

# THEOLOGICAL MISINTERPRETATIONS OF CURRENT PHYSICAL COSMOLOGY\*

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**Abstract:** In earlier writings, I argued that *neither* of the two major physical cosmologies of the twentieth century *support* divine creation, so that atheism has nothing to fear from the explanations required by these cosmologies. Yet theists ranging from Augustine, Aquinas, Descartes, and Leibniz to Richard Swinburne and Philip Quinn have maintained that, at *every* instant anew, the existence of the world *requires* divine creation *ex nihilo* as its cause. Indeed, according to some such theists, for any given moment *t*, God's volition that the-world-should-exist-at-*t* supposedly *brings about* its actual existence at *t*.

In an effort to establish the current viability of this doctrine of perpetual divine conservation, Philip Quinn<sup>1</sup> argued that it is entirely compatible with *physical* energy-conservation in the Big Bang cosmology, as well as with the physics of the steady-state theories.

But I now contend that instead, there is a logical *incompatibility* on both counts. Besides, the stated tenet of divine conservation has an additional defect: It speciously purchases plausibility by trading on the multiply disanalogous volitional explanations of human actions.

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## 1. INTRODUCTION

It has been claimed that the Big Bang Cosmogony—and also the now largely unpopular steady-state cosmology—pose a *scientifically insoluble* problem of matter-energy creation and fail to explain why the world does not lapse into nonbeing at any given moment. We are told that this alleged conundrum is solved by postulating divine intervention as an external cause. If there is a first moment at which the universe begins to exist, we learn, then this creative supernatural intervention occurs at that moment and ever after. In any case, divine creative intervention is allegedly required *throughout all existing time*, no matter whether the universe has a temporal beginning or not.

In the case of the Big Bang theory, the champions of this thesis have ranged from Pope Pius XII in 1951, as he told the Pontifical Academy of Sciences, to the British astronomer Bernard Lovell, the American astronomer Robert Jastrow, and to the theistic philosophers Richard Swinburne at Oxford and Philip Quinn at Notre Dame University in the United States. Lovell had made the same claim à propos of the steady-state cosmology.

In my earlier papers of 1989 through 1991,<sup>2,3,4,5</sup> I disputed this theological twist. And I maintained more generally that *atheism has nothing to fear at all* from these two major twentieth-century physical cosmologies, because neither of them support the idea of God-the-creator.<sup>6</sup> But, I shall now argue further that, conversely, perpetual divine creationism actually has a great deal to fear from both of these cosmologies.

The familiar meaning of the word “creation” lends itself to the insinuation of a creative role of a supernatural agency *without argument*. As Webster’s Dictionary tells us, in its primary use, the term “creation” means: “Act of causing to exist, or fact of being brought into existence by divine power or its equivalent; especially the act of bringing the universe or this world into existence out of nothing.” Evidently, the transitive verb “to create” calls for a *subject* as well as an object. And in a *cosmological* context, the verb is laden with the notion of a divine *agency* or cause *external* to the entire world.

In a 1989 paper, which was reprinted in John Leslie’s 1990 volume *Physical Cosmology and Philosophy*,<sup>7,8</sup> I argued that the question of whether the universe had a temporal origin had been *fallaciously transmuted* into the *pseudo-problem* of the creation of the world with its matter-energy by a cause *external* to the universe.

In a 1991 paper in *Erkenntnis*,<sup>9</sup> I extended my arguments so as to include a critique of the thesis of the English physicist C. J. Isham. According to Isham, the Hartle and Hawking version of quantum cosmology lends itself to supporting Augustinian creation *ex nihilo*. Writing in a 1988 Vatican Observatory volume, Isham<sup>10</sup> extolled as “profound” Augustine’s doctrine that God created *both time itself and matter*. Yet, as I shall explain at the end of Section 5, I contend that Augustine’s view is fundamentally unsound.

My 1989 paper<sup>11</sup> provoked three responses, only one of which will concern me here, because it pertains to the most influential of the creationist scenarios: *Perpetual* divine creation.

The theist Philip L. Quinn of Notre Dame University has recently offered a cosmological defense of divine creation and conservation,<sup>12</sup> which I shall challenge here.

In the 1989 paper,<sup>13</sup> I had not confined myself to the minimalist doctrine that God created the world all at once. Instead, I had also taken explicit issue with Descartes's thesis of *perpetual divine conservation* of matter vis-à-vis Lavoisier's hypothesis of *natural* spontaneous matter-conservation through time. The Cartesian doctrine asserts that the preservation of matter in existence requires divine *repetition* of an act of creation at every moment. That thesis of *creatio continuans* was espoused by a historically long succession of theists.<sup>14,15</sup> I shall argue, however, that it fails altogether for an array of reasons.

The upshot of this article will strengthen considerably, I trust, my earlier objections to theological creationism. As already noted, previously I had argued mainly that atheism has nothing to fear from the physical cosmologies of the past half century, because they provide no evidential support for divine creation. Philip Quinn's challenge, among others, now prompts me to offer the following *stronger* indictment of creationist natural theology: The Big Bang model of general relativity theory as well as the steady-state theory are *each logically incompatible* with the theological doctrine that divine *creatio continuans* is *required* in both of their worlds. Moreover, that doctrine is vitiated by major epistemological and conceptual difficulties, as I shall try to show.

The well-known American Roman Catholic Jesuit theologian Michael Buckley at Notre Dame University,<sup>16</sup> in a critique of Paul Davies's "wishy-washy" theology, comes fairly close to conceding unintentionally my impending thesis that divine volitional creation offers a *pseudoe*xplanation, when Buckley makes a major concession concerning the hypothesized process of divine creation. As he admits: "We really do not know how God 'pulls it off.' Catholicism has found no great scandal in this admitted ignorance." But if theology is thus admittedly ignorant, then the theological hypothesis of creation *ex nihilo* adds no articulated *causal* understanding of the existence of matter-energy to *any* physical model of cosmogony! We have no evidence at all for effective volitional actions that are *causally unmediated* by a nervous system and yet conform to the practical syllogism. As we know, in that syllogism an action is explained by a desire-cum-belief set. And it would, of course, be entirely illicit for the theist to trade tacitly on the picture of *transformative* causation to defend creation *ex nihilo*. Yet Pope Pius XII<sup>17</sup> and many, many others have told us that science is explanatorily defective in a basic way without the hypothesis of divine creation *ex nihilo*.

In rejecting creationist theological appropriations of the steady-state and Big Bang cosmologies alike, I need not make any claims concerning their respective technical scientific merits, which are currently oscillating somewhat in the case of the Big Bang model, although the major features of the model continue to command much loyalty from cosmologists. For example, until 1990, when NASA's satellite COBE found wrinkles in the previously uniform density of the cosmic microwave radiation, the Big Bang model conspicuously lacked an explanation of the genesis of the galaxies! But when the Berkeley physicist George

Smoot announced the detection of the density fluctuations in April 1991 to the American Physical Society, he electrified the newspapers and some of the faithful by declaring: "If you are religious, this is like looking at God."

Though probably unintended, the journalistic moral seems to be that you have a better chance to behold the Almighty with a differential microwave radiometer than by praying! Yet the evidential fortunes of the *Big Bang theory* are not entirely secure, although it has been almost universally victorious among cosmologists so far over the rival steady-state theories. Now it confronts the embarrassing discrepancy between the age of the oldest stars and the newly calculated lesser age of the universe since the Big Bang. Yet it would seem most recently that the cosmic expansion will continue forever instead of being followed by a cosmic collapse and annihilating crunch. Thus, our own galaxy will be ever more "alone" in the cosmos, a prospect that some people may find depressing but which I myself view with complete equanimity.

The steady-state cosmology now has few adherents among physical scientists, with such notable exceptions as Hoyle and Narlikar and perhaps others. Previously, I criticized the specific theistic reading that the English radio astronomer Sir Bernard Lovell gave of the steady-state world. It is philosophically instructive, however, I believe, that, despite the serious empirical difficulties of the steady-state theory, I examine further critically its theological creationist interpretation, as articulated in 1993 by Quinn. And it will be expeditious to discuss it before I deal with the Big Bang theory.

## 2. THE STEADY-STATE COSMOLOGY

The steady-state theories were pioneered in the late 1940s by Fred Hoyle and by Hermann Bondi and Thomas Gold. Very recently, Hoyle<sup>18</sup> published a modification of his 1948 theory in the journal *Astrophysics and Space Science*. But for my philosophical purposes here, which pertain to attempted *theological appropriations* of physical cosmology, I need to focus on the simplest of the 1948 versions. That original form of the theory features a *violation* of matter-energy conservation by the formation of new matter without any transformative causation, i.e., "out of nothing," whereas the modification of the theory in the 1980s and since no longer features such a violation. At the hands of such astronomers as Lovell,<sup>19,20</sup> divine intervention was claimed to be required by the *nonconservative* formation of the new matter that had been deduced in the original 1948 theory. (But in the modified recent version, the positive energy of the new matter is balanced by the negative energy of the so-called C-field.)

The steady-state theory postulated originally *as a matter of natural law* that while the galaxies are receding from each other everywhere in the universe, the matter-*density* nonetheless ubiquitously *remains constant* through time. This constancy is enunciated by the so-called Perfect Cosmological Principle. Hence the name "steady-state" for this cosmic scenario of eternal constancy of density. But, if there is such constancy of density alongside the galactic recession, then completely *new* matter must pop into existence out of nowhere in violation of

matter-conservation, such that it fills, at the requisite rate, the spaces vacated by the galactic recession. Yet the ensuing rate at which the presumed new matter would make its cosmic debut is so small as to presumably elude detection in the laboratory, at least foreseeably.

Lovell<sup>21</sup> asked, in effect: What is the *external cause* of the coming into existence of the new hydrogen atoms in the Bondi and Gold universe, which come into being in violation of matter-energy conservation? Thereupon he complains that the “steady-state theory has no solution to the problem of creation of [new] matter.” Note that Lovell uses the theologically tinged causal term “creation,” instead of the neutral descriptive term “accretion.”

Now observe that Lovell’s demand for an *external cause* of the new matter is unfortunately loaded with tacitly taking the law of energy-conservation for granted, as is clear from his complaint<sup>22</sup> that the steady-state theory makes no provision for “the *energy input* which gave rise to the created [hydrogen] atom” (my italics). But the steady-state theory explicitly *denies* that energy-conservation law. Thus, Lovell’s conservationist assumption of the need for other energy as the source of the matter “input” *contradicts* the steady-state theory! After all, the steady-state theory had deduced an *altogether natural* violation of energy-conservation from its postulate of density-constancy in an expanding universe. Hence Lovell simply begged the question when he asked for the energy-source or transformative cause of the new hydrogen.

It is granted, of course, that the postulate of density-constancy may be questioned as long as there is insufficient evidence for it. Thus, Lovell and everyone else is entitled to ask for the *observational credentials* of the steady-state theory. But, as we saw, *that was not* his question, since he did not challenge that theory epistemologically but only ontologically. I am happy to report that at a 1986 meeting in Locarno, Lovell conceded my point, and he said so in the published proceedings.<sup>23</sup>

In my 1989 article,<sup>24</sup> I had drawn the following conclusion: “. . . in the steady-state theory, . . . *non-conservative matter-accretion* [or popping into existence *ex nihilo*] is claimed to transpire *without any kind of external [or supernatural] cause*, because it is held to be cosmically the spontaneous, natural, unperturbed behavior of the physical world!”<sup>25,26</sup> Quinn objects<sup>27</sup>: “But neither does the steady-state theory *rule out* a [required] divine cause for the [eternal] coming to be of its new hydrogen” (my italics). Yet, I shall now argue here against Quinn that his claim of such a required divine creative role is indeed *ruled out* as definitely *inconsistent* with the steady-state cosmology.

As Quinn emphasizes, several contemporary theists besides himself echo the doctrine of *creatio continuans* championed by Aquinas, Descartes, Berkeley, Leibniz, Locke, Jonathan Edwards et al. Thus, Quinn maintains explicitly that perpetual divine creative activity is crucial for such mere physical energy or matter-conservation as holds in a Big Bang universe, no less than for the hypothesized coming into existence of new matter in the steady-state world. And, as Quinn tells us, Richard Swinburne attributes to theists the view that “God keeps the universe in being, whether he has been doing so for ever or only for a finite time.”<sup>28</sup> Indeed, the British physicist-theologian John Polkinghorne sees just the

doctrine of *perpetual* rather than initial creation as the essence of the Christian scenario, although his views should not be equated with Quinn's in other respects. In short, as Descartes claimed in the Third Meditation, creation and conservation require the same divine power and action. And, as Berkeley explained, divine conservation is simply continued and repeated creation.

Thus, in the traditional theistic account, it is held<sup>29</sup> that "all contingent things are continuously dependent upon God for their existence." I shall challenge that claim as *ill-conceived* from the outset. On Quinn's view,<sup>30</sup> "God not only creates all contingent things but also conserves them in existence, moment by moment, in a way that is tantamount to continuously creating or recreating them" (my italics).

According to Quinn,<sup>31</sup> the relevant "relation of metaphysical dependence or causation" is a primitive relation rendered by the following locution: "God willing that  $x$ -exists-at- $t$  brings about  $x$ -existing-at- $t$ ." I disregard here my multiple malaise with this sort of notion of divine *volitional* causation, but just recall my brief objections to it à propos of the Jesuit Buckley's agnostic disclaimer as to the mediating causal process. Yet, as every paralytic and paraplegic knows all too well, a mediating causal process involving the adequate functioning of the nervous system needs to be specified when we explain *in the context of existing evidence*, say, a particular outcome as the product of human volitional action. If, for example, Jones wants an electric light bulb to be turned on, it won't do to explain the lit state of the bulb by *merely* saying in the manner of the Book of Genesis: "Jones willed: Let there be light"! We have no evidence at all for this kind of unmediated causation, which is reminiscent of *word magic*.

Quinn emphasizes that his relation of divine bringing about volitionally "must have the following marks in order to serve its theological purposes"<sup>32</sup>: (a) ". . . what does the bringing about [i.e., divine volition] is the *total* cause of what is brought about; nothing else is required by way of causal contribution in order for the effect to obtain," because the divine will is causally *sufficient* and (b) ". . . the bringing about is the *sole* cause of what is brought about; causal *overdetermination* is ruled out"<sup>33</sup> (my italics), since it allows more than one sufficient cause.

Quinn is concerned to rule out sufficient causes other than divine volition in order to claim that God's creative and conservative actions are *necessary* for the existence of the physical entities. In short, as Quinn has it, God is the *total* and *only* cause of the existence of things. And the crucial underlying assumption is that this very existence *must have a cause at all*, a posit that I shall discredit in Section 4 below.

Now note that the cardinal postulate of the theories of Hoyle and of Bondi and Gold is the so-called Perfect Cosmological Principle. Rightly or wrongly, it asserts, as a matter of natural law, that there is conservation of matter-*density*. But it is of *decisive* importance that, in conjunction with that law of density-conservation, the so-called expansion of the universe or mutual galactic recession is *causally sufficient* for the *completely natural* coming into existence *ex nihilo* (out of nowhere) of new matter! Equally crucial is the fact that, *without* this cosmic expansion, density-conservation *alone* would *not* issue in matter-accretion.

Thus, Leibniz could get his coveted *sufficient* reason for the existence of the new matter *from the physics itself without God*, if he could have known the content of the 1948 steady-state theory of Bondi and Gold. Indeed, this natural *physical* causal sufficiency is decisive, because it obviously rules out the theistic claim, made by Quinn and Lovell, that external creative divine intervention in the universe is *required* for such formation of new matter.

It has been wrongly claimed that the Bondi and Gold explanation of the rate of the formation of new matter is suspect as being *teleological*, since it is *seemingly* dictated by the *outcome*-state of *density*-conservation during the expansion. But this objection is without merit. Density-conservation is no more teleological than energy-conservation or charge-conservation. The outcome states result from the prior state in accord with the pertinent laws. One might object equally fallaciously, that neutrino-production during radioactive decay, as postulated by Pauli and Fermi, is teleological, because it is governed by the outcome-state of *energy*-conservation, given that the fragments of the radioactive decay have a smaller total mass-energy than their undecayed ancestor. Relatedly, the claim that teleology dictates the formation of new matter in the steady-state world cannot sustain the theistic creationist interpretation of the nonconservative formation of new matter in the steady-state theory.

Thus, contrary to Quinn, the steady-state cosmology is indeed *logically incompatible* with his and Lovell's claim that divine creative intervention is causally necessary for the *nonconservative* popping into existence of new matter in the steady-state universe.

But that is not all. In Quinn's theistic scenario, we recall, the divine creative will is both the *total* and the *sole* cause of the matter-accretion. This alleged totality and exclusivity of *God's* causal role in the existence of the new matter entails the *bizarre conclusion* that the physics of the steady-state universe makes no causal contribution at all to the popping into existence of the new matter.

Let me emphatically reject as completely futile and evasive the reply that, at any moment in the steady-state world, it is within God's power to *suspend* its density-conservation principle, much as a government can revoke the normativity of its statutory laws. Note at once the dubious analogy between revoking a statutory, *normative* law, which does not describe actual behavior, and "suspending" a *descriptive* law. But suppose that someone would try to disarm the physical causal sufficiency for the genesis of new matter which I have demonstrated, declaring: God does his creative job *indirectly* by keeping the law of density-conservation in place during the cosmic expansion. In this way, it might be thought, the doctrine of required indirect divine creation might be made compatible with the physics after all. But such an attempt to neutralize my critique simply fails.

In the first place, Quinn asserted the logical compatibility of the required theistic creationist scenario with the *assumed truth* of the steady-state cosmology. But that cosmology categorically features *as given* the eternal temporal invariance of density-conservation in an expanding universe. Secondly, but no less importantly, Quinn, citing Leibniz and a 1988 work by David Braine,<sup>34</sup> told us explicitly that divine creative causation is direct in the form of *unmediated* bring-

ing about the existence of matter, rather than only indirect, such as via the density-conservation law. As Quinn explained<sup>35</sup>: In characterizing the causal relation in his account of creation and conservation, he had “specified that what does the bringing about causes what is brought about *immediately* rather than remotely by means of instruments such as secondary physical causes.”

Thus it would completely beg the question in this context to seek refuge in the *deus ex machina* of the alleged divine ability to suspend the density-conservation law, as it were, or to stop the expansion of the universe. Theists are free to take that supposed divine ability on faith, if they can clarify just what it means. But that freedom is unavailing, because the context of the entire cosmological debate on divine creation is one of *argument* in natural rather than fideist theology. Thus it would clearly be question-begging, if not simply frivolous, to claim, in effect, that, within the steady-state cosmology, the Perfect Cosmological Principle is tacitly predicated on the proviso that God *refrain* from *suspending* density-conservation and/or from arresting the cosmic expansion. Neither Bondi, nor Gold, nor Hoyle—all reputedly atheists—would dream of such a proviso. And it is not they who are begging the question. *Besides*, the proposed *deus ex machina* of indirect divine creation is plainly *ad hoc*, since no evidence is offered for it at all.

As is now very clear, I trust, the steady-state theory radically belies the inveterate thesis that, *no matter what the physics of our world*, any matter-energy coming into being *ex nihilo* requires an external divine creative cause. And that alone, I claim, clearly discredits the received theistic view as articulated by Quinn. Indeed, it is, I claim, one of the gravest and *most insidious* of errors in the *entire history* of philosophy to legislate the need for external causes independently of what the actual physics of our world may be. I shall now articulate this major moral historically before turning to the Big Bang cosmology. In order to do so, let me now first refine my earlier published statement of the generalized fundamental lesson I draw from the history of science for the issues before us.

### 3. THE IMPORT OF THE HISTORY OF SCIENCE FOR THE POSTULATION OF EXTERNAL CAUSES

Important episodes in the history of science have shown that new evidence or new theoretical insights have warranted fundamental changes in dealing with the following major question: Is it justified, in a given context, to postulate causes *external* to physical or biological systems as *intervening* in them, in order to explain some observed behavior of these systems? The historical evolution of the answers to this question bears directly on the legitimacy of inferring an *external* cause to account for the behavior of the universe as a whole, *or even for its very existence*. Let us see just how.

According to Aristotle, a force is needed as the external cause of a sublunar body's nonvertical motion, even if it moves horizontally with constant velocity. In his physics, the demand for such a disturbing external dynamical cause to explain any such motion arises from the following assumption: When



a sublunar body is not acted on by an external force, its *natural*, spontaneous, dynamically unperturbed behavior is to be at rest at its “proper place,” or—if it is not already there—to move vertically toward it.

Yet, as we know, Galileo’s analysis of the motions of spheres on inclined planes, among other things, led him to conclude that the empirical evidence speaks against just this Aristotelian assumption. As Newton’s First Law of Motion tells us, uniform motion *never* requires any external force as its cause; only accelerated motion does. Thus, Galileo and Newton *eliminated a supposed external* dynamical cause on *empirical* grounds, explaining that uniform motion can occur spontaneously without such a cause.

But, if so, then the Aristotelian demand for a causal explanation of *any* motion whatever by reference to an external perturbing force is predicated on a *false underlying assumption*.

Clearly, the Aristotelians begged the question by tenaciously continuing to ask: “What net external force, pray tell, keeps a uniformly moving body going?” Thus, scientific and philosophical questions can be anything but innocent by loading the dice with a *petitio principii!*

A brief example from the history of biology, starting with Louis Pasteur but including Oparin and Urey, likewise illustrates a change as to the hypothesized need for external causes in the debate on the feasibility of the spontaneous generation of life from nonliving substances.<sup>36</sup>

I have adduced these examples in addition to the steady-state world to show that a scientific or philosophical theory may be fundamentally mistaken in calling for some sort of external cause to explain certain states of affairs. No physicist or philosopher can be justly criticized for failing to answer a causal question inspired by that mistaken demand for an external cause.<sup>37</sup> Incidentally, I do not deny that in *other* cases, physical evidence may show the need for an external cause where none was theretofore suspected, as noted by the historian Lorraine Darden.

Now let me argue that the stated moral from the particular examples I adduced from the history of science spells a salutary caveat for the purported problem of creation.

#### 4. THE QUESTION OF THE *RATIO ESSENDI* AS A PSEUDOPROBLEM

I claim that the question “Why is there anything at all rather than just nothing?” is a misguided query, at least to the extent that it calls for a cause external to the universe. Thus, it is wrong-headed, I shall now contend, to ask for the external cause or reason of the bare existence and persistence of the world, its so-called *ratio essendi*. But it is vital to distinguish such a supposed *creative* cause or reason, as Aquinas did, from a merely *transformative* cause, which just produces *changes* in things that *already exist* in *some* form, or generates new entities from previously existing objects.

There is a crucial underlying assumption that animates the theological creationist and conservationist *ratio essendi* given by an array of famous theists.

They take it to be axiomatic that *if* there is a physical world *at all*, then its spontaneous, undisturbed or natural state is one of *utter nothingness*, whatever that is. Those many theists who make this dubious assumption have thereby generated grounds for claiming that the very existence of matter, energy, or whatever constitutes a *deviation* from the alleged spontaneity of nothingness. And that supposed deviation must then have a suitably potent *external* cause.

Just this assumption of spontaneous nothingness is at least insinuated by the biblical story of Genesis. But Aquinas and Leibniz, among others, make it explicit. Aquinas used the loaded, question-begging word “creature” to refer to any contingent entity and declared: “the being of *every* creature depends on God, so that not for a moment could it subsist, *but would fall into nothingness* were it not kept in being by the operation of Divine power” (my italics).<sup>38</sup> Thus, here we have the fateful crucial presupposition: There would be no world at all or just nothingness, whatever that is, were it not for divine creative and conservative *intervention*.

But what, I must ask, is the evidence for this philosophically fateful assumption of the spontaneity of nothingness? Why, in the absence of an external supernatural (creative) cause, *should* there be just nothing, even if we are clear what that would mean? Leibniz and Richard Swinburne have offered a defense of the spontaneity of nothing by arguing from *simplicity* that the nonexistence of the world (“nothingness”) is *its* [*sic*] most probable state. But I argue in my forthcoming “A New Critique of Theological Interpretations of Physical Cosmology” that this defense is completely unavailing.

The baseless tacit presupposition of spontaneous nothingness also contributed to Leibniz’s demand for a necessary being to provide a *sufficient reason* for the existence and persistence of contingent things. Yet, *I deny that the mere logical or empirical contingency of the existence of any given particulars can support the spontaneity of utter nothingness* and the need for a logically necessary being as the creator. It will emerge that the theological presupposition of the spontaneity of nothingness lacks even the most rudimentary plausibility. Moreover, some philosophers, such as Henri Bergson, have asserted the unintelligibility of the notion of absolute Nothingness.

As I have just argued, the seminal question as to the *ratio essendi* of the world of contingent beings, far from being innocent and imperative, has forfeited the rationale that animated it at the hands of such major figures as Aquinas and Descartes. Their problem turns out to have been a *pseudoproblem*. And their proposed theological resolution of it is a *pseudo-explanation*. One cannot overestimate, I believe, the extent to which the dubious rationale for a *ratio essendi* unconsciously insinuates itself to confer spurious plausibility on that pseudo-explanation. This point must be borne in mind as *prophylaxis* against the insidious temptation to ask for a *creative cause* of the very existence of the *entire world*.

Now let me turn to:

## 5. THE BIG BANG UNIVERSE OF THE GENERAL THEORY OF RELATIVITY

Two subtopics will concern us:

- A. What is the Big Bang in the Event-Ontology of the General Theory of Relativity? For brevity, I shall hereafter speak of the general theory of relativity as the “GTR.”
- B. I shall contend that *physical* energy conservation *rules out* divine *creatio continuans*.

### A. *What Is the Big Bang in the Event-Ontology of the General Theory of Relativity?*

In my earlier writings,<sup>39,40,41</sup> I had discussed two Big Bang models, which I called Case (i) and Case (ii) respectively and which I am about to characterize. Yet, as I noted then and will see shortly, Case (i) is *not a bona fide* model of the GTR for reasons given in the *event ontology* of that theory. In the putative Case (i) model, the Big Bang is *supposedly* the temporally first physical event of the space-time, and is said to occur at the instant  $t=0$ . But the Big Bang does not meet the requirements for being a *bona fide* physical event in the GTR. Instead, there is a hole in the space-time manifold at the putative  $t=0$ , such that *at unboundedly ever earlier moments* of time before, say, 14 billion years ago, the space-time metric of the GTR becomes degenerate, and the so-called scalar curvature as well as the density approach infinity.<sup>42</sup> The locution “Big Bang” is a shorthand *façon de parler* for this mathematical behavior of the 4-metric and scalar curvature at *regressively* earlier times.

The physicist John Stachel<sup>43</sup> has justified the view that this singular status robs the Big Bang of its *event-status* in the GTR. As he showed, points of the *theoretical* manifold first *acquire* the physical significance of being *events*, when they stand in the chrono-geometric relations specified by the space-time metric, which familiarly does double duty as the gravitational field in the GTR.

Thus, in the GTR, it turns out that “the notion of an event makes physical sense only when [both] manifold and metric structure are [well] defined around it.”<sup>44,45</sup> And in that theory, space-time is taken to be “the collection of all [physical] events.” But the Big Bang does *not* qualify as a physical point-event of the space-time to which one could assign three spatial coordinates, and one time coordinate. Therefore, contrary to the Case (i) model, which features a *first* physical event, the past cosmic time-interval is *open* or unbounded, rather than closed or bounded by a first moment, although its metrical duration in years is only *finite*.

Despite the ontological illegitimacy of the Case (i) model, I have discussed it, because Pope Pius XII, Sir Bernard Lovell, and William Craig<sup>46</sup> each claimed support from it for divine creation *ex nihilo*. Besides, the Case (i) model had figured in the astrophysicist Narlikar’s *secular* creationism with which I took issue elsewhere.<sup>47</sup>

But, as we just saw, the Big Bang is actually excluded as not being a physical event occurring at an actual moment of time. Thus understood the relativistically *bona fide* Big Bang models *differ* from those in Case (i) by being temporally *unbounded* (open) in the past. And hence the past physical career of the Big Bang universe *did not include a first physical event or state at which it could be said to have begun*. I designated the *bona fide* temporally unbounded models as *Case (ii) models*.

However, in either Case (i) or Case (ii), the current *age* of the Big Bang universe is *metrically of finite* duration, whose numerical value is under dispute, depending numerically on the time-rate of its expansion.<sup>48</sup> Moreover, there are good reasons in the GTR for claiming that *no instants of physical time whatever* existed *before* that finite time-interval in either Case (i) or Case (ii).<sup>49</sup> Thus, even if the singular Big Bang *were* included as an event having occurred at a *bona fide* moment of time  $t=0$ , this hypothetical instant *had no temporal predecessor*. *A fortiori*, it could *not* have been *preceded* by a state of nothingness, even if the notion of such a state were well-defined.

As we now see, physical processes of some sort *already* existed at every *actual* instant of past time. After all, despite the finite duration of the past, *there was no time* at all at which the physical world did not exist *yet*. Thus, we can say that the Big Bang universe *always* existed, although its age is only, say, somewhere between 8 or 15 times  $10^9$  years. Here, the word “always” means “for all actual times,” but it does not guarantee that time, past or future, is of infinite duration in years.

As we saw, in the Case (i) world, there did not exist any instants of cosmic time before  $t=0$ . Therefore, no supposed earlier cause, either creative or transformative, could possibly have been operative before  $t=0$ . For that reason alone, the Big Bang could not have had any temporally prior creative or transformative cause. Nor could “it” have had a simultaneous cause, creative or otherwise, because there simply was no “it” or instantaneous event that could have been the momentary effect of such a cause. And in the face of the groundlessness of the spontaneity of nothingness, there is no basis for a creative cause of the Big Bang as construed in the Pickwickian sense of a *façon de parler* I mentioned above.

Let me take for granted the altogether reasonable view that only *events* can qualify as the momentary *effects* of other events, or of the action of an agency. As I just argued, the Big Bang is a nonevent, and  $t=0$  is not at all a *bona fide* time of “its” occurrence. Thus the “Big Bang” *cannot be the effect of any cause in the case of either event-causation or agent-causation alike*. By the same token, a nonexistent event at the putative  $t=0$  cannot have a cause, *either earlier or simultaneous!* Besides, it cannot have an *earlier* cause, either creative or transformative, if only because there was no earlier time at all. And recall (from Section 4) that I have already undercut the entire rationale for any creative *ratio essendi* anyway by discrediting its assumed spontaneity of nothingness.

## B. Physical Energy Conservation Versus Divine Creatio Continuans

We are ready now to examine Quinn's contention that purportedly *required* divine creation and conservation are entirely consistent with the Big Bang models in both Case (i) and Case (ii). Indeed, Quinn asserts such consistency in all those cases in which *the GTR or any other physical theory* features a *physical* energy-conservation law.

It is very important to bear in mind that the theistic tradition which Quinn tries to defend has insisted aprioristically on the necessity of divine preservation of matter or energy against annihilation, regardless of the particular forms of matter or energy that populate the physical ontologies of successive scientific theories. Thus he is concerned to argue strenuously that the necessity of perpetual divine conservation is logically *compatible* with the old matter-conservation law dating from Lavoisier, and also with such energy-conservation as is valid in GTR universes. Indeed, Quinn and his fellow theists insist quite generally on the logical compatibility of the necessity of divine conservation with whatever *physical* matter-energy conservation law is presumed to be true at any given stage of science. Each such stage features a specific technical physical ontology of matter or energy. But I shall argue that, instead, there is *incompatibility* between the physical and divine conservation scenarios.

Quinn<sup>50</sup> offers the following definitions of divine creation and conservation, which I find very obscure: (i) God *creates*  $x$  at  $t = \text{def. God willing that } x \text{ exists-at-} t$  brings about  $x$ -existing-at- $t$ , and there is no  $t'$  prior to  $t$  such that  $x$  exists at  $t'$ , and (ii) God *conserves*  $x$  at  $t = \text{def. God willing that } x \text{ exists-at-} t$  brings about  $x$ -existing-at- $t$ , and there is some  $t'$  prior to  $t$  such that  $x$  exists at  $t'$ .

Quinn<sup>51</sup> points out that his formulations deliberately leave open whether God's volitions or willings "are timelessly eternal by not building into this locution [of divine volitions] a variable ranging over times of occurrence of divine willings." But I submit that the notion of *timelessly eternal acts of willing* is obscure and elusive to the point of making such divine willings altogether nonexplanatory as causes of the existence of our world. Quinn's use of the concept of "willing" clearly draws on the acts of volition familiar from the conative life of humans. But such volitional states are *inherently temporal* rather than "timelessly eternal." Thus, Quinn's divine volitional creation scenario is conceptually elusive. Furthermore, insofar as it is analogous at all to human volitions, there is no evidence whatsoever for the occurrence of such Pickwickian volitions.

Nor do I understand what we are to make of the posited scenario that the instantaneously "ensuing" temporal *bringing about* of the existence-of- $x$ -at-time- $t$  is the *effect* of such an *atemporal* volition. Besides, all of the cases of instantaneous action-at-a-distance familiar from pre-relativistic physics (e.g., gravitational attraction in Newton's law of universal gravitation) feature *causally symmetric laws* of coexistence (*interactions*), whereas Quinn's instantaneous divine creative causation is claimed to be *causally asymmetric*. Furthermore, let me just recall anew the Jesuit Buckley's agnostic disclaimer that Catholic theology does *not* know *how* God brings about the existence of the world.

It must be borne in mind that the theists whom Quinn claims to vindicate

assert the necessity of divine *creatio continuans* unqualifiedly for the lifetime of a tree, for the conservation of the energy in an isolated finite subsystem of the universe, and—when such conservation is defined for the universe as a whole—for the entire cosmos.

We can now turn to Quinn's treatment of the *bona fide* relativistic Big Bang models of Case (ii), featuring a temporally *unbounded* past. He describes his theological scenario for all authentic moments of time as follows<sup>52</sup>:

... God *conserves* the sum total of matter-energy whenever it exists, but there is no time at which he creates it or brings it into existence after a prior period of its nonexistence. (my italics)

But, now, my thesis will be the following: Insofar as the GTR does license a matter-energy conservation law for a specified subclass of the Case (ii) Big Bang models or for isolated subsystems of the universe, the physics itself *rules out* Quinn's theological doctrine that physical energy-conservation is only an *epiphenomenon* in the sense of Malebranche's occasionalism, *requiring* repeated divine creation *ex nihilo* at every instant. One form of the energy-conservation law tells us that the total energy-content of an isolated or closed system remains constant naturally and spontaneously. Another form, which is even taught in freshman physics or chemistry, asserts *tout court* that *energy can neither be created nor destroyed*.

To be more specific concerning both cosmological and subcosmological energy-conservation that is licensed by the GTR, consider the spatially closed (or "3-sphere") "Friedmann" Big Bang universe, which exists altogether for only a finite span of time. It is clearly a physically closed system since there is nothing else. When the matter of that universe takes the form of "dust" (i.e., when the pressure in it vanishes), the *total rest-mass of that universe is conserved for the entire time-period of its existence*.<sup>53</sup>

Apart from the stated cosmological rest-mass-conservation law, Wald<sup>54</sup> points out that "in general relativity . . . a conserved total energy of an isolated system [i.e., subsystem of the universe such as a condensed star, immersed in an asymptotically flat spacetime<sup>55</sup>] can be defined." (That total energy is the so-called ADM-energy.<sup>56</sup>) Note that for any particular physical theory *T* such as the GTR, a physical system passes muster as "closed" in the absence of any outflow or influx of the kinds of physical entities that qualify as mass or energy in the ontology of *T*.

In the present Big Bang context, my argument from *physical* energy-conservation against the necessity of divine *creatio continuans* is as follows: *Given the pertinent mass- or energy-conservation law of the Friedmann Big Bang dust world, it follows decisively that the physical closure of this universe is causally sufficient for the conservation of its particular mass-energy-content. But just that physical causal sufficiency for energy conservation, in turn, rules out the major claim of theistic creationism that such physical conservation requires perpetual divine creative intervention ab extra as a necessary condition!*

Here, as in the steady-state world, Leibniz can get his sufficient reason for

physical existence from the physics itself and would not need God. And, as I have already emphasized twice, Leibniz's *quest* for an External Sufficient Reason was ill-grounded on the alleged spontaneity of nothingness.

It is of cardinal importance to note vis-à-vis Quinn that the causal sufficiency of the physics for energy-conservation which I have claimed is licensed by the *conjunction* of the physical energy-conservation law with the physical closure of the universe, *not* by the physical closure alone. *Mutatis mutandis* for the stated *subcosmological* systems for which the GTR licenses a conservation law. In short, my thesis of causal sufficiency relies on a solution to the initial value problem.

But Quinn's view of divine conservation as the *total* and *sole* cause of energy-conservation turns this paramount physical process into a mere *epiphenomenon* in the spirit of Malebranche's *occasionalism*. Thereby, Quinn robs the physics of any causal role in energy-conservation, just as he had made the physics causally irrelevant to the genesis of new matter in the steady-state cosmology. Yet, as I have just argued, the *physics* is, in fact, *causally sufficient* in each of the major rival physical cosmologies. And since Quinn claims to accept the physics, his demotion of it to causally ineffectual, and hence also to causally *nonexplanatory* factors is untenable. Moreover, if he is to be believed, a philosophically enlightened physics teacher ought to explain energy-conservation to students by attributing it *solely* to divine intervention, since the physics does not causally explanatory work in Quinn's scenario.

The bizarre character of that scenario is thrown into still bolder relief, when we consider an *alternative* formulation of the energy-conservation law that is found in standard reference works, such as the *International Encyclopedia of Science*,<sup>57</sup> which *articulates* the statement "*The mass-energy content of an isolated system remains constant.*" The articulation follows immediately upon it and reads: "*The energy can be converted from one form to another, but can neither be created nor destroyed.*" Hence, even if the system is open, a *change* in its energy content can occur only by the exportation or importation of energy, *not* by its creation *ex nihilo* or *annihilation*.

Thus, the *alternative* formulation of the energy-conservation law *applies alike* to physically open and closed systems. And, importantly, this formulation does not restrict at all the kinds of agencies or devices that are declared *unable* to create or destroy energy. Instead, it asserts the impossibility of its creation or annihilation *tout court* as a law of nature. Therefore, *if* the law is true *and* there is also a God, he is *not almighty*.

Furthermore, since the law declares the impossibility of the annihilation of the energy *tout court*, the energy *could not lapse into nothingness* in the absence of God. Therefore, contrary to the long theistic tradition of perpetual creation espoused by Quinn, God is clearly *not* needed to *prevent* such supposed spontaneous annihilation by creative intervention. *This is a conclusion of cardinal importance.*

Lastly, let me object to Augustine's version of creation *ex nihilo*. In Book XI of his *Confessions*, he considers a challenger's question "What did God do before He made Heaven and Earth?" But Augustine *rejects* the answer of some-

one who replied that God was busy preparing hell for those who would ask this question! Instead, he tells us that there simply was no time before creation, because God first had to create *both* time *and* matter. As I remarked at the start, the British physicist C. J. Isham<sup>58</sup> regards Augustine's reply that "time itself was made by God" as "profound."

Yet I consider it very unsatisfactory. What are we to understand by Augustine's assertion that God "brings about" the existence of time itself or creates it? I submit that his claim is either unintelligible or, at best, uselessly circular and unilluminating. In any case, if Augustine means only that time and matter are *existentially coextensive* in the sense of a "relationalist" ontology of time, then, as I have been at pains to argue, they do not need any *external cause* or creator as the *ratio essendi* of their very existence, let alone a divine one. Furthermore, the locution "*was made*," as used in regard to the creation of *time itself*, must not be allowed to suggest that, like stars or atoms, time itself came into existence *in the course of time*. Such a notion would make *illicit* appeal to some fictitious *supertime*. Therefore, *pace* Isham, the locution "*time itself was made*" by God is senseless here.

Similar objections apply, in my view, to *Aquinas's* doctrine, reported by Quinn,<sup>59</sup> "that one of two things God made in the beginning was a unique first *now* from which time began."

## 6. QUANTUM COSMOLOGIES

The so-called quantum cosmologies are quite speculative. And, no self-consistent theory of quantum gravity—uniting quantum theory and general relativity—is currently available.<sup>60</sup> Thus, it may be premature to entrust one's philosophic fortunes to the extant versions of quantum cosmology, let alone to invoke them as support for divine creationism.

Although it is probably the better part of wisdom to wait philosophically until the dust settles in physics, let me just suggest here why, in my view, the creationist cannot get support from quantum cosmology that was *unavailable*, as I have argued, from the pre-quantum Big Bang and steady-state theories. It will turn out that some of the arguments I gave against theistic creationist interpretations of the classical Case (i) and Case (ii) models carry over to the three quantum cosmologies. And, just like the Case (ii) models, the third quantum version does not even provide a point of application for an attempt to argue for *initial* divine creation. Nor does it lend itself to divine *creatio continuans* any more than the other two.

The relevant highlights of the three quantum cosmologies can be briefly described as follows:

1. The semiclassical *inflationary* Big Bang models pioneered by Alan Guth and subsequently modified by Linde, Albrecht, and Steinhardt. In Guth's version, the model is a *modification of the Case (ii) Big Bang world of the GTR* such that (a), between  $10^{-35}$  and  $10^{-33}$  seconds, the expansion rate was inflationary or enormously higher than thereafter, (b) the Big Bang universe itself originated in



quantum fluctuations in *nongravitational* fields. There is a so-called true vacuum featuring quantum energy fluctuations during the first  $10^{-35}$  seconds, which is succeeded by the so-called false vacuum of the inflationary period. In these models, Einstein's GTR field equations are used to derive the false vacuum.

During the inflationary period, *energy-density* is conserved, which means that in analogy to the popping into existence of new *matter* in the old steady-state theory, additional energy pops into existence *during that period*. But it turns out that after this inflationary period, the energy-value returns permanently to the status quo ante. Thus, except for the tiny inflationary period, the model exhibits such physical energy-conservation as is present in the classical Case (ii) model.

Clearly, I can carry over to this semiclassical quantum model my objections to the *theological* interpretations of the Case (ii) models and of the steady-state theory.

2. A second version of quantum cosmology is furnished by the so-called wave-function models.<sup>61,62,63,64</sup> Whereas the semiclassical inflationary models quantize only *nongravitational* fields, the wave-function models quantize all fields. But, like the former, they also feature an inflationary episode. The *temporal* structure of the wave-function models is that of the Case (i) Big Bang model, but with the important difference that there is *no singularity* at the initial state  $t=0$ . Thus, here there is a *bona fide* first state of the universe. But it cannot have an earlier cause, since there is no prior time. Nor is there any basis for thinking that its initial state has a *simultaneous* asymmetric cause supplied by divine volition. We have no empirical evidence at all for the existence of creative causes *ex nihilo*. The demand for such a cause of the very existence of the entire universe is inspired—as I showed in Section 4—by the *groundless* assumption of the spontaneity of nothingness. Moreover, there is no extant viable account of a criterion of asymmetric *instantaneous* causation such that divine volition would qualify under it as the creative cause of the universe. In any case, attributions of volitions to God are completely *ex post facto* and can be invoked unwarrantedly no matter what the facts of the world. Yet the physics of the wave-function model yields a *probability* for the existence of our world as one member of a set of alternative worlds.

Overall, my objections to a theological reading of the wave-function model can be stated by carrying over those I offered à propos of the classical Case (i) model and against divine conservation à propos of the Case (ii) Big Bang model.

3. The third set of quantum cosmologies, the *vacuum fluctuation* models, are quite distinct from the first two, although there are quantum fluctuations in the course of the careers of the other models as well. Quentin Smith<sup>65</sup> has lucidly outlined a series of these models, beginning with Tryon's in 1973, and including those of Brout, Englert, Gott, and others.

Their cardinal feature is that there is a preexisting background space in which our universe is embedded, and that our world is a quantum fluctuation of the vacuum of this larger space. Yet our world is only one of many vacuum fluctuation worlds that emerge randomly from the embedding vacuum space.

As Quentin Smith explains,<sup>66</sup> these models lend themselves to incorporation in Brandon Carter's theory of a World Ensemble explanation of our world, and especially of its "anthropic coincidences."

These models are of interest for various philosophic purposes. But the prior existence of their background space provides no point of application for an attempt to argue for initial divine creation. Nor do they lend themselves to divine *creatio continuans*, any more than any of the others we have considered.

## 7. CONCLUSION

I conclude that, in the major cosmologies of the twentieth century, there is no scope at all for a creative role of the deity *qua ratio essendi*.

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