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Theoretical Research Article

If God exists eternally and creates at least one universe, then he creates an infinite number universes

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ABSTRACT

According to many religions, God has created the world, i.e., he has created our universe. The universes, that God creates, we will call local universes.

Under Universe we will understand everything, i.e., all matter and energy that has existed, exists and will exist and outside of the universe there is nothing.

The principal result of the present paper is as follows: if God exists eternally and creates at least one universe, then he creates an infinite number of local universes and the initial moments of these local universes are unbounded from below and from above on the time axis. The union of these local universes is the whole universe (Theorem 2.2).

The above stated result is an addition to the basic situations about the creation of the world according to Roman Catholicism, Christianity and other religions.

Furthermore, in the paper a review is done of some results in relation with the three fundamental open questions of cosmology of the universe as a whole, namely:

1) does time of the universe have a beginning,

2) is the universe infinite or not and

3) origin and development of the universe as a whole and not of its separate regions.

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1. Introduction

In this article we will prove, that if God exists eternally and creates at least one universe, then he creates an infinite number of local universes (Theorem 2.2).

Furthermore, we consider the following basic open questions in cosmology of the universe as a whole:

(i) does the universe have a beginning in time;

(ii) is the universe infinite or finite and

(iii) origin and development of the universe as a whole and not of its individual regions.

In articles [5, 6] it is automatically assumed, that the time of the universe does not have a beginning and is proved, that

(i) consciousness and the perfection of consciousness of the universe have no beginning and no end in time, primacy of matter is not absolute and is relative in regard to its forms of motion (the primacy of matter is relative only to the genesis) and

(ii) the universe is cyclic.

We will note, that a) the results (i) and (ii) are the first in this direction and b) the forms of motion of matter are mechanical, physical, chemical, biological and social.

Besides the result (ii) for a cyclic universe has been proved five times: the first time in [5], the second time in [6], the third time in [7, Corollary 2.3], where the correction of the Big Bang theory is used, the fourth time again in [7, Theorem 3.2], where the proof is independent of the Big Bang theory and the fifth time in [8, Corollary 2.5].

The basic question whether the universe has a beginning in time or not is not resolved in philosophy and physics. This question is considered from a physical and philosophical viewpoint." Concerning the existence of the universe there are two main physical and philosophical models that contradict each other: a model where the universe has no beginning in time and where it undergoes an infinite number of expansions and contractions in the past and the future and a model in which the universe has a beginning in time.

In the first case the universe is called cyclic. The above two models relate to the concept of infinity, which complicates the

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question of their validity. Namely, in view of the realized infinity in time of the universe we do not yet have perfect physical and philosophical models either for the beginning of the universe in time or for a negation of this beginning. In this regard we will note the following.

"The concept of infinity has been used widely in mathematics. We cannot imagine the existence of that science without the use of this concept, notwithstanding the unique maxim of the German mathematician Dawid Hilbert, according to whom no concept in mathematics needs more precision in defining it as the concept an infinity" [6]. This applies also to physics and philosophy, which use the concept of infinity as well. In particular the existing physical and philosophical models for a universe without a beginning in time and for a universe with a beginning in time do not supply a final solution to the problem.

We also note the following. According to the theoretical physicists P. Steinhardt and N. Turok" It appears that we now have two distinct possibilities: a universe with a definitive beginning and a universe that is made and remade forever. The ultimate arbiter will be Nature" [12]. *In this way P. Steinhardt and N. Turok acknowledge in fact, that the physical and the philosophical models stating that the universe has a beginning in time or that the universe has no beginning in time are hypotheses. Given the above statement we note explicitly that Nature cannot be an arbiter for which one of the last two opposite assertions is true." [7]*

Here we mention, that *in [7], Proposition 2.1, we prove, that the universe is eternal, that is, the Universe does not have a beginning in time. This is an answer of the first basic open question in cosmology of the universe as a whole, namely whether the time of the universe has a beginning or not.*

By states of the universe we understand, for example, expansion, contraction, cycle, consciousness, big bang, different types of death such as heat death, great freeze, great void, false vacuum, great rupture, great rift and others.

In [8] we prove, that

(i) the universe is infinite [Theorem 2.2] and

(ii) if in its eternal existence the infinite universe obtains some state (some death), then it receives this state (this death) an infinite number of times and the initial moments of these states (these deaths) are unbounded from below and from above on the time axis. [Theorem 2.3 and Corollary 2.4].

Result (i) is an answer to the second basic open question in cosmology of the universe as a whole, namely whether the universe is finite or not.

Result (ii) implies the following previously mentioned results: (a) consciousness and the perfection of consciousness of the universe have no beginning and no end in time [5,6], (b) the universe is cyclic [5,6,7,8] and (c) if the universe has had a Big Bang, then it has had an infinite number of Big Bangs [7,8].

We will mention some physical and philosophical models. A. Einstein in the 1920s proposed a physical model for a future cyclic universe as an alternative to the expanding universe model. However, R. Tolman in 1934 [15] renounces this model.

The Bulgarian physicist A. Polikarov offered a physical and philosophical model for a stationary universe, i.e., a universe that is unchanging in its entirety [11].

In the beginning of the 21-century new cyclic physical models are created, linked with the dark energy and dark matter of the universe. Such models, based on the string theory, are the model of P. Steinhardt and N. Turok [12, 13], as well as the model of L. Baum and P. Frampton [1, 2], which utilizes the phantom energy of the universe.

The English physicist Penrose created the conformal cyclic cosmology model [9], [10]. In that model the existence of the universe occurs in endless cycles called zones. With the completion of one cycle, a Big Bang takes place and a new cycle begins. Gurzadyan and Penrose extend this model [3]. We should note, that in 2020 Penrose received the joint Nobel Prize in Physics along with Reinhard Gentzel and Andrea Ghez for their work on the theory of black holes in the universe.

In [6] we make a strict mathematical interpretation of the statements in [5], since the results of [5] about a cyclic universe and about the infinite repetition of consciousness and perfect consciousness of the universe remain unanswered and without discussion.

There are many physical models in which the universe has a beginning in time. We will not consider them in details and we shall mention only the model of A. Mithani and A. Vilenkin [4].

According to the Big Bang theory the universe arises 13,7-13,8 billion years ago from an extremely small, dense and hot fireball by a unique Big Bang and the initial inflation continues until now.

If we accept the original Big Bang theory, then we prove in [7], using the axiomatic method, that

(i) an infinite number of Big Bangs have existed in the past and will exist

in the future (Theorem 2.2) and

(ii) that the universe is cyclic (Corollary 2.3).

Besides we prove directly also in [7], using the axiomatic method, that the universe is cyclic without assuming that the universe has had a Big Bang (Theorem 3.2).

The statement (i) is a negation and a correction of the original Big Bang theory, according to which the universe possesses only one Big Bang.

Recently physical models were created for parallel universes, for example Tegmark [14], that is for universes, which have no intersection with each other and for a mega-universe.

The concept for a mega-universe appears lately together with parallel, old and new universes. The concepts for parallel and other universes and also for a mega-universe, are admissible from a physical viewpoint. However, they contradict the general concept for a universe: the universe is the whole matter and energy which has existed, exists and will exist.

Here we must note, that all "parallel and other universes", if they exist, are a part of the whole universe.

We do not use the concept of a parallel universe and of a mega-universe and we keep the traditional concept of a universe instead of a mega-universe.

We will make two important clarifications:

1) The universe is everything, i.e. all matter and energy that has existed, exists and will exist and that outside the universe there is nothing.

2) Here, as in works [5-8], we do not consider the physical nature and laws of separate parts of the universe but we consider the universe as a whole from a purely mathematical point of view.

2. If God exists eternally and creates at least one universe, then he creates an infinite number of local universes

In this section we will use the fact that the Universe is a closed material system.

We will note that according to physics the following definition holds.

Definition 1. *A material system is called closed if nothing can enter into it and nothing can go out of.*

Definition 2. *The universes, which God creates, we call local universes.*

All local universes, which God creates, may have or may not have an intersection with each other. The creation of an infinite number of local universes is a process that takes place within the universe as a whole. Therefore, at this creation, the universe remains a closed material system.

"As we noted, there are two unproven basic physical and philosophical models of the universe that contradict each other: a model in which the universe has a beginning in time and a model with no beginning in time. Common sense dictates, that the second model is true. This implies that there is a single infinite axis of time for the universe" [7].

In [7], a proposition, which establishes this fact is proved, i.e., that the second model applies. It uses the law of the preservation of the energy: namely, the total energy of any closed material system is a constant with respect to time. For the proof of this proposition, we will use specification 1) of the introduction, namely that the universe is everything, that is, all matter and energy that has existed, exists and will exist, and that outside the universe there is nothing.

We will note again that all parallel and other universes, if they exist, are part of the whole universe.

Proposition 2.1. [7] The universe is eternal and for it there exists an infinite time axis $(-\infty, +\infty)$.

Proof. The law of the preservation of energy applies for every closed material system. This law can be applied to the universe since there is nothing outside it, nothing can enter the universe and nothing can come out. Therefore, the universe as a whole is a closed material system and its total energy is a constant with respect to time. "This fact implies that the universe has existed forever and will exist forever. Therefore, there exists an infinite time axis $(-\infty, +\infty)$. The proposition is proved.

This result is an answer to the first basic open question in cosmology of the universe as a whole, namely whether the time of the universe has a beginning or not. From Proposition 2.1 it follows that the time of the universe had no beginning and that time has existed eternally along with the universe. The time axis referred to is called axis t. On this axis we shall plot distinct intervals either $(-\infty, t)$ or $(t, +\infty)$ of the existing of the universe, where t is a fixed moment on the axis t." [7].

According to Roman Catholicism and Christianity and other religions God exists eternally and creates the world, i.e., our universe. Therefore, we can accept the following axioms.

Axiom 2.1. God exists eternally, i.e., he exists in the interval $(-\infty, +\infty)$ on the time axis.

Axiom 2.2. In his eternal existence God creates at least one universe.

If we accept the indicated axioms, then we can prove the following basic result.

Theorem 2.2. If God exists eternally and creates at least one universe, then he creates an infinite number of local universes and the initial moments of these local universes are unbounded from below and from above on the time axis. The union of these local universes is the whole universe.

Proof. According to Proposition 2.1, an infinite time axis $(-\infty, +\infty)$ exists for the universe.

Let n be an arbitrary natural number. We will carry out the proof by induction with respect to n in two parts, namely that exist

1) an infinite strictly decreasing unbounded series $b_1, b_2, \dots, b_n, \dots$ and

2) an infinite strictly increasing unbounded series $d_1, d_2, \dots, d_n, \dots$ from the initial moments on the axis t of the local universes, which God creates.

At first, we will conduct the induction of the first mentioned series.

Let a_1 be an arbitrary moment in the universe's existence, i.e., a_1 is a point on the time axis t and $a_1 < -1$. Since in the interval $(-\infty, a_1)$ of the time axis t God has existed eternally, then, according to Axiom 2.2, in this interval God has created some local universe with an initial moment $b_1, b_1 < a_1$. Therefore, $b_1 < -1$. We note that the induction is done for $n = 1$.

Suppose that there exists a strictly decreasing sequence $a_1, a_2, \dots a_n$ on the time axis t, such that $a_i < -i, i = 1, 2, \dots n$ and God has created n local universes with initial moments $b_i, b_i < a_i, i = 1, 2, \dots n$. Therefore, $b_i < -i, i = 2, \dots, n, b_n < b_{n-1} < \cdots < b_2 < b_1$ holds and every moment $b_i, i = 1, \dots, n$, is an initial moment of the i-th local universe.

Let a_{n+1} be an arbitrary moment in the universe's existence, i.e., a_{n+1} is a point on the time axis t, $a_{n+1} < b_n$ and $a_{n+1} < -(n+1)$. Since in the interval $(-\infty, a_{n+1})$ of the time axis God has existed eternally, then, according to Axiom 2.2, in this interval God has created some local universe with starting moment $b_{n+1}, b_{n+1} < a_{n+1}$. Therefore, $b_{n+1} < -(n+1), b_{n+1} < b_n$ and the last local universe is different from the mentioned local universes, since for the initial moments $b_i, 1 \le i \le n+1$ of the created local universes $b_{n+1} < b_n < b_{n-1} < \cdots < b_2 < b_1$ holds.

We proved by an induction in the first mentioned part, that God has created an infinite number different local universes and the initial moments $b_1, b_2, \dots, b_n \dots$ of these local universes are unbounded from below in the time axis t, since for every initial moment b_n, where n is an arbitrary natural, $b_n < -n$ is fulfilled. For the completeness of the induction, we receive an infinite strictly decreasing sequence $a_1, a_2, \dots, a_n, \dots$ from moments which are also unbounded from below in the time axis t.

Let n be again an arbitrary natural. We will conduct the induction in the second mentioned series.

Let c_1 be again an arbitrary moment of the existence of the universe, that is c_1 is a point on the axis t and $c_1 > 1$. Since in the interval $(c_1, +\infty)$ on the time axis God exists eternally, then, by Axiom 2.2, in this interval God creates some local universe with an initial moment $d_1, d_1 > c_1$ of this local universe. Therefore, $d_1 > 1$. We note that the induction is done for $n = 1$.

Suppose that there exists a strictly increasing sequence $c_1, c_2, \dots, c_n$ of moments on the axis t, such that $c_i > i, i = 1, 2, \dots, n$ and God creates n local universes with initial moments $d_i, d_i > c_i, i = 1, 2, \dots n$. Therefore, $d_i > i, i = 2, \dots, n, d_n > d_{n-1} > \cdots > d_2 > d_1$ holds and every moment $d_i, i = 1, \dots, n$, is an initial moment of the i-th local universe.

Let c_{n+1} be an arbitrary moment of the existence of the universe, that is c_{n+1} is a point on the time axis t, $c_{n+1} > d_n$ and $c_{n+1} > n + 1$.

Since in the interval $(c_{n+1}, +\infty)$ on the time axis God exists eternally, then, by Axiom 2.2, in this interval God creates some local universe with an initial moment $d_{n+1} > c_{n+1}$. Therefore, $d_{n+1} > n + 1, d_{n+1} > d_n$ and the last local universe is different from the mentioned local universes, since for the initial moments $d_i, 1 \le i \le n + 1$, of the created local universes $d_{n+1} > d_n > d_{n-1} > \cdots > d_2 > d_1$ holds.

We proved by an induction in the second mentioned part, that God creates an infinite number different local universes and the initial moments $d_1, d_2, \dots, d_n, \dots$ of these universes are

unbounded from above in the time axis t, since for every initial moment d_n, where n is an arbitrary natural, $d_n > n$ is fulfilled.

For the completeness of the induction, we receive an infinite strictly increasing sequence $c_1, c_2, \ldots, c_n, \ldots$ from moments which are also unbounded from above in this axis.

We proved in general by an induction, that God creates an infinite number of local universes, which initial moments are unbounded from below and from above on the time axis.

Obviously, the union of these local universes is the whole universe. The theorem is proved.

Remark. We will note, that the part of Theorem 2.2 "the initial moments of these local universes are unbounded ... from above on the time axis" refers to the future.

The proved theorem is an addition of the basic situations for the creation of the world according to of Roman Catholicism, Christianity and others religions.

3. Conclusion

The principal result of the present paper is the following: if God exists eternally and creates at least one universe, then he creates an infinite number of local universes and the initial moments of these local universes are unbounded from below and from above on the time axis. The union of these local universes is the whole universe (Theorem 2.2). In conclusion we will mention only the results of papers [5-8], which have proofs for the origin and the development of the universe as a whole and not of its separate regions. We do not include the results of any physical and philosophical models, since, as we noted, they are without strict proofs and therefore, they are hypotheses. Besides in the papers [5-8] the following results are proved.

1) (i) consciousness and the perfection of consciousness of the universe have no beginning and no end in time, the primacy of matter is not absolute and is relative in regard to its forms of motion of the universe (the primacy of matter is relative only to the genesis [5, 6] and

(ii) the universe is cyclic [5, 6, 7 and 8, Corollary 2.5].

2) The universe is eternal [7]. We will note again, that this is an answer to the first basic open questions in cosmology, namely whether the time of the universe has a beginning or not.

3) The universe is infinite ([8], Theorem 2.2). This result is an answer to the second basic open question in cosmology, namely whether the universe is finite or not.

4) If in its eternal existence the infinite universe obtains some state (some death), then it receives this state (this death) countless times and the initial moments of these states (these deaths) are unbounded from below and from above on the time axis ([8], Theorem 2.3 and Corollary 2.4).

5) If the universe has had a Big Bang, then it has had and will have an infinite number of Big Bangs and the initial moments of these Big Bangs are unbounded from below and from above on the time axis [7, 8].

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