Cosmological Argument

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4. The *Kalām* Cosmological Argument

A second type of cosmological argument, contending for a first or beginning cause of the universe, has a venerable history, especially in the Islamic tradition. Although it had numerous defenders through the centuries, it received new life in the recent voluminous writings of William Lane Craig. Craig formulates the *kalām* cosmological argument this way (in Craig and Smith 1993, chap. 1):

1. Everything that begins to exist has a cause of its existence.
2. The universe began to exist.
3. Therefore, the universe has a cause of its existence.
4. Since no scientific explanation (in terms of physical laws) can provide a causal account of the origin of the universe, the cause must be personal (explanation is given in terms of a personal agent)

This argument has been the subject of much recent debate, some of which we will summarize here.

4.1 The Causal Principle and Quantum Physics

The basis for the argument's first premise is the Causal Principle that undergirds all cosmological arguments. Craig holds that this premise is intuitively obvious; no one, he says, seriously denies it (Craig, in Craig and Smith 1993, 57). Although at times Craig suggests that one might treat the principle as an empirical generalization based on our ordinary and scientific experiences (which would not be strong enough for the argument to succeed), ultimately, he argues, the truth of the Causal Principle rests "upon the metaphysical intuition that something cannot come out of nothing" (Craig, in Craig and Smith 1993, 147).

The Causal Principle has been the subject of extended criticism. We addressed objections to the Causal Principle from a philosophical perspective earlier in 3.4. Some critics of the argument deny that they share Craig's intuitions about the Causal Principle (Oppy 2002a). Others raise objections based on quantum physics (Davies, 1984, 200). On the quantum level, the connection between cause and effect, if not entirely broken, is to some extent loosened. For example, it appears that electrons can pass out of existence at one point and come back into existence elsewhere. One can neither trace their intermediate existence nor determine what causes them to come into existence at one point rather than another.

Neither can one precisely determine or predict where they will reappear; their subsequent location is only statistically probable given what we know about their antecedent states. Hence, "quantum-mechanical considerations show that the causal proposition is limited in its application, if applicable at all, and consequently that a probabilistic argument for a cause of the Big Bang cannot go through" (Smith, in Craig and Smith, 1993, 121-23, 182).

Craig responds that appeals to quantum phenomena do not affect the *kalām* argument. For one thing, quantum events are not completely devoid of causal conditions. Even if one grants that the causal conditions are not jointly sufficient to determine the event, at least some necessary conditions are involved in the quantum event. But when one considers the beginning of the universe, he notes, there are no prior necessary causal conditions; simply nothing exists (Craig, in Craig and Smith, 1993, 146; see Koons, 203).

For another, a difference exists between predictability and causality. It is true that, given Heisenberg's principle of uncertainty, we cannot precisely predict individual subatomic events. What is debated is whether this inability to predict is due to the absence of sufficient causal conditions, or whether it is merely a result of the fact that any attempt to precisely measure these events alters their status. The very introduction of the observer into the arena so affects what is observed that it gives the appearance that effects occur without sufficient or determinative causes. But we have no way of knowing what is happening without introducing observers into the situation and the changes they bring. In the above example, we simply are unable to discern the intermediate states of the electron's existence. When Heisenberg's indeterminacy is understood not as describing the events themselves but rather our knowledge of the events, the Causal Principle still holds and can still be applied to the initial singularity, although we cannot expect to achieve any kind of determinative predictability about what occurs given the cause.

At the same time, it should be recognized that showing that indeterminacy is a real feature of the world at the quantum level would have significant negative implications for the more general Causal Principle that underlies the deductive cosmological argument. The more this indeterminacy has ontological significance, the weaker is the Causal Principle. The more this indeterminacy has merely epistemic significance, the less it affects the Causal Principle. Quantum accounts allow for additional speculation regarding origins and structures of universes. In effect, whether Craig's response to the quantum objection succeeds depends upon deeper issues, in particular, the epistemic and ontological status of quantum indeterminacy and the nature of the Big Bang as a quantum phenomemon.

4.2 Impossibility of an Actual Infinite?

In defense of premise 2, Craig develops both *a priori* and *a posteriori* arguments to defend the second premise. His primary *a priori* argument is

5. An actual infinite cannot exist.
6. A beginningless temporal series of events is an actual infinite.
7. Therefore, a beginningless temporal series of events cannot exist.

Since (7) follows validly, if (5) and (6) are true, the argument is sound. In defense of premise (5), Craig argues that if actual infinites that neither increase nor decrease in the number of members they contain were to exist, we would have rather absurd consequences. For example, imagine a library with an actually infinite number of books. Suppose that the library also contains an infinite number of red and an infinite number of black books, so that for every red book there is a black book, and vice versa. It follows that the library contains as many red books as the total books in its collection, and as many red books as red and black books combined. But this is absurd; in reality the subset cannot be equivalent to the entire set. Hence, actual infinites cannot exist in reality.

Craig's point is this. Two sets *A* and *B* are the same size just in case they can be put into one-to-one correspondence, that is, if and only if every member of *A* can be correlated with exactly one member of *B* in such a way that no member of *B* is left out. It is well known that in the case of infinite sets, this notion of 'same size' yields results like the following: the set of all natural numbers (let this be '*A*') is the same size as the set of squares of natural numbers ('*B*'), since every member of *A* can be correlated with exactly one member of *B* in a way that leaves out no member of *B* (correlate 0↔0, 1↔1, 2↔4, 3↔9, 4↔16,…). So this is a case — recognized in fact as early as Galileo (*Dialogues Concerning Two New Sciences*) — where two infinite sets have the same size but, intuitively, one of them appears to be smaller than the other; one set consists of only some of the members of another, but you nonetheless never run out of either when you pair off their members.

Craig uses a similar, intuitive notion of "smaller than" in his argument concerning the library. It appears that the set *B* of red books in the library is smaller than the set *A* of all the books in the library, even though both have the same (infinite) size. Craig concludes that it is absurd to suppose that such a library is possible *in actuality*, since the set of red books would simultaneously have to be smaller than the set of all books and yet equal in size.

Critics fail to be convinced by these paradoxes of infinity. When the intuitive notion of "smaller than" is replaced by a precise definition, finite sets and infinite sets behave somewhat differently. Cantor, and all subsequent set theorists, define a set *B* to be smaller than set *A* (i.e., has fewer members) just in case *B* is the same size as a subset of *A*, but *A* is not the same size as any subset of *B*. The application of this definition to finite and infinite sets yields results that Craig finds counter-intuitive but which mathematicians and logicians see as our best understanding for comparing the size of sets. They see the fact that an infinite set can be put into one-to-one correspondence with one of its own proper subsets as one of the *defining characteristics* of an infinite set, not an absurdity. Say that set *C* is a *proper* subset of *A* just in case every element of *C* is an element of *A* while *A* has some element that is not an element of *C*. In finite sets, but not necessarily in infinite sets, when set *B* is a proper subset of *A*, *B* is smaller than *A*. But this doesn't hold for infinite sets — we've seen this above where *B* is the set of squares of natural numbers and *A* is the set of all natural numbers.

Cantorian mathematicians argue that these results apply to any infinite set, whether in pure mathematics, imaginary libraries, or the real world series of concrete events. Thus, Smith argues that Craig begs the question by wrongly presuming that an intuitive relationship holds between finite sets and their proper subsets — that a set has more members than its proper subsets — must hold even in the case of infinite sets (Smith, in Craig and Smith 1993, 85). So while Craig thinks that Cantor's set theoretic definitions yield absurdities when applied to the world of concrete objects, set theorists see no problem so long as the definitions are maintained. Further discussion is in Oppy 2006, 137-54.

Why should one think premise (6) is true — that a beginningless series, such as the universe up to this point, is an actual rather than a potential infinite? For Craig, an actual infinite is a determinate totality or a completed unity, whereas the potential infinite is not. Since the past events of a beginningless series can be conceptually collected together and numbered, the series is a determinate totality. And since the past is beginningless, it has no starting point and is infinite. If the universe had a starting point, so that events were added to or subtracted from this point, we would have a potential infinite that increased through time by adding new members. The fact that the events do not occur simultaneously is irrelevant.

Craig is well aware of the fact that he is using actual and potential infinite in a way that differs from the traditional usage in Aristotle and Aquinas. For Aristotle all the elements in an actual finite exist simultaneously, whereas a potential infinite is realized over time by addition or division. Hence, the temporal series of events, as formed by successively adding new events, was a potential, not an actual, infinite (Aristotle, *Physics*, III, 6). For Craig, however, an actual infinite is a timeless totality that cannot be added to or reduced. “Since past events, as determinate parts of reality, are definite and distinct and can be numbered, they can be conceptually collected into a totality” (Craig, in Craig and Smith 1993, 25). Hence, a further critical issue in the *kalām* argument is whether, as Craig suggests, completeness (in terms of being a determinate totality) characterizes an actual infinite, or whether an infinite formed by successive synthesis is a potential infinite (as Rundle holds, chap 8).

4.3 The Big Bang Theory of Cosmic Origins

Craig's a posteriori argument for premise 2 invokes recent cosmology and the Big Bang theory of cosmic origins. Since the universe is expanding as the galaxies recede from each other, if we reverse the direction of our view and look back in time, the farther we look, the smaller the universe becomes. If we push backwards far enough, we find that the universe reaches a state of compression where the density and gravitational force are infinite. This unique singularity constitutes the beginning of the universe — of matter, energy, space, time, and all physical laws. It is not that the universe arose out of some prior state, for there was no prior state. Since time too comes to be, one cannot ask what happened before the initial event. Neither should one think that the universe expanded from some initial ‘point’ into space. Since the Big Bang initiates the very laws of physics, one cannot expect any physical explanation of this singularity; physical laws used to explain the expansion of the universe no longer hold at any time before $t>0$.

One picture, then, is of the universe beginning in a singular, non-temporal event roughly 13-14 billion years ago. Something, perhaps a quantum vacuum, came into existence. Its tremendous energy caused it, in the first fractions of a second, to expand and explode, creating the four-dimensional space-time universe that we experience today. How this all happened in the first 10^{-35} seconds and subsequently is a matter of serious debate; what advocates of premise 2 maintain is that since the universe and all its material elements originate in the Big Bang, the universe is temporally finite and thus had a beginning.

4.4 The Big Bang Is Not An Event

The response to this argument from the Big Bang is that, given the Grand Theory of Relativity, the Big Bang is not an event at all. An event takes place within a space-time context. But the Big Bang has no space-time context; there is neither time prior to the Big Bang nor a space in which the Big Bang occurs. Hence, the Big Bang cannot be considered as a physical event occurring at a moment of time. As Hawking notes, the finite universe has no space-time boundaries and hence lacks singularity and a beginning (Hawking 116, 136). Time might be multi-dimensional or imaginary, in which case one asymptotically approaches a beginning singularity but never reaches it. And without a beginning the universe requires no cause. The best one can say is that the universe is finite with respect to the past, not that it was an event with a beginning.

Given this understanding of event, we could reconceive the *kalām* argument.

8. If something has a finite past, its existence has a cause.
9. The universe has a finite past.
10. Therefore, the universe has a cause of its existence.
11. Since space-time originated with the universe and therefore similarly has a finite past, the cause of the universe's existence must transcend space-time (must have existed aspatially and, when there was no universe, atemporally).
12. If the cause of the universe's existence transcends space-time, no scientific explanation (in terms of physical laws) can provide a causal account of the origin of the universe.
13. If no scientific explanation can provide a causal account of the origin of the universe, the cause

must be personal (explanation is given in terms of a personal agent).

The problem with this formulation is with premise 8. Whereas behind premise 1 lays the ancient Parmenidean contention that out of nothing nothing comes, no principle directly connects finitude with causation. Critics contend that we have no reason to think that just because something is finite it must have a cause of its coming into existence. Grünbaum argues that events can only result from other events. “Since the Big Bang singularity is technically a non-event, and t=0 is not a *bona fide* time of its occurrence, the singularity cannot be the effect of any cause in the case of either event-causation or agent causation alike…. The singularity t=0 cannot have a cause” (Grünbaum 1994). Of course, if the Big Bang singularity is not an event, then by this reasoning other events cannot be the effect of it, which seems to remove all events and all effects.

Rundle defends this view of events by arguing that coming into and going out of existence are symmetrical and both are in time. Ontologically applying infinity to future events does not differ from applying it to past events. Beginning from today one can always add another day to the past or future, since an infinity of past days exists in the same way as an infinity of future days. Thus, just as a day in the future is only finitely distant from today, so any day in the past is finitely distant from today. The past, like the future, is only potentially infinite. In the former case, though the universe is finite, there was no initial event or beginning of material existence; for any given event there is a possible precedent event finitely distant from us in time. Similarly, in the future at any finite point in time, there is a possible subsequent event, so that though the future is finite, it does not require an end to the universe (180). But then either there is a possible prior and posterior stage to any event so that the material uiverse is actually infinite (which he rejects) or else matter is uncaused, with no beginning or end. He accepts the latter; matter-energy is neither caused nor indestructible.

Rundle's argument is suspect in that it assumes that going from the present to the past does not differ from moving from the past to the present; both involve actually finite though potentially infinite series. But although to count events from present to the past always means the event is a finite time-distance from the present, to get to the present from the beginningless past one would have to traverse an actual infinite without a starting point. The two movements are quite disparate, and as Craig (1979) argues, one cannot traverse an infinite. Where there is an indefinite past there is no reason that one has arrived at today rather than yesterday or tomorrow. [Craig defends his case using the example, derived from Bertrand Russell, of Tristan Shandy, who takes a year to write in his diary one day's events. This example has generated a literature of its own (Eells, Oderberg, Oppy 2002b)].

One response to Grünbaum's objection is to opt for broader notions of “event” and “cause.” We might broaden the notion of “event” by removing the requirement that it must be relational, taking place in a space-time context. In the Big Bang the space-time universe commences and then continues to exist in time measurable subsequent to the initiating singularity (Silk 2001, 456). Thus, one might consider the Big Bang as either the event of the commencing of the universe or else a state in which “any two points in the observable universe were arbitrarily close together” (Silk 2001, 63). As such, one might inquire why there was this initial state of the universe in the finite past. Likewise, one need not require that causation embody the Humean condition of temporal priority, but may treat causation conditionally, or perhaps even, as traditionally, a relation of production. Any causal statement about the universe would have to be expressed atemporally, but for the theist this presents no problem provided that God is conceived atemporally and sense can be made of atemporal causation.

4.5 A Non-finite Universe

Some have suggested that since we cannot ”exclude the possibility of a prior phase of existence” (Silk 2001, 63); it is possible that the universe has cycled through oscillations, perhaps infinitely, so that Big

Bangs occurred not once but an infinite number of times in the past and will do so in the future. The current universe is a "reboot" of previous universes that have expanded and then contracted (Musser 2004).

The idea of an oscillating universe faces significant problems. For one, no set of physical laws accounts for a series of cyclical universe-collapses and re-explosions. That the universe once exploded into existence provides no evidence that the event could reoccur once, if not an infinite number of times, should the universe collapse. Even an oscillating universe seems to be finite (Smith, in Craig and Smith 1993, 113). Further, the cycle of collapses and expansions would not, as was pictured, be periodic (of even duration). Rather, entropy would rise from cycle to cycle, so that even were a series of universe-oscillations possible, they would become progressively longer (Davies 1992, 52). If the universe were without beginning, by now that cycle would be infinite in duration, without any hope of contraction. Third, though each recollapse would destroy the components of the universe, the radiation would remain, so that each successive cycle would add to the total. "The radiation ends up as blackbody radiation. Because we measure a specific amount of cosmic blackbody radiation in the background radiation, we infer that a closed (oscillating) universe can have undergone only a finite number of repeated bounces" or cycles, no more than 100 and certainly not the infinite number required for a beginningless series. "We reluctantly conclude that a future singularity is inevitable in a closed universe; hypothetical observers cannot pass through it, and so the universe probably cannot be cyclical" (Silk 2001, 380, 399).

The central thesis of the oscillating theory has been countered by recent discoveries that the expansion of the universe is actually speeding up. Observations of distant supernova show that they appear to be fainter than they should be were the universe expanding at a steady rate. "Relative dimness of the supernovae showed that they were 10% to 15% farther out than expected, … indicating that the expansion has accelerated over billions of years" (Glanz, 2157). The hypothesis that these variations in intensity are caused by light being absorbed when passing through cosmic dust is no longer considered a viable explanation because the most distant supernova yet discovered is brighter than it should be if dust were the responsible factor (Sincell). Some force in the universe not only counteracts gravity but pushes the galaxies in the universe apart ever faster. This increased speed appears to be due to dark energy, a mysterious type of energy, characterized by a negative pressure, composing as much as 70% of the universe. Dark matter, it seems, is overmatched by dark energy.[3]

4.6 Personal Explanation

Finally, something needs to be said about statement 4, which asserts that the cause of the universe is personal. Defenders of the cosmological argument suggest two possible kinds of explanation. *Natural explanation* is provided in terms of precedent events, causal laws, or necessary conditions that invoke natural existents. *Personal explanation* is given "in terms of the intentional action of a rational agent" (Swinburne, 1979, 20). We have seen that one cannot provide a natural causal explanation for the initial event, for there are no precedent events or natural existents to which the laws of physics apply. The line of scientific explanation runs out at the initial singularity, and perhaps even before we arrive at the singularity (at 10^{-35} seconds). If no scientific explanation (in terms of physical laws) can provide a causal account of the origin of the universe, the explanation must be personal, i.e., in terms of the intentional action of a rational, supernatural agent. One might wonder, as Rundle does, how a supernatural agent could bring about the universe. He contends that a personal agent (God) cannot be the cause because intentional agency needs a body and actions occur within space-time.

But acceptance of the cosmological argument does not depend on an explanation of the manner of causation by a necessary being. When we explain that the girl raised her hand because she wanted to ask a question, we can accept that she was the cause of the raised hand without understanding how her wanting to ask a question brought about her raising it. As Swinburne notes, an event is "fully explained when we have cited the agent, his intention that the event occur, and his basic powers" that include his ability to bring about events of that sort (1979, 33). Similarly, theists argue, we may never know why and how creation took place. Nevertheless, we may accept it as an explanation in the sense that we can say that God created that initial event, that he had the intention to do so, and that such an event lies within the power of an omniscient and omnipotent being; not having a body is irrelevant.

Paul Davies argues that one need not appeal to God to account for the Big Bang. Its cause, he suggests, is found within the cosmic system itself. Originally a vacuum lacking space-time dimensions, the universe "found itself in an excited vacuum state," a "ferment of quantum activity, teeming with virtual particles and full of complex interactions" (Davies 1984, 191-2), which, subject to a cosmic repulsive force, resulted in an immense increase in energy. Subsequent explosions from this collapsing vacuum released the energy in this vacuum, reinvigorating the cosmic inflation and setting the scenario for the subsequent expansion of the universe. But what is the origin of this increase in energy that eventually made the Big Bang possible? Davies's response is that the law of conservation of energy (that the total quantity of energy in the universe remains fixed despite transfer from one form to another), which now applies to our universe, did not apply to the initial expansion. Cosmic repulsion in the vacuum caused the energy to increase from zero to an enormous amount. This great explosion released energy, from which all matter emerged. Consequently, he contends, since the conclusion of the *kalām* argument is false, one of the premises of the argument — in all likelihood the first — is false.

Craig argues that several problems face this scenario. For one thing, how can empty space explode without there being matter or energy? Since space is a function of matter, if no matter existed, neither could space, let alone empty space, exist. Further, if the vacuum has energy, the question arises concerning the origin of the vacuum and its energy. In short, merely pushing the question of the beginning of the universe back to some primordial quantum vacuum does not escape the problem of what brought this vacuum laden with energy into existence. A quantum vacuum is not nothing (as in Newtonian physics) but "a sea of continually forming and dissolving particles which borrow energy from the vacuum for their brief existence" (Craig 1993, 143). Hence, he concludes, the appeal to a vacuum as the initial state is misleading. Defenders of the argument affirm that only a personal explanation can provide the sufficient reason for the existence of the universe.

The issues raised by the *kalām* argument concern not only the nature of explanation and when an explanation is necessary, but even whether an explanation of the universe is possible (given the above discussion). Whereas all agree that it makes no sense to ask about what occurs before the Big Bang (since there was no prior time) or about something coming out of nothing, the dispute rests on whether there needs to be a cause of the first natural existent, whether something like the universe can be finite and yet not have a beginning, and the nature of infinities and their connection with reality.

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