

Cosmogenesis

In one version of the Big Bang model, the universe did not arise at a point in space and time due to a cause. Rather, the Big Bang can be taken as representing the origin of nature itself along with all of its properties, including space, time and causality. Nature is the realm coextensive with these properties. The Big Bang represents the horizon beyond which space, time and causality are not postulated. Such a horizon would not be a barrier beyond which unobservable events occur at undeterminable locations due to undetectable causes, but the horizon beyond which science is not applicable because events, locations and causes do not exist. The tautological spatial, temporal and causal closure of nature renders the metaphysical realm one of unknowability and inconceivability.

According to this perspective, questions of where, when, or why the universe originated are invitations to play pin-the-tale-on-the-donkey without a donkey. To ask where is to seek to specify a point in space. Such a point could not exist if there were no space in which that point could exist. To ask when is to seek to specify a point in time. Such a point could not exist if there were no time in which that point could exist. To ask why is to seek a cause. Such a cause could not exist in the absence of causality. To say that science cannot answer these questions is not to say that it could given additional effort, or that some other enterprise could. It is to say that answers do not exist even in principle to compound questions that presuppose meaningless premises. These are instead pseudoquestions, a favorite of Stephen Hawking's being, "What is to found one mile north of the North Pole?" Genuine questions have answers, at least in principle. Conversely, pseudoquestions, because they are categorically unanswerable, cannot properly be asked.

A source for the theorized initial universal singularity is sometimes sought. That original singularity is postulated to have been coextensive with all of nature, including all of space, time and causality. The Big Bang is thus theorized to have occurred everywhere at once. What is postulated beyond the horizon of the Big Bang is not empty space devoid of physical objects at all locations, but rather the realm to which the concept of location is misapplied. There is literally no "there" there.

The contention is not merely that the universe has existed only during the most recent 14 billion years, but that only 14 billion years have existed. Nothing happened "before" the Big Bang because it is only after the Big Bang that happening is possible. The phrase "before time" is oxymoronic, and thus unintelligible and meaningless. Time does not extend so far back as to exclude itself. One cannot look back to a time when there was no time because there was never a time when time was not. The nonexistence of prenatal time is consistent with the assertions of St. Augustine. The universe arose with time, not in it. And if, as Hawking asserts, space-time is unbounded, then the universe had no temporal beginning. The no-boundary proposal of Hartle and Hawking features imaginary time in which tunneling may occur from nothing. Beyond the realm of time is eternity, which is not the condition of infinite time but of timelessness. It is the absence of the property of time. Due to their impossibility, events in this realm constitute an empty class, like the class of married bachelors.

Focusing on the matter of causality, a finite causal regress is necessitated by a finite past. Seeking a cause for the origin of the universe presupposes one of the properties of the universe the creation of which is at issue and does nothing to terminate the regress. A first cause is

necessary within nature (setting aside the issue of what is necessary to initiate nature) only if nature is exclusively causal, which it is not. Causality does not exhaust explanation, lawfulness or determination, even in the macroscopic Newtonian realm. Because of the omnipresence of spontaneity and chance, it is not a category of unlimited extension and universal validity. Nature is causal only in the same sense that humans are Hungarians: as an accent fallacy.

Additionally, the history of the universe is traced back beyond the classical, macroscopic, superatomic, Newtonian realm to the subatomic scale and near singularity. This is the realm of quantum phenomena, which are paradoxically acausal. These include quantum fluctuation, which is an empirical fact. Even if a cause can be fortuitously situated in time such that coincident causation may be invoked, it is not clear how any cause, divine or otherwise, could be forced into the quantum realm, where classical mechanics, causality and general relativity do not apply. However strange this domain may seem, as Fredeic Raphael observes, "Science and common sense seldom tell the same story." That the earth is the center of the universe and does not move is a common-sense but erroneous intuition. Seeking the cause of cosmogenesis is thus an incoherent, chimerical enterprise, and uncaused cosmogenesis is not the logical impossibility it is occasionally claimed to be.

Nevertheless, events may have explanations even if they do not have causes. Quantum fluctuation may be validly offered as a reason, which is epistemological, as opposed to a cause, which is ontological. Caused or not, quantum fluctuation happens. Therefore, even if it be supposed that quantum events require causes, such causes prove themselves to be readily available. If the origin of the universe needs a cause, then one need look no further than that which causes *any* quantum fluctuation.

Time is clearly excluded from eternity. However, even if causality may seem not to be, without time, causes cannot precede their effects, as precedence could not exist. Appeals to logic seem to fail because of the implied temporality of the syllogism itself. Premises are considered and *then* a conclusion is drawn, which could not occur without time. In "The Self-Organizing Quantum Universe" (an article by Ambjørn, J., Jurkiewicz, J. and R. Loll in *Scientific American*, 7/08), causality is described as "the principle that events occur in a specific temporal sequence of cause and effect." The arrow of time is fundamental to the causal dynamical triangulations of the authors, whose simulations produce our observed spatial geometry. In this view, it is the structure of spacetime that allows this distinction. By contrast, the Euclidean quantum gravity of Stephen Hawking employs imaginary time, hoping that causality would emerge as a derived, macroscopic property.

As nature is the realm of causality, a supernatural cause would be oxymoronic. Causes cannot come from a realm devoid of causality. Supernaturalists may ask how skeptics know that the supernatural cannot provide something that it lacks, but such is the nature of logic. Either supernatural causation is oxymoronic or it at least does not deserve presumption, leaving supernaturalists to try to extend research into the supernatural, itself an oxymoronic endeavor. Of course, research itself is irrelevant to faith, with which supernaturalists seem to be satisfied. Even if God is somehow responsible for nature, it is not by way of causality. Additionally, He is beyond research, making eponymic theology impossible and leaving creationists powerless to discover grounds for rejecting the null hypothesis that presupposes nature.

Again, the transcendent qualifies as such by featuring timelessness, spacelessness and causelessness. Otherwise, it is simply not another realm, but is this one. If it could be known whether space, time or causality existed beyond nature, then the realm in question automatically qualifies as part of nature. Accessing the inaccessible is oxymoronic.

On a related topic, a black hole, despite space and time being warped (even infinitely) within its event horizon, is still qualitatively natural. The interior of a black hole is inaccessible and isolated from nature, but not absolutely, as quantum tunneling could provide matter with a means of escape. Also, light cannot escape from black holes, but gravity waves can.

Consider now the following insight. In *Sky & Telescope*, March 1983 (p. 211), Alan MacRobert writes:

The first suggestion of how creation could be achieved in a purely natural context was published in 1973 by Edward P. Tryon, a physicist at Hunter College of the City University of New York. Tryon called attention to the fact that, according to the Heisenberg uncertainty principle of quantum mechanics, the universe could have burst into existence out of literally nothing if certain constraints on its total energy, and on conserved quantities such as electric charge, were met.

As Tryon tells it, the idea first occurred to him one afternoon in his Manhattan apartment. He had been wondering why the universe's total amount of mass-energy seems equal to its total gravitational potential energy, the energy in the gravity that every piece of mass exerts on every other piece of mass. There was no apparent reason why these two quantities should have anything to do with each other. Yet they matched to the (rather poor) accuracy with which they were known. Tryon realized that if these two quantities were *exactly* equal they would cancel out, since potential energy is negative. The universe would then have a net energy of zero.

According to quantum mechanics, any system with a very small net energy can appear from nothing, exist for a brief moment, and vanish. These "virtual particles," or quantum fluctuations, are observed in the laboratory and appear spontaneously throughout space all the time. A quantum fluctuation as heavy as an electron-positron pair has a lifetime of only 10^{-21} second. One with 10^{21} times less energy could last for a full second. Any system with a net energy of exactly zero could appear from nothing in this manner and exist forever.

Tryon realized that there is no limit to the size of the quantum fluctuations that are always occurring in empty space. Larger ones are merely less frequent than smaller ones. Given enough time even the largest conceivable ones must inevitably occur, spontaneously and purely by chance. A very large system arising in this manner might be indistinguishable from the Big Bang.

The fundamental question is not about creation "in a purely natural context," but about the arising of that natural context itself. Nor is it about a phenomenon occurring "given enough time," but about the emergence of time itself. Even if a preexisting vacuum is presupposed, the uncertainty principle states that the energy of a vacuum cannot be fixed at zero due to quantum indeterminacy, what Leonard Susskind calls "the metastability of the vacuum." Additionally, string theory suggests that information could traverse the Big Bang bottleneck from a period of pre-existing time. Alternatively, if the universe has always existed, then it had no origin, and no need arises to find a cause for an origin that never happened. It should also be noted that cosmic flatness has come to be seen in a new light due to the theory of inflation.

However counterintuitive, then, the Big Bang violates conservation laws only if it yields a universe with net energy. If the universe has no net energy, then there was no net creation when

it arose. If the universe is energetically equivalent to nonexistence, then the Big Bang is in full accordance with the principle of nothing from nothing (*de nihilo nihil*). This is also reflected in the null physics of Terence Witt, which derives from the premise that all of existence (matter and antimatter, energy, electric charges and fields, momentum, etc.) sums to zero. MIT cosmologist Alan Guth calls the universe the ultimate free lunch, when in fact, in this sense, it is no lunch at all, and thus poses no problem by being free. The principle of the conservation of mass has been used to assert the logical impossibility of the emergence of a universe that features mass. This ignores the equivalence and interconvertibility of mass and energy. Stars create energy at the expense of matter. Black holes radiate via the creation of matter at the expense of gravitational energy. If the universe as a whole has no net energy (as discussed above), then the presence of mass violates no conservation law. Just as matter plus antimatter equals annihilation, so something plus antisomething equals nothing.

Put another way, the sane mind views the mathematical statement “ $2-2=0$ ” as an equation. Applying creationist reasoning, the right side represents nothing, while the left side contains actual quantities that constitute something, whether or not their net value is zero. Either the truth of the equation is recognized or it is not. So it is with the universe as a whole.

Therefore, this apparent paradox is illusory, with the task of wrestling with this figment delegated to creationists, who routinely posit God as something arising from nothing, and also routinely accuse science of being unable to account for existence, as if anything, including religion, could account for it any better. Ironically, for Fred Hoyle, the scientific consensus was insufficiently secular. He said, “The passionate frenzy with which the Big Bang cosmology is clutched to the corporate scientific bosom evidently arises from a deep-rooted attachment to the first page of Genesis.” Actually, a deep-rooted attachment to the superior explanation of data amply suffices.

In a letter to the *Los Angeles Times*, 12/23/05, John F. Haggerty, referring to “the wonders and complexity of the universe,” claims that to “be told it came out of nothing is no explanation.” True, until quantum mechanics is applied. He continues, “But the question of why there is something, and not nothing, is one that natural science, which is not competent beyond the horizon of experience, cannot answer and, therefore, it should not be the subject of a biology class.” Beyond the horizon of experience, alternatives to natural science have even lesser competence, at least to explain, if not to “answer.” And there are simpler reasons for its exclusion from biology (and social studies and home economics). Physics, rather than biology, can in fact explain why there is what Mr. Haggerty calls “something.” If, as stated above, there is no *net* “something,” then there actually *is* “nothing,” and, consequently, nothing to explain, at least at this level of discussion. This diffuses and nullifies would-be objections such as that of Karen Hong, who, in a letter to the *Los Angeles Times*, 1/14/06, writes, “Reason tells us that nothing can come from nothing. Something had to start the ‘Big Bang.’ That something was God or an intelligent designer, if you prefer that term.” This falsely dichotomous hoary chestnut excludes the superior quantum mechanical explanations, which extend beyond the limits of Hong’s “reason.” One need not learn physics in biology class. But learning it nowhere simply leaves one an ignoramus.

There also arises the objection that laws of physics, including the principles of quantum mechanics, could not exist within a state of “absolutely nothing.” This again ignores the inapplicability of common sense to the quantum realm. Common sense dictates that a photon may not be in two places simultaneously, but photons simply ignore this and do it anyway. The apparent mutual exclusivity of physical laws and “absolutely nothing” may be similarly illusory.

But if the word *nothing* means the absence of absolutely everything, then that would include conservation laws. Laws cannot apply in a realm where they do not exist.

Cosmogogenesis may indeed be improbable. Nevertheless, unless an event is logically and physically impossible, then even a probability of zero only means that it *almost* never happens. Allowance must be made for noise, which consists of sporadic exceptions that do not accumulate and thus have no cumulative quantitative influence. Radio silence may contain static even in the absence of any signal.

The matter of fine tuning seems to excite creationists and inspires the Anthropic Principle. However, if this is a matter of necessity, then God is unnecessary. If a matter of contingency, then this may be handled by multiverse models, which posit causally disconnected, isolated regions even within nature. In these models, infinitesimal probabilities are countered with reciprocally large numbers of universes. And a universe balanced and adjusted in a way that allows life is one in which life is not miraculous, which it would be in a universe in which life was impossible. Caution must be exercised in avoiding the gambler's fallacy of how lucky *we* are that *our* planet formed and *our* species emerged. (Similarly, improbability is why life would not be cosmically ubiquitous, not why it would not be on Earth. Lotteries are typically won by *somebody*, just not everybody.) We find ourselves in this kind of universe because in no other kind could *finding* occur. It is also important that multiverse or metaverse models only arise as a logical consequence of explanatorily superior theories rather than by arbitrary hubris. Incidentally, in the *Los Angeles Times*, 6/28/08, Sean M. Carroll explains how a multiverse model allows for the emergence of our universe from another. In a manner similar to biological reproduction, our universe could begin in a state of entropy lower than that of its parent.

When dealing with multiverse models, creationists sometimes observe that infinite possibilities do not necessarily entail all possibilities. An infinite set of identical copies of a "wrong" universe could exist, and so they demand some guarantee that diversity would occur. Logically, diversity need not be guaranteed but merely allowed. It need only be possible, not necessary. Rather, it is creationists who require a guarantee that diversity will *not* occur in order to provide some role for God. In the absence of such a guarantee, no problem arises and God is unnecessary.

In practical terms, the Big Bang theory predicted the relative abundances of light elements and the existence and temperature of the cosmic microwave background radiation. The inflationary model dealt with the horizon, flatness, and smoothness problems. The Bible, apparently, does not even address these issues. When creationists try to solve these problems, they must perpetrate a double standard in order to seem not to fail. For example, the AiG website (answersingenesis.com) proudly trumpets, "Big Bang founded on unprovable assumptions," while elsewhere on the same site (and already cited earlier in these essays) it is claimed, "All philosophical systems start with axioms (presuppositions), or unprovable propositions accepted as true, and deduce theorems from them. Therefore Christians should not be faulted for having axioms." If Christians should not be faulted, then neither should scientists. If it is wrong for scientists to resort to unprovable assumptions, then it is equally wrong for Christians to do so. Unprovable or not, the mechanisms invoked by science are natural, which are more worthy of presumption than any alternative. Therefore, invoking the supernatural while simultaneously criticizing science for resorting to "unprovable assumptions" goes beyond a mere *tu quoque* fallacy and becomes an *argumentum ad ignorantiam* in the form of the pot calling the sugar black.

When objects appear to be more than 10,000 light-years distant, young-Earth creationists hypothesize that the speed of light has changed, which is not the null hypothesis. An age for the universe of 10,000 years is arbitrary with respect to the facts, which are no less consistent with the notion that the universe, including all human memory, came into being one minute ago.

AiG also declares, “Secular scientists blast Big Bang.” Criticism of theories is a trivial truth. All theories deserve criticism, with the one least deserving of adverse criticism being the most deserving of merit, and therefore the winner. Science grades on a curve, such that supremacy does not require perfection. Creationists think it noteworthy that cosmologists can be found who criticize the Big Bang theory, as if science did not criticize creationism even more. However much the Big Bang theory is criticized, it explanatorily fails less than any of the alternatives.

Some of the most amusing statements on answersingenesis.com are those made by Jonathan Sarfati, who states, “It is unreasonable to believe something could begin to exist without a cause.” This ignores quantum mechanics, to which causality does not strictly apply. He claims, “Quantum mechanics *never* produces something out of nothing.” It may only be that it does not allow for the production of a *net* something out of nothing, whereas pseudosomething out of nothing occurs constantly, as noted above. Also, quantum mechanics is the probabilistic science that never says never.

Sarfati says, “Theories that the universe is a quantum fluctuation must presuppose that there was *something* to fluctuate – their ‘quantum vacuum’ is a lot of matter-antimatter potential – not ‘nothing.’” If the matter and antimatter are equal, then such a vacuum is no *net* something and the first law of thermodynamics is not violated by its existence.

He asserts that “if there is no cause, there is no explanation why this particular universe appeared at a *particular time*, nor why it was a universe and not, say, a banana or cat which appeared. This universe can’t have any properties to explain its preferential coming into existence, because it wouldn’t have *any* properties until it actually came into existence.” In the quantum mechanical realm, events such as the radioactive decay of particular atomic nuclei are random with respect to any “particular time.” The “particular time” that the universe arose was at the beginning of time, time being one of those properties “it wouldn’t have” until the universe “actually came into existence.” Bananas and cats are best explained as derived species caused by their phylogenetic histories. And they undeniable have “appeared,” only later. The Platonic idealist implication is that if there were a cause, then the universe would have properties before it came into existence, which Sarfati himself denies.

Mention is made on AiG of “*ad hoc* unobservable entities required to prop up the [Big Bang] theory.” *Ad hoc* hypotheses are required by *all* theories. The quantity of these hypotheses determines the relative explanatory value of a theory, in accordance with Ockham’s Razor. Any “unobservable entities” hypothesized by science are unobservable only because they are historically singular. They are at least natural and therefore better than the metaphysical ones resorted to by religion, which are not even observable in principle. Thus, problems solved naturally by science are an even bigger problem for those who solve them supernaturally. A commentator at AiG says, “Cosmologists grasp at straws,” which are at least physical, whereas creationists grasp at the insubstantial, which is worse. Ultimately, the *ad hoc* hypotheses of science are consistently fewer and better.

Sarfati writes, “To help the atheist position that the universe came into existence without a cause, one would need to find Raman bands appearing without being caused by transitions in

vibrational quantum states, or alpha particles appearing without pre-existing nuclei, etc.” The phenomena cited by Tryon will do nicely.

“If quantum mechanics was as acausal as some people think, then . . . I may as well burn my Ph.D. thesis.” Since the alternative would be for most of the scientific community to burn theirs instead, this is an insignificant threat. Although, given his improper subjunctive verb form, his education does leave *something* to be desired.

Sarfati acknowledges that eternity lacks the properties of space and time. If space and time cannot be extrapolated beyond nature so as to apply to God, then neither can causality. God may be uncaused, but neither can He *be* a cause, given that He inhabits an acausal realm. He is thus capable of being neither cause nor effect. Effects have causes, but both reside exclusively in nature because nature is defined by them.

In the *Los Angeles Times*, 4/17/11, Vincent Bugliosi is quoted as believing “that atheists have failed to account for the ‘first cause’ argument for God’s existence,” saying that “nothing in existence can give itself existence because if it did, then it would have to have preceded itself, an impossibility.” The issue is not something *in* existence giving itself existence but the emergence of existence itself from atemporal, aspatial, acausal nonexistence. No paradox arises as long as existence is not thought to have preceded itself, which it is not. To precede is to be set earlier *in time*, such that the notion of preceding time itself is absurd. A cause cannot precede causality because neither time nor space nor causality can be preceded. Seeking a cause for causality is as absurd as the idea of having a countdown in anticipation of the beginning of time.