On William Lane Craig's Argument for Creatio ex Nihilo

"The first question which should rightly be asked is 'Why is there something rather than nothing?'"
Leibniz

Introduction

This paper examines William Lane Craig's defense of the claim that the universe had a beginning as presented in his essay entitled Philosophical and Scientific Pointers to Creatio ex Nihilo. This claim constitutes the first premise in a larger argument whose final conclusion rests in the existence of a personal Creator. The entire argument, known as the Kalam Cosmological Argument, is a variant of that class of arguments which presents the existence of the world as the basic fact in need of explanation and which cannot find its explanation within itself (Drees, 1990).

The distinctive feature of kalam-style cosmology is its stress on the impossibility of the actual infinite's existence. Put simply, kalam arguments try to demonstrate (1) that the existence of an actual infinite (a concept from modern set theory to be discussed shortly) is impossible and (2) that even if it were possible, the universe itself is not actually infinite and hence must have had a beginning. The argument is presented in three logically successive phases, each of which offers a choice between two mutually exclusive alternatives:

1. Either the universe a) began or b) did not begin.

2. Either the beginning was a) caused or b) uncaused.

3. Either the cause was a) personal or b) impersonal.

The argument works by supporting the a) option of each premise and then using it as the basis for the following premise. Hence the kalam is actually a series of connected arguments. To be successful, each of these arguments must be logically valid and have true premises. Since the kalam is a series of arguments that take the form of a valid argument -- known as a disjunctive syllogism -- its formal validity is beyond dispute. To be a sound argument, however, the kalam must have true premises.

This paper focuses on the first of these premises -- that the universe had a beginning. Specifically, I will provide an analysis and commentary on each of the two philosophical arguments used to support this premise. In the commentary sections, objections will be raised and critiqued for their relative merit. Finally, I will offer a brief account of the cosmological evidence for and against Craig's position. The final section renders a judgment as to whether or not Craig's treatment of the kalam provides a reasonable basis for accepting the truth of the premise that the universe had a beginning. What follows, then, is an analysis of the first philosophical argument for the beginning of the universe.

The First Philosophical Argument

Craig casts his first argument in the form of a deductive syllogism. It is sketched out as follows:

1. An actual infinite cannot exist.

2. A beginningless series of events in time is an actual infinite.

3. Therefore, a beginningless series of events in time cannot exist.

Argument One, Premise One: An actual infinite cannot exist.

The meaning of the term actual infinite is crucial toward the understanding of this argument. An actual infinite is a concept germane to contemporary set theory and is defined as a collection of things which are a) infinite in number, b) fully and definitely determined to which c) nothing further may be added or subtracted. One of the unique traits of an actual infinite is that part of the set is equal to whole set. For instance, in an actually infinite set of numbers, the number of even numbers in the set is equal to all of the numbers in the set. This follows because an infinite set of numbers

contains an infinite number of even numbers as well as an infinite number of all numbers. For the same reason, in an actually infinite set of real integers, the number of prime numbers {3,5,7,11...} is equal to the number of real integers {1,2,3,4...}. Thus, the part of the set is equal to the whole of the set.

By contrast, a potential infinite is a set of things that can be added to without ever reaching infinity. Such a set may be ever increasing without limit yet is at all times finite. Whereas actual infinites are definite collections, potential infinites contain an indefinite collection of things. The collection of all paintings in a museum is a potential infinite. This is because its members are neither definite (new members can be added), nor really infinite (i.e., the final number paintings will never reach infinity).

It should be pointed out that Craig denies neither the theoretical utility nor the formal validity of actual infinites. What Craig will deny is the real existence of actual infinites. But what does Craig mean by existence? For Craig, something exists if it is an empirically valid manifestation found in the real world. Existence, in this sense, is understood as something that lies outside the mind. Craig explicitly asserts that actual infinites do not exist in this sense.

Having defined the relevant terms, Craig next moves to demonstrate the absurdities that would result if an actual infinite could exist. Thus, he imagines a library composed of an infinite number of books. If all of the books were one of two colors, red and black, then the number of black books would be equal to number of red books. In addition, the number of black books would also be the same as the number of black books plus red books! For in this latter collection there would exist all the black books plus an infinite number of red books.

What if a millionaire donated a million new books to the library? Conversely, suppose an LSU graduate student were to check out the entire collection of books so that he would no longer have to be bothered with the frustrating process of waiting for particular books that are long overdue. In either case, the library would contain the same number of books since, by definition, it is impossible to add to or subtract from an actually infinite set. Through this example, Craig means to illustrate the impossibility of the real existence of an actual infinite. While this counter-intuitive paradox may make sense at the level of mathematical theory, it does not make much sense in the real world of things. Hence, from the absurdities that would result, Craig concludes that actual infinites can not exist.

Commentary: Argument One, Premise One

The late J.L. Mackie (1982) argued that the alleged absurdities entailed by the existence of an actual infinite (e.g., infinities of different sizes) involve no real contradiction (p.93). The reason for this is that our normal criteria for distinguishing between smaller than and equal to in finite groups do not apply when applied to infinite groups of things. They are, in fact, logically incompatible when applied to infinite groups.

In finite groups, explains Mackie, smaller than means that the members of one group can be correlated one to one with a proper part of another group; equal to means that the members of the two groups can be matched exactly in a one to one correlation (ibid). These two criteria are mutually compatible for all finite groups, but not for infinite groups. Infinite set theory is thus forced to maintain logical consistency by abandoning the principle that the whole is greater than its part. Understanding this relationship between the two criteria, he concludes, shows that there is no real contradiction (ibid).

This response appears to miss the mark. What Mackie has done is to call into question the formal validity of the concept of an actually infinite set. That is to say, Mackie has stated that the principles of finite sets -- the Cantorian principle of correspondence, and the Euclidean principle that the whole is greater than its parts -- are not mutually compatible for infinite sets. Thus, Mackie draws attention to a pair of competing conditions which may give rise to the absurdities entailed in the existence of an actual infinite.

However, the issue is not one of internal consistency, per se, but whether or not such a system can be instantiated in the real world (Craig, 1984). What this means is that even if the contradiction could be alleviated, for instance, by abandoning the Euclidean principle in favor of correspondence, a justification is still owed as to how this principle would succeed in alleviating the aforementioned absurdities. That is, Craig can grant Mackie his point, remove the Euclidean principle, and still maintain that a corresponding set of absurdities would ensue, and thereby deny the existence of an actual infinite. On this point, Mackie's objection seems wanting.

Another objection concerns the distinction between actual and potential infinites. The property of indefiniteness found in potentially infinite sets would seem to rule out the possibility of any

qualitative change in the nature of a potential infinite such that it could become an actual infinite. It may be asked, however, if in adding an infinity of elements to a potential infinite the qualitative nature of that set would be effectively changed such that it would become actually infinite. And since the set now has a new property (infinity), it may be asked whether the demarcating criteria of indefiniteness remains functionally relevant in this case.

That is, has the barrier separating actual infinity and potential infinity been traversed by adding an infinity of elements to a potential infinite? This problem will be addressed, in some detail, in the analysis of the Second Philosophical Argument. For now, however, it is enough to note that a further clarification of the relationship between potential and actual infinites may be needed.

There is a more pressing challenge to the premise that actual infinites cannot exist. This challenge hinges on the relationship between mental existence and material existence. Craig claims that actual infinites cannot exist in the same sense that stars, rocks and men can (1995, p.187). It is in this sense that he claims the concept of actual infinite has no real existence.

At an ontological level, it is admittedly difficult to determine the way in which mathematically driven concepts such as an actual infinite might play out in the real world. Craig's technique involves a cleverly conceived, counter-factual example of a library replete with an infinite collection of books. The existence of a library whose total volume of books remains the same regardless of the number of books added or removed does seem absurd. In our ordinary experience of libraries, such a collection would seem, at best, only potentially infinite.

However, strictly speaking, Craig's example more readily shows that actual infinites would not operate in the real world in the way as potential infinites would. More specifically, Craig demonstrates the intuitive difficulties involved when attempting to instantiate mental concepts such as that of an actually infinite library by appealing to the instantiable features of finite concepts. In defense of Craig, mathematician and set theory expert David Hilbert writes:

"the [actual] infinite is nowhere to be found in reality. It neither exists in nature nor provides a legitimate basis for rational thought--a remarkable harmony between being and thought.... The role that remains for the [actual] infinite to play is solely that of an idea" (cited in Craig, 1979).

As another physicist notes, however:

"...transfinite numbers have strange properties when we are used to garden variety arithmetic. There is, however, nothing in them which would lead to judgments of physical impossibility on their account." Mathematical concepts are judged for validity largely on the basis of internal consistency" (insert cite).

To this one philosopher adds:

"It is a typical Rationalist mistake, attempting to constrain the possibilities of mathematical physics by pure thought, beyond the requirement of consistency...One imagines an early 20th century Craig objecting to relativity, not because of theoretical incoherence or experimental falsity, but conceptual difficulties and the manifest absurdity of non-Euclidean geometry"

Taking a slightly different tack, we might simply ask why it is necessary to take the principles of mathematical physics to be a fitting model for demonstrating either the existence or nonexistence of anything. A variation of this kind reasoning can be found in Descarte's Ontological Proof. Whereas Descartes' uses the properties of a triangle -- properties he claimed to deduce within his mind alone -- to prove existence, Craig uses properties of transfinite mathematics to demonstrate nonexistence. Both attempts, however, are beset with the same amply documented ontological difficulties inherent when conflating conceptual and material existence.

Craig seems guilty of attempting to put a square peg into a round hole, and failing the attempt, justifies the failure by claiming that the peg cannot possibly exist. No warrant has been established for the premise that conceptual validity constitutes a necessary criterion for external existence. That Craig's examples show certain principles in set theory have no correlative instantiation in the real world is to beg the question that it is the conceptual principles that must do the work.

Moreover, the argument assumes that the "example" in question does justice to the problem. While the questioning of this assumption shifts the burden of proof to the other side, it may yet be premature to assume that there exists no disconfirming instance(s) or counterexample(s) to that given by Craig. One is hard pressed to imagine that libraries would be the ideal place to start. For these reasons, the veracity of this premise seems disputable. While it may have an intuitive appeal

for some audiences, it is, in my view, unsatisfying. Since it is the major premise on which this phase of his argument depends, it calls into question the soundness of the entire argument.

Argument One, Premise Two: A beginning series of events in time is an actual infinite.

The second (minor) premise in this argument states that the beginningless series of events is an actual infinite. Specifically, a beginningless series of events is a collection of occurrences at which no final starting point ever arrives. The series regresses back infinitely. Thus, in considering the collection of stars {a, b, c, d, e, f...}, it may be asked where (f) derived from. If it is answered that star (f) came from the explosion of another star (f-1) existing prior to it, it might be inquired as to the origin of star (f-1). If each successive answer harkens back to a previous star, ad infinitum, such a collection of stars, says Craig, would constitute a beginningless series of events.

By event, Craig means something that happens. This relation is annexed to the term "in time." Time is, therefore, a constituent feature of a series of events, precluding the possibility of a single event or a series of events occurring either outside or in the absence of time. Importantly, the argument involves a hidden assumption dealing with the nature of time itself, namely that time is finite and progresses by discrete and successive addition. While an extended discussion on the nature of time is beyond the scope of this essay, several important implications of Craig's conceptions of time will be discussed in the section which examines the scientific arguments for and against a finite universe. For now, we should note that Craig employs a notion of temporality that privileges a certain theory of time and space that is not explicitly justified.

An alternative example may help to clarify Craig's notion of a beginningless series of events. The Battle of Hastings took place in 1066. The Declaration of Independence was adopted in 1776, 710 years after the Battle of Hastings. If the series of past events in the universe is actually infinite, we can say that the Battle of Hastings was preceded by an infinite number of events. We can say the same about the Declaration of Independence. In fact we can say that the set of past events before the Battle of Hastings is equal to the set of past events before the Declaration of Independence because part of an actually infinite set is equal to the whole set (Ramey, 1995).

But how can that be? 710 years separate these two events, i.e.; 710 years were added to the set of past events before the Battle of Hastings to get to the Declaration of Independence. By definition, however, nothing can be added to an actual infinite. Hence, the series of past events before the Battle of Hastings cannot be actually infinite (ibid). Craig thus concludes that the series of all past events must be finite and have a beginning. But the universe is the series of all events, so the universe must have had a beginning.

Commentary: Argument One, Premise Two

Two details in this portion of Craig's should be emphasized. First, the argument equates the universe with the series of events occurring in time. Alternatively, we may view Craig's argument as employing an additional syllogism to complete his argument. As stated:

1. An actual infinite cannot exist.

2. A beginningless series of events in time is an actual infinite.

3. Therefore, a beginningless series of events in time cannot exist.

As implied:

1. A beginningless series of events in time cannot exist.

2. An eternal universe is a beginningless series of events in time.

3. Therefore, an eternal universe cannot exist.

Thus, if the universe has existed forever it constitutes an actual infinite, a conclusion which Craig obviously denies.

Second, Craig's notion of an actual infinity of events is restricted to past time. Potential infinites are restricted to the future since they do not yet exist. Thus, Craig's argument imposes a temporal limit on how actually infinite collections of events are temporally constituted, namely those events which have occurred in and up to, but not including, present or future occurrences. A somewhat crude, but helpful illustration is found in the following point line:

Past Present Future

A)-)-)-)-)-)-)-)-)-)-> **B** -)-)-)-)-)-)-)-)-)--> **C**

AI collection of events/ PI collection of events

One objection at this point challenges the claim that the series of past events as constituting a and/or the only actually infinite series. For example, it may be possible to start with today, and count backwards into time. Counting this way, would entail a series of events that was only potentially infinite since it had a definite starting point (today) and (potentially) no end.

Another possible objection concerns the assigning of the term "actual infinite" to an arbitrary set of events that occurred at equally arbitrary points in the past. That is, the set of all or some past events constituted, at one time, only and at best, a potentially infinite set. This is because they would have been nonexistent up to the time they occurred. The series of events constituting the Battle of Hastings could only have been a potential infinite up to the point that they (presumably) occurred.

But potentially infinite sets are not, nor can they ever be actually infinite. So, if the set of future events is at best only potentially infinite, and if an actually infinite set can never be a potential infinite, then Craig owes us a reason as to why what once could only have been a potentially infinite series of future events can now be regarded as an actually infinite set.

These and other objections are taken up in Craig's Second Philosophical Argument. For it is these types of objections that the second argument is supposed to overcome. For his part, Craig maintains that only the future is potentially infinite, since it does not exist; the past is actual in a way the future is not. The evidence for this, according to Craig, is that we have traces of the past in the present, but no traces of the future. Hence, he concludes, "if the series of past events never began to exist, there must have been an actually infinite number of past events" (1979).

In other words, if the series of past events had no beginning, it is actually infinite. If premise one is correct, however, it follows that a beginningless series of events in time cannot exist, and thus by logical implication if follows that the universe had a beginning. In order to address the aforementioned objections, we turn to the analysis of Craig's Second Philosophical Argument in support of the claim that the universe had a beginning.

The Second Philosophical Argument

The second philosophical argument for the beginning of the universe does not dispute the existence of the actual infinite but instead points out that an actual infinite is not attained by adding new members to a potential infinite. This argument is sketched out as follows:

1. The series of events in time is a collection formed by adding one member after another.

2. A collection formed by adding one member after another cannot be actually infinite.

3. Therefore, the series of events in time cannot be actually infinite.

This argument expresses the notion that an actual infinite, even if it could come to exist, could not do so by the addition of successive elements to a collection.

Argument Two, Premise One: The series of events in time is a collection formed by adding one member after another.

This point, for Craig, is obvious; its negation would entail the simultaneous existence of all past events. Returning to the example of the Battle of Hastings and the Declaration of Independence, it seems obvious to Craig that the 710 years between them came about by adding one year after the other. History is the continual addition of new events, one event being added after another.

Commentary: Argument Two, Premise One

It has already been noted that Craig privileges a conception of time that is linear and discrete in progression. Indeed, this premise is grounded on such a conception of time. Yet, there is a general consensus among cosmologists in physics that time can be projected into the past only so far. There is a barrier of sorts, a singularity, where space and time were themselves created. At that point, it is meaningless to talk of before and after. The very concepts of space and time begin to

dissolve and with it the assumption that time exists in the first place (McFarlane, 1995). This particular position calls into question the notion that a past series of events can be legitimately presented as a set of such events occurring in time.

Beyond this, an extended discussion of the nature of time is required. As stated previously, such a discussion is beyond the immediate scope of this essay. In the section which examines the cosmological evidence for a universe with a beginning, however, several theories will be offered which entail radically different views on the temporal-spatial ordering of the universe and thus bear directly in Craig's argument.

Argument Two, Premise Two: A collection formed by adding one member after another cannot be actually infinite.

This is the crucial premise in the argument. Craig's warrant for this claim follows from one of the defining features of an actual infinite, namely that nothing further may be added to it. Any set to which another member can be added is not infinite, simply because another member could always be added. Infinity can never be reached by successive addition.

This notion has been called the "impossibility of counting to infinity," or alternatively, "the impossibility of traversing the infinite" (Craig, 1995, p.190). Craig asks us to imagine a man "running up a flight of stairs so that each time his foot strikes the top step, another step appears above it. It is clear that the man could run forever, but he would never climb over the final step because there would always be one more step to cross (ibid).

Alternatively, it may be said that 1995 would never have arrived had it been preceded by an infinite number of years, because one cannot cross an infinite number of years to reach 1995 anymore than the man running up the stairs can cross an infinity of steps. Thus, the number of years before 1995 must be finite or potentially infinite, but not actually infinite. Thus, it follows from premises one and two that the series of events in time cannot be actually infinite.

Commentary: Argument Two, Premise Two

One objection to this premise states that from the claim that it is impossible to traverse one actually infinite series of events, it does not necessarily follow that another series of events, such as those constituting the present, cannot exist. That is, Craig offers no argument against the possibility that there may exist co-occurring sets of infinite and finite collections such that both an actually infinite past and a finite present could exist.

But consider the following example: X is in the process of attempting to count to zero from a collection of infinite negative numbers. X will never reach zero because it is not a part of the set of infinite negative numbers and hence would entail a violation of the traversion principle. Craig's reasoning, it may be objected, asks us to conclude that zero does not therefore exist (i.e., "today" does not exist). Hence, the question concerns whether the traversion principle logically precludes the existence of other events (whether finite or infinite) which lay outside an actual infinite.

Upon closer examination, however, this objection misses the point entirely. As previously stated, the argument does not dispute the possibility of an actual infinite's existence. In fact, it does not dispute the possibility of co-occurring infinite and finite sets of events. Craig could concede the logical possibility that the present might somehow exist in spite of the existence of an actual infinite series of past events. What the argument explicitly maintains is that if the past were actually infinite, and even if the present could exist, we would never actually arrive at it. But, of course, we have arrived at it. Therefore, the past is not actually infinite.

Recall an earlier objection to the apparently arbitrary designation of past events as constituting an actual infinite. The objection was that the Battle of Hastings, at one time, constituted only a potentially infinite series of events prior to 1066. This objection is countered on the same grounds. Craig's point is that if the past were actually infinite, then history never would have arrived at 1066 A.D. In other words, his argument is, once again, a reductio ad absurdum (or indirect proof), in which one assumes the truth of something -- in this case the existence of an actual infinite -- and then shows the absurd or illogical consequences which follow. For clarity, the proof may be stated in logical sequence:

1. The universe is actually infinite.

2. So, the series of events in the universe are actually infinite.

3. So, the series of events leading up to 1066 A.D. are actually infinite.

4. But if this series is in fact actually infinite, then istory never would have arrived 1066 A.D.

5. But it did arrive at 1066.

6. Hence (1) is false, and the universe is potentially infinite, not actually infinite.

7. (4) represents the logical consequence of (1); but since it is false (5), then we can conclude that (1) is

likewise false.

Again, Craig reasons that if the past did constitute an actually infinite series of events, then "today" could never arrive, not that it couldn't exist. As he puts it, you would never find a person counting an infinite number of negative numbers and reaching the number zero because there would always be one more number to count. Indeed, this notion may be extended to show that if an infinite number of days has elapsed before the present day, then not only our present day but any day in the past could not have arrived!

Mackie objected to this premise on the grounds that it erroneously assumes an infinitely distant starting point for the temporal series and then pronounces it impossible to traverse the distance from that point to today (1982, p.93). But, notes Mackie, if the concept of infinity is to be taken seriously, then in an infinite past there would be no starting point whatsoever, even an infinitely distant one. Yet, from any specific point in past time there is only a finite stretch that needs to be traversed to reach the present (ibid).

Now Craig has asserted that he knows of no Kalam proponent who assumes an infinitely distant starting point (Craig, 1984). But even granted this point, the beginningless character of an infinite temporal series seems to exacerbate the problem of its formation by successive addition. In this, the past would be constituted along the lines of Zeno's paradox, in which Achilles must have travelled across an infinite series of intervals from a beginningless and open end to reach the finish line. The fact that there is no beginning at all, not even an infinitely distant starting one, makes the problem worse, not better (Craig, 1984).

The second part of Mackie's objection is clearly in error. The claim expresses the notion that from any specific moment in past time there is only a finite stretch to the present. This seems right enough. But the issue is not how a finite segment of a series of events can be traversed, but rather how the whole series of events can be formed (or traversed) by successive addition. Mackie's claim appears to commit the fallacy of composition. That is, from the fact that every finite segment of the series can be traversed, it does not follow that whole can also.

Another common objection concerns the distinction between an actually infinite set and a beginningless infinite series. In this view, the set of all past events is actually infinite, while the series of past events is potentially infinite. That is, it is not necessary to regard the past as a beginningless infinite series with an end in the present. This is shown by starting with the present moment and counting backward into a past with no definite end, in which case we would have only a potential infinite. The problem of an actual infinite's being formed by successive addition would not even arise.

Craig has countered this objection by arguing that while it may be possible to conceptually enumerate a sequence of events in backwards order, such an ordering does not conform to the real progress of the temporal series of events. As he states:

"Numbering the series from the present backwards only shows that if there are an infinite number of past events, then we can denumerate an infinite number of past events. But the problem is, how can this infinite collection of events come to be formed by successive addition? How we mentally conceive the series does not in any way affect the ontological character of the series itself as a series with no beginning but an end, or in other words, as an actual infinite completed by successive addition" (1979, p.52) .

This rebuttal seems reasonable enough. Taken together, then, both the major and minor premise of this argument seem more plausible than the objections leveled against them. And, taken together, they imply that the universe began to exist.

Evidence for a Finite Universe

The scientific argument for a finite universe is by far the most controversial. This argument is grounded in a particular cosmology -- a view or theory of time and space -- which is currently the subject of considerable debate. Part of this controversy concerns the nature of theory of itself. Theories are general propositions, descriptive, explanatory, and predictive in function, which purport to represent some truth or set of truth-values. In so far as they are generalizations, they represent, at best, only a partial view of the truth, if any. In so far as they are representative, they do not constitute reality in and of themselves. Rather theories provide one way of representing truth by selecting and organizing facts about the material world.

Thomas Kuhn has shown how the very nature of scientific progress renders any given theory beholden to the evolving collective psyche of the scientific community (Kuhn, 1962). The final justification for a theory, argues Kuhn, lies in its ability to solve the problems that are culturally sanctioned by a community of like-minded adherents. Thus, scientific theories, for Kuhn, are not meritorious as much for any Truth they may represent, as they are for how efficaciously they solve scientific puzzles.

Karl Popper has taken a different tack in attacking the nature of theory, suggesting that theories can never be proven to be true. At best they can be supported (Popper, 1962). This is because theories, properly rendered, are at all times subject to falsifiability. Theories engender logically deducible hypotheses which can potentially disconfirm the theory. Moreover, since it is not possible to construct and test all possible disconfirming possibilities, theories must be regarded as tentative truths In Popper's view, theories are innocent until proven guilty. With these limitations in mind, we may now look to the current cosmological theories dealing with the universe.

There are three theoretical models of the universe which have gained prominence among cosmologists in the past twenty years -- the big bang theory, the steady state model, and the oscillating model. The big bang theory states, in brief, that at some point in the past, the entire known universe was contracted down to a single point. The steady state model posits that the universe has existed in the same state for all eternity. The oscillating model explains the universe as a kind of spring which has expanded and contracted from eternity. Craig has sided with the first theory on the grounds that it signals an event which marks the beginning of the universe.

Craig argues that the big bang model is well-supported by recent scientific findings. Earlier this century, for instance, Edwin Hubble discovered that light from distant galaxies is red-shifted, implying that the universe is expanding from an initial explosion which took place a finite time ago (Ramey, 1995). Some scientists have challenged this interpretation of the red-shift, but its explanatory power is, as of yet, unmatched by alternative theories (ibid).

Second, the big bang theory predicted the discovery of three-degree blackbody radiation. That is, the entire universe was discovered to be bathed with a background of microwave radiation, indicating that the universe was once very hot and very dense. The steady state model of the universe predicted that no such state could have existed since the universe was supposed to be the same from eternity. This finding, for a majority of cosmologists, effectively disconfirmed the steady state model (ibid).

Concerning the oscillating model, astrophysicist Robert C. Newman (1992) writes:

> "If there is any process which causes our universe to lose energy at a non-zero rate, then an oscillating universe would have run out of energy (and so ceased to oscillate) long ago" (p. 82).

Added to this is the fact that no scientist has offered an explanation as to why a contracting universe would "bounce" and begin expanding again (Ramey, 1995). Moreover, recent evidence confirms that galaxies are moving too quickly away from one another for gravity to pull them back into a compressed point. Thus, Craig argues it is all but improbable that the universe as we know it is one in which an infinite series of expanding and contracting events would occur.

Given the aforementioned exigencies intrinsic to the nature of theory, Craig's evidence for a universe with a beginning must be viewed with some caution. It will be noted, however, that the big bang theory and its supporting observations seem to provide a more reasonable basis for speculating on the nature of the universe than the alternative models currently in vogue. In so far as the big bang theory is consistent with the notion of a finite universe, Craig's argument seems more compelling than the objections leveled against it.

Conclusion

The premise that the universe had a beginning is supported by a combination of two philosophical arguments and the most recent scientific evidence. The first philosophical argument states that the universe had a beginning and is justified in the indirect proof that its alternative produces a series of counter-intuitive absurdities. A significant challenge to this justification arises in the recognition that the conceptual properties comprising an actual infinite do not constitute a necessary criterion for establishing real existence. On this point, however, no philosopher, to date, has been able to show that Craig's justification is unreasonable -- only that it may not be necessary. On the other hand, if it is asserted that actual infinites can exist, the burden of proof shifts to the other side in which case its proponent will be required to present instantiated evidence for the existence of an actual infinite.

In anticipating the difficulties associated with correlating concept with reality, Craig has provided a second philosophical argument which shows that even if it were possible for an actual infinite to exist, it could not come to exist by the members of a collection being formed in successive addition. This is tantamount to saying that in order for an infinite collection to come to exist in the real world, given our contemporary notions of time, the members would have to be created simultaneously.

And no philosopher to date has successfully overcome the problem of traversing the infinite -- a problem which would have to be overcome if "today" were ever to arrive from an actually infinite series of past events. Finally, Craig has shown that there are a number of scientific findings which support the big bang theory. Although scientific theories, such as the big bang, cannot presume certainty, this particular theory, nevertheless, currently seems to provide the best fit for the available data. More importantly, the big bang theory predicts that a state existed in which the universe did, in fact, begin.

In conclusion, the objections raised in this paper -- both philosophical and cosmological -- against Craig's premise, seem less compelling than the premise itself. Hence, I conclude with Craig, that, taken together, these arguments provide reasonable grounds for accepting the premise that the universe began to exist.

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