.

An interval is closed if it has two boundary points, an instant that is the earliest instant of the interval and an instant that is latest instant of the interval. If the hour-long interval from noon to 1 P.M. is closed, its earliest instant is the instant denoted by "noon" and its latest instant is the instant denoted by "1 P.M."

An interval is half-open in the early direction if it has no earliest instant. If we delete the instant denoted "noon" from the mentioned hour, it would be an hour that is half-open in the early direction. The first hour would be closed if the hypothetical first instant $t = 0$ actually existed. But since it does not exist, the first hour is half-open in the early direction.

I use the idea in big bang cosmology that the first hour (minute, second, etc.) of the universe's existence is half-open in the earlier direction. This means there is no instant corresponding to the number zero in the

real line interval that contains an infinitely many (continuum-many) numbers greater than zero and either less than one or one. $0 > x < \text{or} = 1$. If time is continuous, then there is no first instant x that immediately follows the hypothetical "first instant" $t = 0$. This is because between any two instants, there are an infinite number of other instants. If we "cut out" the instant $t = 0$ that corresponds to 0 in the interval $0 > x < \text{or} = 1$, we will not find a certain instant that immediately comes after the "cut out" instant $t = 0$. For example, the instant y corresponding to the number 0.5 cannot be the first instant, since between the number 0 and the number 0.5 there is the number 0.25 and some instant z corresponding to 0.25 . The same holds for any other number in the interval $0 > x < \text{or} = 1$.

3. CRAIG'S KALAM COSMOLOGICAL ARGUMENT FOR THEISM

This account of instants, intervals, and the beginning of the universe provides us with enough information to see why Craig's Kalam cosmological argument for theism is unsound.

Let us consider how Craig attempts to justify the first half of the Kalam cosmological argument for theism (or atheism). I mean the three sentences stated at the beginning of this chapter, namely, (1) whatever begins to exist has a cause; (2) the universe began to exist; and the inference to the conclusion, (3) the universe has a cause (implying that the universe's beginning to exist has a cause).

I am going to make two points in this section. First, Craig's theory is inconsistent with big bang cosmology, which is the theory Craig uses in his empirical argument for the thesis that the universe began to exist. Second, Craig's theory of mathematics is false a priori, which makes his interpretation of the Kalam argument false of logical necessity, regardless of what the empirical facts are.

I am first going to explain how set theory is an essential part of big bang cosmology and how this entails that Craig's empirical argument for the beginning of the universe is falsified.

Consider the first second-long state of the universe's existence. This is an interval that has continuum-many instantaneous states as its parts. This interval is a set. Since this set has an actually infinite number of members, it is inconsistent with Craig's theory, for Craig believes it is "metaphysically impossible" for there to be an actual infinite.

Below I mention several technical words, such as "higher order predicate logic," "manifold," and "topology." It is not necessary to understand these words or phrases to understand my argument. It suffices to know that Craig's theory is inconsistent with the concepts expressed by these words or phrases.

According to big bang cosmology and Einstein's general theory of relativity, the universe has a topology, which is a set of actually infinite subsets that have certain relations to each other. These theories also state that the universe is a continuous manifold, which is a set of an actual infinite, specifically, actual continuum-many points. The universe also has a metric, which demarcates time into intervals of various lengths, hours, days, years, and so on. The intervals demarcated by the metric are sets of actually infinite, continuum-many instants. Furthermore, the metric requires an actually infinite and continuous manifold and topology. In general relativity and big bang cosmology a metric is defined on (in terms of) a point in an actually infinite continuum.

Craig denies that there is an actual infinite. His theory implies there cannot be an actually infinite topological structure of the universe, there cannot be an actually infinite manifold, there cannot be a metric defined on a point in an actually infinite continuum of points, and so on. Big bang cosmology implies that there is an actually infinite manifold, topology, and metrication. It logically follows that the sentences of his version of the *Kalam* argument (e.g., "The universe began to exist"), under Craig's interpretation of their semantic content, expressed highly disconfirmed propositions. Craig's theory that there is a "potential infinite" alone also makes his theory inconsistent with contemporary physical science, specifically, big bang cosmology.

Further, Craig's a priori argument for a merely potential infinity is self-contradictory. Craig is committed to the contradiction that "x has a potentiality to be infinite" and "x does not have to have a potentiality to be infinite." This is because x's possibility or potentiality for becoming realized cannot be realized, because if it were, there would be an actual infinite. Craig mentions this contradiction and seems to think a mere question-begging denial made in a few sentences by Aristotle solves it. Aristotle writes [*Physics*, 3.6.206]:

the infinite has a potential existence. But the phrase "potential existence" is ambiguous. When we speak of the potential existence of the statue, we mean that there will be an actual statue. It is not so with the infinite. There will not be an actual infinite.

If by saying that the infinite has a potential existence, and we do not mean it can actually exist, what could "potential" mean? This trades a self-contradictory theory for an unintelligible theory. If "potential" has a special meaning for the case of infinity, we may ask what is said by "the infinite has a potential existence. . . . There will not be an actual infinite."

No sense can be made of his claim that the infinite has a "potential" existence. But we do learn that "there will not be an actual infinite." This implies that in every case there is actual only *finite* series or things.

But Craig claims that “finite” means something different than “potential infinite.” Again, this is either self-contradictory or unintelligible.

If Craig’s theory is both empirically disconfirmed and logically self-contradictory, this does not pose any obstacle for the construction of a Kalam cosmological argument for atheism.

4. THE KALAM COSMOLOGICAL ARGUMENT FOR ATHEISM

Every instantaneous state of the universe corresponding to a number in the interval $0 < x < \text{or} = 1$ preceded and is caused by earlier instantaneous states. There is no instantaneous state in the first half-open second, or the first half-open one-billionth of a second, that is uncaused. Since the beginning of the universe’s existence is the instantaneous states that are members of a half-open interval, it follows from what I have said that the universe’s beginning to exist is internally caused. This needs some elaboration.

Some theists might ask: What causes *the whole sequence* of instantaneous states? Regarding the universe’s beginning to exist, it may be asked, what causes the first half-open *hour* or the first half-open interval of *one-billionth of a second*, of the universe’s existence? Each instantaneous member of the interval-long state is causally related to earlier and later instantaneous members, but *none* of these is causally related to the whole interval-long state. Nor do *all* of the instantaneous members jointly cause the interval-long state. Does the interval-long state, the set of the instantaneous states, need an external cause, such as a divine cause?

Swinburne says that the interval or set of states does need an external cause: “[I]f the only causes of its past states are prior past states, *the set* of past states as a whole will have no cause and so no explanation” (1991: 124, emphasis added). Swinburne argues that there will be an explanation if God causes the set of past states. But this argument is unsound since a *set*, by definition, is an abstract object and an *abstract object* (by definition) cannot enter into causal relations with other objects, including a concrete object such as God. Thus, the argument that there is something above and beyond the states, namely, *the set* of states, cannot lead to an external cause since the “something” that is posited is not the sort of thing that can be caused.

A problem about sets is also present in William Rowe’s discussion of whether or not the universe can be causally explained. Rowe’s (1975, 1989) argument is in one respect advantaged over Swinburne’s, since Rowe admits at the outset that the set of all the states is not a candidate for causal explanation. He emphasizes that the question “Why does the infinite series exist?” should not be construed as asking for a causal

reason for the set's existence (since an abstract object cannot have a cause of its existence); rather, it should be construed as asking for a causal reason for the fact that the set has these members rather than some other members or no members at all. Suppose "A is the set of dependent beings. In asking why A exists we are not asking for an explanation of the existence of an abstract entity; we are asking why A has the members it has rather than some other members or none at all" (1989: 150). According to Rowe, this question may be coherently answered by saying that A has the members it actually possesses because some being apart from the members is causally responsible for A having these members.

However, it seems to me that Rowe's discussion exhibits a set-theoretic fallacy, even though it is different from Swinburne's. A set necessarily contains its members. This is an axiom of set theory and one of the axioms of second-order predicate logic with identity. Accordingly, the question "why does the set A contain the members it actually contains?" – if it makes sense at all – has the answer "every set necessarily contains all and only the members it actually contains, and A is a set." Rowe's question therefore cannot admit of the answer "the set A of dependent beings contains all and only the beings it actually contains because God caused A to contain these beings rather than some other beings." God cannot make choices about logically impossible states of affairs, such as choosing whether or not the set [Jack, Jill] should contain Jack and Jill or some other members instead.

Why does the first half-open second-long state of the universe exist? It exists because (1) the existence of each instantaneous state that is a member of this second-long state is caused by earlier instantaneous states, and (2) the state is the set of these instantaneous states and is logically entailed by these states (where "logically" means higher order predicate logic with identity). If one wishes "logical entailment" to be a relation between propositions or interpreted sentences, then we can say that the proposition expressed by "these instantaneous states exist" logically entails the proposition expressed by "the set of these instantaneous states exists."

The first half-open interval is not caused by any or all of its instantaneous states and is not caused by any external cause. If Jack and Jill are each caused to exist, then the set [Jack, Jill] does not need an extra cause of its existence. This is because the existence of Jack and Jill *logically entail* the existence of the set [Jack, Jill]. In each possible world in which Jack and Jill exist, the set [Jack, Jill] exists. In each possible world in which the set [Jack, Jill] exists, Jack and Jill exist. If we call this set S, we may say that "S exists" and "Jack and Jill exist" express logically equivalent propositions.

The same holds for the earliest minute-long or one-second-long half-open interval of the universe's existence. This interval is a set S_I of continuum-many instantaneous states C , where " C " denotes the continuum-many states that are members of the set. By parallel reasoning, we can conclude that " C exists" and " S_I exists" express logically equivalent propositions. One cannot nontrivially ask, " C exists, but why does S_I exist?" for the answer to the question is logically implied by the question itself, namely, that C exists. Accordingly, questions such as those of Swinburne, Rowe, and many others both entail and even contain the answers to their questions, " C exists, but why does S_I exist?" or " S_I exists, but why does C exist?"¹

What does the "the beginning of the universe's existence" refer to? It seems that it cannot refer to any half-open interval-long state, since for any half-open interval-long state there is a briefer state that would seem to constitute a better candidate for being the state with which the universe's beginning should be identified. Since there is no first instant and there are an infinite number of briefer and briefer first intervals of a given length, "the beginning of the universe" does not refer to one instant or one interval. It must refer to many instants or intervals.

Nor can the beginning be a closed interval of any length. If we ask about an earliest closed hour, we will receive the answer that there is no one earliest closed hour. Each instant but the last instant of time (if the universe is closed in the future direction) is the early boundary of the earliest closed intervals of many lengths; the same instant is the early boundary of a closed hour, a closed second, and so on. But there is no first closed hour because that would require an instant that is the earliest boundary of the closed hour, and this would be the first instant at which the universe exists. Each instant later than the hypothetical $t = 0$ is an early boundary of a closed hour in some sequence of closed hours. There are infinitely many such sequences, since there are infinitely many instants later than the hypothetical $t = 0$. Thus, every first, closed hour h_2 in some sequence T_2 of nonoverlapping hours begins later than some earlier closed hour h_1 that is the first hour of some other sequence T_1 of nonoverlapping hours, such that the earlier closed hour h_1 partly overlaps h_2 .

We are dealing with an empirical theory, big bang cosmology, and this provides a way of defining the beginning of the universe. There are different kinds of states of the universe; for example, one kind of state is the electro-weak era, the era when the electromagnetic force was not differentiated from the weak force. Earlier than that there may be a strong-electro-weak state, which would be a state in which the electromagnetic force was unified with the weak force and strong force, leaving only the gravitational force as the other force. Some have speculated that at an

even earlier time the gravitational force was unified with the other three forces, and that this kind of state had a temporal length of 10^{-43} seconds. This is usually called “the Planck era.” This would be the first kind of state of the universe. Physicists speculate that there is no subinterval of this interval wherein the universe is in a different kind of state than any later subinterval of this interval. On empirical grounds, this justifies the use of “the beginning of the universe” to refer to the earliest Planck state.

The argument I have given may be called an atheistic version of the Kalam cosmological argument for an explanation of the universe’s beginning to exist. My explanation mentions only beings that exist contingently; the universe might not have existed and the states of the universe might not have existed. Since the existence of each state is caused by earlier states, and since the existence of all these states entails the universe’s existence, there is an explanation for everything that contingently exists. This falsifies a belief that is held by virtually everyone. For example, Jordan Howard Sobel writes that “if anything is contingent, then it is not possible that, for every fact or entity, x , there is a reason of some sort or other for x ” (Sobel 2004: 222).

It also invalidates Sobel’s and others’ belief that a complete explanation of the universe’s existence requires that the premises all be necessary truths and that the conclusion thereby be a necessary truth. My atheistic cosmological argument is a complete explanation of the universe’s existence, and its premises are the contingent truths: There is an earliest interval I of each length that is half-open in the early direction. The existence of each instantaneous state S that belongs to the interval I is sufficiently causally explained by earlier states. Each half-open interval I of states is explained by virtue of being logically equivalent to the states (or, if you prefer, “ I exists” is logically equivalent to “ C exists,” where C is the continuum-many instantaneous states that are members of the set I). Note, furthermore, that the conclusion logically derived from these premises is the contingent truth, “the universe begins to exist.”

Is this a complete explanation? Does it leave any explanatory factors unexplained? There remains an apparent problem about why our basic laws of nature obtain and not others. But there is an explanation of why these basic laws obtain rather than other basic laws.

5. BASIC LAWS OF NATURE

Why do the basic laws of nature, L , obtain? Examples of basic laws are the law of conservation of mass-energy and the law of increasing entropy or disorder. Since we are working with big bang cosmology, and this cosmology is a solution to Einstein’s equation in the general theory

of relativity, we may include in our basic laws Einstein's equation (which says, very roughly, that the curvature of space-time is dependent on the mass-energy in space-time and vice versa). The Friedman universe of big bang cosmology is not specified by a basic law of nature, since this law (i.e., equation) is derived from the Einstein equation in conjunction with initial conditions.

Why do the basic laws of conservation, entropy, and general relativity obtain? In brief, the basic laws are instantiated for the reason that these laws instantiated themselves. But what could this mean?

Basic laws of nature, such as L , are defined in terms of the states of the universe. Each of these states is a particular that has among its properties a certain dispositional property L ; L is a disposition each state possesses to cause a later state to exist with certain kinds of properties and relations. A state S_2 's disposition L is occurrently realized by the state S_2 if S_2 is caused to realize this disposition by an earlier state S_1 that possesses the kinds of properties and relations (e.g., a certain degree of entropy) that are required to make S_2 occurrently realize this disposition.

Since a basic law L is a property of each state, the explanation of why the basic law L obtains, rather than some other possible laws, is that each state that exemplifies L is caused to exemplify L by an earlier state that exemplifies L (and other relevant properties). The obtaining of the basic law of nature L is nothing over and above each state's exemplification of the dispositional property L . Since each state's exemplification of L is caused by an earlier state, the obtaining of L is explained. What other explanation could there be? God cannot cause the laws to be instantiated by the states, since the earlier states have already performed this task, so to speak.

State S_1 's disposition to conserve matter and energy is occurrently realized. This realization consists in the fact that the instantaneous end point of a series of states C coincides at the instant t with the beginning point of a later series E . The last instantaneous state of C causally affects the beginning point of E . The last state of C causally acts on the first state of E by bringing it into existence with the same amount of mass and energy possessed by the last state of C and by every earlier state of C .

6. GALE'S ARGUMENT THAT WHOLES CANNOT BE EXPLAINED IN TERMS OF CAUSES OF THEIR PARTS

The reader may feel that there is some issue not yet addressed. What is this issue? Is it the problem that it might have been the case that there was a different whole, composed of different parts, and nothing explains why the actual whole of parts exists? Indeed, why is there a

whole of parts rather than nothing at all? These questions have already been answered. The reason why this whole of parts exists, rather than some other possible whole, is that this whole's existence is logically required by the existence of its parts, and its parts exist. The parts of the merely possible whole do not exist, and therefore the actual existence of this merely possible whole is not logically required.

But why these parts? These parts exist because all of them have been caused to exist by earlier parts. Other possible parts do not exist because nothing causes them to exist.

But why is there something rather than nothing? The whole of parts is something. The reason it exists is that every one of its parts has been caused to exist by earlier parts and the whole's existence is logically required by the existence of the parts. The reason there is not nothing is that a universe caused itself to begin to exist and the basic laws governing this universe instantiated themselves.

But why is there such a thing as a universe that causes itself to begin to exist? The reason is that this universe's existence is logically required by the existence of its parts and its parts exist because each of them is caused to exist by an earlier part.

But haven't some philosophers, such as Richard (Gale 1991) shown that a whole cannot be explained by the fact that each of its parts is explained? Isn't this a "truism" or at least a platitude now accepted by both atheists and theists? I agree that this is a platitude, but not all platitudes are true. Gale (1991: 252–84) has argued against the Hume-Edwards thesis that a causal explanation of each part of whole suffices to explain the existence of the whole. But Gale's argument, although sound, is logically irrelevant to the Kalam cosmological argument for atheism I have presented.

Gale states that the existence of each part of an automobile has a causal explanation (e.g., the carburetor is made by Delco-Remy in Chicago, the starter motor by United Motors in Kansas City, and so on for each other part of the car). But this does not explain the existence of the automobile. The explanation of its existence is that its various parts are assembled by certain workers in a Detroit assembly plant. The notion of *assembling* particulars into a whole is crucial to Gale's criticism of the Hume-Edwards thesis.

Gale does not categorize wholes or define assemblies (or even use this word as a name of a kind of whole), but the examples he offers imply that he is talking about assemblies. If a whole is not a set, it may be an assembly, and this is a kind of whole that can have an external causal explanation in terms of an assembler or assemblers, in addition to the causal explanations of each of its parts. Furthermore, the causes of these parts would also be external to this whole; for example, a tire is a part of

a car, but the people and tools (or their causal activities) that made the rubber, steel, and so on that belong to the tire are not parts of the car.

The difficulty arises in trying to show that the universe is relevantly analogous to a car or some other sort of assembled whole (e.g., a computer or bridge).

There is a difference in the senses of "part" that applies to automobiles and the universe or a succession of causes and effects. Each state of the universe is caused by earlier parts and causes later parts. But the door of a car is not a cause or effect of the steering wheel or some other such part, and there is no series of causes and effects consisting of a door, wheel, roof, transmission, and so on, by means of which the car can be conceived as a finite series of causally interrelated particulars, such that each particular part is caused to exist by another particular part.

Gale did not argue that the causal succession that is the topic of the Kalam or other cosmological arguments is an assembly. The point that is often overlooked is that Gale's argument refutes only Hume's general claim that the existence of *every kind of whole* is explained if each of its parts is causally explained. The fact that the half-open causal process that consists of the universe causing itself to begin to exist cannot be an assembly is consistent with Gale's argument being sound, but it also makes Gale's argument logically irrelevant to my Kalam argument for an atheistic explanation of the universe's beginning to exist.

7. CAUSATION OF INSTANTANEOUS STATES

It might be objected that the existence of the beginning of the universe, a half-open temporally extended state of a very brief length, cannot be explained by my Kalam atheistic explanation. There might be a feeling that my explanation is circular, or question-begging, or that the explananda (the explained parts, their whole, and the self-instantiated laws) are already defined in terms of the explanans (what explains the parts, whole, and basic laws). But there is nothing circular or question-begging in the explanations; what is being explained is *the existence of the parts, the existence of the whole, and the instantiation of the basic laws L*. What explains these facts is that each part is *caused to exist by an earlier part* of the whole, the whole is *logically required to exist by the existence of the parts*, and each instantiation of *L* is *caused by an earlier part that also instantiates L*, and so on ad infinitum, so there never is a brute fact that "*L* just is instantiated, without any causal explanation of why it is instantiated."

The skeptic appears to have no arguments left. The skeptic seems reduced to imaginative appeals to alleged counterexamples to my claim that the universe's beginning to exist is self-caused by virtue of the fact

that the earliest intervals of any length are half-open in the earlier direction. We can find theists such as Burke, Vallicella, Deltete, Pruss, and many others that have been reduced to this state of imagining bizarre counterexamples.

They appeal to some half-open state and note that it is intuitively implausible that this state's existence is explained by the fact that each of its parts is caused by an earlier part. They do not change the subject, as Gale did (he changed the subject to cars and other assemblies), but imagine alleged counterexamples to a set of instantaneous states whose explanation is internal to it.

For example, Burke (1984) and others wish to refute what I have called the complete atheist explanation of the beginning to exist of the universe. Burke formulates a principle he believes this explanation is committed to:

- (P) For any set S of times and any physical object x : If for every time belonging to S there is an explanation of why x exists at that time, these explanations, taken collectively, explain why it is that x exists at every time belonging to S .

Burke asks us to suppose that a fully grown duck sprang into existence on our table. The duck exists throughout a finite interval of time I that is half-open in the earlier direction; there is no first instant at which the duck exists. For every instant t at which the duck exists, there is a causal explanation of why the duck exists at t ; the explanation is that the duck existed at some instant t' earlier than t , and it is a natural law that a healthy duck would endure throughout the brief period from t' to t .

Burke asserts that this does not explain why the duck exists at every time in the interval I rather than at no time during I . He maintains that in this case we would say the duck spontaneously came into existence, with no cause or explanation of its existence, and that we have here a clear violation of the principle of causality.

The problems with such alleged counterexamples are easy to see: the counterexample includes its own refutation in the last clause, "we have here a clear violation of the principle of causality." Of course we do, and that is why this cannot be a counterexample to the principle of causality in big bang cosmology or to its application to the beginning of the universe's existence. The causal law that is a part of big bang cosmology is that, for each temporally extended effect E , such as a duck resting on a table for five minutes, there is an earlier temporally extended cause C , such that the end point of the causal series C coincides at the same instant t with E 's beginning point. At this instant t , the end point of the causal process C has a causal relation R_t to the beginning point of

the affected process E , such that C 's endpoint causes E 's beginning point to exist at t . The causal relation R_1 is C 's endpoint exercising its causal power on the beginning point of the affected series E . This is a case of simultaneous causation.

The causal law of big bang cosmology is that, apart from cases where there is a singularity, each temporally extended effect E has a first instantaneous state that both closes E in the earlier direction and coincides with (is simultaneous with) the last instantaneous state of the earlier temporally extended cause C , a state that closes C in the later direction. The causal power is transferred from earlier to later instants in C until it reaches the last instant of C , at which time the end point of C exercises this power on the beginning point of E by instantaneously bringing this beginning point into existence. The end point of C causally acts on the beginning point of E and thereby "expends" the causal power on the beginning point of E . This beginning point is affected by the end point of C , and the nature of this beginning point is determined by this causal impact.

The beginning point then causes to exist other points in E ; each of these points is also causally influenced by earlier points in E , points that are later than the beginning point but earlier than the causally influenced point.

It is nomically impossible for the duck's state of resting on the table to exist in a half-open temporally extended interval, with no beginning point on which the cause of this state of rest can act. It is nomically necessary that there be an earlier causal process, such as someone laying the duck down on the table, whose last instant coincides with the beginning point of the duck's state of rest, such that the last instant of this causal process causally acts on the beginning point of the duck's state of rest by bringing it into existence.

An interval is half-open in the earlier direction only if its beginning point is a singularity, that is, its alleged beginning point is in fact physically impossible and does not exist. This interval, at the big bang, is a case where the causal law does not apply, by virtue of there being a singularity. For the second and later intervals of any given length, the intervals are closed and the causal law applies. The first interval of any given length is half-open in the earlier direction because it is physically impossible for it to be closed in the earlier direction. Accordingly, there is no first instant of the universe's beginning to exist that is uncaused and that requires an external cause, such as God, to bring it into existence.

For any set S of times that is free from singularities, the explanation of why x exists at the first instant of the set S is that the end point of an earlier causal process S_1 coincides with x at t , causally acts upon x at t , and causes x to exist at t . For each later time in the set S , x exists at that

time because earlier instants in S cause x to exist at that time, such that the nature of this causation is determined in part by the way in which the end point of the earlier causal process S_+ affected the beginning point of the set S .

But if the beginning point of the set S is a singularity, this beginning point does not exist, and the set S is half-open in the earlier direction. In this case, each instantaneous state in S is caused by earlier instantaneous states in S , but there is no instantaneous state in S that instantaneously coincides with the end point of an earlier causal process that is external to S . S is internally caused. The beginning of the universe's existence, since it is half-open, is internally caused.

Once we distinguished singularities from normal points, it violates the causal laws of big bang cosmology to hypothesize bizarre examples, such as ducks springing into existence on desks or the motion of a ball occurring without any force being exerted on the ball.

My atheistic explanation of the universe's beginning to exist is a complete explanation. It is a complete explanation in that what is explained, the explanandum, cannot possibly (logically possibly) be given an additional or further genuine and nonredundant explanation. For example, God cannot cause the whole, the parts, or the instantiation of the laws, since these have an internal explanation; God's attempt to cause something to exist would be ineffectual since the item in question is already sufficiently caused to exist by earlier parts of the whole. A partial explanation of the explanandum is such that it is logically possible to provide an additional genuine explanation, so as to make up a complete explanation of the explanandum.

My atheist argument is a contingently true explanation of why other contingently true statements are, in fact, true. In fact, my "atheistic second half of the Kalam argument" implies that there is no contingent truth whose truth is left unexplained. This shows that atheists and theists are mistaken in believing that it is logically impossible for every contingently true statement to have an explanation. In fact, as we have seen, this is not only logically possible but empirically actual (to the extent that big bang cosmology is empirically confirmed).²

NOTES

1. I should emphasize that Rowe has acknowledged the difficulties that set-theoretic concepts introduce into the cosmological argument and wishes to take a different approach (Rowe 1997, 1998). This answers my criticisms of the aspect of Rowe's theory that consists in its set-theoretic ways of being formulated, but does not answer the other, more fundamental, criticisms presented in this chapter.

2. I would like to thank Michael Martin for his helpful and constructive remarks on earlier versions of this essay.

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