The Ultimate Question of Origins: God and the Beginning of the Universe

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The absolute origin of the universe, of all matter and energy, even of physical space and time themselves, in the Big Bang singularity contradicts the perennial naturalistic assumption that the universe has always existed. One after another, models designed to avert the initial cosmological singularity--the Steady State model, the Oscillating model, Vacuum Fluctuation models--have come and gone. Current quantum gravity models, such as the Hartle-Hawking model and the Vilenkin model, must appeal to the physically unintelligible and metaphysically dubious device of "imaginary time" to avoid the universe's beginning. The contingency implied by an absolute beginning *ex nihilo* points to a transcendent cause of the universe beyond space and time. Philosophical objections to a cause of the universe fail to carry conviction.

Source: *Astrophysics and Space Science* 269-270 (1999): 723-740

The Fundamental Question

From time immemorial men have turned their gaze toward the heavens and *wondered*. Both cosmology and philosophy trace their roots to the wonder felt by the ancient Greeks as they contemplated the cosmos. According to Aristotle,

> it is owing to their wonder that men both now begin and at first began to philosophize; they wondered originally at the obvious difficulties, then advanced little by little and stated difficulties about the greater matters, e.g. about the phenomena of the moon and those of the sun and the stars, and about the origin of the universe.{1}

The question of why the universe exists remains the ultimate mystery. Derek Parfit, a contemporary philosopher, declares that "No question is more sublime than why there is a Universe: why there is anything rather than nothing."{2}

This question led the great German mathematician and philosopher Gottfried Wilhelm Leibniz to posit the existence of a metaphysically necessary being which carries within itself the sufficient reason for its own existence and which constitutes the sufficient reason for the existence of everything else in the world.{3} Leibniz identified this being as God. Leibniz's critics, on the other hand, claimed that the space-time universe may itself be the necessary being demanded by Leibniz's argument. Thus, the Scottish sceptic David Hume queried, "Why may not the material universe be the necessarily existent Being . . . ?" Indeed, "How can anything, that exists from eternity, have a cause, since that relation implies a priority in time and a beginning of existence?"{4} There is no warrant for going beyond the universe to posit a supernatural ground of its existence. As Bertrand Russell put it so succinctly in his BBC radio debate with Frederick Copleston, "The universe is just there, and that's all."{5}

The Origin of the Universe

This stand-off persisted unaltered until 1917, the year in which Albert Einstein made a cosmological application of his newly discovered General Theory of Relativity.{6} To his chagrin, he found that GTR would not permit a static model of the universe unless he introduced into his gravitational field equations a certain "fudge factor" L in order to counterbalance the gravitational effect of matter. Einstein's universe was balanced on a razor's edge, however, and the least perturbation would cause the universe either to implode or to expand. By taking this feature of Einstein's model seriously, Alexander Friedman and Georges Lemaitre were able to formulate independently in the 1920s solutions to the field equations which predicted an expanding universe.{7}

The monumental significance of the Friedman-Lemaitre model lay in its historization of the universe. As one commentator has remarked, up to this time the idea of the expansion of the universe "was absolutely beyond comprehension. Throughout all of human history the universe was regarded as fixed and immutable and the idea that it might actually be changing was inconceivable."{8} But if the Friedman-Lemaitre model were correct, the universe could no longer be adequately treated as a static entity existing, in effect, timelessly. Rather the universe has a history, and time will not be matter of indifference for our investigation of the cosmos. In 1929 Edwin Hubble's measurements of the red-shift in the optical spectra of light from distant galaxies,{9} which was taken to indicate a universal recessional motion of the light sources in the line of sight, provided a dramatic verification of the Friedman-Lemaitre model. Incredibly, what Hubble had discovered was the isotropic expansion of the universe predicted by Friedman and Lemaitre. It marked a veritable turning point in the history of science. "Of all the great predictions that science has ever made over the centuries," exclaims John Wheeler, "was there ever one greater than this, to predict, and predict correctly, and predict against all expectation a phenomenon so fantastic as the expansion of the universe?"{10}

The Standard Big Bang Model

As a GTR-based theory, the Friedman-Lemaitre model does not describe the expansion of the material content of the universe into a pre-existing, empty, Newtonian space, but rather the expansion of space itself. This has the astonishing implication that as one reverses the expansion and extrapolates back in time, space-time curvature becomes progressively greater until one finally arrives at a singular state at which space-time curvature becomes infinite. This state therefore constitutes an edge or boundary to space-time itself. P. C. W. Davies comments,

> An initial cosmological singularity . . . forms a past temporal extremity to the universe. We cannot continue physical reasoning, or even the concept of spacetime, through such an extremity. . . . On this view the big bang represents the creation event; the creation not only of all the matter and energy in the universe, but also of spacetime itself.{11}

The popular expression "Big Bang," originally a derisive term coined by Fred Hoyle to characterize the beginning of the universe predicted by the Friedman-Lemaitre model, is thus potentially misleading, since the expansion cannot be visualized from the outside (there being no "outside," just as there is no "before" with respect to the Big Bang).{12}

The standard Big Bang model thus describes a universe which is not eternal in the past, but which came into being a finite time ago. Moreover,--and this deserves underscoring--the origin it posits is an absolute origin *ex nihilo*. For not only all matter and energy, but space and time themselves come into being at the initial cosmological singularity. As Barrow and Tipler emphasize, "At this singularity, space and time came into existence; literally nothing existed before the singularity, so, if the Universe originated at such a singularity, we would truly have a creation *ex nihilo*."{13} Thus, we may graphically represent space-time as a cone (Fig. 1).

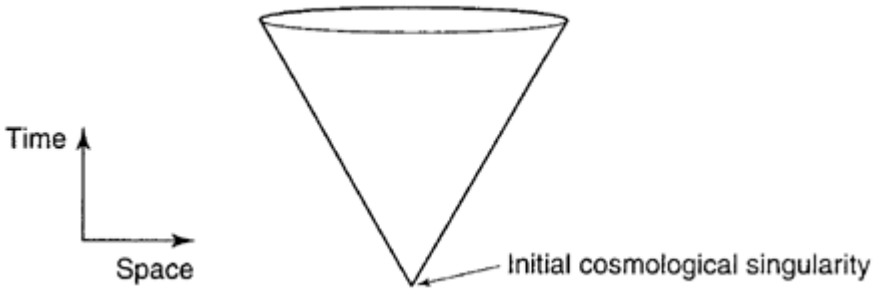

Fig. 1: Conical Representation of Standard Model Space-Time. Space and time begin at the initial cosmological singularity, before which literally nothing exists.

On such a model the universe originates *ex nihilo* in the sense that at the initial singularity it is true that *There is no earlier space-time point* or it is false that *Something existed prior to the singularity.*

Now such a conclusion is profoundly disturbing for anyone who ponders it. For the question cannot be suppressed: *Why does the universe exist rather than nothing?* In light of the universe's origin *ex nihilo*, one can no longer dismiss this question with a shrug and a slogan, "The universe is just there and that's all." For the universe is not "just there;" rather it *came into being*. The beginning of the universe discloses that the universe is not, as Hume thought, a necessarily existing being but is contingent in its existence. Philosophers analyzing the concept of necessary existence agree that the essential properties of any necessarily existing entity include its being eternal, uncaused, incorruptible, and indestructible{14}--for otherwise it would be capable of non-existence, which is self-contradictory. Thus, if the universe began to exist, its lacks at least one of the essential properties of necessary existence-eternality. Therefore, the reason for its existence cannot be immanent, but must in some mysterious way be ultra-mundane, or transcendent. Otherwise, one must say that the universe simply sprang into being uncaused out of absolutely nothing, which seems absurd. Sir Arthur Eddington, contemplating the beginning of the universe, opined that the expansion of the universe was so preposterous and incredible that "I feel almost an indignation that anyone should believe in it--except myself."{15} He finally felt forced to conclude, "The beginning seems to present insuperable difficulties unless we agree to look on it as frankly supernatural."{16}

I find that most scientists do not reflect philosophically upon the metaphysical implications of their theories. But, in the words of one astrophysical team, "The problem of the origin [of the universe] involves a certain metaphysical aspect which may be either appealing or revolting."{17}

The Steady State Model

Revolted by the stark metaphysical alternatives presented us by an absolute beginning of the universe, certain theorists have been understandably eager to subvert the Standard Model and restore an eternal universe. Sir Fred Hoyle, for example, could countenance neither an uncaused nor a supernaturally caused origin of the universe. With respect to the first alternative, he wrote, "This most peculiar situation is taken by many astronomers to represent *the origin of the universe.* The universe is supposed to have begun at this particular time. From where? The usual answer, surely an unsatisfactory one, is: from nothing!"{18} Equally unsatisfactory in Hoyle's mind was the postulation of a supernatural cause. Noting that some accept happily the universe's absolute beginning, Hoyle complained,

> To many people this thought process seems highly satisfactory because a 'something' outside physics can then be introduced at t = 0. By a semantic manoeuvre, the word 'something' is then replaced by 'god,' except that the first letter becomes a capital, God, in order to warn us that we must not carry the enquiry any further.{19}

To Hoyle's credit, he did carry the inquiry further by helping to formulate in 1948 the first competitor to the Standard Model, namely, the Steady State Model of the universe.{20} According to this theory, the universe is in a state of isotropic cosmic expansion, but as the galaxies recede, new matter is drawn into being *ex nihilo* in the interstices of space created by the galactic recession (Fig. 2).

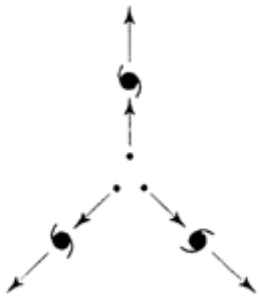

Fig. 2: Steady State Model. As the galaxies mutually recede, new matter comes into existence to replace them. The universe thus constantly renews itself and so never began to exist.

If one extrapolates the expansion of the universe back in time, the density of the universe never increases because the matter and energy simply vanish as the galaxies mutually approach!

The Steady State theory never secured a single piece of experimental verification; its appeal was purely metaphysical.{21} The discovery of progressively more radio galaxies at ever greater distances undermined the theory by showing that the universe had an evolutionary history. But the decisive refutation of the Steady State Model came with two discoveries which constituted, in addition to the galactic red-shift, the most significant evidence for the Big Bang theory: the cosmogonic nucleosynthesis of the light elements and the microwave background radiation. As a result, in the words of Ivan King, "The steady-state theory has now been laid to rest, as a result of clear-cut observations of how things have changed with time."{22}

Oscillating Models

The Standard Model was based on the assumptions of homogeneity and isotropy. Some cosmologists speculated that by denying homogeneity and isotropy, one might be able to craft an Oscillating Model of the universe.{23} If the internal gravitational pull of the mass of the universe were able to overcome the force of its expansion, then the expansion could be reversed into a cosmic contraction, a Big Crunch. If the universe were not homogeneous and isotropic, then the collapsing universe might not coalesce at a point, but the material contents of the universe might pass each other by, so that the universe would appear to bounce back from the contraction into a new expansion phase. If this process of expansion and contraction could be repeated indefinitely, then an absolute beginning of the universe might be avoided (Fig. 3).

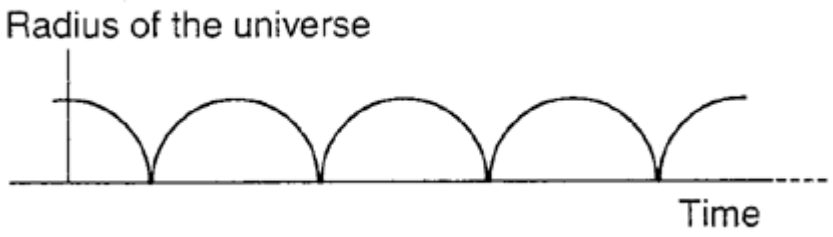

Fig. 3: Oscillating Model. Each expansion phase is preceded and succeeded by a contraction phase, so that the universe in concertina-like fashion exists beginninglessly and endlessly.

Such a theory is extraordinarily speculative, but again there were metaphysical motivations for adopting this model.{24} The prospects of the Oscillating Model were severely dimmed in 1970, however, by Penrose and Hawking's formulation of the Singularity Theorems which bear their names.{25} The theorems disclosed that under very generalized conditions an initial cosmological singularity is inevitable, even for inhomogeneous and non-isotropic universes. Reflecting on the impact of this discovery, Hawking notes that the Hawking-Penrose Singularity Theorems "led to the abandonment of attempts (mainly by the Russians) to argue that there was a previous contracting phase and a non-singular bounce into expansion. Instead almost everyone now believes that the universe, and time itself, had a beginning at the big bang."{26}

Despite the fact that the termini of a closed universe must be singularities and that no space-time trajectory can be extended through a singularity, the Oscillating Model exhibited a stubborn persistence. Three further strikes were lodged against it. First, there are no known physics which would cause a collapsing universe to bounce back to a new expansion. Second, the observational evidence indicates that the mean mass density of the universe is insufficient to generate enough gravitational attraction to halt and reverse the expansion.{27} Third, since entropy is conserved from cycle to cycle in such a model, which has the effect of generating larger and longer oscillations with each successive cycle, the thermodynamic properties of an Oscillating Model imply the very beginning its proponents sought to avoid (Fig. 4).{28}

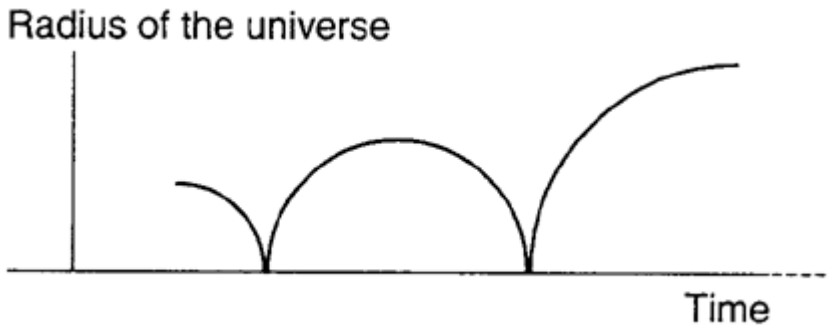

Fig. 4: Oscillating Model with Entropy Increase. Due to the conservation of entropy each successive oscillation has a larger radius and longer expansion time.

Although these difficulties were well-known, proponents of the Oscillating Model tenaciously clung to it until a new alternative to the Standard Model emerged during the 1970s.{29} The theory drew its life from its avoidance of an absolute beginning of the universe; but once other models became available claiming to offer the same benefit, the Oscillating Model sank under the weight of its own deficiencies.

Vacuum Fluctuation Models

Cosmologists realized that a physical description of the universe prior to the Planck time would require the introduction of quantum physics in addition to GTR. In 1973 Edward Tryon speculated whether the universe might not be a long-lived virtual particle, whose total energy is zero, born out of the primordial vacuum.{30} This seemingly bizarre speculation gave rise to a new generation of cosmogonic theories which we may call Vacuum Fluctuation Models. In such models, it is hypothesized that prior to some inflationary era the Universe-as-a-whole is a primordial vacuum which exists, not in a state of expansion, but eternally in a steady state. Throughout this vacuum sub-atomic energy fluctuations constantly occur, by means of which matter is created and mini-universes are born (Fig. 5).

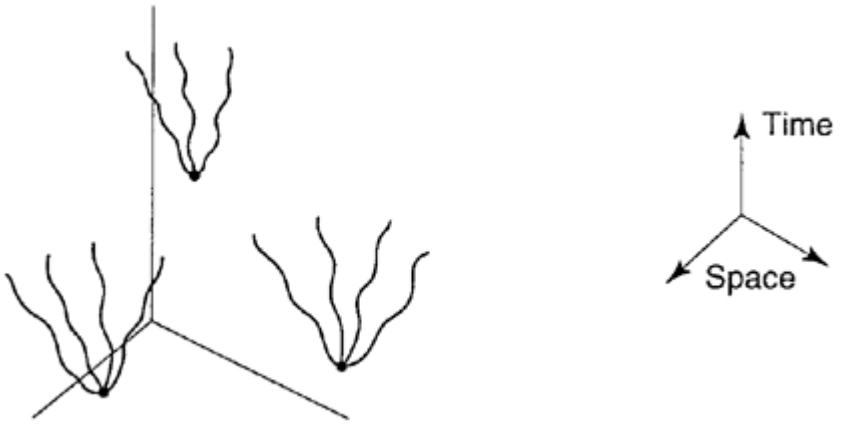

Fig. 5: Vacuum Fluctuation Models. Within the vacuum of the wider Universe, fluctuations occur which grow into mini-universes. Ours is but one of these, and its relative beginning does not imply a beginning for the Universe-as-a-whole.

Our expanding universe is but one of an indefinite number of mini-universes conceived within the womb of the greater Universe-as-a-whole. Thus, the beginning of our universe does not represent an absolute beginning, but merely a change in the eternal, uncaused Universe-as-a-whole.

Vacuum Fluctuation Models did not outlive the decade of the 1980s. Not only were there theoretical problems with the production mechanisms of matter, but these models faced a deep internal incoherence.{31} According to such models, it is impossible to specify precisely when and where a fluctuation will occur in the primordial vacuum which will then grow into a universe. Within any finite interval of time there is a positive probability of such a fluctuation occurring at any point in space. Thus, given infinite past time, universes will eventually be spawned at *every* point in the primordial vacuum, and, as they expand, they will begin to collide and coalesce with one another. Thus, given infinite past time, we should by now be observing an infinitely old universe, not a relatively young one. About the only way to avert the problem would be to postulate an expansion of the primordial vacuum itself; but then we are right back to the absolute origin implied by the Standard Model. According to Isham this problem proved to be "fairly lethal" to Vacuum Fluctuation Models; hence, these models were "jettisoned twenty years ago" and "nothing much" has been done with them since.{32}

Chaotic Inflationary Model

Inflation also forms the context for the next alternative to arise: the Chaotic Inflationary Model. One of the most fertile of the inflation theorists has been the Russian cosmologist Andrei Linde.{33} In Linde's model inflation *never* ends: each inflating domain of the universe when it reaches a certain volume gives rise via inflation to another domain, and so on, *ad infinitum* (Fig. 6).

Fig. 6: Chaotic Inflationary Model. The wider universe produces via inflation separate domains which continue to recede from one another. Since these "bubbles" do not interact, they cannot collide and coalesce as the mini-universes postulated by Vacuum Fluctuation Models could.

Linde's model thus has an infinite future. But Linde is troubled at the prospect of an absolute beginning. He writes, "The most difficult aspect of this problem is not the existence of the singularity itself, but the question of what was *before* the singularity . . . . This problem lies somewhere at the boundary between physics and metaphysics."{34} Linde therefore proposes that chaotic inflation is not only endless, but beginningless. Every domain in the universe is the product of inflation in another domain, so that the singularity is averted and with it as well the question of what came before (or, more accurately, what caused it).

In 1994, however, Arvind Borde and Alexander Vilenkin showed that a universe eternally inflating toward the future cannot be geodesically complete in the past, so that there must have existed at some point in the indefinite past an initial singularity. They write,

> A model in which the inflationary phase has no end . . . naturally leads to this question: Can this model also be extended to the infinite past, avoiding in this way the problem of the initial singularity?
> . . . this is in fact not possible in future-eternal inflationary spacetimes as long as they obey some reasonable physical conditions: such models must necessarily possess initial singularities.
> . . . the fact that inflationary spacetimes are past incomplete forces one to address the question of what, if anything, came before.{35}

> In response, Linde reluctantly concurs with the conclusion of Borde and Vilenkin: there must have been a Big Bang singularity at some point in the past.{36}

Quantum Gravity Models

At the close of their analysis of Linde's Chaotic Inflationary Model, Borde and Vilenkin say with respect to Linde's metaphysical question, "The most promising way to deal with this problem is probably to treat the Universe quantum mechanically and describe it by a wave function rather than by a classical spacetime."{37} They thereby allude to the last class of models attempting to avoid the initial cosmological singularity which we shall consider, namely, Quantum Gravity Models. Vilenkin and, more famously, James Hartle and Stephen Hawking have proposed models of the universe which Vilenkin candidly calls exercises in "metaphysical cosmology."{38} In his best-selling popularization of his theory, Hawking even reveals an explicitly theological orientation. He concedes that on the Standard Model one could legitimately identify the Big Bang singularity as the instant at which God created the universe.{39} Indeed, he thinks that a number of attempts to avoid the Big Bang were probably motivated by the feeling that a beginning of time "smacks of divine intervention."{40} He sees his own model as preferable to the

Standard Model because there would be no edge of space-time at which one "would have to appeal to God or some new law."{41}

Both the Hartle-Hawking and the Vilenkin models eliminate the initial singularity by transforming the conical hyper-surface of classical space-time into a smooth, curved hyper-surface having no edge (Fig. 7).

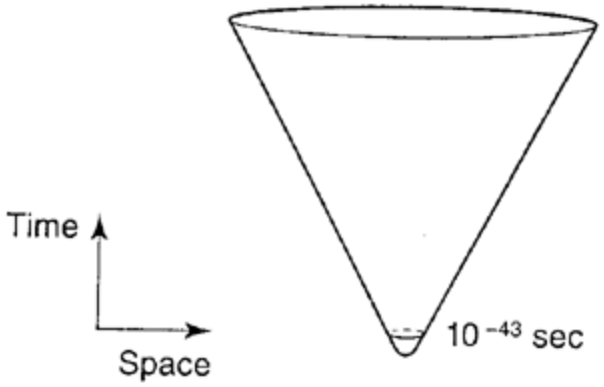

Fig. 7: Quantum Gravity Model. In the Hartle-Hawking version, space-time is "rounded off" prior to the Planck time, so that although the past is finite, there is no edge or beginning point.

This is accomplished by the introduction of imaginary numbers for the time variable in Einstein's gravitational equations, which effectively eliminates the singularity. Hawking sees profound theological implications in the model:

> The idea that space and time may form a closed surface without boundary . . . has profound implications for the role of God in the affairs of the universe . . . . So long as the universe had a beginning, we could suppose it had a creator. But if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end. What place, then, for a creator?{42}

Hawking does not deny the existence of God, but he does think his model eliminates the need for a Creator.

The key to assessing this theological claim is the physical interpretation of Quantum Gravity Models. By positing a finite (imaginary) time on a closed surface prior the Planck time rather than an infinite time on an open surface, such models actually seem to support, rather than undercut, the idea that time had a beginning. Such theories, if successful, enable us to model the origin of the universe without an initial singularity involving infinite density, temperature, pressure, and so on. As Barrow points out, "This type of quantum universe has not always existed; it comes into being just as the classical cosmologies could, but it does not start at a Big Bang where physical quantities are infinite . . . ."{43} Barrow points out that such models are "often described as giving a picture of 'creation out of nothing,'" the only caveat being that in this case "there is no definite . . . point of creation."{44} Hartle-Hawking themselves construe their model as giving "the amplitude for the Universe to appear from nothing," and Hawking has asserted that according to the model the universe "would quite literally be created out of nothing: not just out of the vacuum, but out of absolutely nothing at all, because there is nothing outside the universe."{45} Taken at face value, these statements entail the beginning of the universe. Hawking's claim quoted above concerning the theological implications of his model must therefore be understood to mean that on such models there are no beginning or ending *points*, and, hence, no need for a Creator. But having a beginning does not entail having a beginning point. Even in the Standard Model, theorists sometimes "cut out" the initial singular point without thinking that therefore space-time no longer begins to exist and that the problem of the origin of the universe is thereby resolved. Time begins to exist just in case for any finite temporal interval, there are only a finite number of equal temporal intervals earlier than it. That condition is fulfilled for Quantum

Gravity Models as well as for the Standard Model. Nor should we think that by giving the amplitude for the universe to appear from nothing quantum cosmologists have eliminated the need for a Creator, for that probability is conditional upon several choices which only the Creator could make (such as selecting the wave function of the universe) and is dubiously applied to absolute nothingness.{46}

Perhaps it will be said that such an interpretation of Quantum Gravity Models fails to take seriously the notion of "imaginary time." Introducing imaginary numbers for the time variable in Einstein's equation has the peculiar effect of making the time dimension indistinguishable from space. But in that case, the imaginary time regime prior to the Planck time is not a space-time at all, but a Euclidean four-dimensional space. Construed realistically, such a four-space would be evacuated of all temporal becoming and would simply exist timelessly. Thus, Hawking describes it as "completely self-contained and not affected by anything outside itself. It would be neither created nor destroyed. It would just BE."{47}

The question which arises for this construal of the model is whether such an interpretation is meant to be taken realistically or instrumentally. On this score, there can be little doubt that the use of imaginary quantities for time is a mere mathematical device without ontological significance. Barrow observes, "physicists have often carried out this 'change time into space' procedure as a useful trick for doing certain problems in ordinary quantum mechanics, although they did not imagine that time was *really* like space. At the end of the calculation, they just swop [*sic*] back into the usual interpretation of there being one dimension of time and three . . . dimensions of . . . space."{48} In his model, Hawking simply declines to re-convert to real numbers. If we do, then the singularity re-appears. Hawking admits, "Only if we could picture the universe in terms of imaginary time would there be no singularities . . . . When one goes back to the real time in which we live, however, there will still appear to be singularities."{49} Hawking's model is thus a way of re-describing a universe with a singular beginning point in such a way that that singularity is transformed away; but such a re-description is not realist in character.

Hawking has recently stated explicitly that he interprets the Hartle-Hawking model non-realistically. He confesses, "I'm a positivist . . . I don't demand that a theory correspond to reality because I don't know what it is."{50} Still more extreme, "I take the positivist viewpoint that a physical theory is just a mathematical model and that it is meaningless to ask whether it corresponds to reality."{51} In assessing the worth of a theory, "All I'm concerned with is that the theory should predict the results of measurements."{52} The clearest example of Hawking's instrumentalism is his analysis of particle pair creation in terms of an electron quantum tunneling in Euclidean space (with time being imaginary) and an electron/positron pair accelerating away from each other in Minkowski space-time.{53} This analysis is directly analogous to the Hartle-Hawking cosmological model; and yet no one would construe particle pair creation as literally the result of an electron's transitioning out of a timelessly existing four-space into our classical space-time. It is just an alternative description employing imaginary numbers rather than real numbers.

Significantly, the use of imaginary quantities for time is an inherent feature of *all* Quantum Gravity Models.{54} This precludes their being construed realistically as accounts of the origin of the space-time universe in a timelessly existing four-space. Rather they are ways of modeling the real beginning of the universe *ex nihilo* in such a way as to not involve a singularity. What brought the universe into being remains unexplained on such accounts.

Summary

With each successive failure of alternative cosmogonic theories, the Standard Model has been corroborated. It can be confidently said that no cosmogonic model has been as repeatedly verified in its predictions and as corroborated by attempts at its falsification, or as concordant with empirical discoveries and as philosophically coherent, as the Standard Big Bang Model. This does not prove that it is correct, but it does show that it is the best explanation of the evidence which we have and therefore merits our provisional acceptance.

Beyond the Big Bang

The discovery that the universe is not eternal in the past but had a beginning has profound metaphysical implications. For it implies that the universe is not necessary in its existence but rather has its ground in a transcendent, metaphysically necessary being. The only way of avoiding this conclusion would be to deny Leibniz's conviction that anything that exists must have a reason for its existence, either in the necessity of its own nature or else in an external ground. Reflecting upon the current situation, P. C. W. Davies muses,

> 'What caused the big bang?' . . . One might consider some supernatural force, some agency beyond space and time as being responsible for the big bang, or one might prefer to regard the big bang as an event without a cause. It seems to me that we don't have too much choice. Either . . . something outside of the physical world . . . or . . . an event without a cause.{55}

The problem with saying that the Big Bang is an event without a cause is that it entails that the universe came into being uncaused out of nothing, which seems metaphysically absurd. Philosopher of science Bernulf Kanitscheider remonstrates, "If taken seriously, the initial singularity is in head-on collision with the most successful ontological commitment that was a guiding line of research since Epicurus and Lucretius," namely, *out of nothing nothing comes,* which Kanitscheider calls "a metaphysical hypothesis which has proved so fruitful in every corner of science that we are surely well-advised to try as hard as we can to eschew processes of absolute origin."{56} But if the universe began to exist, we are therefore driven to the second alternative: a supernatural agency beyond space and time.

The Supernaturalist Alternative

If we go the route of postulating some causal agency beyond space and time as being responsible for the origin of the universe, then conceptual analysis enables us to recover a number of striking properties which must be possessed by such an ultra-mundane being. For as the cause of space and time, this entity must transcend space and time and therefore exist atemporally and non-spatially, at least sans the universe. This transcendent cause must therefore be changeless and immaterial, since timelessness entails changelessness, and changelessness implies immateriality. Such a cause must be beginningless and uncaused, at least in the sense of lacking any antecedent causal conditions. Ockham's Razor will shave away further causes, since we should not multiply causes beyond necessity. This entity must be unimaginably powerful, since it created the universe without any material cause.

Finally, and most remarkably, such a transcendent cause is plausibly to be taken to be personal. As Oxford philosopher Richard Swinburne points out, there are two types of causal explanation: scientific explanations in terms of laws and initial conditions and personal explanations in terms of agents and their volitions.{57} A first state of the universe *cannot* have a scientific explanation, since there is nothing before it, and therefore it can be accounted for only in terms of a personal explanation. Moreover, the personhood of the cause of the universe is implied by its timelessness and immateriality, since the only entities we know of which can possess such properties are either minds or abstract objects, and abstract objects do not stand in causal relations. Therefore, the transcendent cause of the origin of the universe must be of the order of mind. This same conclusion is also implied by the fact that we have in this case the origin of a temporal effect from a timeless cause. If the cause of the origin of the universe were an impersonal set of necessary and sufficient conditions, it would be impossible for the cause to exist without its effect. For if the necessary and sufficient conditions of the effect are timelessly given, then their effect must be given as well. The only way for the cause to be timeless and changeless but for its effect to originate *de novo* a finite time ago is for the cause to be a personal agent who freely chooses to bring about an effect without antecedent determining conditions. Thus, we are brought, not merely to a transcendent cause of the universe, but to its personal creator.

Naturalistic Objections

Many persons will, of course, be reluctant to take on board such metaphysical baggage. But what objection is there to the postulate of a personal, causal agency beyond the universe? Some critiques may be easily dismissed. For example, metaphysician John Post obviously begs the question when he claims that there cannot be a cause of the origin of the universe, since "by definition the universe contains everything there is or ever was or will be."{58} Again it is an obvious *non-sequitur* when he infers that because "the singularity cannot be caused by some earlier *natural* event or process," therefore "contemporary physical cosmology cannot be cited in support of the idea of a *divine* cause or creator of the universe."{59}

On the other hand, Smith realizes that the metaphysician must take seriously the "more difficult question" of "whether or not the singularity or the Big Bang probably is an effect of a supernatural cause."{60} What problem, then, is there with a supernaturalist perspective? Adolf Grünbaum has argued vigorously against what he styles "the New Creation Argument" for a supernatural cause of the origin of the universe.{61} His basic *Ansatz* is based on the assumption that causal priority implies temporal priority. Since there were no instants of time prior to the Big Bang, it follows that the Big Bang cannot have a cause.{62}

It seems to me that there are a number of options for dealing with this objection, one of which is to hold that the Creator of the universe is causally, but not temporally, prior to the Big Bang singularity, such that His act of causing the universe to begin to exist is simultaneous, or co-incident, with its beginning to exist. Grünbaum provides no justification for his assumption that causal priority implies temporal priority. Discussions of causal directionality deal routinely with cases in which cause and effect are simultaneous. One could hold that the Creator sans the universe exists changelessly and, hence, timelessly and at the Big Bang singularity created the universe along with time and space. For the Creator sans the universe, there simply is no time because there are no events of any sort; time begins with the first event, at the moment of creation.

The time of the first event would be not only the first time at which the universe exists, but also, technically, the first time at which the Creator exists, since sans the universe the Creator is timeless.{63} The act of creation is thus simultaneous with the origination of the universe.

The scenario I have sketched of the Creator's status sans the universe requires that the Creator be both a timeless and personal agent. But some philosophers have argued that such a notion is self-contradictory.{64} For it is a necessary condition of personhood that an individual be capable of remembering, anticipating, reflecting, deliberating, deciding, and so forth. But these are inherently temporal activities. Therefore, there can be no atemporal persons.

The weakness in this reasoning is that it conflates *common* properties of persons with *essential* properties of persons. The sorts of activities delineated above are certainly common properties of temporal persons. But that does not imply that such properties are essential to personhood. Arguably, what is necessary and sufficient for personhood is self-consciousness and free volition, and these are not inherently temporal notions. In his study of divine timelessness, John Yates writes,

> The classical theist may immediately grant that concepts such as reflection, memory, and anticipation could not apply to a timeless being (nor to any omniscient being), but this is not to admit that the key concepts of consciousness and knowledge are inapplicable to such a deity . . . . there does not seem to be any essential temporal element in words like . . . 'understand,' to 'be aware,' to 'know,' and so on . . . . an atemporal deity could possess maximal understanding, awareness, and knowledge in a single, all-embracing vision of himself and the sum of reality.{65}

Similarly, the Creator could possess a free, changeless intention of the will to create a universe with a temporal beginning. Thus, it seems that neither self-consciousness nor free volition entail temporality. But since these are plausibly sufficient for personhood, there is no incoherence in the notion of a timeless, personal Creator of the universe.

All of the above objections have been offered as attempted justification of the apparently incredible position that the universe sprang into being uncaused out of nothing. But I, for one, find the premisses of those objections far less perspicuous than the proposition that *whatever begins to exist has a cause.* It is far more plausible to deny one of those premisses than to affirm what Hume called the "absurd Proposition" that something might arise without a cause,{66} that the universe, in this case, should pop into existence uncaused out of nothing.

Conclusion

We can summarize our argument as follows:

1. Whatever exists has a reason for its existence, either in the necessity of its own nature or in an external ground.
2. Whatever begins to exist is not necessary in its existence.
3. If the universe has an external ground of its existence, then there exists a Personal Creator of the universe, who, sans the universe, is timeless, spaceless, beginningless, changeless, necessary, uncaused, and enormously powerful.
4. The universe began to exist.

From (2) and (4) it follows that

5. Therefore, the universe is not necessary in its existence.

From (1) and (5) it follows further that

6. Therefore, the universe has an external ground of its existence.

From (3) and (6) it we can conclude that

7. Therefore, there exists a Personal Creator of the universe, who, sans the universe, is timeless, spaceless, beginningless, changeless, necessary, uncaused, and enormously powerful.

And this, as Thomas Aquinas laconically remarked,{67} is what everybody means by God.

Endnotes

{1}*Metaphysics* A. 2. 982^{b}10-15.

{2}Derek Parfit, "Why Anything? Why This?" *London Review of Books* 20/2 (January 22, 1998), p.24.

{3}Gottfried Wilhelm Leibniz, "The Principles of Nature and of Grace, Founded on Reason," in *The Monadology and Other Philosophical Writings*, trans. Robert Latta (London: Oxford University Press, 1951), p. 415; idem, "The Monadology," in *Monadology and Other Philosophical Writings,* pp. 237-39.

{4}David Hume, *Dialogues concerning Natural Religion,* ed. with an Introduction by Norman Kemp Smith, Library of Liberal Arts (Indianapolis: Bobbs-Merrill, 1947), pt. IX, p. 190.

{5}Bertrand Russell and F. C. Copleston, "The Existence of God," in *The Existence of God,* ed. with an Introduction by John Hick, Problems of Philosophy Series (New York: Macmillan, 1964), p. 175.

{6}A. Einstein, "Cosmological Considerations on the General Theory of Relativity," in *The Principle of relativity,* by A. Einstein, *et. al.,* with Notes by A. Sommerfeld, trans. W. Perrett and J. B. Jefferey (rep. ed.: New York: Dover Publications, 1952), pp. 177-88.

{7}A. Friedman, "Über die Krümmung des Raumes," *Zeitschrift für Physik* 10 (1922): 377-86; G. Lemaitre, "Un univers homogène de masse constante et de rayon croissant, rendant compte de la vitesse radiale des nébuleuses extragalactiques," *Annales de la Société scientifique de Bruxelles* 47 (1927): 49-59.

{8}Gregory L. Naber, *Spacetime and Singularities: an Introduction* (Cambridge: Cambridge University Press, 1988), pp. 126-27.

{9}E. Hubble, "A Relation between Distance and Radial Velocity among Extra-galactic Nebulae," *Proceedings of the National Academy of Sciences* 15 (1929): 168-73.

{10}John A. Wheeler, "Beyond the Hole," in *Some Strangeness in the Proportion,* ed. Harry Woolf (Reading, Mass.: Addison-Wesley, 1980), p. 354.

{11}P. C. W. Davies, "Spacetime Singularities in Cosmology," in *The Study of Time III,* ed. J. T. Fraser (Berlin: Springer Verlag).

{12}As Gott, Gunn, Schramm, and Tinsley write,

"the universe began from a state of infinite density about one Hubble time ago. Space and time were created in that event and so was all the matter in the universe. It is not meaningful to ask what happened before the big bang; it is somewhat like asking what is north of the North Pole. Similarly, it is not sensible to ask where the big bang took place. The point-universe was not an object isolated in space; it was the entire universe, and so the only answer can be that the big bang happened everywhere" (J. Richard Gott III, James E. Gunn, David N. Schramm, and Beatrice M. Tinsley, "Will the Universe Expand Forever?" *Scientific American* [March 1976], p. 65).

{13}John Barrow and Frank Tipler, *The Anthropic Cosmological Principle* (Oxford: Clarendon Press, 1986), p. 442.

{14}For this analysis, see John Hick, "God as Necessary Being," *Journal of Philosophy* 57 (1960): 733-34.

{15}Arthur Eddington, *The Expanding Universe* (New York: Macmillan, 1933), p. 124.

{16}Ibid., p. 178.

{17}Hubert Reeves, Jean Audouze, William A. Fowler, and David N. Schramm, "On the Origin of Light Elements," *Astrophysical Journal* 179 (1973):

{18}Fred Hoyle, *Astronomy Today* (London: Heinemann, 1975), p. 165.

{19}Fred Hoyle, *Astronomy and Cosmology: A Modern Course* (San Francisco: W. H. Freeman, 1975), p. 658.

{20}H. Bondi and T. Gold, "The Steady State Theory of the Expanding Universe," *Monthly Notices of the Royal Astronomical Society* 108 (1948): 252-70; F. Hoyle, "A New Model for the Expanding Universe," *Monthly Notices of the Royal Astronomical Society* 108 (1948): 372-82.

{21}As Jaki points out, Hoyle and his colleagues were inspired by "openly anti-theological, or rather anti-Christian motivations" (Stanley L. Jaki, *Science and Creation* [Edinburgh: Scottish Academic Press, 1974), p. 347. Martin Rees recalls his mentor Dennis Sciama's dogged commitment to the Steady State Model: "For him, as for its inventors, it had a deep philosophical appeal--the universe existed, from everlasting to everlasting, in a uniquely self-consistent state. When conflicting evidence emerged, Sciama therefore sought a loophole (even an unlikely seeming one) rather as a defense lawyer clutches at any argument to rebut the prosecution case" (Martin Rees, *Before the Beginning,* with a Foreword by Stephen Hawking [Reading, Mass.: Addison-Wesley, 1997], p. 41). The phrase "from everlasting to everlasting" is the Psalmist's description of God (Ps. 90.2). Rees gives a good account of the discoveries leading to the demise of the Steady State Model.

{22}Ivan R. King, *The Universe Unfolding* (San Francisco: W. H. Freeman, 1976), p. 462.

{23}See, *e.g.,* E. M. Lifschitz and I. M Khalatnikov, "Investigations in Relativist Cosmology," *Advances in Physics* 12 (1963): 207.

{24}As evident from the sentiments expressed by John Gribbin:

"The biggest problem with the Big Bang theory of the origin of the universe is philosophical--perhaps even theological--what was there before the bang? This problem alone was sufficient to give a great initial impetus to the Steady State theory; but with that theory now sadly in conflict with the observations, the best way round this initial difficulty is provided by a model in which the universe expands from a singularity, collapses back again, and repeats the cycle indefinitely" (John Gribbin, "Oscillating Universe Bounces Back," *Nature* 259 [1976]: 15).

Scientists not infrequently misexpress the difficulty posed by the beginning of the universe as to what existed before the Big Bang (which invites the easy response that there was no "before"). The real question concerns the causal conditions of this event, why the universe exists rather than nothing.

{25}R. Penrose, "Gravitational Collapse and Space-Time Singularities," *Physical Review Letters* 14 (1965): 57-59; S. W. Hawking and R. Penrose, in *The Large-Scale Structure of Space-Time,* ed. S. W. Hawking and G. F. R. Ellis (Cambridge: Cambridge University Press, 1973), p. 266.

{26}Stephen Hawking and Roger Penrose, *The Nature of Space and Time,* The Isaac Newton Institute Series of Lectures (Princeton, N. J.: Princeton University Press, 1996), p. 20.

{27}Associated Press News Release, 9 January 1998.

{28}I. D. Novikov and Ya. B. Zeldovich, "Physical Processes near Cosmological Singularities," *Annual Review of Astronomy and Astrophysics* 11 (1973): pp. 401-02; Joseph Silk, *The Big Bang,* 2d ed. (San Francisco: W. H. Freeman, 1989), pp. 311-12..

{29}Looking back, quantum cosmologist Christopher Isham muses,

"Perhaps the best argument in favor of the thesis that the Big Bang supports theism is the obvious unease with which it is greeted by some atheist physicists. At times this has led to scientific ideas, such as continuous creation or an oscillating universe, being advanced with a tenacity which so exceeds their intrinsic worth that one can only suspect the operation of psychological forces lying very much deeper than the usual academic desire of a theorist to support his/her theory" (Christopher Isham, "Creation of the Universe as a Quantum Process," in *Physics, Philosophy and Theology: a Common quest for Understanding,* ed. R. J. Russell, W. R. Stoeger, and G. V. Coyne [Vatican City: Vatican Observatory, 1988], p. 378).

One recalls, for example, the late Carl Sagan on his *Cosmos* television series propounding the oscillating model and reading from Hindu scriptures about cyclical Brahman years in order to illustrate the model, but with nary a hint to his viewers about the difficulties attending this model.

{30}Edward Tryon, "Is the Universe a Vacuum Fluctuation?" *Nature* 246 (1973): 396-97.

{31}See Isham, "Creation of the Universe," pp. 385-87.

{32}Christopher Isham, "Space, Time, and Quantum Cosmology," paper presented at the conference "God, Time, and Modern Physics," March 1990; Christopher Isham, "Quantum Cosmology and the Origin of the Universe," lecture presented at the conference "Cosmos and Creation," Cambridge University, 14 July 1994.

{33}See, *e.g.,* A. D. Linde, "The Inflationary Universe," *Reports on Progress in Physics* 47 (1984): 925-86; idem, "Chaotic Inflation," *Physics Letters* 1298 (1983): 177-81. For a recent critical review of inflationary scenarios, including Linde's, see John Earman and Jesus Mosterin, "A Critical Look at Inflationary Cosmology," *Philosophy of Science* 66 (1999): 1-49.

{34}Linde, "Inflationary Universe," p. 976.

{35}A. Borde and A. Vilenkin, "Eternal Inflation and the Initial Singularity," *Physical Review Letters* 72 (1994): 3305, 3307.

{36}Andrei Linde, Dmitri Linde, and Arthur Mezhlumian, "From the Big Bang Theory to the Theory of a Stationary Universe," *Physical Review D* 49 (1994): 1783-1826.

{37}Borde and Vilenkin, "Eternal Inflation," p. 3307.

{38}A. Vilenkin, "Birth of Inflationary Universes," *Physical Review D* 27 (1983): 2854. See J. Hartle and S. Hawking, "Wave Function of the Universe," *Physical Review D* 28 (1983): 2960-75; A. Vilenkin, "Creation of the Universe from Nothing," *Physical Letters* 117B (1982): 25-28.

{39}Stephen Hawking, *A Brief History of Time* (New York: Bantam Books, 1988), p. 9.

{40}Ibid., p. 46.

{41}Ibid., p. 136.

{42}Ibid., pp. 140-141.

{43}John D. Barrow, *Theories of Everything* (Oxford: Clarendon Press, 1991), p. 68.

{44}Ibid., pp. 67-68.

{45}Hartle and Hawking, "Wave Function of the Universe," p. 2961; Hawking and Penrose, *Nature of Space and Time,* p. 85.

{46}See my "Hartle-Hawking Cosmology and Atheism," *Analysis* 57 (1997): 291-95. With respect to determining the wave function of the universe DeWitt says, "Here the physicist must play God" (B. DeWitt, "Quantum Gravity," *Scientific American* 249 [1983]: 120).

{47}Hawking, *Brief History of Time,* p. 136.

{48}Barrow, *Theories of Everything*, pp. 66-67.

{49}Hawking, *Brief History of Time,* pp. 138-39.

{50}Hawking and Penrose, *Nature of Space and Time,* p. 121.

{51}Ibid., pp. 3-4. Cf. his comment, "I . . . am a positivist who believes that physical theories are just mathematical models we construct, and that it is meaningless to ask if they correspond to reality, just whether they predict observations" (Stephen Hawking, "The Objections of an Unashamed Positivist," in *The Large, the Small, and the Human,* by Roger Penrose [Cambridge: Cambridge University Press, 1997], p. 169).

{52}Hawking and Penrose, *Nature of Space and Time,* p. 121; cf. pp. 4, 53-55.

{53}Ibid., pp. 53-55.

{54}As pointed out by Christopher Isham, "Quantum Theories of the Creation of the Universe," in *Quantum Cosmology and the Laws of Nature,* ed. R. J. Russell, N. Murphey, and C. J. Isham (Vatican City: Vatican Observatory, 1993), p. 56.

{55}Paul Davies, "The Birth of the Cosmos," in *God, Cosmos, Nature and Creativity,* ed. Jill Gready (Edinburgh: Scottish Academic Press, 1995), pp. 8-9.

{56}Bernulf Kanitscheider, "Does Physical Cosmology Transcend the Limits of Naturalistic Reasoning?" in *Studies on Mario Bunge's "Treatise,"* ed. P. Weingartner and G. J. W. Doen (Amsterdam: Rodopi, 1990), p. 344.

{57}Richard Swinburne, *The Existence of God*, rev. ed. (Oxford: Clarendon Press, 1991), pp. 32-48.

{58}John Post, *Metaphysics: a Contemporary Introduction* (New York: Paragon House, 1991), p. 85.

{59}Ibid., p. 87.

{60}Quentin Smith, "The Uncaused Beginning of the Universe," in *Theism, Atheism, and Big Bang Cosmology*, by William Lane Craig and Quentin Smith (Oxford: Clarendon Press, 1993), p. 120.

{61}Adolf Grünbaum, "The Pseudo-Problem of Creation in Physical Cosmology," *Philosophy of Science* 56 (1989): 373-94. For a response, see William Lane Craig, "The Origin and Creation of the Universe: a reply to Adolf Grünbaum," *British Journal for the Philosophy of Science* 43 (1992): 233-40.

{62}Adolf Grünbaum, "Creation as a Pseudo-Explanation in Current Physical Cosmology," *Erkenntnis* 35 (1991): 233-54. For a response, see William Lane Craig, "Prof. Grünbaum on Creation," *Erkenntnis* 40 (1994): 325-41.

{63}Brian Leftow puts this nicely when he writes,

"If God existed in time once time existed and time had a first moment, then God would have a first moment of existence: there would be a moment before which He did not exist, because there was no 'before' that moment . . . . Yet even if He . . . had a first moment of existence, one could still call God's existence unlimited were it understood that He would have existed even if time did not. For as long as this is true, we cannot infer from God's having had a first moment of existence that God *came into* existence or would not

have existed save if time did" (Brian Leftow, *Time and Eternity,* Cornell Studies in Philosophy of Religion [Ithaca, N.Y.: Cornell University Press, 1991], p. 269; cf. p. 201).

Senor has dubbed such a model of divine eternity "accidental temporalism" (Thomas D. Senor, "Divine Temporality and Creation *ex nihilo," Faith and Philosophy* 10 [1993]: 88). See further William Lane Craig, "Timelessness and Creation," *Australasian Journal of Philosophy* 74 (1996): 646-56.

{64}See discussion and references in William Lane Craig, "Divine Timelessness and Personhood," *International Journal for Philosophy of Religion* 43 (1998): 109-24.

{65}John C. Yates, *The Timelessness of God* (Lanham, Md.: University Press of America, 1990), p. 173.

{66}David Hume to John Stewart, February, 1754, in *The Letters of David Hume,* 2 vols., ed. J. Y. T. Greig (Oxford: Clarendon Press, 1932), 1: 187.

{67}Thomas Aquinas *Summa theologiae* 1a.2.3.