

**THE DOCTRINE OF *CREATIO EX NIHILO*
IS A BIG FUSS OVER NOTHING:
PART 2: THE INDUCTIVE ARGUMENT**

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1.0 Introduction. In their contribution to *The New Mormon Challenge*, entitled “Craftsman or Creator: An Examination of the Mormon Doctrine of Creation & a Defense of *Creatio Ex Nihilo*,” Paul Copan and William Lane Craig (hereinafter “C&C”) argue that the notion of creation *ex nihilo* is required by modern cosmology.¹ In particular, they argue that the notion of creation *ex nihilo* is supported by the Standard Big Bang Theory and my laws of thermodynamics. They conclude that these scientific theories are the best explanation of the origin of the universe. They then argue that the Standard Big Bang theory of the universe and the laws of thermodynamics require that the “universe” was created from nothing. They insist that the scientific evidence shows that the Mormon belief in a “universe” that is eternal in some sense must be false. Indeed, they argue that such models of cosmology are inconsistent with the view that God is a material being who has always existed.

In response, I argue that C&C have failed to recognize important distinctions necessary to make sense of the Mormon view of God. I begin by arguing that currently tenable cosmological theories are not consistent with the doctrine of *creatio ex nihilo*. The standard model of the big bang theory suffers from a number of defects which are cured by inflationary theories of cosmology. I also argue that C&C have failed to make contact with Mormon views because they fail to competently address the implications of chaotic inflationary theories of the universe, including the possibility that God organized the local space-time universe by bringing order out of the eternally existing quantum vacuum. They also fail to competently address issues arising from the possibility that the local universe is not all that there is; rather, the Universe may be larger than our space-time continuum and may consist of a multi-verse as predicted by the chaotic inflationary theory. I also argue that given a certain view of God’s relation to natural law, it is consistent to view God as a material being who exists within a space-time manifold that transcends our local universe and who can enter into causal and interpersonal relations within our local space-time universe.

2.0 The Inductive Big Bang Argument Against Mormonism. The Standard Model of the big bang theory is based upon evidence demonstrating that the universe is expanding. First, when we view distant galaxies, the light from these galaxies is “red-shifted,” showing that they are receding from us at mutual recessional velocities. There is also a background radiation that is

¹ Francis Beckwith, Carl Mosser and Paul Owens, eds., *The New Mormon Challenge* (Grand Rapids: Zondervan, 2001), 113-77. (I worked from a pre-publication manuscript and therefore the page numbers may not correspond to the published book). The first section of the article dealing with scriptural arguments is essentially the same as Copan’s article, “Is *Creatio Ex Nihilo* a Post-Biblical Invention? An Examination of Gerhard May’s Proposal,” *Trinity Journal* 17 (1996), 77-93.

uniform in all directions that is probably a relic from about 300,000 years after the big bang event. Finally, the abundance of light elements, helium, lithium, and beryllium relative to hydrogen also supports the view that our universe began in a big bang event about 16 billion years ago. Thus, the standard model entails that all mass-energy, space-time and even the laws of nature themselves originate in the event of the big bang.

If we reverse the expansion of the universe in time, we arrive at a “time” when the gravity of the mass-energy in the known universe is so great that it simply collapses on itself to form a black hole or a space-time singularity. The gravitational force is so great that even light cannot escape it. It is of paramount importance to understand that when the entire local universe is contracted as predicted by the standard model, that space-time itself ceases to exist due to the infinite curvature of space-time itself in the unimaginable gravitational force of the singularity. Thus, in terms of the space-time that defines our local universe, there is no “before” the big bang because there is no time “before” such an event.

C&C argue that the big bang precludes taking the idea of a material deity who has always existed seriously because such a deity is subject to space-time and “does not transcend the laws of nature.”² It is plausible to see statements by early Mormons such as Orson Pratt and B.H. Roberts as entailing that God is an essentially material being who exists within the universe - though they do not define the scope of the “universe” they have in mind.³ The standard model of the big bang theory is inconsistent with such a view of God to the extent the “universe” means the “local space-time universe” because the local space-time universe has not always existed but came into being a finite time ago. Therefore, a material being who exists within space-time could not exist “before” there was space-time. Further, C&C argue that all matter is subject to natural laws and these laws themselves came into existence at the time of the big bang. Because the universe is expanding, if we reverse the expansion, then we arrive at a point of “infinite density.” This point is known as the space-time singularity at which the curvature of space-time, temperature, pressure and density all become “infinite” according the standard model. Now it is extremely important to note that C&C equate the absence of local space-time as equivalent to “absolute nothing” and so the Big Bang event represents for them the beginning of the space-time universe whereas logically prior to this event there was absolutely nothing. They quote Paul Davies to drive home this point:

If we extrapolate this prediction [of contraction] to its extreme, we reach a point when all distances in the universe have shrunk to zero. An initial cosmological singularity therefore forms a past temporal extremity to the universe. We cannot continue physical reasoning, or even the concept of spacetime, through such an extremity. For this reason most cosmologists think of the initial singularity as the beginning of the universe. On this view the big bang represents the creation event;

² *Id.* at 163.

³ See, Blake T. Ostler, *Exploring Mormon Thought: The Attributes of God* (SLC: Greg Kofford Books, 2001), ch. 3.

the creation not only of all the matter and energy in the universe, but also of spacetime itself.⁴

C&C argue that the standard model supports the doctrine of *creatio ex nihilo*. They also argue that acceptance of the standard model of the big bang means that “no physical, spatio-temporal entity can be the Creator of the Big Bang. If there is a Supreme God who is the Creator of the universe... He must be an immaterial, non-physical, non-spatio-temporal being with the power to create the world out of nothing.”⁵

C&C argue that the big bang theory “is irreconcilable with the traditional Mormon understanding of God as a temporal, material being immanent in the universe. Not only must God on the Mormon conception have a beginning, but must also come to an end, either being swallowed up and crushed into oblivion in the Big Crunch or else literally disintegrated into the cold, dark recesses of out space – a pitiable deity indeed!”⁶ For these reasons, the view that God is an essentially material being who has always existed *within the local, space-time universe without beginning* is untenable if the theory is accepted. In addition, the view that there is an eternal chain of deities who are essentially material beings who have always existed within the local, space-time universe is also untenable. Indeed, any view that sees the *local, space-time universe* as having always existed into an infinite past without a beginning is untenable. C&C boldly conclude their argument with a rhetorical flourish:

The Big Bang represents the origin of all matter and energy, even of physical space and time themselves, as we have seen. Therefore, it is irreconcilable with the theory to hold that matter/energy are eternal or that God is the physical product of a beginningless progression. The problem posed by the Big Bang theory supports creation *ex nihilo*, but because the Mormon concept of God as an extended, material object existing in the universe requires, in connection with Big Bang cosmogony, that God Himself (or His progenitors) came into being *ex nihilo*. Thus, Big Bang cosmogony is a veritable dagger at the throat of Mormon theology.⁷

C&C further argue that problem arises if we take God to be a material being who exists in some space-time manifold *outside the local universe* or who enters into relations within the our local, pocket universe from a perspective outside of it. C&C argue that it is physically impossible for any material reality to traverse the space-time singularity that marks the point of origin of our local universe. No material reality that we know of *that is subject to the laws of nature* could possibly survive “passing through” the space-time singularity to enter our local universe from

⁴ *Id.* at 161.

⁵ *NMC*, 176.

⁶ *Id.* 171.

⁷ *Id.* 170.

without it. As C&C state: “[G]iven the Mormon concept of God as a finite, physical, spatio-temporal being, the Creator must exist in some discrete space-time manifold, in which case it is unintelligible how he can be causally related to our world.”⁸

I will outline a view of God that I have argued is consistent with Mormon scriptures which holds that God is in fact a material being who can control even the incredible forces within a black hole or space-time singularity. Further, God creates by informing chaos with the initial conditions that give rise to the big bang and to the natural laws that govern our local space-time universe. God can enter into causal relations within the local universe from “outside” of it by entering into our space-time universe. Moreover, God can govern innumerable universes through his spiritual presence and influence within those universes as I shall explain.

In addition, before responding to the argument, I want to explain why it has very little persuasive power for me. Perhaps because I have studied the history of philosophy and science the philosophy of science I am generally unpersuaded by arguments based upon the most recent scientific theories. While I am quite unsure whether any of the scientific theories discussed by C&C or by me in this paper are fully accurate, I am certain that present theories will be radically modified and probably totally replaced by other theories in the not too distant future. Indeed, the standard theory of Big Bang cosmology adopted by C&C as a sword against Mormonism is a good case in point of a theory that has been superceded. Because the standard model preferred by C&C is beset by theoretical problems that are resolved by inflationary theories, almost all astrophysicists now accept some form of inflationary theory instead of the standard model. This shift has occurred largely in the last two decades, since Craig began to write about the Big Bang theory. Thus, the argument given by C&C is largely already outdated. Yet the greater lesson is that any religious commitment based on scientific evidence is tenuous and likely to be upset by new evidence. Because my commitment to Mormonism has greater prior epistemic probability for me than *any* scientific theory, it is more reasonable for me to question the acceptance of the scientific evidence as a basis of religious belief rather than reject my religious beliefs. I will show why C&C’s argument is open to devastating objections and counterexamples from accepted scientific evidence – but I don’t even hold out the hope that they will abandon their commitment to *creatio ex nihilo* because I offer scientific evidence to support my argument for an eternal multiverse. I suspect that their religious commitments are also more fundamental than their acceptance of any scientific theory.

3.0 The “Nothing” Before the Big Bang is Inconsistent with *Creatio Ex Nihilo*. C&C argue that the doctrine of creation out of nothing is required by modern cosmology. C&C argue that because space-time came into existence with the big bang that absolutely nothing existed “prior to” the big bang. That claim is simply not true. The doctrine of *creatio ex nihilo* is inconsistent with the inflationary theory of the universe because the quantum vacuum is not “nothing” in the sense required by that doctrine. The quantum field is a physical reality that has physical properties and is seething with energy and activity. Creation *ex nihilo* does not refer to creation “out of nothing” as if nothing were something out of which everything is derived. Rather, the notion of *creatio ex nihilo* is

⁸ *NMC*, 171.

the negation of any physical states of affairs whatsoever before a certain time, say a time of absolute creation at T_c . Thus, prior to T_c there are not any physical states of affairs of nature whatsoever if *creatio ex nihilo* is true.

The notion of nothing as the negation of all forms of existence arose within the context of Greek thought. A basic concept of creation "from nothing" was expressed by Parmenides who argued that "what is" could not have come into existence at some time because to do so it must either come from "what is not" or from "what is." "What is" could not have derived from "what is not" because such an idea treats "what is not" as if it were somehow something that existed:

What is without beginning, indestructible, entire, single, unshakable, endless; neither has it been no shall it be, since now it is; all alike, single, solid. For what birth could you seek for it? Whence and how could it have grown? I will not let you say or think that it was from what is not; for it cannot be said or thought that anything is not.

Parmenides thus considered a basic notion of creation out of nothing and rejected it on the principle that something cannot be conceived to derive from nothing. He further criticized the very concept of "what is not" as linguistic confusion. "What is not" should not be posited as the subject of a predicate such that a being could create "from" it. This position was adopted virtually unanimously by the Greeks. There was a sense, however, in which many Greeks (as well as Philo Judaeus and some early Christian writers) thought that the world was created literally from "nothing."

Plotinus taught that the world was created from *hyle*, usually translated simply as "matter." The notion of "matter" involved, however, was not the modern notion of matter as something solid, extended and enduring. Nor did it include the modern notion of that matter may include various states of energy. Rather, the Platonic *hyle* could not be thought to truly exist without form being imparted by the ideas. It was a state no-"thing"-ness which could be individuated into things. The underlying *hyle* was thought to be a substratum or ground on which positive attributes of matter had to be grafted. This notion of a "potential" matter without form was widely held to pre-exist the creation of the world. Moreover, this *hyle* was thought to be the source of evil. Plotinus explained:

There remains, only, if Evil exists at all, that it be situate in the realm of non-being, that it be in some mode, as it were, the non-being or to a certain degree communicate in non-being. By non-being, of course, we are not to understand something which simply does not exist, but something of a utterly different order from authentic being.

The notion of "nothing" at issue in the Christian idea of creation out of nothing does not involve the notion of creation "from relative non-being" accept by Middle Platonists, Philo Judaeus and Plotinus. It is important to note that God can be said without linguistic confusion to "create from" or derive what exists from the relative non-being or formless potential matter, for it is a physical state of affairs upon which God could act and from which He could elicit order out of

chaos. This particular idea of creation from relative non-being was explicitly rejected by the earliest Christian writers who adopted the technical phrase for creation from absolute nothing (in Greek *ex ouk on*) in conscious opposition to the phrase for relative non-being (*to me on*).

It is equally important to note that the early Christians who first adopted the idea of creation from nothing, Theophilus and Tatian, did not intend the idea of creation "from what is not" criticized by Parmenides. Though they used the phrases "from" or "out of", they did not intend that "nothing" described a prior state of affairs from which God derived all that exists. Christian writers, like the Greeks, uniformly rejected the notion that something could derive from nothing on the principle that "nothing comes from nothing" (*ex nihilo nihil fit.*) As St. Anselm carefully explained in Chapters 7 and 8 of his *Monologium*, it is sometimes thought to say that God created "from nothing" that either to make nothing something or to say that nothing is the "material" from which existence is derived. To say that God creates *ex nihilo*, however, does not mean that God derived existence "from" some material (*ex nihilo tanquam materia*) or pre-existing physical states of affairs; rather, it means either that at first there was not any physical state of affairs and then God created and then there was something, or that God created the world *non ex aliquo* "not out of something." The idea of "nothing" entailed in the idea of creation out of nothing is thus the absolute negation of any physical state of affairs chronologically or logically prior to God's creating. In other words, it entails the negation of any non-logical conditions on God's creating.

Thus, the idea of creation *ex nihilo* is not consistent with the view of creation from "nothing" as it was understood in Middle Platonic and neo-Platonic sources. However, the ancient view of "nothing" as a ground of existence that could receive form is remarkably similar in many respects to the idea of "nothing" that exists in the modern quantum mechanics. Quantum mechanics demonstrates that the notion of "absolute nothing" assumed by the creedal doctrine of *creatio ex nihilo* is physically impossible. There simply is no such thing as empty space, or even of absolute nothing outside of space-time. Even in the absence of space and space-time, there is a vacuum buzzing with the activity of "virtual particles" inherent in the very nature of the equations which describe the behavior of quantum realities.

3.0 The Big Bang Theory of Cosmology Does not Support *Creatio Ex Nihilo*. Much of the force of C&C's argument is diffused by making some essential distinctions. First, the local space-time universe must be distinguished from the visible universe and from the multi-verse, or the Universe that defines all that exists in any way. Second, the concept of the "nothing" that existed "prior to" the big bang must be clarified. The quantum vacuum that exists prior to the big bang and which transcends our space-time universe is a seething ocean of physical activity – the ultimate chaos. The quantum vacuum is not "nothing" in the sense required by the doctrine of creation out of nothing; it is however a chaos in a sense that is consistent with Mormon thought. Finally, the nature of God's power and God's relation to natural law in Mormon thought must be clarified. Once I have addressed these concepts, I will address the specific arguments made by C&C and show that they dissolve once these concepts are grasped.

3.1 The Local Universe and the Multiverse. C&C use the term "universe" to refer to all that exists in any way. Further, they assume that the "local universe" we inhabit is all that there is

and there is nothing else. However, recent developments in big bang cosmology argue that our local universe is not all that exists. As Rem Edwards explained:

Our spacetime system, the only one we can observe directly (at least in part), the one whose origins we can trace to a chaotic Big Bang, originated about 15 billion years ago. All events that compose our spacetime system are causally connected with other events within that system, which is in principle traceable back to the Big Bang....

Most Quantum Cosmologists, those who apply quantum theory to cosmological questions, hold that our universe is but one of infinitely many universes spawned, not by God, but by and from the near-nothingness of quantum-foamy empty space. According to this “many worlds” Big Fizz inflationary scenario, the relevant infinitely fertile “empty space” is not a part of, does not belong to, our cosmic epoch. The Big Fizz Cosmology postulates a transcendent quantum-fizzy Motherspacetime or Superspacetime within which infinitely many child-worlds or universes co-exist in infinitely extended space throughout infinite time. After child worlds are thus spawned, they may or may not then begin to oscillate.... According to cosmological theories widely accepted today, since infinite Superspacetime has always existed, it co-exists within infinite Supertime. When a spatiotemporally finite universe like ours expands, it pushes into pre-existing Superspacetime, not into absolute nothingness.⁹

Thus, the term “universe” is equivocal. C&C have used the term in a way that presupposes the creation out of nothing of our universe and that is all that there is. However, to make sense of inflationary theories of cosmology, we must distinguish between three meanings of the “universe”: (1) the visible universe; (2) our “local universe”; and (3) the “multi-verse” or the Universe that is all there is that exists in any sense. “Universe” usually means all that exists and thus it is a “uni”-verse, or the sole and only one description of all there is. However, the Universe as a whole must be distinguished from the region of the Universe that is visible to us. Because the speed of light is finite, in fact about 186,000 miles per second, it takes time for light signals to reach us. Thus, there are regions of our local universe from which we have not yet received light signals. The *visible* universe is a spherical region at which we are the center. It is the sphere defined by the distance that light has had time to travel to reach us since the pocket universe began at the time of the Big Bang. This sphere is finite in size and constitutes all that we can possibly see or detect. The boundary of the sphere constitutes a horizon beyond which we cannot see. The sphere of the visible universe is always increasing in size at the speed of light with the passage of time relative to us. It follows that astronomy can tell us about the structure of only the *visible* universe, and not all that exists. We cannot have evidence or testable statements of anything beyond the horizon. Such limits also mean that we can never make testable statements about the initial structure or the origin of the Universe as

⁹ Rem B. Edwards, “How Process Theology Can Affirm Creation *Ex Nihilo*,” *Process Studies* 29:1 (2000), 82-82.

all that exists in any way.

Our “local space-time universe” is the space-time region that came into existence at the moment of the big bang event. The local or pocket universe is larger than the visible universe because there are regions of the local or pocket universe we cannot see. We cannot see them because the light from these regions has not had enough time to reach earth since the time hypothesized for the Big Bang event. Thus, we cannot see all of the local pocket universe even with perfect telescopes. Nevertheless, beyond the universe that is visible to us there is a region or regions of space-time that formed at the same time as the big bang event giving rise to the space-time universe in which we exist.

Is there anything “beyond” our local space-time universe, any realities that are not included in the local universe? This question is the central issues that C&C must address, for if there are realities outside the local universe, then *creatio ex nihilo* cannot possibly be supported by referring to the big bang event because all that exists does not come into existence at the big bang, but only our local universe. Modern chaotic inflationary theories of cosmology predict that it is likely that our local universe is not the only pocket or bubble universe that exists. The preferred theory of the local universe since the early 1980s includes an episode of “inflation,” to which I will refer as the “inflationary theory of cosmology.” The inflationary theory of cosmology is simply the view that a brief period of accelerated expansion occurred very early after the big bang which gave rise to our local universe. It is now well-accepted that gravity need not be always attractive. Rather, there are collections of matter called *scalar fields* whose gravitational effect can be repulsive. Scalar fields resemble electric or magnetic fields except they have no polar direction. It is suggested that scalar fields became the largest contributor to the energy of the very early local universe and brought about a brief period of accelerated expansion of the local universe. The expansion slowed and began to decelerate only when the scalar fields decayed into regular matter. Remember, energy and matter are two aspects of the same reality, and the energy of the scalar fields converts to matter when certain symmetries of the field are broken.

3.2 What Existed Before the Big Bang? The inflationary theory is important to cosmologists because even a very short period of inflation in the early universe can resolve a number of problems that plague the standard theory of the big bang favored by C&C. First, the standard theory could not explain why the density of the universe was so close to the unstable critical value between perpetual expansion (an open universe) and recollapse due to the gravitational force of the existing local universe (a closed universe). The inflationary theory explains why the local universe is so close to the divide between a closed and an open universe. Second, the standard theory could not explain why the universe looks the same in all directions when it arises out of causally disconnected regions. This problem is especially acute for the very uniform cosmic microwave background radiation. However, the inflationary theory resolves this problem. Third, the standard theory cannot explain the non-uniformities which gravitationally collapsed to form galaxies which must have been present at the very origin of the universe. However, the inflationary theory easily explains the origin of the non-uniformities that collapsed to form galaxies. The inflationary theory has been widely accepted by cosmologists because its predictions were confirmed by the COBE satellite in 1994. The data taken over a four year period are in very good agreement with the

predictions of the inflationary theory.¹⁰ For these reasons, the inflationary theory of the universe is better supported than the standard theory of cosmology for which C&C argue.

More importantly, if the inflationary theory of the universe is true, then “prior to” the big bang that evolved into our pocket universe, there are two types of realities that may have existed forever without a beginning *outside of our local universe* – a beginningless series of other bubble universes and the quantum vacuum. First, if we reverse the expansion of our universe backward in time, we logically arrive at a universe that exists in a density smaller than the Planck density, which equals about 10 to the 94th grams per cubic centimeter. At this range, the formulas that describe quantum physics are dominant. Because quantum physics governs the universe smaller than the Planck density, the so called singularity is subject to Heisenberg’s uncertainty principle. Quantum theory teaches us that physical realities smaller than the Planck density have both particle-like and wave-like characteristics. One of the surprising features of this wave-particle duality is that it is in principle impossible to measure simultaneously both the position and momentum of such wave-particle dualities. This limit on our ability to measure both momentum and position with certainty of subatomic particles is known as the Heisenberg Uncertainty Principle. Rather than having a definite momentum and position, such wave-particle realities have only a certain probability of being in a certain place at a certain time. Thus, any inquiry into what brought about the big bang event must consider the impact of quantum physics which govern the universe at such densities.

The most important impact of quantum physics upon big bang cosmology is that the idea of “absolute nothing” is *physically* impossible. First, even absolutely empty space itself – if it were possible -- is viewed in modern physics as “something,” a field possessing its own physical properties having an actual mass-energy. The texture of empty space is described by the laws of quantum mechanics as fine-grained and foamy. Space can be bent, stretched, shrunk, warped, vibrated and knotted. However, any region of empty space-time is still the result of the big bang. Further, “prior to” the big bang, before space-time as we know it existed, there was nevertheless a quantum vacuum that existed in non-measured superspace-time. “Absolute nothing” is physically impossible because there is always the probability of wave-particles smaller than the Planck constant occurring even in the absence of any other physical reality. Instead, “nothing” is described in quantum theory as a quantum vacuum. This vacuum is not a negation of any physical states of affairs whatsoever as required by the doctrine of *creatio ex nihilo*. The quantum theory prohibits us from suggesting that there could be absolutely “nothing.” Quantum theory requires us to admit that even in the absence of space-time altogether, there is a quantum vacuum that is buzzing and alive with the energy manifested as “virtual particles.” This vacuum is the perfect description of chaos because it is the lowest energy state in which an entire system can reside.

Virtual particles are pairs of oppositely charged subatomic particles that continuously appear and disappear. Matter and antimatter particles are constantly being created in empty space; although usually they annihilate one another almost immediately – though not always. Each of these particles is individually unobservable in accordance with Heisenberg’s Uncertainty Principle. Such an

¹⁰ John D. Barrow, *Impossibility* (Oxford: University Press, 1998), 164-66.

unobserved process is known as a virtual process. However, scientists have actually coaxed these otherwise unobservable virtual particle-pairs into enduring existence by imposing an external force field in which case the virtual particles become detectable. The quantum vacuum may be viewed as a sea seething with an concatenation of “virtual particles” or pairs of sub-atomic particles that flash into existence and then annihilate one another – all within the probabilities allowed by the Heisenberg Uncertainty Principle. This view of the quantum vacuum is subject to direct experimental test.

If we inquire, “what existed before the big bang event?,” the answer is that a “quantum vacuum” exists in non-measurable “superspacetime” prior to the so-called big bang out of which our local universe probably originated. The quantum vacuum is the ultimate chaos. The “false vacuum” arises naturally in any theory that posits scalar fields. We now know that the false vacuum contains more than enough energy to explain the existence of the entire local universe. Alan Guth and other inflationary theorists propose that the true vacuum “decayed” into a false vacuum, and provided the energy for virtual particles to escape from “empty space” into enduring reality within the random fluctuations allowed by the Uncertainty Principle. Thereafter, they undergo a period of inflation into an entire local universe.⁹ Thereafter, the expansion of the local universe proceeds as suggested by the standard model.

Moreover, it is possible that the quantum vacuum, the ultimate chaos, existed forever in unmeasured superspacetime before the creation of our local universe. What I mean by “unmeasured” is that there is no time-metric whatsoever that applies to it; there are no events that recur at regular intervals that would allow us to establish a time metric in such a superspacetime. However, the chaotic inflationary theory predicts something even more astounding – that ours is not the only “pocket universe” or “space-time bubble” that exists. A “pocket universe” is a causally separate region of spacetime that begins with a quantum fluctuation that then expands just as our own local universe did after the big bang. Each pocket universe arises out of its own big bang event. Moreover, each separate pocket universe begins with different initial conditions that give rise to different constants of Nature. Thus, each pocket universe may have different Natural laws than our own local universe. If the chaotic inflationary theory is accepted, then it is probable that “universes” are self-reproducing.¹⁰ From this theory it follows that if the universe contains at least one inflationary domain of a sufficiently large size, then it begins unceasingly producing new inflationary domains. This process continues without end into the future. If so, then we must speak of the “multi-verse” rather than the “local universe” as comprising all reality. As John D. Barrow observed:

⁹ Alan H. Guth, (2000), [atro-ph/0002188](#); [astro-ph.0002156](#); and Alan H. Guth *The Inflationary Universe* (New York: Addison Wesley, 1998), 167-87, 245-52; Timothy Ferris, *Coming of Age in the Milky Way* (New York: William Morrow, 1988), 349-66.

¹⁰ See Andrei Linde, “The Self-Reproducing Inflationary Universe,” *Scientific American* (Nov. 1994); “The Inflationary Universe,” *Physics Today* 40 (1987), 61; and *Physics Review D* 59 (1999), [hep-ph/9807493](#); John D. Barrow, *Impossibility* (Oxford: Oxford University Press, 1998), 164-174; M.J. Reese, *Before the Beginning* (New York: Simon & Schuster, 1997).

Andre Linde has discovered that inflation has a tendency to be self-reproducing. Remarkably, it appears that the fluctuations that inflation produces have form that inevitably induces further inflation to occur from small subregions of the bubbles that are already inflating. Inflation appears to be a potentially unending, self-reproducing process: in short, it is an epidemic. Each bubble that it produces somewhere in space and time during this process can possess different values of many of its constants of Nature, defining the form of the physical structures that can arise within it. The Universe thus appears to be likely to be far, far more complicated in its historical development, as well as its spatial variation, than we had suspected.¹¹

If there were prior non-local universes that existed before our own local universe, then there is no reason why the process of one universe spawning from another prior universe could not be an eternal process that has no beginning. As Barrow stated: “Probably the whole self-reproducing network of inflating bubble universes need have no beginning, but particular bubbles may have beginnings when their histories are traced backwards. These beginnings would correspond to the quantum-mechanical fluctuations in the energy of the Universe from place to place, and would appear spontaneously, with some probability, from time to time.”¹² Thus, the inflationary theory of the local universe makes it probable that bubble or pocket universes have been created one after the other forever without beginning. We live within one of these bubbles or pockets within a larger reality, a more complex reality than previous generations dared to imagine. It is possible that our own local universe has been preceded by an infinity of prior bubble universes that have come and passed away. It is possible that our universe arises out of the physical conditions that obtained in a prior universe that had physical constants that were different and thus had different laws of Nature than our own local universe! It is also possible that the quantum vacuum is the most basic state of material existence and that it has always “quasi-existed” in a state of absolute chaos prior to being organized by God.

Far from supporting the notion of *creation ex nihilo*, the currently tenable theories of big bang cosmology are inconsistent with such a doctrine. I am open to the view that God created our universe by bringing order out of a quantum field that existed prior to the existence of our local universe. The quantum field is truly the perfect description of “absolute chaos.” The quantum field is seething with “virtual particles” that pass in and out of “measurable existence.” At a point about 16 billion years ago, God willed to bring order out of the chaos by informing it with conditions necessary to bring about the big bang. Thus, instead of contradicting the account given in Mormon scripture that God created by organizing a material chaos, the chaotic inflationary theory seems to describe conditions precisely consistent with the Mormon view. I hasten to add that I am also open to the possibility that our pocket-universe arose from a prior “universe” as proposed by Linde’s self-

¹¹ John D. Barrow, *Impossibility*, 171-72.

¹² *Id.* at 172.

reproducing universe theory. On either view, our physical universe was not created from nothing, but from prior material states.

I also want to mention that even though theories about what might have existed prior to the big bang are speculation squared; nevertheless, they are not scientifically groundless. As John Barrows observed, even though we can never have direct evidence of a multi-verse in superspacetime due to the constraints of the light-signal horizon, the chaotic inflationary theory which predicts an infinity of bubble universe other than our own is not a desperate attempt to salvage a theory as was the steady state hypothesis:

By contrast [to the steady state hypothesis], the extension of the inflationary universe to its chaotic and eternal forms was not proposed to rescue simpler versions from adverse observational facts. It emerged as the inevitable (and, to many minds, unwelcome) logical consequence of a theory that was not beset by observational problems.¹³

The chaotic inflationary theory is currently the best supported hypothesis of the origin of our local universe. Like any scientific theory, that assessment is subject to change as more evidence is gathered or discovered. The chaotic inflationary theory is preferred to the standard big bang theory defended by C&C because it resolves the problems of that theory and is consistent with the most recent evidence gathered by satellites. It predicts the existence of many bubble universes. We live inside one of these bubbles and we cannot see outside of it – indeed, we cannot even see all of the bubble in which we reside. We can never know just how “likely” it is that a bubble universe like ours can occur or that the initial constants giving rise to the Natural laws that govern our local universe occur in a bio-friendly manner. However, if Mormonism is correct, there are worlds without end that are inhabited – and these worlds need not be within our own bubble universe. Moreover, they are all created by God.

3.3 Objections to the Chaotic Inflationary and Vacuum Fluctuation Theories. Craig argues that vacuum fluctuation models of cosmogony are not viable because they imply that our local universe would already be filled with an infinite number of universes:

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. According to such models, it is impossible to specify precisely when and where a fluctuation will occur in the primordial vacuum which will 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 an infinite past time, we should by now be

¹³ John D. Barrows, *Impossibility*, 174.

observing an infinitely old universe, not a relatively young one.¹⁴

However, this objection is multiply flawed. First, work on vacuum fluctuation theories has not ceased since the early 1980s. If anything, work on the vacuum fluctuation models has increased at a rapid rate.¹⁵ Second, the notion that the quantum inflations occur over an infinite period of time *within the local universe* in the vacuum fluctuation theory is false. First, the vacuum fluctuation theory neither predicts nor implies that our local universe is eternal; rather, it is the multiverse within which our local universe is nested that is eternal. Thus, the argument that we should see an infinitely old universe is simply false. Given the vacuum fluctuation theory we should see only a finitely old local universe. However, given our spatio-temporal horizon, it is impossible to access information from the infinitely old multiverse within which our local universe is nested. Further, vacuum fluctuation theories in no way entail that our local universe should by now be overrun with universes created from other vacuum fluctuations. Rather, the fluctuations occur outside of the local universe because they constitute discontinuous spatio-temporal realities. If a vacuum fluctuation arises outside of our local universe in the multiverse, then it would not have any causal connection with our local universe. Thus, it is simply false that our local universe would be consumed by other universes given an infinite amount of time. Finally, there may well be vacuum fluctuations that occur within our local universe that are manifested by black holes. Craig's objection simply misunderstands the vacuum fluctuation model and what it predicts.

Craig also argues that the chaotic inflation models are not tenable:

[A] universe eternally inflating toward the future cannot be geodisically complete in the past, there must have existed at some point in the indefinite past an initial singularity.... Linde reluctantly concurs with the conclusion ... there must have been a Big Bang singularity at some point in the past.¹⁶

However, Craig has once again misunderstood the theory. The fact that the theory predicts an initial singularity to our local universe does not imply that there must have been in *initial* singularity to the multiverse. The point is that each bubble universe may indeed begin with a singularity, but that does not mean that the collection of bubble universes within the multiverse had a beginning. As Victor Stenger explained:

According to this [inflationary big bang] scenario, by means of a random quantum

¹⁴ William Lane Craig, "The Ultimate Question of Origins: God and the Beginning of the Universe," *Astrophysics and Space Science* (1999), 723-40.

¹⁵ See e.g., J.A. Peacock, *Cosmological Physics* (Cambridge: Cambridge University Press, 1999); J. Peeble, *Principles of Physical Cosmology* (Princeton: Princeton University Press, 1993); J. Lidsey et al., *Reviews of Modern Physics* 69 (1997); L. H. Ryder, *Quantum Field Theory* (Cambridge: Cambridge University Press, 1996).

¹⁶ Craig, "The Ultimate Questions," 5.

fluctuation the universe ‘tunneled’ from a pure vacuum (‘nothing’) to what is called a *false vacuum*, a region of space that contains no matter or radiation but is not quite ‘nothing.’ The space inside this bubble of a false vacuum was curved or warped.... The bubble then inflated exponentially and the universe grew by many orders of magnitude in a tiny fraction of a second....

Within the framework of established knowledge of physics and cosmology, our universe could be one of many in an infinite super universe or ‘multiverse’.... An infinity of random universes is suggested by the modern *inflationary model* of the universe. As we have seen, a quantum fluctuation can produce a tiny, empty region of curved space will exponentially expand, increasing its energy sufficiently to produce energy equivalent to all the mass of a universe in a tiny fraction of second. Andre Linde proposed that a background spacetime ‘foam’ empty of matter and radiation will experience local quantum fluctuations in curvature, forming many bubbles of false vacuum that individually inflate into a mini-universes with random characteristics. In this view, our universe is one of those expanding bubbles....¹⁷

Thus, there are two possibilities that suggest an eternal multiverse in current chaotic inflationary theories. First, the first bubble universe may in fact have originated out of an initial singularity within the vacuum. However, this vacuum is not “nothing” as required by the doctrine of *creatio ex nihilo*. Second, there is no reason why the series of universes cannot be infinite without a “first bubble universe” or “initial” singularity. It follows that the doctrine of *creatio ex nihilo* is not implied even if there were a first or initial singularity. Moreover, there is no reason why there must be a first or initial singularity given the chaotic inflationary theory. Further, the fact that the local universe begins with a singularity cannot be taken as an argument against the viability of the theory, for the presence of a singularity is assumed within the Standard Big Bang Theory defended by C&C. Therefore, they must give us some other reason why the Standard Model should be preferred to vacuum fluctuation or chaotic inflationary theories. But they have not given any other objections. As Stegner explained in a later article responding to Craig:

I have described a scenario for an infinite, eternal, and symmetric universe that had no beginning. The quantum fluctuation occurs at one particular spatial point in an infinite void. Obviously it could have happened elsewhere in this void as well. This multiple universe scenario is exactly what is suggested by the chaotic inflationary model of Andre Linde. While multiple universes are not required to deflate the kalam argument, they can be used to provide a scenario by which the so-called anthropic coincidences may have arisen naturally.¹⁸

¹⁷ Victor J. Stenger, “The Anthropic Coincidences: A Natural Explanation,” at http://spot.colorado.edu/~vstenger/Cosmo/anthro_skintel.html

¹⁸ Victor J. Stenger, “The Other Side of Time,” at http://www.infidels.org/library/modern/vic_stenger/otherside.html

3.0 Mormon Concept(s) of God and the Multiverse. The impression that God is merely another material object among others within a limited universe in Mormon belief, a notion expressly stated by C&C repeatedly, is simply inadequate to capture the majesty and reverence of the Mormon testimony of God. First, “God” is three individual persons who have joined in a wonderful unity of love to create a new level of existence in shared life in one another. God is, above all, a loving and interpersonal reality for Mormons. Further, God is not “finite” in the sense that C&C suggest. God is not merely limited to existence as just another material object within the confines of the local space-time universe. Rather, all ordered existence of any nature is dependent on God. He is the Lord of innumerable worlds. Mormon scripture states clearly that God is without beginning and without end, not a being who came into existence at some point in time as C&C assert. Mormon scriptures also uniformly assert that God is a being of unimaginable glory and creativity:

Behold, I am the Lord God Almighty, and Endless is my name; for I am without beginning of days or end of years; and is not this endless? And behold, thou art my son, wherefore look, and I will show thee the workmanship of mine hands; but not all, for my works are without end, and also my words, for they never cease. Wherefore, no man can behold all my works, except he behold all my glory; and no man can behold all my glory, and afterwards remain in the flesh on earth. (Moses :3-5)

The worlds created by God literally cannot be numbered. Worlds are created and pass away and others are brought into existence:

And worlds without number have I created; and I also created them for mine own purpose But only an account of this earth and the inhabitants thereof, give I unto you. For behold, there are many worlds that have passed away by the word of my power. And there are many that now stand and innumerable are they unto man; but all things are numbered unto me, for they are mine and I know them. (Moses 1:32-35)

Thus, for Mormons God is an eternal being in the sense that he has no beginning or end, and there is no beginning or end to his works and creations. It is true that both the Father and the Son at one time experienced a mortal sojourn like we experience in this life; but it does not follow that there is not an eternal God. In particular, just as Christ was the God Jehovah prior to his mortal sojourn, so the Father was also God from all eternity prior to the temporal period of his mortal sojourn.¹⁹ The fact that the divine persons have bodies does not entail that they are limited to a particular place in virtue of their spiritual presence or ability to exercise their will at all places at all times immediately.

Yet if God the Son has (as opposed to *is*) a glorified, resurrected body, as almost all

¹⁹ See, my *Exploring Mormon Thought*, ch. 3.

Christians affirm, then how could this glorified body avoid the effects of gravity and other cosmic forces that surely will require it to disintegrate over time like all other merely physical objects in the material universe. The answer for those who accept the creeds give is that God is not subject to natural laws; rather, he created them. If the glorified body of Christ is not subject to the forces of Nature, including gravity, entropy, electromagnetism and so forth, then no force of Nature can affect his body if he does not want it to. It's that simple.

How can a God who possesses a material, glorified body move from one bubble universe to another, how he could survive the crushing forces of gravity in a black hole singularity? C&C are correct to criticize those Mormon scientists who speculate that perhaps God is merely another being within the local universe who did not organize the mass/energy of the universe into an ordered cosmos; but rather came to exist after having not previously existed. David Bailey's solution to the supposed problem is to use the word "eternal" in a more limited sense, to mean something on the order of billions of years, is not consistent with Mormon scripture. On Bailey's view, God did not organize the mass/energy of the vacuum to create our local universe – and this view is also unacceptable given the statements in Mormon scripture that I have just cited.

However, the arguments given by C&C against the chaotic inflationary theory and the vacuum fluctuation are miserably inadequate. They respond to Mormons who have suggested that these models are congenial to Mormon thought in this way:

... Mormon thinkers have sought to escape these difficulties [of the big bang cosmology] by rejecting the Standard Model and availing themselves of alternative cosmogonic theories. Such attempts have about them something of an air of grasping at straws, however, since the alternative theories are never examined in detail nor is any attempt made to show that these models they offer are better explanations of the data than the Standard Model. For example, Bart Kovalis appeals to Lindes's Chaotic Inflationary Model to justify Mormon belief in multiple "worlds," but fails to show how such a model can preserve God's eternal existence given its past geodesic incompleteness. Harrison appears to endorse Vacuum Fluctuation Models ... but he is silent when it comes to difficulties such models face with respect to the infinitude of the past, not to speak of why we ought to adopt them rather than the Standard Model.²⁰

However, Mormons have not needed to show that these models are better than the standard model for the simple reason that they are not really in competition. As I explained above, the standard model doesn't address what might have existed before the singularity. Moreover, a fairly broad consensus has emerged among astrophysicists that the inflationary models are preferred to a simple standard model because of the failure of the latter to explain the flatness, horizon and density fluctuation problems that plague the standard model. These problems are resolved by the chaotic inflationary model. For that reason, it is the preferred theory of cosmology. Further, after the period

²⁰ NMC, 174.

of inflation predicted by such inflationary models, the expansion of the local universe proceeds just as the standard model suggests. Thus, these inflationary models do not replace the standard model; they merely supplement it to correct for its deficiencies.

C&C argue that the “past geodesic incompleteness” of the chaotic inflationary model remains a problem for Mormons. They do not explain what they mean by a “geodesic incompleteness” in their article in *NMC*, but they refer to it again in another article, “The Ultimate Question of Origins: God and the Beginning of the Universe.”²¹ What they mean is simply that “there must have existed at some point in the indefinite past an initial singularity.”²² What they fail to explain is why such a view is problematic, for there is also an initial singularity in the standard model which they support. So if “geodesic incompleteness” is a problem for a theory, then chaotic inflationary theories are at least on par with the standard model. C&C appear to imply that all reality must initiate from a single singularity. However, the fact that there must be an “initial singularity” in chaotic inflationary theories does not mean that all bubble or pocket universes began in the same singularity that gave rise to our local universe; rather, there have been innumerable singularities that arise in an infinite number of universes, and the set of pocket universes is without beginning. Thus, the chaotic inflationary theory does not entail that all reality commences in a singularity and thus from absolutely nothing, but only that space-time pockets or bubbles form that way. More importantly, it is the very presence of the singularity in the chaotic inflationary theories that demands consideration of quantum mechanics applied to cosmology – but that point is simply lost on C&C. Thus, the “past geodesic incompleteness” is a greater problem for the standard model than for inflationary models. As Andre Linde explained:

From this theory it follows that if the universe contains at least one inflationary domain of a sufficiently large size, it begins unceasingly producing new inflationary domains. Inflation in each particular point may end quickly, but many other places will continue to expand. The total of all these domains will grow without end. In essence, on inflationary universe sprouts other inflationary bubbles, which in turn produce other inflationary bubbles.

This process, which I have called eternal inflation, keeps going as a chain reaction, producing a fractallike pattern of universes. In this scenario the universe as a whole is immortal. Each particular part of the universe may stem from a singularity somewhere in the past, and it may end in a singularity somewhere in the future. There is, however, no end for the evolution of the entire universe.

The situation with the very beginning is less certain. There is a chance that all parts of the universe were created simultaneously in an initial big bang singularity. The necessity of this assumption, however, is no longer obvious.

²¹ *Astrophysics and Space Science* 269-70 (1999): 723-40.

²² *Id.* at 728.

Furthermore, the total number of inflationary bubbles in our ‘cosmic tree’ grows exponentially in time. Therefore, most bubbles (including our own part of the universe) grow indefinitely far away from the trunk of this tree. Although this scenario makes the existence of the big bang almost irrelevant, for all practical purposes, one can consider the moment of formation of each inflationary bubble as a new ‘big bang.’ From this perspective, inflation is not a part of the big bang theory, as we thought 15 years ago. On the contrary, the big bang is a part of inflationary theory.²³

But if God is a material being subject to natural laws, God cannot be older than the local universe because he could not exist past the singularity. As I have explained, if Mormons were somehow stuck with the view that God is locked within the local universe, that might be a problem; but they aren’t. God is not subject to natural laws in any sense that creates this problem. Now it is true that Mormons speak of the universe as an eternal reality; but to my knowledge no Mormon who holds that the universe is eternal has intended to limit the universe to our local universe. Rather, it seems to me that Mormons in prior generations who spoke of an eternal and uncreated universe were speaking of the universe in the sense that it is all that exists in any way, i.e., the superverse, or the multiverse of modern cosmology rather than the merely local universe.

But how can a God who consists of persons having glorified, resurrected bodies or bodies of spirit matter survive the singularity? Now I want to point out that C&C cannot assert that nothing can pass through a singularity because given the natural law of gravity it would be crushed, for relativity theory predicts that all laws of Nature break down at that point. We just don’t know what happens or could happen within a black hole or singularity. We cannot predict or surmise what the properties of gravity are under such conditions. However, I suggest that once we get clear about the kind of power God can exercise in the Mormon view that the problem disappears. Through his Almighty power God can simply control the natural laws that may govern such a reality. I have defined God’s power within Mormon thought as follows:

A is maximally powerful at a time t if A is able unilaterally to bring any state of affairs SA which: (i) does not logically entail that “A does not bring about SA at t;” (ii) is compossible with all events which preceded t in time in the actual world; and (iii) A’s essential properties are consistent with A’s bringing about the maximal range of states of affairs possible for any being given (ii).²⁴

Once this idea of God’s maximal power is adopted, it becomes clear why and how God can govern any events that occur in a singularity though he has a glorified body. For example, the notion that God would be crushed by the gravity within a black hole is impossible because any states

²³ Andre Linde, “The Self-Reproducing Inflationary Universe.”

²⁴ *Exploring Mormon Thought*, ch 4.

of affairs that occur within the black hole are subject to God's power. God has power to stop such effects from occurring. Thus, God can literally control the effects of gravity in a black hole and even move from one bubble universe to another at will because such acts are states of affairs that: (i) do not logically entail that they are not brought about by God; (ii) such acts are consistent with all states of affairs that precede or are in causal continuity with God's acts; and (iii) God's essential properties are such that he can bring about the maximal range of states of affairs consistent with what has occurred prior to any such acts.

Yet if God is subject to natural laws, then how could he control them? It is a mistake to assume that a Mormon must adopt the view that God is subject to the Natural laws that obtain in our local universe. Elsewhere I have explained at length my view of God's relation to natural law.²⁵ Succinctly, on the Mormon view matter consists of realities that manifest "intelligence" in the sense that they exhibit law-like behavior. Mormons refer to these basic realities as "intelligences." The individual "intelligences" (or natural substances or events) that comprise the basic constituents of matter have invariable natural tendencies. For example, molecules of water have a natural tendency to bond in such a way that when it is 32 degrees F, it is a solid. Because these natural tendencies are invariable within a range of behavior, we can formulate laws that describe how they act in given circumstances. Moreover, not only can we describe how these substances act, we can also discover the properties of these substances that explain why they act as they do in the given circumstances. However, these "intelligences" or natural substances cannot act or be acted upon unless God "concur" by informing these realities with his light and intelligence. Thus, the fact that the "intelligences" (or natural substances or events) have the causal properties they do is a function of the essential properties of these realities, whereas the fact that these basic realities can manifest a power to act or be acted upon is dependent upon God's concurring power. It is imperative to see that on this view of natural law, the eternal natures of the intelligences (substances or events) and God's concurring power are more basic than the natural laws, for the natural laws arise from God's concurring power and the essential natural tendencies of these intelligences rather than vice versa.

C&C assume that if the divine persons of the Father and the Son have glorified resurrected bodies, as Mormons believe, then God must be subject to natural laws obtaining in the local universe because it is only by the existence of natural laws that such bodies could exist. I have already explained why that assumption is false in my response to Parrish. Moreover, they assume that all matter came into existence with the big bang creating our local universe. But why is a Mormon bound to believe that? Given the predictions of the chaotic inflationary theory, there are innumerable bubble universes beside our own that may have mass/energy organized into material forms. They each have laws of nature that differ from our own local universe. Why couldn't God exist within one of these and then create a new universe which he chooses to inhabit – just as Christ chose our particular orb on which to exist among an innumerable host of worlds? Why couldn't God exist in the space-time manifold of the superverse and choose to enter our particular bubble universe at will? We have no idea what laws of Nature, if any, may govern the space-time manifold or

²⁵ Blake Ostler, *Exploring Mormon Thought: The Attributes of God* (SLC: Greg Kofford Books, 2001), ch. 4.

superverse. It just may be that God exists in a reality so different from our own that we cannot begin to fathom it with our minds. Given that God exists in the space-time manifold prior to the big bang, it is open to Mormons to adopt the view that there are eternally self-organizing, physical systems within the space-time manifold that are not subject to the natural laws that obtain in our local universe. God organizes universes by choosing initial constants and bringing about the conditions, perhaps a quantum fluctuation or decay of the vacuum to a false vacuum, to bring about new universes. God can choose to exist within any bubble universe. Moreover, he can bring about any conditions within the local universes consistent with the definition of maximal power above.