

Examining The Theological Outcomes of Vilenkin’s View on The Beginning of Universe Based on ‘Quantum Tunneling Out of Nothing’

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Article Info	Abstract
<p>Article type: Research Article</p> <p>Article history: Received 15 March 2023 Received in revised from 1 May 2023 Accepted 12 August 2023 Published online 28 January 2024</p> <p>Keywords: Causality, Creation from The Unprecedented, Quantum Cosmology, Scientific Atheism, Vilenkin’s View</p>	<p>The question of how the universe came into existence continues to be a central concern for both science and theology. Similar to earlier attempts to explain the beginning through material or prime causes, which concluded with the non-existence of a deity, modern cosmological and physical theories have proposed spontaneous, independent-of-cause accounts, such as "quantum tunneling out of nothing." This paper seeks to examine the true propositions put forward by empirical science, which have often been distorted by theological or philosophical inferences that are disconnected from their origins and thus baseless. Critiquing the views of certain atheist scientists, such as Vilenkin, this paper argues that their claims do not negate the existence of a deity. On the contrary, these ideas are shown to be compatible with theological concepts of creation, as they are based on a beginning in the total absence of matter, time, and space. These theories align with the Quranic concepts of <i>ebdaa</i> (creation ex nihilo) and <i>bara</i> (creation from nothing), reflecting a creation pattern that is unprecedented. The turning point in this debate lies in the misinterpretation or misunderstanding of quantum tunneling, which is often wrongly seen as a mathematical model suggesting the universe's beginning was accidental, like atomic decay. Beyond the flawed overgeneralizations of physical and mathematical premises rooted in assumptions of limited uncertainty and randomness, the evidence remains inadequate. Therefore, the inability to prove existence does not equate to proof of non-existence. Uncertainty, as suggested by the Copernican model, is just one of many possible explanations in quantum physics. Other equally plausible accounts, such as the Bohemian view or the multiverse theory, explore accidental phenomena like nuclear decay through deterministic equations in quantum mechanics.</p>
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Introduction

Concerning the history of problematizing the creation of universe, various intellectual and textual bodies of proof have been in focus including Plato's Timaeus, neo-platonic accounts of the eternal emanation of universe from God, and theologians' perspectives of creation from nothing or immaterial creation. In the twenty-first century, too, which is characterized by human thought being dominated by modern sciences, a number of physicists present ideas and perspectives that need to be assessed, criticized and compared to the earlier ones. A typically thought-provoking perspective is that of Vilenkin's '*Quantum Tunneling out of Nothing*'.

Before proceeding, one must concede that physicists' views like other aspects of essentially inadequate understanding of human, are for the most part influenced by philosophical inferences that are based upon the individuals' assumptions and not necessarily scientific facts. It must not, though, be forgotten that when it comes to a dialogue between science and religion, a good starting point can be relying on comprehensibility rather than truth. The next step in exploring truth is verifiability. Accommodating theological ideas within the most valid scientific and philosophical ones, provided that they are translated into a common language would enhance theological validity¹.

The literature review on this inter-disciplinary topic (distinguished from numerous philosophical-dialectic studies particularly drawing on classical theology sources) is extracted from the author's thesis as the first research in Persian addressing the issue. The thesis concentrates on '*Quantum Tunneling out of Nothing*' using the most up-dated, primary cosmology sources including the ones by Vilenkin within a theological-physical framework. Through an impartial critique, one can deal with philosophical reasoning and theological-dialectic skeptical inquires.

It is worth noting that in recent literature, no complete interpretation has been presented of the concept of '*nothing*'. For instance, by offering a confused sense of quantum vacuum, some scholars equate the beginning of universe with mutual neutralization and zero-sum of positive and negative energies². Similarly, other researchers seem to critique Vilenkin's theory from a philosophical point of view. In fact, quantum tunneling, a key concept in quantum physics which is applied inevitably in various fields, is not only misunderstood but also easily downplayed.³ The present paper addresses the niche against the background of the author's academic studies

¹ Werner, Drees, *Beyond the Big Bang: Quantum Cosmologies and God*. (La Salle, IL: Open Court, 1990), 176-179.

²Frank, Kloos, *Nothing*. Translated by Firouz Arash. (Contemporary Culture Publications, 2015), 166. & Tavakoli Bina, Maytham. "The World from Nothing Based on Quantum Vacuum Fluctuations: A Critique of the Proposal of Creation Independent of God." *Journal of the Philosophy of Religion* 19 (2019), 466.

³ Hamid Reza, Shakerin, "The World from Nothing in the View of Tryon and Vilenkin: An Examination and Critique." *Philosophy of Religion* 20, (2023), 85.

in physics, by reviewing the most important theories of the beginning of the universe along with an accurate account of Quantum Tunneling out of Nothing'. Then it will go on to examine the theory from a purely scientific perspective to show the fallacy of metaphysical inferences. The novelty of the present study lies in the fact that rather than critiquing the theory it indicates that the concept of 'nothing' in physics and theology converge, and that the imposed interpretation that the universe is independent of a creator is fallacious. Therefore, this paper argues that Vilenkin's theory or other similar positions, in essence, do not reject the existence of the creator or divine action; on the contrary, these theories and religious accounts seem to comply with 'creation out of nothing'.

To clarify things, the author would like to draw the attention of the readers to the fact that an outstanding scholar, Alan Guth (2013) position. He has designed a model of quantum fluctuations in vacuum and states that

It is a dramatic demonstration that the quantum theory that was developed by studying the hydrogen atom can be applied on larger and larger scales. Here we are applying quantum theory to the universe in its entirety, at time scales of order 10^{-36} second, and it all sounds incredibly fantastic. But the shocking thing is that it works, at least in the sense that it gives answers for important questions that agree to very good precision with what is actually measured.¹

1. A Physics-Based Account of Universe

Prominent scientists in the field of cosmology have constantly sought to find answers to the intriguing questions about creation. The questions such as what the early universe was made of and what the origin is necessitate that we must first prove, from cosmological perspective, that the universe had in fact a beginning or has always existed. Therefore, in section, first the article will be dealing with the clarifying the emanation of universe; then it will go on to explain how the universe began using cosmological models.

1.1. Emanation Of Universe from Modern Cosmological Perspective

When the early universe is at issue, the standard cosmological model is Big Bang as the starting point. Though a successful theory that is supported by observation-based data (e.g., Cosmological Microwave Background Radiation, or CMBR), Big Bang Theory cannot adequately justify the beginning of universe. Indirect theoretical as well as empirical evidence about the first moment following Big Bang indicates that our knowledge of the first three minutes after the Big Bang is speculative. Most cosmologists have offered scenarios just after Max Planck because right now we are dealing with energies that cannot be simulated and regenerated even in the biggest particle accelerator; therefore, we cannot locate the exact point

¹Andrei, Borde, Alan Guth, and Alexander, Vilenkin, "Inflationary Spacetimes Are Not Past-Complete." *Physical Review Letters* 90 (2003).

by means of observation data. Theoretically speaking, if we decide to explain the beginning of universe (assuming $t = 0$ in the Big Bang theory) based on inflationary isotropic and homogeneous universe in modern gravitational physics, we would end up in time space unity where physics laws are invalidated and Einsteinian gravity theory fails. In other words, due to the infinity of mass density, mathematically-based classical general relativity to account for the Big Bang time would not be adequate, and inevitably quantum gravity would need to be taken into consideration¹.

Therefore, the real solution out of space time unity, is the simultaneous application of quantum mechanics and general relativity. In fact, various theoretical models have been proposed for replacing the purported effects of quantum gravity. Nowadays, prominent physicists concede that such a model is not available despite a huge body of data, and by modifying the fundamental principles of quantum and general relativity, one cannot claim that quantum gravity is made, though of course physicists are still busy to come up with an answer.

Hawking in his 'no-boundary' proposal to solve the unity problem of the Big Bang with mathematical assumptions, and by including imaginary time and quantum gravity in Euclidean geometry views space time as infinite but without edge or boundary (like the earth with two extra dimensions). In his view as long as we assume that the universe has a beginning, we must inevitably conclude that it has a creator as well. He goes on to argue that if the universe is actually free of any boundaries or edges and without a beginning or end, then what would be the status for a creator?²

Another theory proposed to account for space time unity is Vilenkin's view. He proves the existence of past time boundary in all cosmological models where Hubble inflation constant is above zero and which believe in the beginning of universe. According to this view, if the universe is constantly in the state of inflation (i.e., the volume increases with time), therefore its past cannot be eternal.

Several other scenarios have been proposed to account for the beginning of universe including emergent universe with Hubble constant equaling zero, universe bouncing with Hubble constant value above zero, reversing the arrows of time to the past infinity by Aguirre and Gratton are all solutions to evade a beginning for the universe. Despite the fact that Vilenkin in the article '*Arrows of time and the beginning of universe*' attempts to answer some of the questions, the answers are still far from convincing for those who believe in models developed for the past

¹ Alexander, Vilenkin, *Many Worlds in One: The Search for Other Universes*. (New York: Hill and Wang, 2006).

² Stephen, Hawking, *A Brief History of Time: From the Big Bang to Black Holes*. (London: Bantam Press, 1988).

preceding the Big Bang. Physicists are divided over the explanatory adequacy of models with each camp stressing that their account can best solve cosmological mysteries.

2.1. Accounting for How of ‘Emerging out Nothing’

Thinkers in each historical era used to seek answers to the way the universe was created and how it worked depending on their depth of knowledge. Once Greek philosophy was in its heyday, the scholars either did not believe in God or recognized Plato’s Timaeus as the source for creation. After the renaissance and domination of empirical science, the issue of creation gained importance particularly in cosmology. Eventually, the issue has re-appeared in physics as Universe from Nothing. While in the majority of sources and the media, the issue has been touched upon by Hawking, Krauss, Klouss, etc. have proposed their own model following their idiosyncratic understanding of ‘nothing’. However, none of them have touched up the question of where ‘Creation out of Nothing’ comes from. This is what is addressed here as a gap in literature.

Quantum tunnelling is one of the key concepts in quantum physics according to which (and contrary to the laws in classical physics), a given particle in the microscopic world when facing an impenetrable barrier following Heisenberg uncertainty principle will tunnel and appear on the other side of energy barrier despite inadequate energy to cross it. Considering this, in the wealth of literature physicists maintain that the positive and negative energy balance in the gravitational field can cancel out the universe energy into nothing. Accompanied by the quantum uncertainty, it supports the view that everything is in fact a quantum bouncing of nothing. Even if this is accepted, we still face the mysterious question of ‘what has codified the quantum possibility in nothing?’

When one attempts to account for ‘vacuum’, the first thing that comes to mind is emptiness or nothingness; nevertheless, it must be remembered that in modern particle physics vacuum and nothing are totally distinct. According to quantum theory, vacuum carries mass energy, tension, particles, fields and their different interactions the interior and exterior of which constantly bounce on subatomic scales due to quantum mechanical property¹ It can be argued that physical vacuum cannot mean ‘nothing’ whereas vacuum in philosophical sense is simply nonexistence and cannot co-occur with existence or being. All this indicates that the physical concept of ‘nothing’ is not the same as in its philosophical sense².

On the other hand, revising an developing the idea of trion which is the focus of the present study was presented by Vilenkin in 1982, and then developed by Lindeh and others. By mathematically analyzing tunneling, he could show that the future of universe depends on its

¹ Alexander, Vilenkin, and Delia, Perlov, *Cosmology for the Curious*. (Switzerland: Springer, 2017), 335.

² Drees, *Beyond the Big Bang*, 73

radius and the radius of the newly emerged universe after tunnelling is in reverse ration with vacuum energy density. Therefore, the highest probability is for the start of the universe with the maximum vacuum energy and minimum initial size:

$$R = c \left(\frac{3}{8\pi G\rho_v} \right)^{1/2}$$

According to this interpretation, universe can tunnel through the energy boundary from a small radius to the large one such that it can move to the other end causing inflation at the end of the tunnel. The odds for tunneling depends on the universe content and radius. At the beginning of universe where radius tends to be zero, there is non-zero probability for tunneling. But the universe with $r = 0$ is not a universe at all. Also, it can be understood that, with the universe radius (R) tending towards zero, the universe that emerges after tunneling only includes vacuum energy (ρ_v) in absence of matter. This can mean that using a mathematical account, an autonomous start of the universe can be concluded., that is tunnelling the universe with the distance of zero (out of nothing) to a finite radius. In this approach, nothing means the state which does not resemble any matter, and is totally devoid of space and time, which is a good starting point for creation.¹

The very scholar who proposed the model of creation from nothing suggests that the beginning of universe is a state without matter, space and time. This we will argue not only contradicts the atheist metaphysical idea of independence of God, but also complies with the views of Christian and Muslim theologians.

In 1983, the no-boundary model proposed by Hawking is an account that explains the beginning of universe, but this is against the model of quantum tunnelling out of nothing. Vilenkin states that “the tunnelling model out of nothing proposed by Linde and him support the idea of a universe that resembles a core at the beginning of creation such the universe at the initial moment was the smallest size and surrounded by the maximal amount of vacuum energy. However, the boundaryless universe proposed by Hawking suggests that the most probable point for the beginning of the universe is the one where the universe with the maximal size contains the minimal amount of vacuum energy. The debate between the two approaches can be solved with regard to theoretical considerations in quantum gravity rather than by empirical data.

2. Examining the physicists' views

2.1. The beginning of universe from modern cosmological perspective

As seen above, in modern cosmology no definite idea of the beginning of universe is presented. The ideas proposed to eliminate singularity is merely a mathematical model in mind that is

¹ Vilenkin and Perlov, *Cosmology*, 336

constructed to describe the observed phenomena. As Carroll puts it, many scholars have expressed their ideas over the extent to which each type of model contributes to a better understanding of the issues; however, there is no agreement on which model simultaneously provides a better theoretical perspective and the best data obtained.

In this vogue, if we are to examine the emanation of universe based on the ontological premise that any assumption of the beginning would necessitate the effect caused by a creator, the physicists like Vilenkin do not even believe that even a beginning would not entail a Primary cause.¹ The reasons against the existence of God based on absence of the beginning cannot be supported. They have largely misunderstood the theistic idea disregarding the cosmological accounts. Conversely, the reasonings using cosmological views to prove the existence of God based on emanation of universe are far from conclusive and are therefore loosely justified. It can be argued that in physics there is not a definite and clear answer to the question of how the universe began. Differences in answers grow out of differences in assumptions that are for the most part metaphysical in nature and rooted in the idiosyncratic inference.²

Vilenkin believes that physics can account for the development of universe from the earliest state; nevertheless, there are fundamental questions concerning the initial state of the universe and everyone can claim an origin, but who can say these claims are true or false. These questions are considered philosophical and explaining and interpreting them is a waste of time³

2.2. A critique of the how of the beginning of universe from nothing

In general, the first and the most straightforward criticism targeted at the physical models is that they are based on mathematical and statistical assumptions, and so they are not definite. As mentioned earlier, a wide range of differences are seen among physicists over the basic concepts. As for the theologically-oriented critique of the models of beginning out of nothing, Dress delineates that “my reasoning is that neither Hawking’s view nor that of Vilenkin bear the pure sense of ‘emerging out of nothing’. Today, boundary-free view of cosmos by Hawking can serve as model with a limited validity for the reflection of creation from nothing, and is not seen as an end point. Rather it is seen as an ongoing contemplation and theorizing. Also, creation from nothing has two components: creation and origin of the initial creation (*ebdaa*) and dependence in every single moment (constant creation). Deism, on the whole, focuses on the former, that is the role of God in the initial creation. On the other hand, many modern cosmologists emphasize the structural dependence in all moments. Consequently, if creation out of nothing is interpreted as the dependence of creation and the active role of God (constant creation) to perpetuate the

¹ Vilenkin, William. "The Beginning of the Universe." *Inference: International Review of Science* 1, no. 4 (2015). <https://inference-review.com/article>.

² Drees, *Beyond the Big Bang*, 160

³ Vilenkin, *Many Worlds*, 10

process of creating rather than considering the initial act of emanation, the theological view is more in line with the cosmological proposition. From a religious point of view, theism yields better results than deism.”¹

Barbour, too, who is a scholar in religion and science studies believes that ‘creation out of nothing’ must be replaced by ‘constant creation’ since the essence of creation is not actually about the beginning of creation, but rather it is about the universe and the creator.² Thus, the universe is the product of the creational, novel and constant act of God which is free and fully volitional.

To sum up this section, one can say that empirical science and particularly quantum cosmology lack the necessary means and potentials for formulating a supernatural proposition (whether to support or refute). More clearly, human science is not and will not be able to reach out beyond the universe and make claims about the creator. This is because the scope and territory of science is nature and deals with rules and principles that govern the phenomena within the natural scope. Additionally, physics is an experimental and inductive science that cannot claim to have included all the data associated with the physical entities. Particularly at the beginning of creation where absence of simulation and replicability would reduce all models to speculation and probabilities. This suggests that the existence of creator is not based on cosmological evidence, and without using modern scientific means, or adequate rational bases, scientists embark upon philosophical reasoning or intuitive arguments.

Concerning the status of science in monotheistic worldview, one can say that for a theist scientist attempts to explain the quality and stages of creation as Almighty's act. For him, explaining nature is equated with this particular act; on the contrary for atheists, science merely accounts for the laws of nature. Therefore, whether emanated out of nothing, prime matter, or energy, the challenge would be to deem the universe independent of a creator, but rather it has accidentally emerged out of quantum tunnelling. Vilenkin himself as the one who initiated the question of creator of universe does not at all attribute the laws to nothing the appreciation of which turn into a deeply mysterious concept. He explicitly concedes where and how these rules are coded before the universe and accordingly space and time exist. He hopes that these mysteries could be solved along with the expansion in the scope of science and knowledge. Similarly, Richard Feynman a key figure in quantum physics who modestly confesses that whatever occurs beyond classical physics is out of capability of science. Also, Drees (1990) maintains that what lies outside rational or intuitive metaphysical concepts can be treated

¹ Drees, *Beyond the Big Bang*, 70- 75

² Mehdi, Golshani, *Science and Religion in the Horizon of Monotheistic Worldview*. (Tehran: Khajeh Nasir al-Din Tusi Industrial University, 2019), 148.

agnostically rather than dismissing it all together. Here the advice by Avicenna seems relevant who advises us to assign what seems strange to possibility.

3. Philosophical View on The Beginning of The Universe

Outstanding philosophers in the world of Christianity and Judaism have concentrated on the beginning of the universe. Unlike Greek philosophers, Saint Augustine and Thomas Aquinas believed that the universe was contingent and that it did not exist prior to creation by the acting creator and by nothing they meant dependence of the entire existence on the Deity.

The problem of universe creation among the Muslim philosophers has been manifest in the polarized debate between contingency and eternity. For instance, following the Plotinus's emanation, Muslim scholars have portrayed the universe as temporal eternal light beams radiated from the sun. Ever since Abu Nasr Muhammad al-Farabi, this issue has been a central one in Islamic philosophy that has stimulated a bulky literature. However, what is of significance in our times, especially in the light of comparative discussion in physics and philosophy, is the inquiry about the content matter from which universe was developed. Allameh Tabatabaiee in his book *Nahayat ul Hikmah* states that if matter can be converted into energy, and also assuming that the first creation is energy and not prime matter, one may come up with fruitful results.¹

4. Theological Perspective of How the Universe Began

Western divinity scholars' attempts to adapt and coordinate Christian teachings on universe creation with Big Bang model have been remarkable. For instance, McMouline believes that Christian ideas of creation grow out of revelation and belief on the one hand and knowledge and rationality on the other. To put it differently, theology has to start with the point after big bang but account for it using the current state of knowledge².

When examining all the religions, one can see that the creation of universe is interconnected with God's action. In canonical religious texts, the belief in the creation of universe is a necessary prerequisite for theism. Robert John Russell, in this respect, delineates that whether the origin is that of quantum or an absolute beginning 15 billion years ago, does not seem to be self-contained. Also, the ultimate explanation of why every creature doesn't imply its entire actualization shows that all the created need to have a creator.³

¹ Mohsen, Fakhri Zadeh, et al. *Islamic Philosophy and Physics*. Series of Philosophy and Physics Meetings, supervised by Abd al-Hossein Khosrowpanah and organized by Mahdi Ashouri. (Tehran: Islamic Azad University, 2021), 363- 365.

² Drees, *Beyond the Big Bang*, 27

³ Richard, Russell, "Cosmology from Alpha to Omega." *Zygon: Journal of Religion and Science* 4 (1994), 563.

Although in interdisciplinary Cristian theological studies, one may encounter modern concerns with creation out of nothing, classical Muslim philosophers often touched upon the beginning of universe within the framework of temporal contingency. With a closer scrutiny in first-order Shiite texts, Quranic evidence, and quoted evidence of Imams alongside the scientific findings can be quite enlightening.

4.1. Quranic Evidence for The Creation of Universe

The words 'khalq', 'fatara', 'hadath', and 'badi' are the words that serve as textual indices for the beginning of universe as a God's act. For instance,

بَدِيعُ السَّمَوَاتِ وَالْأَرْضِ أَنَّى يَكُونُ لَهُ وَلَدٌ وَلَمْ تَكُنْ لَهُ صَاحِبَةٌ وَخَلَقَ كُلَّ شَيْءٍ وَهُوَ بِكُلِّ شَيْءٍ عَلِيمٌ

[He is] Originator of the heavens and the earth. How could He have a son when He does not have a companion [i.e., wife] and He created all things? And He is, of all things, Knowing.

The word 'badi' semantically refers to creation of start of things not based on an earlier pattern. This textual evidence based on this lexical evidence is temporal contingency and its dependence on earlier non-existence. In fact, 'ebdaa' means the creation that did not exist in before the prerequisite for material cause or superficial evidence having been available. *Ebdaa* means making a phenomenon that used to be nothing, and not out of early matter and no stretch of time.¹

Another verse from Quran which indicates the creation in absence of a prior pattern is:

هُوَ اللَّهُ الْخَالِقُ الْبَارِئُ الْمُصَوِّرُ لَهُ الْأَسْمَاءُ الْحُسْنَى يُسَبِّحُ لَهُ مَا فِي السَّمَاوَاتِ وَالْأَرْضِ وَهُوَ الْعَزِيزُ الْحَكِيمُ.

He is Allah, the Creator, the Maker, and the Former. To Him belong the Best Names. Whatever there is in the heavens and the earth glorifies Him and He is the All-mighty, the All-wise.

'Al-bare' is defined by lexicologists as the creator without any prior design.

4.2. The Textual and Quoted Evidence and Creation of Universe

Muslim theologians believe that God has created the universe as an active agent which can be explained in three ways: creation out of something, creation out of nothing, and creation out of something totally new and unknown. The first type (i.e., creation from something) divides into two sub-types: a) thing as eternal matter, and b) thing as a changing phenomenon regarding the creator.

As for thing as eternal matter, there are two major views, namely Platonic view and pre-Socratic view. The former endorses the creator's volition to shape the universe out of the ideal

¹ Mohammad, Soltani Renani, "Conceptual and Logical Analysis of the Hadith 'La Min Shay'in' Regarding Divine Creation." *Studies in Quran and Hadith* 11(2018), 183- 184.

(in Plato's views). The latter is in line with the ideas of Thales, Anaximander, and Anaximenes who stated that the prime matter was what the universe was made of without necessarily supporting the idea of an acting creator. Those who subscribe with the latter are neo-platonic.

The problem with the former view is that it leads up to non-creational nature of matter which is not only dismissed in monotheistic religions but also rationally unacceptable. This is because the being of anything possible to exist in philosophy and contingent in theology necessitates an acting agent of creation.

The second type, namely creation from nothing' such that it means God created everything from 'nothing' has something in common with the first type. In fact, this view resembles the earlier one in that it assigns a creating agent with the difference being that the subject of creation is not something; it is nothing. This view is also fallacious in that it is impossible to change nothing into something. Therefore, creation from 'nothing' in Jowshan Kabir suggests that creating does not involve any raw material from which it is made whether it is God or prime matter.

The idea of 'out of nothing' is superficially similar to that of some physicists who assign the origin to the vibrations of quantum vacuum, is different; nevertheless, vacuum is widely different from nothing because energy density, tension and interaction in fields and particles are all present, but it is referred to as nothing just by way of habit or descriptive convenience.

One can say that asking the question, 'What did God create the universe out of' is misguided since the expression 'out of' would be relevant in other creatures who need to make something out of something else, and not the Deity.

When one sets aside the first two options, the third possibility is creation out of something totally new or unprecedented, or *'creato ex nihilo'* which is used by Christian and Jewish theologians. According to this view, the Deity based on his full volitional power, creates the world without any material prime matter, or earlier pattern. It must be remembered that in Abrahamic religions, the concept of 'out of something totally new' is a well-established view. In Christian theology, the verb 'bara' occurs in the Bible for the early creation and is not used as a transitive verb. The first expression, therefore, is God created rather than God existed, which implies that God's being is presumed.¹

Textual evidence concerning 'creation out of something totally unprecedented' corresponds with *'ibtadaa'* as in Fadak sermon² and Imam Ali's sermons during the battle with Maawiah³.

¹ Drees, *Beyond the Big Bang*, 256- 257

² Abu al-Fadl Ahmad Ibn Abi Tahir Tayfur. *The Eloquence of Women*. (Al-Haidariyah Library, 1999), 27

³ Kulayni, Muhammad ibn Ya'qub. *Al-Kafi (Islamic Edition)*. Vol. 1. Translated by Ghafari Ali Akbar and Akhundi Muhammad. (Tehran: Islamic Book House, 2023), 136-137.

In the two texts, 'ibtadaa' denotes what is created except the Deity. For further conceptualization, and rational and textual evidence¹

The concept of *ibtidaa* which suggests creating independent of time, space and earlier ingredient that are based on Quranic and textual evidence is compatible with Vilenkin's creation out of nothing and lays emphasis on the solitary essence of creator in eternity. To put it differently, the Deity without any need as to any matter, has made the universe existent with his volitional power such that it was an absolute and extensive nothing and had introduced the phenomenon into being, neither out of nothing or something. This type of creation is innovation or invention²

5. Vilenkin's Approach to Independence of Acting Agent in Creation Out of Nothing

As was already seen, the compatibility of theological and cosmological accounts over the concept of nothing, Vilenkin still claims that no acting creator is necessitated for the beginning of universe, and just like a nuclear atomic fission is entirely accidental occurrence.³ Therefore, it would be appropriate to take a second look at causality with the advent of quantum mechanics. As the author intends to make a bridge between science and philosophy, and each historical era has its state-of-the-art conceptualizations, it seems necessary to refresh our understanding of the notion of causality. In this way, misinterpretations and misconceptions can be eliminated.

5.1. Causality, Probability, and Chance

With the development of modern cosmology, quantum mechanics and Einstein's relativity theory upon which modern physics is founded enabled the physicists to theorize on causality of the phenomena in the world employing criteria and empirical premises. An instance of such theorizations is the spontaneous creation of universe out of nothing according to which it is argued to have begun without any necessity for the acting creator, that is accidentally. In this way, accident or happening which is also known as probability or chance and is posed against causality. This of course doesn't mean creating without awareness or knowledge, not even making without goal or purpose, but what Muslim theologians take interest in is the issue of creation without a creator.⁴ The focus here is therefore on skepticism and agnosticism which relativism and indeterminism in Copernican sense propagates in order to reject the agency.

The question is whether the intention of the ones who assume no necessity for creator in quantum beginning is causality or is for dismissing Newtonian physics? When it is claimed that

¹ Reza, Baranjkar, and Mahdi, Nasratiyan Ahur, *Theological Rules (Tawhid)*. (Qom: Dar al-Hekmat Cultural Institute, 2017), 167- 199.

² Soltani Renani, "Conceptual and Logical, 183-184

³ Vilenkin and Perlov, *Cosmology*, 340

⁴ Morteza, Motahhari, *Introduction to Islamic Sciences*, (Tehran: Sadra Publications, undated), 188.

causality is contradicted, one must think of the possibility of modifying causality premise to comply with quantum physics, or on the other present a new reading of quantum physics so that it cannot defy causality¹.

5.2. Ontology of The Laws of Nature

Vilenkin assigns the beginning of universe to no metaphysical cause based on a mathematical quantum tunnelling out of nothing or other physics laws that are associated with subsequent developments. From this point of view, if the tunneled universe is accounted for by the laws, it seems that the laws must be more fundamental than the universe per se. According to Vilenkin, it is possible to be mathematically minded and prove that physics laws are applicable irrespective of time and space, which is so much like the belief of theists who believe in a cause beyond laws or perhaps the basic laws of space and time.²

In explicating the origin of laws, other outstanding scientists such as Kepler, Copernicus, Descartes, and Newton believe that laws are made by the Deity. However, Hawking states that introducing the concept of God doubles the mystery by changing one puzzle with another. And such an answer is no more than the concept of the Deity as a realization of the laws of nature. In his view, understanding the Deity's mind is equivalent to understanding the nature. Hawking speculates that towards the end of the century, we will understand the Deity's mind³. By attaching importance to the role of scientific laws that govern the beginning of universe, Hawking believes that some Gods that set the universe in motion in its location.⁴

Also, in his latest expression of views, he raises a question and complacently offers an answer, "Is there a way that universe has begun with the Deity's choice with the laws that we don't understand or it is determined by the laws of nature? I believe in the latter. If you like it, you may refer to the nature laws as the laws of Almighty, he will not be a personal one. If you meet such an Almighty, I would want to ask him whether he has thought of the complexity of M theory in 11 dimensions?"⁵

Even in Hawking's view, the order in nature and the delicate adjustment of nature's constants cannot bear the evidence to support the existence of a smart designer, but instead confirms the fact that constant scientific laws govern them⁶. Interestingly enough, he initially raises the origin

¹ Motahhari, *Introduction*, 78

² Vilenkin and Perlov, *Cosmology*, 340

³ Stephen, Hawking, *Brief Answers to the Big Questions*. (New York: Bantam Books, 2018), 30.

⁴ Stephen, Hawking, *A Brief History of Time: From the Big Bang to Black Holes*. (London: Bantam Press, 1988), 94.

⁵ Hawking, *Brief Answers*, 35-36

⁶ Stephen, Hawking, *The Grand Design*. (New York: Bantam Press, 2010), 259.

of laws and who applies them, however, he considers the answer to question plausible within a merely scientific scope. Hawking, as an instance, exemplifies John Conway's game of life in which a set of laws that govern the universe upon the initial formation are able to predict future.¹

5.3. Causality and Causality in Quantum Mechanics

Before moving on to critique the physical bases, one must bear in mind that the causality must not be confused with philosophical outcomes such as determinism and quantum uncertainty. Even Copernican version of quantum mechanics offers us the proposition that determinism denotes predictability and not the application of cause-and-effect relation in the nature. Sequentially, which means a chain of linear and consecutive causes that can be obtained just by senses, but causality is proved neither by senses nor by experience, and most of causal relations are non-linear. Therefore, contrary to the fallacious expectations, rejecting the causality in quantum, one may argue that only causal determinism means predictability and knowledge of the future of the system with precision and accepting the current status is typical of classical physics. However, when this is seen against the background of Copernican quantum, the predictability in subatomic universe is contradicted. Therefore, lack of certainty does not mean the rejection of causality, but rather it suggests absence of predictable relations at subatomic level which may on the other hand imply causality.²

Another important critique targeted at those who reject causality in quantum physics such that uncertainty in quantum phenomena associated with some physicists such as Bour, Heisenberg, Dirac who were just too much enthusiastic to do away with some traditions, whereas other physicists looked at the issue from a causal point of view.³ Additionally, there are other substitutive conceptualizations that contribute to determinacy as it is such as Bohemian quantum mechanics that seeks to offer a configuration of a theory which justifies quantum theory drawing on implicit or hidden variables while not rejecting or ignoring causal determinism. Renowned physicists such as Fineman and Dirak that played a substantial role in the development of quantum mechanics hoped that the rival theoretical accounts that had been marginalized could replace in order to solve the philosophical problems.⁴ Yet another concept of importance here is what Overt interpretation subscribe to, that is the multiverse position in answering the question: "How can one explain accidental phenomena such as accidental decay of radiating nucleic atoms using deterministic equations in quantum physics?"

¹ Hawking, *The Grand*, 266-268

² Fakhri Zadeh, et al. *Islamic Philosophy*, 191

³ Fakhri Zadeh, et al. *Islamic Philosophy*, 472

⁴ Fakhri Zadeh, et al. *Islamic Philosophy*, 332

5.4. A Critique of The Foundations of Independence of a Cause

For the critique of the physics laws and their role in casual nature of universe phenomena one can say that the laws of nature can show us how the phenomena in the universe behave rather than why there are things that couldn't have existed. Why this particular system and not anything else? And who has made these choices?

Bruce L. Gordon highlighting the philosophical and religious assumptions in scientific research states that” the nature of mathematical physics needs a deep and serious reflection and revision. The question raised by Stephen Hawking concerning “what fands the flames of equations and shapes the world in a way that one can answer them using such mathematical reasonings such that they can be accounted for using them?” requires a real answer. Logically, mathematical descriptions cannot act as effective cause (whether physical or material). They are neutral in terms of cause. When cosmology identifies the material world as a moving process from one vacuum state into another or from absolutely nothing into existence, no mathematical system can offer an account let alone be an effective cause for these occurrences. The belief that a mathematically-based account shows that the universe does have a cause but is independent of it looks fallacious because it is not ensued from the same accounts, and is a metaphysical inference of the individual rather than ensuring from essential mathematical laws.¹

Those physicists who reduce everything into a mathematical logical proposition and consider it a truth must note that neither calculation accuracy nor using speculative physical models can acceptably explain the natural phenomena. That the scholars in empirical science rely so heavily on mathematical models that are based in probability can be attributed to the fact that they expect science to bear utilitarian fruits and not cast light on the issues of universe. The epistemological challenge of agnosticism grows out of the quantum physicists' intention to reach the ultimate answers using mathematical models.

Vilenkin himself acknowledges that the mathematical laws are so much inadequate and merely the brainchild of the humans that are an approximation of reality and not the reality itself. Even the mathematicians confess that their task is discovery and not invention. Cosmologists devote the biggest share of their attention to observing and the observable segment of the universe, and the rest is left to the philosophers to contemplate on what falsehood lies beyond that.²

Instead of positing that the role of the Deity analyzing contradicts mathematical laws, a good idea is to recall Galileo's words: “God wrote the book of nature in the language of math.”

¹ Robert, Spitzer. *A New Look at the Proof of God's Existence in Contemporary Physics and Philosophy*. Translated by Maytham Tavakoli Bina. (Tehran: Parsig, 2020), 128.

² Vilenkin, *Many Worlds*,5

Finally, in analyzing the quantum beginning of the universe as a radioactive atomic decay one may say that the Russian empirical physicist, Gamov, who explained radioactive decay for the first time using quantum tunnelling, in the introduction to his book 'Creation of Universe' indicates that among the scholars in the past the beginning of the universe was necessarily a divine action. Therefore, only the ones who fail to appreciate the nature of creation, and do not manage to characterize the phenomenon that is not subject to our experimentation proceed to claim that universe was made by accident. The fallacious idea of these materialist thinkers is that the ensuing point is deemed an empirical source. Since the experience-based ingredients (as premises) are inadequate, limited, imprecise and by far inaccessible and informationally fragmentary, they have treated causality with skepticism¹

Conclusion

This paper addressed problematization of the relationship between religious faith and modern physics, and 'beginning of universe out of nothing' as one among many issues that are relevant in the interdisciplinary concerns. At first, the foundations of cosmological models, the origin of the initial shape of the universe out of quantum vacuum through tunnelling are explained so that theological misunderstandings from philosophical inferences of some physicists can be sorted out. This could be one attempt to approach the issue as the edge of science. One may consequently argue that philosophical answers to basic questions that arise in their field is not concerned with the science of physics by virtue of being outside the scope of experimentation. They must instead be examined from metaphysical perspective. In other words, physics describes and explains the phenomena after creation, and has no justification for the starting point and the state prior to that since there is no 'thing' in terms of physics to experience; there is only the Deity and as soon as the volitional action of him is initiated, the universe begins to exist.

Having explored the issues that seem to overlap in philosophy and theology, we may conclude that the universe can be discovered and explained by science and theological accounts are accounted for metaphysically that prevent us from false claims, overestimations, exaggerations, etc. Therefore, creation from the unprecedented which is compliant with quantum tunneling justification (i.e. beginning in absence of matter, space and time) safeguards us against the mistaken view of creation without a cause (acting creator). The latter awareness emphasizes the infinite might of the creator that is capable of making anything out of what did not exist a priori.

As the turning point in the creation and beginning of universe amounts to challenging the very existence of the Deity as the prime cause, the paper discussed the concept of causality.

¹ Muhammad Baqir, Sadr, *Our Philosophy*. Translated by Seyyed Muhammad Hassan Marashi. (Tehran: Sadra Publications, 2000), 499- 507.

Contrary to the position in classical philosophy where God is assumed to be the prime cause, the quantum model of creation out of nothing maintains that the universe has started as an accidental occurrence (not requiring creator's act) such as atomic decay. It must be remembered that following Pauli exclusion principle in quantum mechanics, analysis of a component cannot be generalizable to the whole system and subatomic effects on a quantum scale cannot be responsible for great structures in the universe.

Such a philosophical inference was based on the premise that modern-day cosmology accounts for the universe based on phenomena or mathematical modelling, whereas physics laws such as quantum tunneling is not capable of offering a cause-and-effect relationship to such questions. As a result, they can never replace the belief in the prime cause of the universe. Additionally, causality as a rational principle is independent of experience. On the whole, the physical inference and its methods must undergo changes so that instead of a static stance it can be promoted and enhanced for compatibility with causality.

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