

ON THE KALAM COSMOLOGICAL ARGUMENT

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ABSTRACT

This paper examines the Kalam cosmological argument, as put forward by William Craig. Craig infers the existence of a personal God from the supposedly finite past of the universe. The temporal finiteness of the universe is based upon philosophical arguments for the presumed impossibility of an actual infinity of past events and is confirmed by two lines of scientific evidence.

The arguments against an actual infinity - if valid - prove too much, placing undue limitations on God. Moreover, the arguments themselves are dubious. Although the concept of an actual infinity may lead to conclusions that are counter-intuitive, the impossibility of the actual infinite has not been demonstrated.

The scientific arguments for a finite past - the big bang singularity and the second law of thermodynamics - are examined. It is found that there are still various seemingly plausible alternatives to a finite past. Big bang cosmology contradicts Craig's philosophical conclusions at a few points. The status and value of scientifically-based arguments for the existence of God are briefly discussed.

INTRODUCTION

The cosmological argument is probably the most popular of the theological existence proofs. Over the years many different versions of it have been presented. This paper is concerned with the Kalam Cosmological Argument, which aims to demonstrate that the universe was created *ex nihilo* by a personal creator. The argument is grounded upon the supposed impossibility of an actual infinity of past events. The finite past of the universe is then held to imply its *ex nihilo* creation by a personal creator.

Many of the arguments against an actual infinity can be traced back to Aristotle, although the Christian philosopher John Philoponus seems to have been the first to apply them (in 529 A.D.) to a demonstration of the finite age of the universe.¹ Philoponus' proofs for creation were taken up and further developed in the 9th and 10th centuries by a number of Islamic philosophers of the Kalam school, becoming thus known as the *Kalam* cosmological argument.²

In recent times this proof for the existence of God has been defended by William Craig in a number of publications (Craig 1979, 1980, 1984, 1991). According to Craig (1979, preface) this is the most plausible of the proofs for the existence of God. Craig's argumentation consists of three steps:

- (1) the universe had a beginning, a first event.
- (2) that first event was caused.
- (3) that cause was personal rather than impersonal.

In short, the finite past of the universe implies its *ex nihilo* creation by a personal creator.

The prime concern of this paper is with step (1). Craig has marshalled a number of philosophical and scientific arguments purporting to demonstrate that the universe must have had a finite past. It is my intention to examine some of the implications and shortcomings of Craig's arguments against an infinite past.

PHILOSOPHICAL FACTORS

Craig bases his premise of a first event primarily on the supposed impossibility of an actual infinity of past events. We shall first address the question as to whether Craig's arguments against the actual infinite are in fact valid. Then, supposing they are, we shall examine various theological implications.

1. Is an Actual Infinity Impossible?

Craig's arguments against an actual infinity fall into three categories:
(1) it is impossible to add to an actually infinite collection.

¹see Sorabji (1983, 198).

²see Davidson (1987, 117-153).

(2) the fact that infinite collections are all of equal size leads to contradictions.
(3) a collection formed by adding one member after another cannot be actually infinite. These arguments have been examined in detail by Smith (1987), who finds them to be fallacious and who concludes that there is no philosophical objection to an infinite past (although Smith believes that there are valid scientific objections to it). It is not my intent to here repeat Smith's analysis, which I believe to be correct, but to note only a few major concerns.

I believe that the prime confusion arises from the fact that Craig often assesses infinite sets by criteria that properly apply only to finite sets. Infinite sets certainly have strange properties. For example, if ω represents infinity, then $1 + \omega = \omega$; $2 * \omega = \omega$; and even $\omega^2 = \omega$. Since we are used to dealing concretely only with finite sets, such properties of infinite sets do seem almost unbelievable. Nevertheless, as demonstrated by Cantor and confirmed by modern mathematicians, trans-finite mathematics is logically consistent. Although a number of paradoxes can arise in the usage of infinite sets, these are generally a result of self-reference problems.

Craig notes that he is arguing only against an actual infinity in the real world, and in no way wishes to undermine the concept of actual infinity as found in Cantorian trans-finite mathematics. But there, according to Craig, actual infinity is only an idea:

What I shall argue is that while the actual infinite may be a fruitful and consistent concept in the mathematical realm, it cannot be translated from the mathematical world into the real world, for this would involve counter-intuitive absurdities. (Craig 1979, 69)

He gives a number of illustrations, one being a library consisting of an infinite number of books. Such a library has some strange properties. For example, if we eliminate half of the books (i.e., the odd-numbered ones) then we still have as many books as we started with. Yet if we now loan out the remaining books (i.e., the even-numbered ones) then we have nothing left, even though we have removed exactly the same number as before. Furthermore, Craig argues, if we add a book to an infinite library then we can see that the collection is increased by one; we don't have the same number of books as before, as should be the case for an infinite set. He concludes that such examples serve to illustrate that an actual infinite cannot exist in the real world (Craig 1980, 7).

Does this argument really demonstrate the impossibility of an actual infinity in the real world? I think not. The above operations on books could also be done on, say, the positive integers. Remove the odd ones and you still have an infinity left; remove now also the even ones and nothing remains. Or take the even integers, which form an infinite set, and you can still add any odd number to it, leaving us still with an infinite set. If these operations are permissible for numbers, why not also for books? Since one could set up a one-to-one correspondence between the natural numbers and books in a library (or events in time), it follows that likewise an actual infinity of books (or events) need not involve

any logical difficulties, however counter-intuitive such an actual infinite library might be.

The essential distinction between books and numbers, according to Craig, is that the former are concrete things while the latter are mere ideas. We can see and feel books and hence, presumably, counter-intuitive notions must be rejected. Yet one might question whether it is meaningful for us to even contemplate the occurrence of an actual infinity in the real world of our experiences. After all, within the limitations of our finite experiences, memories, and thoughts we can never distinguish between the infinite and merely the very large. Even if we could eliminate half of the books in an infinite library, the remainder will still be beyond our ability to count and thus, in any practical sense, will be the same as what we started with. Since all our human experiences are finite, the real actual infinite is necessarily counter-intuitive. But that by itself does not render it impossible.

2. God and the Future

Let us suppose, for the sake of the argument, that Craig's proof against the actual infinite were valid. It would seem that such a ban on the actual infinite would have some awkward theological consequences. Consider, first of all, the question of future events. The Bible, in its description of the life-hereafter, pictures it as a temporal existence, with flowing water and ripening fruit, where the saints shall reign for ever and ever (Rev.22:1-5): a seemingly endless future time. Is this view of the future not ruled out by Craig's argument against an actual infinity of past events, which implies that the future must likewise be finite?

Craig argues that this need not be the case. The future differs from the past in that it is not an actual completed infinity; it is only potentially infinite, in the sense of being inexhaustible. A potential infinity is, according to Craig, permissible:

a potential infinite is a collection that is increasing without limit but is at all times finite...it is not truly infinite- it is simply indefinite. (Craig 1980, 6)

Past events are real since they have actually occurred, while future events do not actually exist because they have not (yet) occurred (Craig 1979, 97). Kant offered a similar argument against an infinitely old (or infinitely large) universe. Bennett (1971), in his discussion of Kant, argues that, to be intelligible, the notion that I have completed a infinity of tasks involves the notion I am now infinitely experienced, or endowed with an infinite stock of memories. In contrast, the notion that I shall perform a future infinity of tasks does not entail that I must possess, now or at any future time, an infinite stock of memories. For in this case the process will take forever and at any particular future time only a finite number of tasks will have been completed. Thus there exists a fundamental asymmetry in sentient beings: they have a more epistemic grasp of the past than of the future.

At first sight such a past/future distinction seems valid enough. However, when applied to the omniscient God of orthodox theology (and it must be kept in mind that this is just a step in an alleged proof for the existence of such a God), it becomes problematic. After all, such a God knows the future as definitely as He knows the past. If the future is indeed endless, then to an omniscient God it exists as a definite actual infinity, rather than as an indefinite potential infinity. It would seem that to God an endless future would have the same status as a beginningless past. Both entail the notion that God has an infinite stock of memories or thoughts (cf. Ps.139:17).

As Bennett (1971, 136) notes, any being who doesn't share our human epistemic asymmetry between past and future won't see the force in Kant's discussion of the size and age of the world. Thus the considerations leading to a finite past must similarly apply to the future. If Craig's argument against an actual infinity is valid it implies that God's knowledge encompasses only a finite number of future events. This leads to the conclusion that either the future is finite, and there is a last event, or God's knowledge of the future is incomplete.

3. God and the Past

There appear to be further difficulties. Craig's arguments against the real existence of actual infinity are sufficiently general that they seem to apply not only to the physical universe, but also to God Himself. This must have significant implications for God, who is generally considered in orthodox theology to be infinite.

For example, Craig's ban on the actual infinite implies that also God's past must then be finite. Indeed, Craig himself comes to this conclusion:

... prior to creation God would have to be changeless. Otherwise you would get an infinite series of past events in God's life, and we have seen that such an infinite series is impossible. So God would be changeless and hence, timeless prior to creation. (Craig 1980, 12)

We note in passing that Craig takes changelessness to imply timelessness. Yet, whereas timelessness certainly implies changelessness, it is not clear that the converse necessarily holds. It seems that Craig views God as being essentially "frozen" for an infinite time before the first event.

It must be stressed that Craig's argument against the actual infinite is meant to apply only to the prohibition of an actual infinity of past events, not to an actual infinity of past time. Craig notes specifically:

the Newtonian could hold that if God is changeless prior to creation, then an undifferentiated, measureless, infinite time could elapse before the first event, but that an infinite temporal series of definite and distinct events could not elapse... (Craig 1979, footnote no.170 on p.172)

Craig (1979, 95) defines an "event" as "that which happens", something concerned with change. It seems that Craig is interpreting God's eternity in the sense of infinite duration, rather than in the sense of atemporal existence. The above quotes suggest that God is quiescent in the eternity before creation. Before the creation of the universe God, in the Newtonian view, exists in absolute time changelessly and independently prior to creation; creation simply marks the first event in time (Craig 1979, 152).

Is it permissible to allow an infinity of past time while ruling out an infinity of past events? One could ask what meaning time has in the absence of events that occur to mark its passage. Nonetheless, let us suppose that there exists an absolute Newtonian time, which exists as a frame in which events take place. Then before creation we have, according to Craig, an infinite eventless time.

But even in an empty, infinite time there would still be the everlasting passage from one time unit to the next, else how is infinite time to be distinguished from an isolated unit of time? Would not an infinite absolute time necessarily imply the passage of an actual infinity of absolute time units? There is nothing in Craig's arguments against the existence of an actual infinite that suggests these arguments do not apply equally well to units of time as they do to events in time. At least, Craig has not shown why units of time should be exempt from the argument against an actual infinity.

It could be argued that, since there are no physical events to measure this time, we are not confronted with an actual infinity. But does this limitation apply to God? If God is omniscient then He must know also of the passage of time. To God, it would seem, even the passage of a unit of time is something "which happens" and thus should count as an event. If God has existed through a past infinity of time then an actual infinity of units of time has elapsed. It follows that God's knowledge of a past that consists of finite events embedded within infinite time must include knowledge of an actual infinity of past units of time.

Goetz (1989) has argued that, assuming the validity of Craig's arguments against an actual infinity, another option is an eternal "quiescent" universe in which God caused the first event a finite time past. This in effect adds a frozen universe to a frozen God and is open to the same objections as already noted above. In his very recent discussion of Goetz's argument Craig (1991) does, albeit in a footnote, mention that in a frozen universe temporal passage might still continue according to an intrinsic metric time. Conceding that the reasoning of Kalam can be applied to metric time as well as to events, he suggests that in that case an eternally frozen universe still involves the actual infinite and must therefore be ruled out.

It is not clear to me why the same consideration should not be applied also to an eternally "frozen" God. God's past must then likewise be finite; He must have started to exist a finite time past. This conclusion may be avoided by considering God's eternity in an atemporal sense. Does Craig perhaps, after all, consider God's timelessness as more

than changelessness? At one point he does write:

So in my opinion, God was timeless prior to creation, and He created time along with the world. From that point on God places Himself within time so that He can interact with the world He has created. (Craig 1980, 12)

It seems that here Craig uses "timeless" in the sense of "atemporal". But is this meaningful? Clearly, we can't have it both ways: God's existence is either temporal or atemporal. It seems incoherent to argue that God is atemporal except for a stretch of time in which He exists in time. This surely does not fit into the usual notion of God's atemporal existence as involving His apprehension of time as a unity, without experiencing succession. Moreover, if God is temporal, how can we meaningfully speak of His existence in the absence of time? The conclusion to which we are led, assuming that the actual infinite can't exist, is that the universe, time, and God all started to exist a finite time past.

Furthermore, the admission that time itself has a finite past endangers Craig's argument for a personal creator. Craig's argument for the first cause being a personal agent rests upon the assumption that there was an infinite timespan before creation. Since all moments in such an infinite time are alike, he argues, it requires a personal being to freely choose to create at any time wholly apart from any distinguishing conditions of one moment from another (Craig 1979, 151). Elsewhere Craig affirms that the only way to have an eternal cause but an effect that begins at a point in time is if the cause is a personal agent who freely decides to create an effect in time. For example, a man sitting from eternity may will to get up (Craig 1984, 93).

To summarize, it appears Craig's disallowance of the actual infinite places undue restrictions not only on the past, but also on the future, on God, and on time itself. It calls into question also Craig's argument for a personal creator, since this is based upon the presumed existence of an infinite, measureless time. Furthermore, the demand that God be changeless prior to creation, allowing no succession of acts or thoughts, places rather stringent conditions on the nature of God.

Hence, while there may be aspects of infinity that appear incomprehensible to us, it seems to me that, in the absence of water-tight logical disproofs of actual infinity, the better course is to attribute this perceived deficiency to human finiteness rather than to confer undue constraints upon God and his attributes.

SCIENTIFIC FACTORS

For the cosmological argument to work without placing undue limitations on God, proper distinction must be made between Creator and creation. The demonstration of the finite past of the physical universe is therefore perhaps better based on physical, rather than logical, grounds. Thus, for example, a scientific version of the cosmological

argument commonly appeals to such concepts as the Big Bang singularity, or to the second law of thermodynamics.

Such scientific arguments are, of course, not rigorous proofs. They involve not straightforward deductions from observations but explanations and extensions of the empirical data in terms of scientific theories. Since observations always underdetermine scientific theories, many different theoretical possibilities exist. It must thus be shown that theories involving a finite past are somehow more plausible or probable than those postulating an infinite past. As is well-known, both the construction and assessment of scientific theories are highly subjective processes, strongly dependent upon one's prior philosophical and religious commitments. The problem is thus that of finding sufficient common ground regarding theory selection criteria that the favoured theory will be found acceptable to the (as yet) non-believer.

1. The Big Bang Singularity

Interestingly, both Craig (1980, 8-9) and Smith (1988) argue that the evidence from astronomy points to a beginning of the universe (the Big Bang singularity) at some finite time in the past, although Smith goes on to argue that the universe was uncaused.

(a) The Big Bang Model

The first step consists of showing the superiority of cosmological models having a past singularity (i.e., Big Bang models) over those that don't.

Big Bang models have the advantage of offering a natural explanation of the galactic redshifts in terms of expansion, of the background radiation, and of the relative abundances of the light elements. Yet there is much dependence upon unproven assumptions such as, for example, the applicability of general relativity even at infinite densities and quantum dimensions, and the validity of the cosmological principle. It necessarily involves an extrapolation, via current scientific theory, from the presently observed universe to the remote past, where conditions are postulated to have been very much different. Given the uncertain status of current scientific theories (e.g., no viable theory of quantum gravity has yet been found) any conclusions about past singularities must be considered to be rather speculative.

Furthermore, the big bang theory itself is presently facing grave observational difficulties. Two problems in particular are prominent: (1) the observed density of the universe is only a few percent of that predicted by inflationary big bang theory and (2) the big bang has difficulty accounting for the formation of galaxies and larger structures. The recent discovery by Smoot(1992) of small fluctuations in the background radiation has not solved this latter problem. The observed "seeds" are too small to have produced, via ordinary means, highly organized galaxies within a few billion years. To form galaxies the universe must be much denser: one must postulate that more than 95% of the mass of the universe is actually in the form of cold, dark matter. Many esoteric candidates have

been proposed but all seem to have short-comings.³

A number of rival, non-singularity models have been advanced. For example, Paul Marmet (1992) has presented a plasma cosmology that explains the redshifts as being due to a non-Doppler mechanism. This leads to an essentially static, ageless universe. Marmet's model has the advantage of offering a plausible explanation of how physically related objects can have highly differing red-shifts⁴, a phenomenon that seems to count against the velocity interpretation of the red-shifts. However, these alternatives no doubt also have their observational deficiencies.

Given a variety of cosmological models, all with their advantages and disadvantages, how can one demonstrate any particular one (e.g., the Big Bang model) to be superior? The criteria must involve more than mere empirical adequacy, since all these models face observational deficiencies that can be overcome via ad hoc adjustments. But what are these criteria? Craig does not clearly spell them out. I find that Craig tends to minimize the problems for the Big Bang and to give undue weight to those for rival theories. Perhaps this assessment is at least partly due to my own biases, but it brings to the fore the difficulty that it is virtually impossible to draw up and apply objective standards for judging scientific theories.

(b) Is the Singularity the Beginning?

Assuming that the Big Bang model is valid, must the Big Bang singularity necessarily be equated with the beginning of the universe? For example, could the expansion not have been preceded by a contraction?

Craig discusses the possibility of an oscillating universe that has been alternately contracting and expanding from eternity. He claims that such a model has been discredited only rather recently. The key question is whether the universe is sufficiently dense so that gravitational attraction will eventually halt each expansion phase and turn it into a contraction. For an oscillating model to function the universe must be "closed". As Craig (1980, 9) points out, present observational evidence favours an "open" (i.e., low-density) universe rather than a closed one. Craig asserts that the universe would have to be at least ten times denser than it is for the universe to be closed. Thus he concludes the oscillating model is impossible.

An open universe does, however, leave another possibility for evading a beginning in time, an option that Craig does not consider. In an open universe matter will continue expanding forever. George Gamow (1954) has suggested that the Big Bang

³see Powell (1992, 19).

⁴see, for example, Arp (1987).

singularity was preceded by a corresponding contraction. In his view the universe has existed from eternity, collapsing from a state of infinite rarification until it arrived at the Big Bang singularity, when the density became immensely great. Since then it has been expanding and the density is steadily diminishing again.

Is Gamow's model feasible? It seems natural that a contracting universe would, once it reached the state of maximum compression, bounce back into an expanding phase rather than remaining at the singularity or vanishing into nothing. Considerations based on such general principles as the conservation of energy appear to point in that direction.

It is to be noted that Craig on the one hand supports big bang cosmology and an open universe (Craig 1980, 9). On the other hand, based on the above philosophical considerations, he affirms that the universe is spatially finite (Craig 1980, 10). Yet, according to standard big bang cosmology (i.e., the Friedmann-Robertson-Walker model) an open universe will be spatially infinite.⁵ This follows directly from the Cosmological Principle (i.e., the assumption of spatial homogeneity) coupled with a negative space curvature. Hence Craig's scientific argumentation leads to a conflict with his earlier philosophical ban of the infinite.

More recently other possibilities have been formulated for a beginningless, big-bang-type universe, further weakening Craig's position. Markov (1989) and Linde (1987) have presented scenarios in which our present universe was created out of a "mother" universe, and so on from past eternity. Such schemes involve vacuum fluctuations and inflation; Linde's model is that of a chaotic inflationary perpetual universe. These models are admittedly very speculative, as are all models concerned with the early universe. Nevertheless, given the inflationary big bang framework, they don't appear to be unduly implausible: if a universe can be created via a quantum fluctuation in empty space, why not also within the space of a previously existing universe?

(c) Problems of Time

A further empirical problem with Craig's argument for a universe with a finite past concerns the definition and measurement of time. Barrow (1988, 235-236) points out that the time interval to a past singularity is finite if measured in "proper time" (i.e., as measured by a clock in gravitational freefall) but it could be infinite if measured in accordance with some other definition of time. For example, we could conceive of a clock that measured the change in the curvature of the universe. According to Barrow, in the most general type of relativistic universe the past singularity is reached in a finite proper time but with an infinite number of oscillations of the curvature. Hence, according to the curvature clock, it takes an infinite past time to reach the singularity. Even if we

⁵see Ellis and Brundit (1970), Harrison (1981, 301) or any text on cosmology.

stick to proper time this still leaves us with an infinite number of physical past "events" (i.e., changes in curvature), which Craig has ruled out as being impossible.

According to Grunbaum (1989, 389) the whole question of creation is a pseudo-problem since big bang theory affirms that at the singularity time came into existence along with the universe. Hence it is meaningless to ask "what happened before $t=0$ " or "what caused the big bang to occur at $t=0$ ", since these questions presuppose that $t=0$ was preceded by other moments of time. But the big bang model denies this assumption. One may postulate the existence of time before the singularity, but one should not expect the big bang model to supply answers to questions that deny its assumptions. In short, one should be consistent: if one is to use the big bang to argue for a past singularity then one should also keep within the limits of the theory and not ask, as Craig does, about prior causes.

In response to this Craig (1986, 170) argues that a cause need not always precede its effect in time: God's causing the world to come into being is simultaneous with the world's coming into being. This may do as an argument that the world was caused. However, as we have seen above, Craig's argument for a personal Creator involves the postulation of an infinity of time units before the creation event. That, according to Grunbaum, is inconsistent with big bang cosmology.

(d) Causality

Finally, there is the question of causality. Given that the universe began to exist a finite time ago, must there have been a cause for that? Quentin Smith (1988, 39) argues that there is at present sufficient evidence to warrant the conclusion that the universe probably began to exist over ten billion years ago, from nothing, without being caused to do so. Due to quantum mechanical considerations, causality breaks down in the initial physical states of the universe near the singularity. Smith appeals to quantum mechanical theories that represent the universe as coming into existence, uncaused, from literally nothing in a quantum tunnelling. The advantage of this, according to Smith, is that the universe comes into existence via the same laws that processes within the universe obey.

To this Craig (1986, 168) has, in my opinion quite correctly, replied that this still requires the pre-existence of the physical laws. Where did they come from?

2. The Second Law of Thermodynamics

Let us move on to the second line of scientific evidence for a beginning of the universe. The second law of thermodynamics stipulates that in a closed system the amount of entropy (i.e., disorder) cannot decrease. Its application to the universe as a whole implies that, at some finite time in the future, the universe will suffer a "heat death": there will be no more useful energy left. It also suggests that the world was initially wound up in a state of low entropy. A host of theists - including Zaanstra (1968a & b) and Craig - have pointed to the second law as one of the clearest indicators of a divine beginning of the physical world. Even a non-theist, such as cosmologist Paul Davies, concludes:

The essential hypothesis- that there was some sort of creation- seems, from the scientific point of view, compelling. The reason stems directly from a large body of scientific evidence that is encompassed by the most universal law of physics known- the second law of thermodynamics...The universe cannot have existed forever, otherwise it would have reached its equilibrium state an infinite time ago. Conclusion: the universe did not always exist. (Davies 1983, 10-11)

As an argument for the finite past of the universe, it has certain advantages over the argument based on the big bang. For while the latter depends quite strongly upon the particular cosmological model adopted, the second law is such of such a fundamental nature that it is quite generally conceded to be one of the most basic laws of all science.

Although most contemporary cosmologists believe in the applicability of the second law to the universe as a whole, some have questioned this⁶. Nevertheless, since no local exceptions have yet been found, it seems plausible that it should hold also for other regions in the universe and, hence, for the universe as a whole. If one follows the general principle that known physical laws should be followed as much as possible, rather than postulating new ones, then the evidence would currently seem to favour the universal applicability of the second law. This assumes, of course, that the physical universe is an isolated system with a negligible amount of supernatural events (i.e., miracles).

Yet, even if we were to grant that the second law is universally applicable, we could not conclude from it that the universe necessarily began a finite time in the past. All that can be said is that the universal entropy has never been decreasing. For example, it may well be that the entropy has merely increased asymptotically from some definite minimum value in the infinite past and will continue to increase to some maximum value in the infinite future. This would be the case in a cosmological model such as Gamow's infinitely old contraction-expansion universe, described above.

Thus the second law of thermodynamics by itself does not provide any independent evidence of a beginning of the universe a finite time ago. It can do that only when used in conjunction with a specific cosmological model.

3. Concluding Remarks

To sum up, the scientific confirmations for a finite age of the physical universe boil down to the presumed big bang singularity. Here there are still various seemingly plausible ways of avoiding a beginning to the universe, and hence of avoiding also Craig's conclusion of a Creator. It must be noted that Craig (1986, 172) is well aware of the fact that the scientific evidence by itself is not compelling; he prefers to think of this evidence rather as confirmatory of the position reached by his philosophical arguments. This makes

⁶see, for example, Drees (1988), p.26.

it all the more regretful that his philosophical case against the actual infinity in the real world is, in my opinion, seriously flawed.

Moreover, as has been noted, the scientific evidence in the form of big bang cosmology contradicts, rather than confirms, his philosophical conclusions at two major points: (1) the observational evidence in a big bang framework yields an open, spatially actual infinite universe and (2) the infinity of time before the singularity, needed in the argument to a personal Creator, is at odds with big bang cosmology..

This is not to deny that the scientific evidence, whatever its limitations, may still have some persuasive force. Indeed, a number of astronomers have drawn theistic implications from big bang cosmology. This has led some to reject big bang cosmology and others to accept a variety of different conceptions of God. Few, however, seem to have thereby been converted to Christianity.

Why is this the case? Possibly because the cosmological argument in itself leads to only a prime mover, an eternal being who merely initiates the universe.⁷ As we have seen, the case for a personal God is weak. Even then this brings us to only a deistic God; the plausibility of providence, supernatural revelation and miracles must still be shown. Clearly, a huge step is still required to move beyond the Prime Mover or Designer, as suggested by the cosmological and teleological arguments, to the living God of the Bible.

A further problem in arguing from the big bang to the biblical God is that the biblical view of reality, as I read it, is quite different from that of big bang cosmology. These differences involve not only matters of origins and eschatology, but also the present structure of the universe. For example, big bang cosmology has no place for a transcendent God, for supernatural causes, or for an immortal soul.

Thus, in constructing a Christian view of reality, big bang cosmology must ultimately be replaced by cosmological concepts that are more in accord with biblical givens. It follows that Craig's argumentation has limited value as a means to bolster the faith of Christians. The acceptance of Craig's empirical evidence, to the extent that it involves a commitment to big bang cosmology, can only lead to a demise in biblical authority.

Moreover, once we allow for a supernatural God, Craig's conclusion that the universe began to exist with the big bang singularity loses force, since other plausible options are now possible. If God could create the entire universe *ex nihilo* at the singularity, it is not unreasonable to conjecture that, for example, He formed this universe

⁷The teleological argument gets us little further. John Leslie, an advocate of the argument from design, contends that God need not be a person at all, but merely a "creatively effective ethical requirement for the existence of a (good) universe or universes" (Leslie 1989, 186).

out of a previous universe, or that He created the entire universe *ex nihilo* in the more recent past. The question now becomes a theological one and can be answered only through what God has revealed to us in His written word, which seems to favour the latter scenario.

Here one might ask: what about God's general revelation? Does God not reveal truths, such as big bang cosmology, to us also through nature? Should we not then reinterpret the Bible in line with such truths?

While the Bible does assert that God reveals truth through nature, such truth is of a limited kind. According to Rom. 1:20:

"Ever since the creation of the world his invisible nature, namely, his eternal power and deity, has been clearly perceived in the things that have been made. So they are without excuse."

It is evident that God reveals himself through nature in such a way that every man is aware of the true God but has rejected him. This knowledge is not dependent upon logical proof or scientific argumentation. It is much more direct. Man, made in the image of God, cannot look upon the things of nature without immediately perceiving them as the work of God. Look at the majesty, beauty, goodness and order around us: at the stars, flowers and so on. Is it not obvious that they must have been created by a great God? But sinful man refuses to honour this God. His mind becomes darkened and his knowledge distorted (Rom. 1:21). It is only through the preaching of the Gospel and the operation of the Holy Spirit that man can come to a proper knowledge of God.

The knowledge revealed through nature concerns only God's attributes. Furthermore, this knowledge is acquired through our direct experience of nature, not through our scientific models. There is no biblical evidence suggesting that God reveals himself through fallible human theorizing. Indeed, the Bible stresses the limitations of human knowledge, particularly with regards to origins (see, for example, Job 38-41; Is. 41:21-24; Ecc. 3:11). Big bang cosmology, to the extent that it consists of theoretical extrapolations beyond the observational data, cannot be considered as part of God's general revelation. It is not a revealed truth. It is mere speculation and as such does not count as valid evidence for God. Nor is it needed: man is already without excuse.

What is left, then, of the apologetic quest of Craig's cosmological argument? I believe that it still has some value, but primarily as an argument that the naturalism inherent in big bang cosmology cannot plausibly be maintained; at some point supernatural intervention is required. It is an attempt to persuade the unbeliever of the implausibility of his naturalistic scheme. Once the unbeliever is convinced of the existence of the supernatural, he can presumably be shown the true (i.e., biblical) state of cosmic affairs. One can then argue: "If you can believe that God miraculously created the entire universe at the big bang singularity, why not also the biblical miracles, such as Christ's incarnation and resurrection? Why not drop this futile pretence of explaining the world naturalistically and accept the supernatural worldview of the Bible?"

From a Christian perspective the biblical worldview is the only valid explanation

of reality. One step towards convincing nonbelievers of this is to demonstrate deficiencies in alternative worldviews. In this respect Craig has done valuable work in pointing out shortcomings in the naturalistic explanations of non-Christians such as Smith⁸ and Davies,⁹.

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⁸see Craig (1992).

⁹see Craig (1986).

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