The Cosmological Argument Revisited

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In this article Mixie argues that the most accepted cosmological model for the origin of the universe, the standard hot big bang theory, and the ontological status of the big bang singularity provide evidence that supports a necessary cause for the universe which we call God.

Vocabulary:

Scientific Empiricism:	method of science in which all knowledge must be proved by repeated experiments
Constituents:	parts of a whole
Entrophy:	disorder
Tensor:	set of coordinates that represents the change in a system
Ex nihilo:	from nothing
Ontological:	refers to the state of being of something
Wave Function:	mathematical representation of all the possible phase paths for a quantum event
Universal	

Wave Function:	mathematical representation of all the possible phase paths for all the particles in the universe at the time of creation
Phase Path:	the possible paths or trajectories of particles represented in a quantum wave function
Epistemological:	refers to our knowledge of things or events

Concepts:

Big Bang Theory:
Big Bang Singularity:
Universal Wave Function:

Questions:

1. What is the "Big Bang?"
2. What is the Big Bang Singularity and why it is important to this argument?
3. What does the ontological status of the Big Bang Singularity refer to?
4. What are the implications of the ontological status of the Big Bang Singularity for the cosmological argument?
5. Evaluate this revision of the cosmological argument.

Introduction

Consider the following form of the cosmological argument:

(A) The physical universe exists.

(B) All physical existents must have a cause.

(C) That which causes something to exist (provides the sufficient reason for its existence) must be either:

(C1) another contingent cause,

or

(C2) a non-contingent (necessary) cause.

(D) If the cause is contingent (C1), then this contingent cause must itself have a cause ad infinitum.

(E) Therefore, that which causes (provides the sufficient reason) the existence of the universe must be either:

(E1) an infinite series of contingent causes,

or

(E2) a necessary cause.

(F) By appeal to the principle of inference to the best explanation, an infinite series of contingent causes does not provide the best explanation for the existence of the universe.

(G) Therefore, the best explanation for the existence of the universe is a necessary cause.

(H) By appeal to empirical evidence, the necessary cause for the existence of the universe is a necessary non-physical being, i.e. God.

By appeal to scientific empiricism, premises (A) and (B) are self-evident. One could argue that it is, in fact, the very nature of the scientific endeavor of humankind to understand the causes of physical existents. Without knowledge of the cause of a phenomenon, one cannot possess complete understanding of the phenomenon in question. This applies to the origin of the universe as well as the individual constituents of the universe.

Premises (C), (D), and (E) reflect the possible alternatives available which claim to provide a sufficient reason for the existence of the universe. Consider premise (E1):

(E1) That which causes (provides the sufficient reason for) the existence of the universe must be an infinite series of contingent causes.

When applied to a proposition, contingency denotes that the opposite of the proposition under consideration is logically possible. The truth value of the statement is dependent upon future conditions which may or may not be realized.When applied to a being, the word "contingent" means that the being either may or may not exist at some time. In his book entitled *The Cosmological Argument*, Bruce Reichenbach says:

> Contingency as applied to existence is not a statement about some certainty or uncertainty that we have with respect to knowing whether an object exists; it is not reporting an epistemological state of affairs. Rather, it is telling us something about the ontology of the existent or future existent; it is informing us about the being itself, namely, that there is no logical or real necessity that it exists now or in the future; its nonexistence is as conceivable as its existence (Reichenbach 1972, 7).

Another concept which is often used to elucidate "contingent" is that of "dependency." When a being is categorized as a contingent being, it is dependent upon another being for its existence. More specifically, it is dependent upon another being as the cause of its existence. The being that provides the cause must actually exist prior to and simultaneously with that which it is causing to exist.

Premise (E2) provides an alternative hypothesis for the cause of the existence of the universe.

By appeal to the principle of inference to the best explanation, premise (F) denies that an infinite series of contingent causes empirically provides the best explanation for the existence of the universe. The hypothesis of an infinite regression of contingent causes fails on this account because:

(a) it conflicts with the established background knowledge supporting the current cosmological models of the origin of the universe;

(b) there is more supporting evidence for the hypothesis that a necessary cause exists, when the current cosmological models of the origin of the universe are integrated with the known elements of a quantum theory of gravity;

(c) there is less evidence against the hypothesis that a necessary cause exists than there is against an infinite regression of contingent causes, as per the current models of the origin of the universe;

(d) the necessary cause hypothesis is simpler than the hypothesis of an infinite series of contingent causes.

The preliminary conclusion (G) states that, by appeal to the inference to the best explanation, a necessary cause is the best explanation for the existence of the universe. This follows from premises (E1), (E2) and (F) via application of the rule of logic known as disjunctive syllogism.

The final conclusion (H) will be justified based upon the ontological status of the big bang singularity. Anticipating Kant's argument for the reduction of the cosmological argument to the ontological

argument, the justification for the conclusion (H) is provided by an argument based upon empirical evidence (current cosmological models), not an *a priori* conception of a necessary being derived through logical and conceptual analysis.

The Standard Hot Big Bang Cosmological Model

I shall argue that the standard hot big bang theory and the ontological status of the big bang singularity provide evidence that not only is a necessary cause the best explanation for the origin of the universe, but the stronger claim that this necessary cause must be a non-physical, intelligent being which exists independently of the physical universe.

In his article entitled "A Big Bang Argument For God's Nonexistence," Quentin Smith summarizes the relevant aspects of the big bang theory as consisting of:

(i) Einstein's field equations which say that the curvature of space-time is determined by the distribution of mass and energy in space-time.

This implies that if there is sufficient density of matter in the universe, space-time will converge and intersect at a point, in the past or the future.

(ii) Accepting the Friedmann solutions as applying to our universe.

The Friedmann solutions assume that the universe is perfectly isotropic and homogeneous thus offering two possible descriptions of the current state of the universe; expansion at a decreasing rate or contracting at an increasing rate.

(iii) Applying the Hawking-Penrose singularity theorems to the Friedmann solutions.

Stephen Hawking, in his work entitled "Theoretical Advances in General Relativity," says that the implication of the solutions for the Hawking-Penrose singularity theorems is that there is a curvature singularity that will intersect every world line, a beginning of time.

The upshot of this is that approximately 10-15 billion years ago, all the matter which now comprises the universe, was squeezed into one point which had zero spatial dimensions, a singularity. When the singularity exploded, in what we refer to as the big bang, space, time and the universe as we understand them began. Smith says,

> The instantaneously existing point is a singularity, which means that it is an end-point of space-time; there is no earlier time than the instant of the singularity for it itself is the first instant of time (Smith 1992, 220).

Roger Penrose, in his book entitled *The Emperor's New Mind* says,

> According to standard theory, this gas was just spewed out as a result of the explosion which created the universe: the big bang. However, it is important that we do not think of this as an ordinary explosion of the familiar kind, where material is ejected from one central point into a pre-existing space. Here, the space itself is created by the explosion, and there is, or was, no central point (Penrose 1989, 326).

The idea of a beginning of space, time and the universe as we know it is generally accepted by cosmologists today. Recall premise (F):

(F) By appeal to the principle of inference to the best explanation, an infinite series of contingent causes does not provide the best explanation for the existence of the universe.

It is by appeal to the wide spread acceptance of the big bang singularity, which is based upon empirical evidence, that I argue premise (F) is justified.

The Big Bang Singularity

By its nature, or lack thereof, the big bang singularity is very difficult to describe. In his article entitled "Breakdown of Predictability in Gravitational Collapse," Hawking describes a singularity as,

> ...a place where the classical concepts of space and time break down as do all the known laws of physics because they are all formulated on a classical space-time background. (Hawking 1976, 246).

Some have mistakenly understood the break down of the known laws of physics and our resulting inability to predict the future as implying that the big bang singularity was a state of maximum chaos, involving complete entropy and lawlessness. It is further argued that the hypotheses of divine creation is inconsistent with the lack of physical laws governing the big bang singularity.

Not only is the conclusion dubious that divine creation is inconsistent with the preceding description of the big bang singularity, it is questionable whether the description itself is accurate. First, it is not accepted that the big bang singularity was in a state of complete entropy or maximally chaotic. This conclusion stems from the mistaken notion that the initial singularity at the big bang exhibits temporal symmetry with singularities found in black holes. Understanding this difference provides an explanation for the second law of thermodynamics, which asserts that the entropy (disorder) of an isolated system increases

with time. On purely logical grounds, it should be clear that the initial singularity could not be a state of maximum entropy. For in that case, how could one explain the second law of thermodynamics? It is logically impossible for the universe to begin in a state of maximum entropy and then increase in entropy (the second law of thermodynamics) over time. Roger Penrose provides the empirical explanation. He says,

> We expect to find, indeed, that the curvature close to a final singularity is completely dominated by the tensor WEYL (the tidal distortion or initial change in shape, of a freely falling particle). This tensor goes to infinity. This appears to be the generic situation with a space-time singularity. Such behavior is associated with a singularity of high entropy (Penrose 1989, 337).

The WEYL tensor is used to denote the distortion effect of gravity on physical bodies, or the non-uniformity in the gravitational field. In the case of a "generic" singularity (any singularity except the big bang singularity), the physical body experiences a distortion of elongation because the gravitation force on that part of the body which first enters the singularity is greater than on that part which enters after. It is this infinite distortion which is associated with high entropy.

However, this is not the state of affairs at the big bang singularity. Penrose continues,

> The standard models of the big bang are provided by the highly symmetrical Friedmann-Robertson-Walker space-times that we considered earlier. Now the distorting tidal effect provided by the tensor WEYL is entirely absent. Instead there is a symmetrical inward acceleration acting on any spherical surface of test particles. This is the effect of the tensor RICCI, (initial change in volume) rather than WEYL. In any FRW-model, the tensor equation WEYL = 0 always holds. As we approach the initial singularity more and more closely we find that it is RICCI that becomes infinite, instead of WEYL, so it is RICCI that dominates near the initial singularity, rather than WEYL. This provides us with a singularity of low entropy (Penrose 1989, 337).

The RICCI tensor is used to denote the change in volume. We see that at the big bang singularity, the volume becomes infinite with zero amount of tidal distortion because there is no space present in which a distortion could be present. The space (volume) that the singularity occupies is infinite. Therefore, there could be no distortions. Interestingly, Penrose mentions that

because of Einstein's famous $E = mc^2$ formula, we could also interpret the RICCI tensor as the equivalent of the energy present. This means that in the big bang singularity there was an infinite amount of energy. In this case, that would mean that there was absolutely no energy present, or creation *ex nihilo*.

The Ontological Status of The Big Bang Singularity

Debate has continued regarding the ontological status of the big bang singularity. I shall argue that the ontological status of the big bang singularity is that of the Universal Wave Function for the possible phase paths of the entire universe. A possible phase path for a universe corresponds to a particular set of values for all the position coordinates and momentum coordinates for every single constituent particle that would be actualized within that universe were that particular phase path to collapse and become actualized. Therefore, the Universal Wave Function would contain at least all the sets of values for the possible phase paths for the particles that currently exist in the universe. This leaves open the question of whether or not the Universal Wave Function must contain all the sets of values for all the particles that may have been possible but not realized in our universe.

Recall that Erwin Schrodinger shared the Nobel Prize in physics in 1933 for his work in developing wave mechanics. Although Schrodinger wanted to interpret the displacement of the electron wave as being real in the sense that the "true" electron was spread out and the displacement measured how much of the electron was at each point in space, Niels Bohr provided what is now the accepted interpretation of the wave function. Bohr reasoned that because there was too much evidence for the particle-like properties of the electron to allow it to be spread out in a classical wave, the electron should be thought of as a localized object, with the displacement of Schrodinger's electron wave at a particular point relating mathematically to the probability that a measurement would show the electron to be localized at that point. Schrodinger's wave equation predicts the properties of a probability wave with which we can predict the probability where an electron will be at a certain point if we should make a measurement.

The Universal Wave Function cannot be determined through physical law because of the limitation imposed by the singularity. Yet, we must guard against allowing epistemological limitation to

dictate ontological status. The evidence for the existence of the Universal Wave Function is based upon our understanding of the special purpose which the quantum mechanical wave function has in quantum mechanics, which is to generate probabilities concerning the possible outcomes of measurements. We understand that for every observation (measurement) taken on the quantum level, there was a prior wave function which generated the probabilities associated with that quantum event and which collapsed, even if it was not or could not actually be calculated. Our inability to calculate does not change the ontological situation. Quantum wave functions exist prior to quantum observations.

Although we can distinguish the Universal Wave Function from a quantum wave function, when considering wave functions qua wave functions, both satisfy the conditions for being wave functions and therefore can be considered the same type species of cause and effect relationship. They differ only in origin and complexity. All wave functions require an observation to collapse. Therefore, the cause and effect relationship is of the same type. Further, the casual relationship between observation and the collapse of the quantum wave function may provide a means of interaction between mind and matter.

This is not an argument from analogy where the Universal Wave Function is held to be analogous to a quantum mechanical wave function that proceeds according to the Schrodinger equation. This is the stronger claim that the Universal Wave Function is of the same type as that of the quantum mechanical wave function differing only in origin and complexity.

Implications Of The Ontological Status Of The Big Bang Singularity For The Cosmological Argument

The collapse of a wave function is caused by a measurement or observation being made. As long as one describes reality according to the Schrodinger wave equation, the wave function proceeds deterministically. However, when a measurement is taken, the wave function collapses and this collapse is governed according to probabilistic law. According to the Copenhagen Interpretation of quantum mechanics, the collapse of the wave function represents an actualization according to the probabilities as prescribed by Schrodinger's equation. According to the Many Worlds Interpretation of quantum mechanics, the Schrodinger wave function generates an

endless proliferating number of different branches of reality. What is important to our discussion is that both of these interpretations agree on one basic point, it is an observation or measurement that causes the wave function to change.

"Observation" implies "observer" and "measurement" implies "measurer.". The wave function collapses during a measurement, and it is the interaction of consciousness with the physical system that is responsible for the collapse. What caused the Universal Wave Function to collapse and actualize our universe out of the infinite possible universes? Clearly, the cause cannot be contained within our universe or part of it because our universe did not exist. Nor can this cause be physical, spatial-temporal, or unconscious because matter, space and time do not exist prior to the big bang singularity and unconscious observers cannot make observations nor do unconscious measurers make measurements. The implication is clear, the cause of the collapse of the Universal Wave Function was a non-physical, a-temporal, conscious observer (God). The cause of the collapse of the Universal Wave Function is also the cause of the universe.

An argument for the necessary cause of the universe being an intelligent cause can be made from the low entropy singularity model proposed by Roger Penrose and referred to as the "orderly singularity school." In this model, the initial singularity had a very regular structure, with just enough irregularity to give rise to the stars and galaxies. This model is the only one which adequately explains the second law of thermodynamics. I have argued by appeal to the inference to the best explanation, that any form of order is best explained by intelligent design. When one contemplates the possible ways that the universe might have started off, the probability of ours being actualized is greater than one in $10^{10^{123}}$. Penrose has described this number as,

> Even if we were to write a "0" on each separate proton and on each separate neutron in the entire universe – and we could throw in all the other particles as well for good measure – we should fall short of writing down the figure needed (Penrose 1989, 344).

At what point does it become irrational to suppose that chance is still a viable alternate explanation?

The existence of a necessary observer is based upon the empirical evidence that for our universe or any other universe to exist, there must be a collapse of the Universal Wave Function that corresponds to the existing universe and any collapse necessitates an observer.

Because the cosmological argument is an *a posterior* argument for the existence of God, it is not within the scope of the cosmological argument to address the issue of God's necessary existence in the absence of the existence of any universe. To address the concept of God's necessary existence not based upon empirical evidence is within the realm of the *a priori* ontological argument.

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