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The Problem of Creation of the World in Cosmology and Metamorphosis of Kantian Antinomies

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The paper gives a philosophical analysis of a famous attempt to model "creation" of the universe in modern cosmology. The Hawking model of quantum cosmology is analyzed with the reference to neo-Platonic and patristic sources, leading to the reformulation of the famous Kantian antinomial predicament on the temporal origin of the universe, in such a way that it transforms into the antinomy of the absolutely necessary being. The conclusion is made that cosmology cannot model creation of the world out of nothing, but can represent a model of differentiation between the intelligible and sensible realms in creation which accounts for the structural element of creatio ex nihilo. In this sense cosmological models are useful to refine and explicate further the epistemological limits arising in modeling of creation of the world.

Keywords: antinomies, cosmology, creation, difference, eternity, space, theology, time, universe.

Introduction

Modern cosmology attempts to predicate the universe in rubrics of the given laws of physics. In spite of the fact that cosmology does not account for the contingent facticity of these laws, it attempts to speculate about "creation" of the universe as if the contingent facticity of the material content of the universe as well as physical laws could be explained. In this paper we discuss one of such cosmological models proposed by Stephen Hawking subjecting it to a philosophical and theological critique. This critique arises from a perennial "negative certitude" of philosophy that the contingent facticity of the world cannot be explained and that any speculation in this respect leads to a theological stance that the ultimate foundation of the world originates in its otherness. The paper starts with a brief account of the Christian concept of creation of the world out of nothing and then a general predicament of any scientific attempt to "model" such a creation, referring to the first Kant's antinomy. Then the Hawking model is analyzed philosophically with the reference to neo-Platonic and patristic sources, leading to the reformulation of the antinomial predicament not in terms of the temporal origin of the universe, but in terms of the absolutely necessary being. Thus it is established that modern cosmology provides an interesting example of the metamorphosis of the

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Kantian antinomies, reflecting the encapsulation of the unity of the human cognitive faculties in the cosmological discourse.

Creation of the World in Theology

The Christian teaching on creation out of nothing, its doctrine of *creatio ex nihilo*, did not enter the cultural and spiritual environment of the ancient world in an empty background. The world-view asserted by Classical Hellenistic philosophy that the world exists necessarily, that is, there is no need for justification of the very fact of the existence of the world, had a deep impact. Greek thought could not cross this line of inquiry about the nature of things that was the foundation of all foundations in its philosophical meditation about the cosmos. The world, according to the Greeks, was permanent, unchangeable and, despite all internal movements, such as the origin and decay of things, the world as a whole was in a state of "eternal return"; its cosmology was cyclic. The endurance of the cosmos of the Greeks was ontologically necessary; the premise of its existence was an absolute fact, the last resort of all possible philosophizing.

The message of the Bible and the doctrine of *creatio ex nihilo*, which was developed by the Fathers of Christian church who challenged Greek philosophy and cosmology by affirming that the cosmos cannot be regarded as a self-explanatory being (May, 1994). Rather, it is dependent on the existence of God and hence cannot be described as eternal, for its dependence on God means that the world is different from God and that its mode of existence, being different from the divine, is *finite* in all possible senses of the word (for example, temporal): if God is infinite, then the world is finite. The world is created by God and in its matter is radically different from God.

The Christian message affirmed two fundamentals with respect to the relationship between God and the world: the world's radical contingency upon God, which implied that the laws established in the world are contingent and do not possess a status of an absolute necessity. This implied that the act of creation of the world by God out of nothing is a "free" act of God's willing kindness to the world and, because of God's freedom, the creation is not inherent in God's own being. This produces a twofold contingency: contingency on the side of the orders in the universe, which could not have existed at all, and contingency on the side of the God-Creator, who could not have created anything at all. As a accompanying result, the dualism of Classical Greek philosophy, in which there was a separation between the intelligible and the sensible worlds, was overcome: the whole universe, intelligible and sensible, heavenly and celestial, was regarded as creation, as penetrated through with a unitary rational order of a contingent kind, which can be studied only in accordance with its own nature and yet is able through the order and harmony in the cosmos to point to the creator.[1]

To summarize, Christian teaching on creation represents an immense shift from Greek philosophical monism toward an ontology of the created being, which has its own foundation in its *otherness*, that is, in God, whose mode of existence is ontologically distinct from that mode of existence of the created world. From a theological point of view, the concept of creation has sense as the concept of the relationship between God and the world, rather than about the world alone. This implies that if science (cosmology, for example) attempts to predicate about the creation of the universe, it can do so only from within the immanent aspects of the world, which are accessible to scientific investigation. This means that it is doubtful from the very beginning that science can provide a model of creation of the world out of nothing that could compete with or simply be leveled to that of the theological teaching about creation.

It would be a challenge for science to try to uncover the signs of the transcendent present in the world. This would mean that "creation in cosmology", understood discursively, could in principle refer to that aspect of the theological *creatio ex nihilo* that is associated with the hidden rationality of a contingent origin, the rationality that is inherent in God. This leads to the conclusion that the understanding of creation, if attempted from within science as a challenge to a theological view, should address not only the origination of the material universe, its evolution, and its sustenance but also the question of its rationality and purposive ability inherent in humans to communicate with the universe and to contemplate this rationality.

Cosmology can become an instrument which helps to reveal the features of necessity in the contingent facticity of the created universe, but in no way it can replace the doctrine of *creatio ex nihilo* for its objective is to explicate the world structure from the point of view of physics, that is as a-priori given set of efficient causality. The question about the very reasons for existence of elementary matter forms, as well as laws which govern it, cannot be addressed by cosmology because the laws which express the specific and concrete being of matter cannot enlighten the underlying causes of its very being. The laws of nature provide us with some tools of explicating the necessary feature of these laws, but they cannot address the issue of the facticity of these laws. The world is given and described in terms of some laws, but these laws cannot describe why this world is such as we have it, but not the other. The coming into existence of the universe and of its laws remains a subject of the theological teaching on *creatio ex nihilo*. Let us now illustrate this general intuition by considering one cosmological theory attempting to interpret "creation of the universe out of nothing".

Origin of the Universe: the Dichotomy between Cosmological Evolution and Initial Conditions as Explication of Kant's First Cosmological Antinomy

We should start by recalling that cosmology, being a part of classical physics, takes for granted that the description of physical processes in the universe is made in terms of space and time. Cosmology uses Einstein's General Relativity in order to model the spatio-temporal continuum of the universe (space and time are relational upon matter content, so that spatio-temporal dynamics in the universe is linked to matter). This implies that if cosmology were to attempt to explain the origin of space and time it would imply also an explanation of the origin of matter in the universe.

This presents a real challenge for cosmology, for this kind of explanation would definitely transcend physics. To explain the origination of matter and space time from "something" which is not matter and not space-time is probably an inconceivable task for physics, which is based on the classical concept of causation. In order to explain the origin of matter and space-time cosmology would have to model the transition from a philosophically understood "nothing" (no-thing in an absolute sense, not a physical vacuum) to something (fields, particles, space-time). This kind of modelling is an improper thing for cosmology to do; it rather demands a philosophical (or theological) logic, when the creation of matter and space-time would be expressed in terms of their relation to a transcendent source.

Correspondingly, in view of this general understanding, classical cosmology experiences difficulties when it attempts to speculate about the temporal origin of the visible cosmos. This problem is inherent for cosmology which affirms that the universe experiences expansion. Since the dynamics of this expansion is described by

the Einstein equations (for the universal scale factor a (radius of the universe) as a function of cosmological time t), the extrapolation of the solution of these equations backward in time leads inevitably to such a point where $t = 0$ and $\alpha = 0$. This point in the evolution of the universe is associated with the beginning of the universe, the point beyond which physics and cosmology can not proceed, for most of the classical concepts loose their sense[2].

If cosmological theory, by extrapolating the expansion of the universe backward in time, would predict that all physical matter and space-time disappears at the point of the 'beginning', then there would be a temptation to announce that the point of the beginning is the absolute *origin* of the universe in terms of both space and time, that is, no thing was before this point in terms of the cosmological time t. In reality, however, the situation is completely opposite, that is the values of all physical parameters (such as density of matter, curvature of space-time etc.) reach infinity at the point of beginning. It is because of this that the initial state of the classical universe is called the Big Bang, or cosmological singularity. Both matter and space-time experience extraordinary behavior at this point, which is hardly to be described by physics, and there is no ground to claim that there was *nothing* at the singularity; on the contrary since all physical quantities are infinite, that is, indefinite there, no particular specification of the initial state is possible at all, all hypotheses will be untestable.

The appearance of infinities in cosmology is inevitable if one assumes the classical forms of matter in the universe, such as radiation and dust.[3] Cosmology with classical forms of matter leads to a series of problems, which can be overcome if one invokes the presence in the universe of "non-classical" matter, such as quantum fields described in modern parlance either as *inflaton* (Φ), or 'cosmological "constant" Λ. In these models the dynamics of the universe is driven either by decaying inflaton Φ or cosmological "constant" Λ.[4] Formally inflationary cosmology succeeds in removing the singularity at $t = 0$ and placing it in the asymptotic limit $t \to -\infty$, so that the problem of the beginning of the universe is converted into the problem of its pre-existence in infinite time. The preexistent vacuum state decays in time driving the evolution of the universe to its present state. The only advantage of this model is that the average energy of the vacuum state, which is given by Λ, is finite at all times so that this cosmological model allows one to avoid a bizarre conclusion about the apocalyptic state of matter and geometry at the Big Bang. [5] It can clearly be seen that if one talks about "creation" of the universe in this case, this is the production of matter not out of nothing, but out of matter described either by Φ or by Λwhose pre-existence is postulated.

In both cases, that is of cosmology with classical matter or inflationary cosmology, physics fails to explain the nature of the initial condition for the equations which drive cosmological evolution. The dichotomy between the laws of dynamics and the initial conditions which fix a specific outcome of these laws acquires some unique features in cosmology. Since we can speculate on the nature of these conditions only from within our universe by extrapolating backward the properties of the observable universe, the 'knowledge' of the initial conditions thus achieved does not tell us anything about the genuine nature of these conditions, as if there were special physical laws responsible for these conditions, separated from us in the past and not being similar to laws of dynamics. Being bounded by the universe in which we live we cannot know the laws of the initial conditions of the universe; for this would require us to transcend beyond the universe, which is impossible.

The ideal variant for cosmologists wishing to describe the creation of matter in the universe would be to construct an initial state such that the total energy of matter would be equal zero and this requirement would be a meta-law, imposed on the matter of the universe in the pre-existent space and time. This kind of a model was offered by Tryon.[6] The major feature of this model is that the universe originates in *preexistent* space and time as a result of a fluctuation of the physical vacuum (a state of quantum matter in which the values of all observables are zero). Geometrically the development of the universe can be presented as a future light cone, whose apex is positioned completely arbitrary in preexistent space and time. This constitutes a philosophical difficulty with this model: it is impossible to specify and justify why the universe originated at a specific point of space and time. The spontaneous creation of the universe (as a result of a fluctuation) could occur anywhere and at any moment of time. This means in turn that the variety of different universes could originate at different locations of preexistent space-time, driving cosmology to face a serious problem of the mutual influence of different universes (See Fig. 1).

It is obvious that this kind of model has nothing to do with creation out of nothing in a theological sense, for space, time, quantum vacuum as well as physics behind the fluctuation, are all assumed to be pre-existent. It is rather reasonable to talk here about the *temporal origination* of the universe rather than about its creation out of nothing.

It is interesting to note that the first 'scientific' ideas on the origination of the universe in pre-existent space and time were proposed by Newton who intended to reconcile the Biblical account of creation, where the world had to have a beginning, with his view that time could have neither beginning nor end. Newton asserted that the visible universe was brought into existence by God in the past which is separated from us by finite time, but this took place within the absolute and infinite space and time. The creation of matter is detached in his model from the creation of time. We see here a fundamental difference from General Relativity, where space and time are relational upon matter and the split in origination of matter and time seems to be theoretically inconsistent. [7]

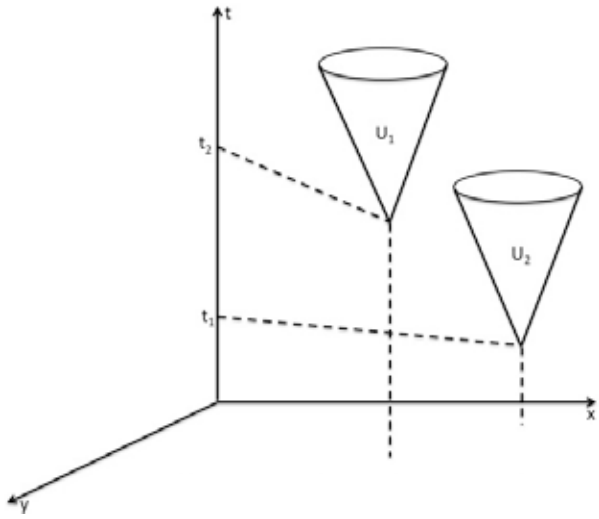

Fig. 1. Indeterminacy of "creation" of the universe in cosmology with preexistent spase and time

The logical difficulty with this kind of model is connected with our inability to locate the moment of time where the universe originated, from outside, by transcending beyond the universe itself, into its imaginable preexistent «before». We can argue about the beginning of time within the visible universe by extrapolating its expansion backward in time. But this will never allow us to claim scientifically that there either was or was not preexistent time «before» our universe came into existence.[8] This situation was described by Kant in his *Critique of Pure Reason* in the first cosmological antinomy (A 426-427/ B454-455 [ET: p. 396]):

> *Thesis*: The world has a beginning in time and is also limited as regards space;
>
> *Antithesis*: The world has no beginning and no limits in space; it is infinite as regards both time and space.

In modern terms, the thesis corresponds to the view that the universe as we know it is unique and the Big Bang is an absolute beginning of the universe, as well as time and space. There are no reasonable arguments about existence of anything beyond our universe and 'prior' to the Big Bang; the latter is the absolute beginning of being. Any attempt to speculate about the 'outside' and 'before' the universe, would be, in a spirit of the Kantian philosophy, an ambitious attempt of reason to depart from the empirical series of causation, corresponding to the visible universe, towards purely intelligible series which have different ontology in comparison with the physical universe.

The antithesis corresponds to the model of the universe with preexistent time and space, where the visible universe is one particular realisation of a potentially infinite number of existing universes, corresponding to different initial conditions at different moments of preexistent time. Because of the impossibility of locating the point of origination of our universe in the preexistent time and hence of making this point special, one cannot claim that there is no time and space beyond the visible universe. It can originate at any moment of preexistent time so that there could pass potentially infinite time before the visible universe came into being. All points of preexistent space and time are equivalent; space and time is uniform and infinite.

One can look at the same antinomy from a different perspective. For example, the thesis can be treated as the affirmation that the visible universe is unique, whereas the antithesis as the opposite, i.e. that the visible universe, being finite in terms of its temporal past, is one particular representative out of the ensemble of the universes with different boundary conditions, that is, at different moments of their origination in preexistent time. In this setting the antinomial nature of any propositions about the origination of the visible universe in preexistent time becomes evident: on the one hand we can not transcend our universe in order to assert scientifically that we are a part of the big ensemble of the universes; on the other hand nothing can stop us from making a Platonic-like assumption that there is the ensemble of the universes, which we cannot verify empirically, but which we can affirm as intelligible entities. In this case the whole meaning of the antinomy reveals itself as predication about two ontologically distinct realities, i.e. the empirical visible universe and the Platonic ensemble of the universes.

The presence of such an antinomy in cosmology with preexistent time points to the fundamental ontological *difference* (*diaphora*) between the empirical and intelligible, which is inevitably invoked by the reason when it tries to speculate about the origins of the world. The antinomy points towards the conceptual and ontological difference between the empirical time in the visible universe and Platonic- like time in

the preexistent, but rather conceptual universe. The attempt to explain the origination of the visible universe out of an ensemble of possible universes, can then be interpreted as a *conceptual* causation from the world of ideas to the empirical world. This indicates not the creation of the universe itself, but rather a special aspect of the created realm, its structural differentiation between the empirical and intelligible.

Thus one can draw a preliminary conclusion that all models of origination of the universe in pre-existent time will never explain the origination in empirical, scientific terms, rather they will indicate instead a problem of the dualism between the evolution of the observable universe (which follows the laws of dynamics, testable in principle) and its initial conditions (which are untestable in principle and which rather belong to the realm of metaphysics). One can refer to E. McMullin who commented that the spontaneous, uncaused origination of the universe, such as that proposed in the model of Tryon, can not be a "creation" in a proper sense, for the cause of creation, that is, a creator, (which must be outside of the chain of spatio-temporal events in the universe) can not be present in the physical theory. This means that the desire to justify "creation" in cosmology leads to causation in a rather philosophical sense, so that a scientist is leaning towards philosophical ideas, or even theology (McMullin 1988, p. 46).

The unsatisfactory nature of the assumption that the universe was created in (preexistent) time was realised as early as the Patristic writes who defended the concept of creation of the world *ex nihilo*. Basil the Great, in his *Hexaemeron* ("The Commentary on Six Days of Creation") I: 5, made a distinction between creation of the intelligible world with no temporal flux and no spatial dimension, and the creation of the visible universe together with "the succession of time, for ever passing on and passing away and never stopping in its course" (Basil the Great 1996, p. 54). Basil asserts that the meaning of the Biblical phrase "In the beginning God created" must be understood as "in the beginning of time" (Ibid., p. 55), that is, God created the visible world together with time, and it was the beginning of time in the visible world. In a different passage Basil argues that the creation of the world was not a spontaneous origination, i.e. conception by chance, but, on the contrary, it was created with a purpose and reason (Ibid, p. 55). In order to articulate the a-temporal nature of "the beginning of the world", and to remove any causation at the beginning in terms of time-series, Basil affirms that "the beginning, in effect, is indivisible and instantaneous...the beginning of time is not yet time and no even the least particle of it." (Ibid., p. 55).

Similarly to Basil, Augustine in his *Confessions*, XI addressed the problem of the origin of time directly, affirming similarly to Basil, and using quite contemporary words, that: "The way, God, in which you made heaven and earth was not that you made them either in heaven or on earth....Nor did you make the universe within the framework of the universe. There was nowhere for it to be made before it was brought into existence" (Augustine 1991, p. 225). The last sentence is a proper theological reaction to any cosmology with preexistent time. If we attempt to talk about creation of the universe out of nothing in cosmology, it means that we can not use for this the cosmological models where the visible universe originates in the "large universe", preexistent with respect to the visible one. Similarly, in the *City of God* XI: 6, Augustine asserts that the universe was not created by God in time, but was created with time. Augustine affirmed the creation of the universe and time within it as the only consistent expression of the Christian affirmation of the *creatio ex nihilo*. The *nihilo* could not be something, it could not have

any attributes of the created things, it must be absolute philosophical no-thing. In particular it is not in time and space.

It is clear then that if cosmology hopes to challenge the theological teaching on *creatio ex nihilo* it must at least refuse any models of the universe with pre-existent time. In other words, time itself must be explained as a result of cosmological theory. This sounds suspicious at first glance, for any physical theory assumes time as necessary background where the dynamics and change take place. A reasonable starting point in this attempt, however, is to find such models of the universe where the initial state will manifest a global space-like singularity, so that it will not require any assumptions about preexistent time. The initiation of the visible universe takes place at this singularity, so that empirical time originates at this singularity and the universe can be said to be created not in time but in the pre-existent space of the singularity.

If one assumes that there is a variety of initial conditions at the global spatial singularity, then the "physics' of this variety is very problematic again. One can produce very exotic theories about the global initial space, but it will have a limited impact for the verifiability of this theory in the visible universe whose initial conditions are posed only in a tiny domain of the global surface, and that is why any proposal for the nature of a global singularity which covers all possible initial conditions would be untestable from within the visible universe [9].

At any rate the model of the origination of the visible universe from the global space-like singularity assumes that there was a finite time back when the observable universe came into existence and started to develop to its present state. Time was brought into existence together with the universe, and the problem of positioning of our universe in preexistent time is not present in such a scenario. At the same time, if the global singularity is assumed to be in existence prior to what we call our universe, it is difficult to assert that the universe was created out of nothing, for the point of origination of the universe is positioned at the initial singularity which is not nothing in a theological sense but preexistent space. It is clear then that one can apply the same argument, which we used before in the context of an antinomial proposition similar to the first antinomy of Kant, where the term *time* is omitted. From a philosophical point of view the difficulty of predicating the origin of the universe in terms of different initial conditions in space is of the same kind at it was before for models with preexistent time. This implies that the next logical step would be to attempt to modify the theory in order to remove all pre-existent entities, such as time or space, and to construct the model of the universe, where space and time would originate together with matter. Can this ambition be realized in cosmology?

In order to make clearer what kind of problem we face here, let us compare the dynamics of particle in classical mechanics on the one hand, and the dynamics of the universe in general relativity on the other hand. The fundamental difference between classical mechanics and general relativity, is that there is no preexistent time in the latter case. Space in general relativity is a relational concept, its dynamics follows the dynamics of matter, and it is a 3-dimensional space which is the dynamical variable in relativity and cosmology. Time emerges in relativity as parameter which describes the change of the 3-space. The common feature of both classical description of dynamics of a single particle as well as the evolution of 3-space is that both of them have a "point" of the beginning (described as a conical singularity). In the case of space-time it means that the 3-space has a zero radius, for example a zero radius of the universe beyond which all concepts such as space and time loose

their sense. From this point of view one could argue that this is exactly the point at which space and time came into existence, that is, they are "created" at this point. The problem, however, typical for both classical dynamics, as well as for cosmology, is that there is a dichotomy between the laws of dynamics and initial conditions; there is a variety of solutions corresponding to the dynamical equations which drive the evolution and which contain a conical singularity. The theory can not select a particular solution, which would be unique and correspond to the visible universe.

We thus face a problem of how to remove this initial point from the solutions. In classical mechanics, it is impossible to do it at all, for time and space do pre-exist and form a background for development of a system. The initial condition corresponds to a choice, made by observers when they start to follow the evolution of a particle. In the case of relativity the situation is much more exciting, for the beginning of time corresponds to some particular properties of space, when the radius of the universe is zero, for example. This point forms a problem for classical physics, for all physical observables approach infinite values in the vicinity of this point; classical physics looses its applicability at the singularity. At the same time, as was proved by Hawking and Penrose, the singularity in classical general relativity is inevitable. The presence of the initial singularities in general relativity leads to the impossibility of formulating in physical terms the initial conditions of the visible universe. The dichotomy between the initial conditions and the laws of the evolution of the universe becomes unbridgeable. If this is true, and we cannot specify in physical terms the "laws" of the initial conditions of the universe, we could not fully answer the question on the nature of the visible universe. In this case the temptation of a deistic kind comes to a cosmologist's mind; one appeals to a deity which did set up the initial conditions and the laws of the universe, but then left the universe to its own devices. Physics and cosmology provide us with the understanding of the laws of the evolution of the universe, but they do not teach us about the foundations of their facticity, that is, in a theological language, what was God's choice in setting up the initial conditions.

From a theological point of view, which advocates that the created order is contingent upon God, that is, radically different from God, and the laws of the world are free from any inherent necessity, originating in God, it would be ambitious to pretend to uncover the "laws" which stand behind the initial conditions of the universe, for the knowledge of these "laws", that is, knowing that the initial conditions of the visible universe are conditioned by something which is ontologically necessary, we would enter the domain of the Divine reason and attempt to apprehend God's intentions in creating the world. This is, however, hardly to be achieved in cosmology on its own, so that theology enters the scene of speculation at this point under the disguise of a hidden theological commitment in cosmology.

Indeed, some cosmologists argue for the possible comprehension of the "laws" of boundary (initial) conditions of the visible universe in principle. Hawking, for example, appeals to the history of science to argue that science eventually uncovers the underlying order of things and events which seemed to be decoherent and arbitrary before. He believes that the same kind of order can be found in the extreme physical situation at the cosmological singularity: "there ought to be some principle that picks out one initial state and hence one model, to represent our universe" (Hawking 1988, pp. 123,133). This belief seems to go contrary to the result on inevitability of the singularities in cosmologies with all pathological features of the theory, which we mentioned above

(infinities of all classical physical variables). This in turn provides us with an argument that the "law" of the initial conditions must be non-classical, different and new in comparison with what is known from general relativity. These laws, if they exist, should avoid the problem of temporal beginning, which has its root in the asymmetry between space and time. Indeed the conical space-time of the universe has one particular feature, which makes the whole geometry singular: its boundary is formed by a conical surface plus a singular point, that is, the apex of a cone. The new nonclassical "laws" of the singularity, if they exist, must change our view on space-time of the universe as a singular cone. This means that the geometrical presentation of the evolution of the visible universe as containing a singular point corresponding to its alleged beginning must be replaced by something which has a different, non-singular boundary. In this case the problem of the beginning of time, according to the proponents of the "laws" of the initial conditions will be explained away and no explicit theistic references would be necessary to explain the "temporal origin" of the universe. How successful is this program?

Elimination of Real Time in Quantum Cosmology ?

When Hawking advocates the existence of the laws of the initial conditions, he assumes that cosmology from being a classical view of the universe must be transformed into the so called quantum cosmology. The latter "theory" represents an as yet unfinished synthesis of general relativity and quantum mechanics, applied to the universe as a whole. This synthesis is a big issue in modern physics, and needs be subjected to a long philosophical scrutiny. The challenge of quantum cosmology is to provide the "laws" of the initial conditions of the visible universe, that is, to describe the state of origination of the universe in such terms as to condition the emergence of the empirical flowing time in the universe. This means that in no way must time be an a-priori ingredient of these "laws". At the same time, quantum cosmology does not deny the presence of space in these laws. In other words, space is considered as a more fundamental ontological reference than time. The visible universe is in space and in time; the state which is prior to the visible universe can not be in time, but it is accepted that it can be in space. The existence of space which is devoid of temporality is considered as existence forever, with no need for an explanation "when" this space came into existence at all. The timeless state of the universe (as a pure space) can be considered as an initial member in a series of temporal causation, which itself is beyond time.

The conceptual transition from classical to quantum physics can be understood as a change of description of physical objects as having some given positions in space to the description of the dynamics of objects in terms of the so called wave function, which is a function of spatial coordinates and is subject to evolution in time according to the Schrödinger equation. It is important that the coordinates of the particle can not be observed

precisely, as occurs in classical mechanics, but one talks about the probability of the particle to be found in the vicinity of the point, which is described by the square of the modulus of the wave function. In general this probability is a function of time and its evolution is completely determined by the Schrodinger equation, if one knows the distribution of probabilities at some initial moment of time. The evolution, described by the Schrödinger equation is reversible, i.e. knowing the initial state one can predict all other states in the evolution of a particle, and, *vice versa*, one can restore the initial condition if the state of particle is known afterwards. In this sense the "evolution" is a-historical, that is, no novelty

is generated in the system. The specificity of the system is thus determined by the setting of particular initial conditions. However, the most considerable conceptual change when one turns to quantum physics, is that the description of physical processes is done in terms of the wave function which *is not a physical observable in principle*. As a mathematical object it belongs to the abstract Hilbert space, whose ontology is detached from the empirical world, and represents rather the world of intelligible forms.

The synthesis of quantum physics with general relativity, especially in its application to cosmology, leads to a novel feature of the resulting theory, which did not exist in the quantum physics of microobjects. This feature is related to nature of time. As we mentioned in the previous section time in relativity is not a natural parameter in the theory, it is rather an epiphenomenon, constructed upon the primary dynamical variable, which is 3-dimensional space. This means that if one wants to construct a quantum state of the whole universe, i.e. describe this mathematically by the wave function of the universe, this function will not be a function of time explicitly, it will be the function of 3-geometry and matter (some field for example) which is linked to geometry according to general relativity. The state of the universe is thus described by the wave function which is defined in the superspace of all possible 3-dimensional geometries as well as all possible states of matter. Time is not present in this "frozen" formalism.

To elucidate this latter point one can make a contrast with the wave function in the realm of ordinary empirical time where the function follows Shrodinger equation with time. If the universe would be described by the wave function following the equation like this, its evolution would follow a simple, *reversible* dynamics. This means that we can predict the state of the universe at some moment of time t_2, knowing its state at $t_1 < t_2$. Since the evolution is reversible, one can reverse this conclusion and predict the past state of the universe at t_1 if one knows it at t_2 which can be taken as the present. Quantum cosmology of the early state of the universe, however has to deal with the situation where the temporality of the universe disappears, so that the description of the equation for the wave function of the universe cannot be done in terms of any temporal dynamics. Since we want to construct the wave function which corresponds to the initial state in terms of classical time t, there must be such a solution the sought wave function with no time must be somehow matched with the wave function which describes the classical universe with time. The condition of this matching would be by definition the "origination" of the visible universe.

A possible solution for the wave function which would provide a conical singularity, and where the initial point would correspond to the beginning of space and time together, is not a good candidate for it represents a space-time with a boundary, which is the surface of the cone plus the point of origination. This is why the desirable solution for 4-dimensional geometry in the quantum domain should rather correspond to the geometry where the 4-dimensional space-time has only a single 3-dimensional boundary. At first glance this kind of solution does not relieve us from the presence of time, for the boundary of 4-dimensional space contains a temporal dimension. The crucial step which has been taken in order to overcome this concern is a conceptual change in views on the asymmetry between space and time, which is an attribute of experience in the macroscopic realm where time is usually considered as an extra-dimension of 4-dimensional space. To overcome this asymmetry Hawking suggested that time, as we perceive it and as it appears in cosmological equations, to be converted into a rather a mathematical abstraction of time – imaginary

time, which is similar to space, but which is principally unobservable and non-measurable. The trick is simple technically but, however, is not so convincing philosophically.[10]

One may elucidate further how the geometrization of time, that is, its actual removal happens in Hawking's model. The transition to imaginary time is dictated in quantum cosmology by two reasons: 1) it attempts to provide the description of the initial conditions of the universe with no reference to anything beyond the universe, which could condition the initial conditions from outside; thus it is believed that the initial conditions of the universe could be inferred as a part of a theory; 2) in calculating the main object of quantum description of the universe, that is, the abstract wave function, which is to provide a solution the geometrical configuration of the universe, the method, used by Hawking, involved the so called path-integral, the mathematical object, defined on the set of all possible universes (all imaginable 3-dimensional spaces). This mathematical method, however, imposed a serious constraint on the form of those metrics, that is, spaces, whose paths should appear in the integral. As Hawking writes, "It seems, therefore, that the path integral for quantum gravity must be taken over nonsingular Euclidean metrics" (Hawking, Penrose 1996, p. 66), that is, over the metrics with imaginary time. One should remember this statement for our further analysis, for it illustrates a remarkable inference in theoretical cosmology: the purely mathematical requirement for consistency and the non-singular nature of calculations leads to a choice of the set of geometries with no obvious reference to the physical world. As Hawking expressed this in his *Brief History of Time* "to avoid the technical difficulties with Feynman's sum over histories, one must use imaginary time" (Hawking 1988, p. 134).

The crucial point now is to formulate proper initial conditions for the space-time of the universe, assuming that the universe in not pseudo-euclidean, that is presented by making explicit the difference between space and time, but Euclidean, that is, time and space are equal and "there is no difference between the time direction and directions of space" (Ibid.) There are two 'natural' (mathematical) choices: the infinite Euclidean space (which incorporates time), and the compact, finite in volume, space which does not have a boundary. Hawking provides some reasons in favor of the finite (compact) space which does not contain a boundary, This constitutes the essence of his and Hartle "The No-Boundary Proposal", that the path integral, involved in calculation of the wave function of the universe must be taken over all *compact* Euclidean metrics (Hartle, Hawking, 1983). This removes the problem of the initial conditions in the universe because, logically, the condition which is supposed to condition the initial state of the universe now reduces to a tautological statement that the universe must be initially with no boundary, that is, the term 'initial' looses its ordinary sense, for there is no special location in the universe which could be taken as an 'initial' boundary: there is no boundary. The immediate implication of such a conclusion is that the classical solutions of the cosmological models with non-physical infinities in the singularities do not threaten physics anymore, so that one could be tempted to say, that the collapse of physics at the cosmological singularity is overcome; there is no breakdown of physics at the edge of the universe and hence there is no need to appeal to the 'laws of the boundary conditions'which, according to classical metaphysics could manifest the transcendent plan of the divine design. One should remember, however, that, according to Hawking himself, the "no-boundary proposal" is merely a proposal, it is not a principle, which is

deduced from any more fundamental theory. In a way it is the ultimate premise, which can not be demonstrated syllogistically. As Hawking affirms "like any other scientific theory, it may initially be put forward for aesthetic or metaphysical reasons" (Hawking 1988, p. 136). This merely reaffirms that the no-boundary proposal is a metaphysical, that is non-physical proposal, which is dictated by some indemonstrable belief in reality as "self-contained and not affected by anything outside itself" (Ibid.)

Finally one can say that if the no-boundary proposal is implemented in theoretical calculations, it leads to a wave function of the universe as a function of the radius of a 3-dimensional section of the 4-dimensional compact space which incorporates an imaginary time. The radius *a* satisfies the Einstein equation which involves the distribution of matter in the universe. The radius of a 3-dimensional compact space *a* can extend indefinitely from zero to infinity. There is however a threshold in terms of *a* which marks a radical change in the behavior of the wave-function of the universe. This change corresponds to the transition from the quantum state of the universe as a 4-dimensional compact Euclidean space (with imaginary time being a spatial dimension) to the classical evolving universe, whose geometrical structure corresponds in general to the curvilinear cylinder where its vertical dimension corresponds to real, empirical time. The change from the quantum state of the universe to the 'classical' universe, whose evolution leads ultimately to what we observe as the present-day visible universe, is accompanied by the transition from imaginary time to real time. [11] Hawking proposes to present this transition graphically in the form given below:

This transition is supposed to describe the 'creation' of the visible universe. There is no however, any temporal location, or origination of the universe, for it originates from space, which has no temporal properties, space simply exists. One must be articulated once more that the creation of the visible universe in Hawking's model is not creation as 'origination', it is rather a transition (in a sense which we will have to establish) from a-temporal, that is, timeless Euclidean space, to space-time, where time is distinct from space, and where one observes the temporal flux of events.

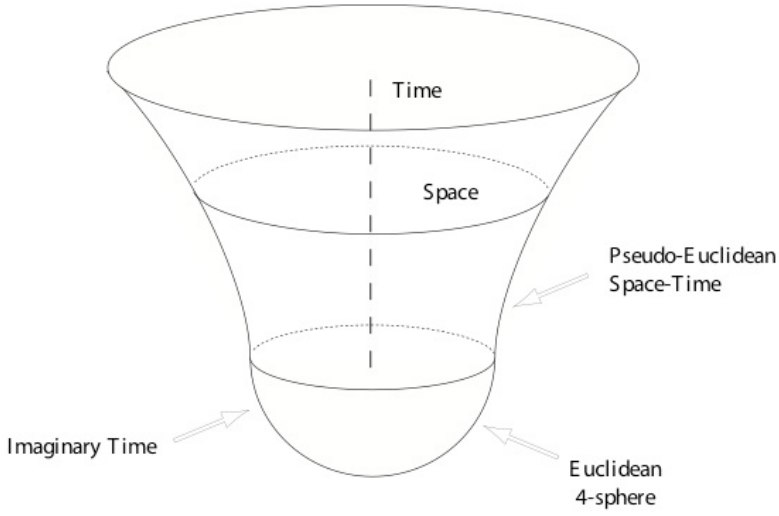

Fig. 2 Hawking's model: "creation" of the universe with the flow of time from the space-like eternity

The major achievement of the scenario, proposed by Hawking is the elimination of the singular states in the history of the universe, where the physical laws break down. The absence of temporal dimension in the boundary state of the universe removes the problem of preexistent time and offers a response to the paradoxes connected with the creation in pre-existent time. One should remember, however, that the validity of this response is contingent upon the belief that that the world has an imaginary dimension, that is, the very notion of the world is imbued with the fundamentally non-physical.

Hawking suggests that if "the so-called imaginary time is really the real time of the world, and that what we call real time is just a figment of our imaginations" (Hawking 1988, p. 139), then the entire universe is compact, with no boundary, so that the vision of the universe as having a beginning in the past (as well as the problem of original creation in general) is just an illusion of human consciousness. Hawking's attempt to elucidate the meaning of the word "reality", as he uses it, leads him ultimately to confusion, for, according to him, mathematical theory is just a model and there is no meaning in questions about the 'reality' of time, whether it is imaginary or real: "it is simply a matter of which is the more useful description" (Hawking 1988, p. 139). There is, however, a positive asset of quantum cosmology, namely the prediction of the inflationary behavior of the universe, when it gets off the quantum realm; for the inflationary cosmology is a popular model nowadays, which is capable of solving of some puzzles of the classical Big-Bang cosmology. [12]

The model, proposed by Hawking, caused a resonance not only in professional physical and mathematical circles, but also among philosophers and even theologians. The reason for this is that Hawking himself concluded his exposition of the "history of time" in the universe in a theological manner; he states that "the idea that space and time may form a closed surface without boundary also has profound implications for the role of God in the affairs of the universe" (Hawking 1988, p. 140). Immediately after this "theological" claim he exposed himself as a *deist*, by asserting that one needs the idea of God in order to describe the initial conditions in the universe and to set up the laws of the universe (Hawking 1988, p. 140). Finally, in order to refute his own *deism*, Hawking proposed to take his scenario of the "evolution" of the universe with an imaginary time, not only as a *model* (which helps with explanation of observations in a spirit of his positivism), but also ontologically: "if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning, nor end: it would simply be" (Hawking 1988, p. 141). The ultimate manifestation of Hawking's triumph as a "religious thinker" is in his concluding phrase which caused so much agitation and controversies in scientifico-theological circles, namely "What place, then, for a creator? (Hawking 1988, p. 141).

Some General Comments on Hawking's Model

Hawking builds his cosmology on the grounds of positivistic, (according to his own definition) methodology, i.e. in an approach which never makes enquiries on the ontological meaning of those "realities" which are present in cosmological theories. He describes his understanding of the meaning of cosmological theories in the following words: "Theory is just a model of the universe, or a restricted part of it, and a set of rules that relate quantities in the model to observations we make. *It exists only in our minds and has no other reality* (whatever that might mean)" (Hawking 1988, p. 9; also p. 139).

If one reads this passage straightforwardly one will be puzzled by the emphasized part of

this quotation; for it follows that cosmology, being a theoretical enterprise, does not provide us with any realistic vision of what the universe is actually, but supplies only the symbolic means for the description of what we observe here and now. If cosmology exists only in our minds, it is similar to any kind of science fiction with the only difference that it pretends to describe the entire universe in a coherent mathematical way, which will be consistent with what we observe in the sky. If one follows consistently this view one must admit that such notions as the universe as a whole, Big Bang etc. are just mental constructs and they have no independent ontological status apart from their remote effects in the present day universe (this conclusion does not surprise us at all, for we have already established the limited sense of reality behind cosmological constructs). Summarizing in different words, cosmology as a theory dealing with the remote temporal past as well as with remote parts of its space has no ontological references, according to Hawking. But Hawking achieved this conclusion on the basis of the ad hoc positivism and not through the epistemological analysis of cosmological constructs. All its claims have a status of conventions useful for understanding of the observable universe in terms of unobservable entities, that is, equations and concepts. Here he manifests the intrinsic teleology pertaining to the process of cosmological explanation, which demands the appeal to the entities which allow a coherent synthesis of the visible universe. A particular cosmological theory is valued for its quality to provide a more effective description of our observations; there is no sense in asking whether the constructs which constitute the theory are referred to anything which we call "real", they just matter as useful tools of description and no more. The ultimate description of the universe represents a *purpose* of cosmological research, but this regulative, formal purposiveness of cosmology does not have to entail the existence of the material pole (*nexus finalis*) of this purpose. The universe as a whole, be it classical or quantum cosmology, is not an object, for the efficient physical causality is not applicable to it. It is subject to that causality which relates the notion of the universe, as a purpose of explanation, to the faculty of reflective judgement, using Kantian terminology.

Later Hawking reaffirmed his positivistic approach to cosmology by juxtaposing it with the Platonism of Penrose (Hawking, Penrose 1996, p. 121). According to Hawking, Penrose is worried about the reality of those concepts which are involved in quantum cosmology, whereas it does not bother him: "I do not demand that a theory corresponds to reality because I do not know what it is (Ibid.). This last remark makes the overall philosophical position of Hawking controversial because, as we mentioned before, he is prone to ontologically realistic commitments.

Indeed if cosmological theory does not provide any empirical evidence for ontological references of cosmological constructs (such as cosmological fluid, global space-time, the wave function of the universe, the Big Bang etc.), then any positive or negative predication about God as the absolute cause of the temporal beginning of the universe, as inferred from a cosmological theory, has only a rhetorical sense; for the construct of the early universe which Hawking proposes as a "true" theory of the state of the universe which preceded that one which we observe now, is just a construct, not an ontological entity. This implies that if Hawking wants to use the beauty and elegance of this construct in order to deny the existence of God-creator, that is, the original cause of the universe, he tacitly levels both constructs, "the universe" and "God", making them uniform terms of the logical alternative which, according to Hawking's logic , must exist only in his mind. If this is true, one then immediately recognizes

that the "God" which is meant by Hawking in his famous phrase "What place, then, for a creator?" is just a concept, an idea of God, a mental symbol of an uncertain deity. If Hawking thinks about God (as a genuine positivist) as a construct, then he can dismiss one construct (God) in favor of another (timeless universe). But this operation of the reason has no proper theological implications, for the God of theology is not a construct, but a subject of existential, that is ontological, experience. All idols of God (even those negative which follow from cosmology) are strictly refused by apophatic theology.

But if Hawking believes that he can dismiss God in an ontological sense, then one should admit, that he falls into contradiction with himself, for there is no chance of comprehending the existence of the living God while resting on a positivistic view of nature. In the concluding chapter of his book Hawking exposes his controversial thought by making a correct distinction between two questions in cosmology: a) "What is the universe?" and b) "Why the universe does exist?". He assumes that his response to the question a) is provided by his arguments throughout his book, that is, the universe has such a particular structure, which follows from the laws of physics and a special no-boundary condition (we remember that this is a positivist's statement). But in the question b) Hawking enquires not into the particular temporal origin of the universe, but into the fact of the very existence of the universe. Why does the universe, which is described by the Hawking model, exist at all? What is the ground of contingent facticity of the universe. This question, by it essence is a perennial ontological question, a response to which can never be made on positivistic grounds. One can say that with certainty, although negative, that this question cannot be answered. Hawking's hope is associated with his vision of a complete theory of the world, which "would be the ultimate triumph of human reason-for then we would know the mind of God" (Hawking 1988, p. 175). It is still unclear whether the knowledge of "the mind of God" in the last quotation is just a mental construction of a positivist scientist, or Hawking speaking about knowledge of God through ontological communion with Him. The dream of the final theory as a principle which could explain the structure of the universe in self-sufficient terms, without appeal to its contingency upon a transcendent source, assumes that the advance of science will stop at some stage, so that the ultimate knowledge will give a divine power into the hands of human beings. This could make a real challenge to the *creatio ex nihilo* concept for knowing the laws of the universe in full would imply no necessity for a transcendent creator. This implies that Hawking's claims of dismissal of a creator of the universe in a sense of an original creation, have a much more moderate impact on theology in comparison with his beliefs in the final theory, be it purely positivistic or not. [13]

In spite of the preceding criticism of Hawking's philosophical presuppositions, the goal here is to demonstrate that his model of creation of the universe out of nothing, which by no means dismisses the Christian dogma of *creatio ex nihilo*, can actually contribute in a quite sophisticated way to the Christian understanding of creation out of nothing. This assumes that one must undertake a theological interpretation of Hawking's model, thus intentionally departing from a positivistic treatment of cosmology. However in this interpretation we follow not a straightforward invocation of theological parallels, but careful studying of Hawking's propositions philosophically, in particular through a prism of the Kantian antinomies.

Our task now is to make an analysis of the key concepts employed by Hawking, in order to make a distinction among them in terms of their ontological nature: what is empirical in his model

and what is intelligible, what is the meaning of the mixing of the empirical and intelligible which takes place in his model and how this interplay between empirical and intelligible can be used in explication of that which theological *creatio ex nihilo* proclaims. By so doing, we intentionally interpret the theory through those philosophical and theological ideas which are not present in the theory itself. The meaning of such an analysis is to support an intuition that any scientific theory, attempting to argue on the origins of the world (including Hawking's as an example), will inevitably contain the features of the dualism between the empirical and intelligible. The problem then is not to overcome this dualism, but to identify this dualism as an inevitable structural element of all attempts to treat the universe as creation, the structural element which involves the process of knowing the universe into antinomial difficulty manifesting the inaccessibility of creation on the grounds of rational enquiry. By revealing the apophatic nature of all claims on creation out of nothing in cosmology, the knowledge of contingent facticity of the universe remains an ultimate mystery pointing toward its otherness, the otherness which points beyond creation as such.

Imaginary Time in Quantum Cosmology and Neo-Platonic Timeless Time

The model of Hawking is a model of the created order (but radically different from that one which is associated with the empirical temporal order) which can be used for formalizing the logic of all possible attempts to describe creation from within the world. In words of the Greek philosophy, with the help of this model one can formulate the *logos* of creation (the expression theological in its essence), where the logos stands for the underlying principle, the foundation to which we have access from within the world. As we mentioned this before, this logos is encoded in the dichotomy in creation between the intelligible and empirical. This dichotomy has a particular technical expression through the Greek noun *diaphora* (difference) in creation, as its constitutive element. In ancient Greek thought this *diaphora* can be elucidated in terms of temporality.

Indeed, recall the distinction between phenomenal reality and transcendent reality, which was developed in neo-Platonism and was used by Christian theologians in order to contrast the created and Creator. At the same time Christianity through adapting and interpreting neo-Platonism made a distinction between the intelligible in creation as contrasted to the empirical (phenomenal) in creation. This implied that the term "transcendent" in the Christian context was referred to the uncreated, whereas both the intelligible and empirical were treated as immanent with and constitutive for creation.

Neo-Platonists made a distinction between *time* and *eternity*, which was based on the distinction in relationship between eternity and intelligible universe on the one hand, and between time and visible (empirical) universe on the other hand. In the Christian context it can be affirmed that the realm of the intelligible has no time (in an empirical sense), i.e. it is timeless, not eternal; for it is still created, so that it has a beginning in a logical sense and cannot be called eternal in the same sense as one asserts the eternity of God. The empirical realm, i.e. the world of senses is always in a state of temporal flux of events and the creation of novelty; from this perspective one can use the Neo-Platonic terminology in order to speak about timeless time of the intelligible created domain as *transcendent time*. In this context the adjective *transcendent* stands as a contrast to empirical time, which is measured by the flow of events.

What then is the meaning of timeless time (or transcendent time) at all if it is detached from

empirical, living time? The response to this question can come from the observation that since all sensible things, involved in temporal flux, are "mirrored" in the intelligible realm through the immanent aspects of their inner essences (i.e. the *logoi*), the flux of these things itself can be "mirrored" in the intelligible world as a definite *structure* (e.g. logical structure), so that this structure would represent itself as "frozen time", as time with no succession or happenings of events, as a serial order stripped of process. This "frozen time" is called timeless time or transcendent time.

There is an interesting distinction, made by Proclus, between transcendent time as "unparticipated" time on the one hand, and empirical time as "participated" time (see for details (Plass 1966). The transcendent time is a fixed 'monad' in distinction with empirical time; it can be thought as a number (in a Pythagorean sense), the number of cycles of the Hellenistic universe. The temporal flux of the empirical world proceeds according to this number, i.e. 'temporal time' is derivative from transcendent time. The ontological status of transcendent time is determined as its participation in the *ousia* of an intelligible being, which is timeless. Proclus used such adjectives as "eternal, fixed, unified" when he referred to transcendent time. If one appropriates transcendent time as a feature of the created realm, it would be more suitable to use such adjectives as "timeless" or "immutable" with respect to it.

Proclus thought about time as an integral concept, which unites both aspects of one and the same being. He treated time as a two-sided unity: on the one side time is in itself, i.e. there is time's inner being which is stable, immutable and timeless; on the other side, outwardly, i.e. with respect to the empirical world, time reveals itself as temporal flow of events and things. The former aspect of time is unparticipated time, the latter one is the time which participates in transcendent time.

Coming back to quantum cosmology, it is not difficult to catch some similarities between Hawking's model of the universe and that one in neo-Platonism. Indeed the attempt of Hawking to make a distinction between the reality of imaginary time of the quantum universe and the reality of empirical flowing time, which one experiences in macroscopic visible universe, is based on his assumption about human cognitive faculties. He asserts that what one experiences as real time is just an "figment of our imagination." This is similar to the neoplatonic distinction between two sides of the same time as unparticipated and participated time. Indeed, the imaginary time in quantum universe is undivided and unified time, which is, in fact, just a spatial dimension, given in its whole span across the Euclidean universe and is described by some number, a radius of this universe, for example. This is the inner aspect of time, that is, it is transcendent timeless time (timeless in a sense that the order of things in this time is not identifiable as the flow of events in real time). The outward aspect of this time, which is accessible to human perception, corresponds to temporal flow in pseudo-Euclidean space-time. It is because of a human intellectual ability that one can speculate that the empirical time can be thought as imagination of transcendent time; thus one can assert that the empirical time indeed participates in transcendent time (but we know about this only through an intellectual inference).

In analogy with Pythagorean metaphysical mathematics one can argue that the wave function of the universe, which contains implicitly all information about the entire structure of the universe as a spatial and temporal continuum, can be considered as a "monadic" property of the universe, that is, such an intelligible totality which is conditioned only by the laws of mathematics

and by the metaphysical (that is, non-empirical) no-boundary proposal. The visible universe, as a domain in the empirical part of the created realm, is predetermined somehow by the wave function in the quantum domain. In other words the "monadic" wave function of the universe, as a part of the intelligible, contains, according to quantum cosmology, the ground for a particular realization of the visible universe. We do not want to pursue this idea in order to claim that the ontology of the visible universe is rooted in the ontology of the intelligible transcendent time. This would be the desire of Hawking, and it was exactly the issue where he was criticized. Our interpretation follows rather a dualistic approach, based on the basic dichotomy within the created world, the the *diaphora* between sensible and intelligible creation with no desire to ontologize the imaginary time universe as existent on the same footing with the empirical universe. On the contrary, the comparison of quantum cosmology with the neo-Platonic treatment of time convinces us that the quantum Euclidean universe in Hawking's model is an intellectual construction, that is, its ontological status corresponds to an entity from the intelligible realm of the created world. This makes Hawking's rhetoric on the place of a creator in the universe unsound. Indeed the 4-dimensional space of the Euclidean universe, being by its epistemological status an unobservable entity, can only be hypostasized by the reason as intelligible reality. The straight relation of this intelligible reality to the visible universe, which is made along the lines of the positivistic rhethoric of Hawking, is inconsistent.

One more note on the similarities between Hawking's model and neo-Platonic views on time. There is the distinction between so called first and second creation which can be found in neo-Platonism. The first creation is the creation of eternity itself, whereas the second creation is the creation of time. In Hawking's case it is difficult to talk seriously about his quantum, Euclidean universe as eternal and endless time, of the 'greatest time', for in terms of imaginary time the universe is finite. It is certain, however, that an order in imaginary time is the timeless order from the point of view of real time. In this sense it recalls the difference between eternity and "the whole time" in neo-Platonism.

The wave function of the universe can be said to encapsulate the whole time, rather than eternity. Indeed, the wave function satisfies the equation which does not contain time at all; time appears later as an internal parameter, derivative from some particular spatial degrees of freedom. But since by itself the wave function represents conceptual reality, that is, it is an object from an intelligible creation, one cannot say that it describes in any plausible way *eternity.*

In analogy with neo-Platonists who assert that the whole time is unity, which is fixed numerically (in a Pythogorean sense), and that the flowing time is derivative from the "whole time", that is, its activity (*energia*) is caused by the whole time, one can see in Hawking's model a similar tendency of thought, namely that the genuine ontological time is imaginary time, and the wholeness of this time for us, human creatures whose senses adjusted rather to the pseudo-euclidean temporal flow, is manifested either in the abstract idea of the wave function of the universe (which, in fact, contains as a variable the variety of different geometries containing in a codified form the wholeness of their own times), or in the image of the 4-dimensional Euclidean sphere. The *energeia* of this timeless transcendent time (imaginary time), that is, the "transformation" of the "whole time" into the temporal flow in real time corresponds to the transition from intelligible timeless time to the empirical time accessible to our senses[14]

The major question then is: what is the status of the transition from imaginary time to

real time? Either this transition is physically real, that is, the timeless Euclidean universe is ontologized as physical reality (which seems to be Hawking's claim when he argues as a physicist), or this transition is purely subjective, that is, it plays merely a role of a theoretical hypothesis in justifying some observable data with no serious reference to the concept of reality which stands behind the scientific constructs involved (this is again Hawking's claim when he reveals himself as a positivist).

With no further comments on this internal inconsistency of the quantum cosmology of Hawking, we are inclined to interpret the transition from the intelligible Euclidean universe to the visible universe which is implied in this cosmology, not as "physically objective", and not as "psychologically subjective", but rather as a detection of the structural ontological differentiation between the intelligible and sensible realms of being. The difference of this interpretation from the original Hawking's model as well as from its critiques by other writers, is that the model of the intelligible Euclidean universe with imaginary timeless time (let us denote this universe as *IU*-intelligible universe) and the visible universe with real, empirical time (denote *VU*-visible universe) are both treated as two ontologically *different* realms of the created order. The transition $IU \rightarrow VU$ which stands in quantum cosmology for the explanation of the origination of the visible universe from the quantum domain and which corresponds to the diagram in Fig. 2 receives a completely different interpretation as seen from within Christianized Platonism, where both realms are related to the created order, but not to anything beyond the created being.

The reader should remember that Fig. 2 is a typical picture reproduced in many books on quantum cosmology and its philosophical commentaries, which explains in visual terms what the model, based on the no-boundary proposal attempts to say – namely, that the visible universe (*VU*), associated with pseudo-euclidean structure (that is with clear distinction between time and space), does originate from the timeless Euclidean region (*IU*), where time is spatialized, being an imaginary spatial coordinate.[15] The Euclidean universe, not being in time, possesses existence with no point of origin: it just exists. The visible universe has its origin as the transition from the quantum domain to the classical domain. Both universes *IU* and *VU* are assumed to be on the same ontological footing in quantum cosmology, so that the diagram is supposed to present the process in the physical realm.

According to our interpretation the diagram in Fig. 2, however, corresponds rather to the transition between two ontologically distinct domains, so that their linking together in one single complex, as is done in the diagram, has no more than an allegorical sense for it unites two ontologically different entities. The transition $IU \rightarrow VU$ then has meaning not as a causal transition from one physical stage to another, but as a logical indication of the *difference* in the created domain between what is given to us as the visible universe, and what is thought of as the intelligible explanation of what is visible.

The comparison of Hawking's model which affirms the universe as a closed one with imaginary time on the one hand, and which provides the mechanism of the emergence of the visible universe involved in temporal flux on the other hand, with the neo-Platonic model of time as a dialectics of transcendent timeless time and flowing time, has for the purposes of our analysis the following significance. The neo-Platonic dichotomy between transcendent and empirical time is rearticulated in the Christian context as the polarity between the intelligible and sensible realms of creation. In other words, from perspective (of the dualism between

the sensible and intelligible in creation) the ambition of quantum cosmology to describe, by using Hawking's model, the *creatio ex nihilo* is unjustified because, in fact, it describes rather the "origination" of that part of space-time, which we associate with the visible universe, out of the timeless realm, which by its own genetic status represents rather an intelligible world, than anything physical, if one intends to ontologize it. If we refine this thought further, we must admit that Hawking's model proposes a scenario of some 'changes' in the created contingent universe (be it intelligible or empirical universe), through the mathematical and physical laws. The fact of this contingency is not reflected in quantum cosmology, which, by its methodological design is monistic, that is, it tries to explain the structure of the universe from within itself. The contingency, on the contrary, if someone would like to reveal its presence in the cosmological theory, would mean identifying such elements in the model, which point to the ground of the universe, its immanent physical and mathematical laws, that is, their contingent facticity, which is beyond the description in terms of these laws, that is transcendent to the universe.

Thus our next step in the analysis of Hawking's cosmological model is to understand what it actually says in terms of the universe's contingence and this leads us again to the question as to what is the meaning of the distinction which appears in Hawking's universe between the spatialised, imaginary time-universe, where time is effectively closed and finite, and the pseudo-euclidean space-time of the visible universe, where the linear history of events is contemplated by us. One possible answer comes from the distinction between the Greek vision of the closed universe, where there was no actual flow of time and special dates in history. History was always problematic for Greek cosmology; history was thought rather as an illusion in an endless cyclic return of the world. The Hellenistic universe has no beginning and no end terms. It is clear now that the model of Hawking, if one treats this model ontologically and accepts that his imaginary time is real (so that the universe is closed) rather stands for the ideal of Greek cosmology and provides the "schemata" of history as the sequence of possible events stripped of the temporal flow. The Hellenistic universe is characteristically non-Christian for it has no beginning and no end. This means that the cosmology with imaginary time is in a serious conflict with Christian eschatology, as the progressive movement of time (*kinesis*) to its rest (*stasis*). The biblical view of time, in contrast to the neo-Platonic treatment of time, does not start from the universe as enclosed (that is, the universe existing as a totality, for example as a 4-dimensional spatial continuum), it rather reflects the awareness that time is the succession of the individual events connected with the divine *economy* in the world. This biblical understanding of time does not allow any *theory* of laws of time which underlie its empirical appearance through separate events. And this is in a strong contradistinction to the neo-Platonic view that the whole time can be described in spatial, overall terms. From here it is clear that the model of Hawking, if one treats this model ontologically, i.e. accepts that his imaginary time is real, so that the universe is closed, rather stands for the ideal of Greek cosmology and provides the "schemata" of history as the sequence of possible events stripped of the temporal flow.

If, however, we look at quantum cosmology as a model initiating the classical universe with a linear flow of time the whole evaluation of Hawking's model can change. For in this case whatever was in the quantum temporal world can be treated as a kind of "typology" of what should happen later in the development of the universe in real time. In this case the reference to quantum state of the universe as to the "past",

looses its strong sense; for from the "typological" point of view the history of the visible universe can be treated as initiated not from the imaginary "past", but from the eschatological "future". This implies, that the "transition" from the quantum universe to the empirical classical universe, as depicted in Fig 1, assuming intuitively that time is flowing to the top of the diagram, can be easily reversed as an upside-down diagram, where time is flowing down from the future.

The analogy which we used while talking about the quantum universe as the concise image of the history of the universe in real time, must not be transferred straightforwardly into the theological discourse of *creatio ex nihilo*, for we must remember that both the quantum universe as well the classical historical universe are both created and contingent upon the othereness which is responsible for their contingent facticity. What we wanted to articulate is the created nature of the universe, which is *differentiated* into the intelligible and empirical. From this perspective indeed the intelligible quantum universe as "giving origination" to the visible universe neither exist in the "past" nor in the "future" of the visible universe, it rather exists as the parallel, intelligible creation, which is articulated by the human being. In this the whole meaning of Hawking's model changes completely, leading us to the conclusion that this model can hardly deal with the *creation ex nihilo* itself, but rather with the constitution of the latter through the articulation of the *difference* in the created world.

Quantum Cosmology and Metamorphosis of Kantian Antinomies

In order to proceed in our treatment of the meaning of Hawking's model from a philosophical and theological point of view, we should refine the notion of the ontological *difference* in creation as related to the Christian understanding of *creatio ex nihilo*. We recall the words in the beginning of the Christian Creed which affirm the belief "in one God, Father, Almighty, Maker of heaven and earth, and all things *visible* and *invisible*". What is meant by things *visible* and *invisible*. Are these terms purely 'technical' words with no deep theological foundation, or, alternatively do they express the dichotomy in creation, its division into two distinct realms, which are both important in the context of religious belief? If the words of the Creed mark an ontological difference between two realms of the created being, what would be a proper theological explanation of this dualism?

The affirmation from the Creed, which we quoted above, reflects the Christian understanding of *creation ex nihilo*: God created the world out of nothing in such a way that there was an initial distinction between two realms: the realm of intelligible forms and the realm of sensible reality. The intelligible realm is simply understood as the "spiritual", "intellectual" level of created being. A good way of referring to this realm is as the *noetic* level of creation, or *kosmos noetos*. On this level God formed the angels , who have no material body. But this level contains also intellectual images of sensible reality, that is, ideas. This makes the noetic realm reminiscent of the world of Platonic ideas. Ideas as intellectual images of sensible reality are inevitable ingredients of scientific theories, so that it is arguable that scientific ideas have an immediate relation to the noetic realm which complements the sensible realm, that is, the material universe. The objective existence of the intelligible realm lies in the fact that it contains the community of living minds following from humanity's ability to think, rationalize, memorize and symbolize the sensible creation in intelligible forms. The only thing which is not so easily grasped by the empiricist or positivist type of thinker, is that the world of intelligible forms has an ontology *different* in comparison to the ontology of the sensible realm. It is exactly at this point that some

modern scientific theories of the universe follow a naive assumption that their mathematical constructs have the same ontology as the objects which they suppose to describe.[16] In theology, the ontological dualism between the realms of creation, proclaimed in the Creed, is, in fact, a structural difference in the unity of creation, which explicates this mystery from the side of creation. The dichotomy in creation in general has its particular manifestation in the constitution of human being, their composite hypostasis traditionally described in terms of body and soul (intellect). Theology asserts human uniqueness exactly as "simultaneous" (joint) existence on two levels of reality, so that only man can be a mediator between these levels and hence be a witness of their ultimate originary unity in the creation.[17]

If one attempts to formulate the concept of *creatio ex nihilo* in cosmological terms, that is, in terms of the traces of creation in the world, one can argue that there is a structural element in the world, that is the *difference* between intelligible and sensible, which carries in itself what the Greeks called the logos (the underlying sense) of creation. In other words, the distinction between the sensible and intelligible can be used in order to affirm that the world is created with a particular sense. The Greek Fathers of Christian Church used the word *difference* as a cosmological, theological, term in order to articulate the *creatio ex nihilo* from within the world. This term comes as the translation of the Greek διαφορα′ (*diaphora*) (this term has theological contradistinction to the Greek word διαιρεσις (*diairesis*) which means *division*). It was Dionysius the Areopagite who used first the term *diaphora*, applying it to the *differences* of all things in creation[18]. Maximus the Confessor followed him and used the term *diaphora*, as a characteristic of created being, its *constitutive* and distinctive feature. The *diaphora* is the ontological feature of the created being, its constitutive element. This implies that *the difference* in creation will never disappear. It plays a constructive role in creation, because it provides a common principle of all created things: all things are differentiated in creation and at the same time the principle of their unity is that they are differentiated. In particular it provides a common principle for the unity of intelligible and sensible creation through its *constitutive* meaning in the creatio *ex nihilo*. From this perspective the issue of the *creatio ex nihilo* can never be separated from the issue of *differentiation* in creation between intelligible and sensible. The *diaphora* in God's creation is an established order, the principle of variety and unity in creation, which is distinct from the Creator.

The immediate implication of the ontological category *diaphora* in creation, as applied to a scientific quest for the *creatio ex nihilo*, is that any physical or cosmological model trying to imitate the *creatio ex nihilo* in scientific terms, should deal with the fact that it is not enough just to produce a reasonable scenario of how the empirical visible (sensible) universe came into being from "nothing"; one should realize that there is a "parallel" creation of the invisible world, the world of intelligible forms or the noetic realm. But the theory of creation of the noetic realm would be quite problematic, because it assumes a theory of meaning, or a theory of the intelligence which is responsible for the models of the sensible creation in physics and their very articulation in the noetic realm. This demonstrates in turn that while providing the genesis of the physical picture of the world, one needs to appeal to realities which are not quantifiable in the rubrics of physics. One needs philosophy or even theology.

Science therefore can responsibly argue only for a "half" of creation (the empirical realm), assuming that the meaning of this "half" is provided from outside, from the *noetic* realm, which is not itself a subject matter of science (but

rather of philosophy and theology). The noetic realm is involved into the formation of scientific knowledge, so that it is this realm which is the guarantor of its expression and preservation, but the origin of this realm is not subject to science. Science uses logical laws and intellectual forms, but it does not give any account for the very possibility of this usage. In this sense science deals with being, but it does not produce the mechanisms of generation of being. As Heidegger was saying: science is not thinking yet! It is because of this that the maximum science can claim in the analysis of the genesis of the world, is that it found the mechanism of *differentiation* in creation between empirical (sensible) and intelligible (noetic) as seen from the sensible perspective. This results in the fact that the *creatio ex nihilo* is accessible through science only up to the extent of ontological *differentiation* in creation, but not as theological creation out of nothing. This idea can be illustrated with the help of the following diagram:

The quantum universe which is represented by the Euclidean 4-dimensional sphere stands here for the intelligible universe *IU*. The visible universe, which resembles the Pseudo-Euclidean space with a clear distinction between time and space, stands here for the visible universe *VU* as a part of the empirical realm. In contradistinction with Fig. 2, we treat *IU* and *VU* as ontologically distinct universes, so that instead of their literal matching (which happens in Fig. 2) and physical causation between them, we rather affirm the mechanism of their differentiation in creation, which by itself represents the constitutive element of *creation ex nihilo* in a theological sense. This means that instead of treating the model of Hawking as the model of creation out of nothing, we treat it as a particular theoretical scheme of the *diaphora* (difference) in being.

Now we come to the climax of our analysis, namely to the point where the dualistic scheme of realms in the world, as a structural element of its created nature, is to be subjected to the antinomial analysis in the style of Kant. Our objective at this stage is to trace that metamorphosis of Kantian antinomies, their mutual interaction, which is explicated in modern cosmology through Hawking's model. Let us rearticulate the main strategy of our analysis.

The pivotal idea of cosmology is to explain the observable cosmos. The idea of the universe as a whole is invoked in cosmology in order to operate mathematically with equations applied to

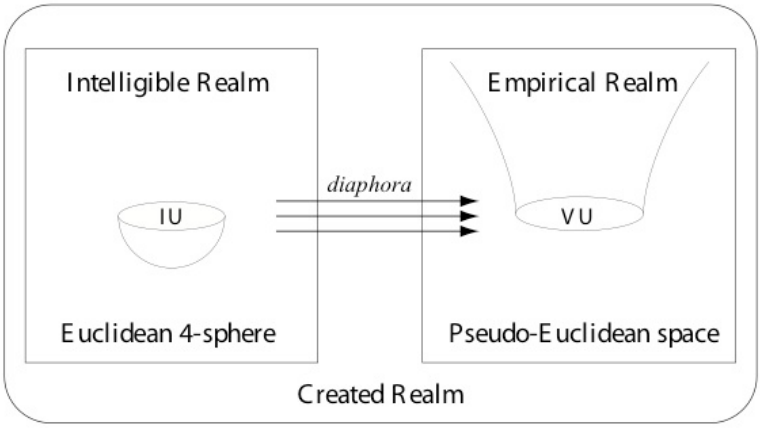

Fig. 3. Interpretation of "creation" in Hawking's cosmology as constitutive differentiation between the intelligible and empirical universes

the universe beyond the horizon of its visibility for us. Yet it is assumed that the universe, being a uniform continuum of matter and space-time at large is subject to a scientific grasp. This universe as a heuristic idea can be denoted as *VU*-visible universe. The specific features of this universe are supposed to be explained in terms of simple principles of unity, which provide the explanation for the whole variety of things in the universe, which seems to be completely contingent at first glance (this is the *telos* of cosmological explanation). The contingency of the observable universe becomes a final target of cosmology, which hopes to replace this contingency by some "necessary law" which itself will need no further explanation. In quantum cosmology it is believed that this kind of law should exist and it is sought in the remote past of the universe when classical physics must be replaced by a quantum description of matter and space-time. This implies that the universe which is observed by us here and now as a contingent state of affairs was not so in the past, that is, it followed a pattern of behavior which excluded the contingency of its further evolution and consequently its appearance to us as it is.

The fundamental difficulty with this attempt is that the law of the initial conditions of the universe, as we have discussed before, does not belong to the temporal series of causations in the visible universe *VU*, that is, by definition it transcends the universe *VU*. In Hawking's model this transcendence is achieved explicitly by breaking the ordinary temporal series of causations in the *VU*, and by appealing to the modified state of affairs which does not contain time, that is, to the Euclidean 4-dimensional space which, being beyond temporal flux, and not subject to any origination, yet initiates the "classical' universe, that is, the universe *VU* with the temporal flux. This *primordial* universe was qualified by us as the intelligible universe and denoted as *IU*. The invocation of the intelligible object *IU* in order to explain so to speak the empirical universe *VU* can become a subject of a criticism, analogous to the Kantian critique of the argument for the existence of absolutely necessary being. Since *IU* can not be found as an element of the empirical series in *VU*, its invocation as an explanatory element has sense only as a construct. This means that *IU* which is to explain the structure of the universe *VU*, in fact, departs from the field of empirical realities and the temporal series in the universe *VU* by acquiring the properties of the pure constructs. This is the logic of the transition in quantum cosmology from *VU* to *IU*: $VU \rightarrow IU$. It is quite natural, for one ascends from the variety of data to a unified principle which is to explain this data.

The situation changes completely, however, when the transition from *VU* to *IU* is reversed, that is, when the quantum universe is now treated as a level of reality which is more fundamental than *VU*, giving rise to the visible universe from the underlying quantum structure. (This is the meaning of Hawking's claim that the quantum universe with imaginary time can be more fundamental and genuine level of reality, whereas the visible distinction between space and time in classical universe is merely a figment of our imagination.) According to the logic of quantum cosmology, the transition $IU \rightarrow VU$ describes the actualization of the visible universe *VU* out of *IU*; it, however, must be understood by us, in view of our interpretation of the quantum universe *IU*, as a causation in a conceptual space, invoked by the thinking intellect. This implies that the *mechanism* which actualizes the universe *VU* out of *IU* is *itself* treated by us also as a construct with the intelligible ontology.

We observe here a kind of intellectual inversion from causation originating in the temporal series ($VU \rightarrow IU$), to causation originating in the purely intelligible series ($IU \rightarrow VU$), the completeness

of which is based upon existence of an absolutely necessary cause (that is, the quantum universe). This jump in reflection is based on an inability to build the empirical content of the concept of the unconditioned condition (*IU*) in the series of empirical causes. According to Kant, however, from the structure of the visible universe *VU* one can not conclude via the empirical analysis to the existence of such a necessary cause (*IU*) which would not be contingent itself. And that is why one can state that there is no an absolutely necessary cause or being which would explain *VU*. This means that the quantum universe has no ontological references in the empirical realm. It exists as an intelligible object, which functions in thought only as the purpose of the logical justification of the theory of the visible universe *VU* as a contingent state of affairs involved in temporal flux. Hawking, as we have seen, believes, however, that *IU* has the same physical ontology as *VU*, and that is why the causation which brings *VU* into existence out of *IU* is sought as a physical law (we mentioned before that Hawking claimed that there must be laws of the initial conditions in the universe).

The clash between the realistic treatment of *IU* promoted by Hawking in spite of his generally positivistic metaphysics on the one hand, and the opposite claim on the same treatment following from a simple Kantian analysis, leads us to an antinomial puzzle, which points to the only justifiable formula for dealing with the situation; namely to treat Hawking's intention to justify the visible universe as originated from quantum level, i.e. the transition $IU \rightarrow VU$, as an example of antinomial reasoning, which is similar to the Kantian reasoning on an absolutely necessary being expressed in his *Critique of Pure Reason* in the fourth antinomy (A452-453/B480-481). The antinomy about the origination of the visible universe out of intelligible quantum universe can now be formulated as follows:

Thesis: There belongs to the world the quantum universe (Euclidean 4-sphere) *IU* which provides the boundary condition for the visible universe *VU*, and whose existence is absolutely necessary for the visible universe *VU* to exist; and this is a causal condition for *VU* to be as it is.

Antithesis: There nowhere exists the quantum universe *IU* in the world, as the cause of the visible universe *VU* (there is no connection between *IU* and *VU*: they belong to the different ontological realms (intelligible and empirical) correspondingly).

The appearance of such an antinomy in the discourse of origin of the universe is remarkable because, as we remember, the initial motivation of Hawking's model was to overcome the difficulties associated with the first Kantian antinomy on the origin of the universe in time, that is on the beginning of the universe in time. What happened, as a result of quantum cosmology's attempt to remove the problematics of the first antinomy, is very interesting: one detects a certain metamorphosis of antinomies. The overcoming of the first antinomy led with a sort of inevitability to the formulation of the antinomy of the origin of the universe not in terms of time, but in terms of the absolutely necessary being. This shift in the explication of the problem of origin of the universe has taken place not purely philosophically, but under the pressure of developments of cosmological theory. In other words, the very progress of knowledge suggested a concrete scheme of that how to explicate the intrinsic interconnectedness of the Kantian antinomies. This shift, as we argue, reflects some general patterns of scientific attempts to find the foundation of the world undertaken by human subjects.

Kant could use the antinomy formulated by us for a negative conclusion about the empirical evidence for the existence of an absolutely necessary being (*IU*) as a cause of the visible universe *VU*. His argument would be that the quantum universe *IU* belongs to the intelligible realm and does not have an independent ontological being apart from the thought, which brought the ideas of *IU* into being. However this conclusion constitutes nothing negative, for the antinomies, as puzzles for human reason, can be considered as natural difficulties arising in relating the ontology of the sensible world to the ontology of the intelligible world and vice versa; these difficulties point towards the limits of the human power of knowledge. However, one can go further and claim that the new explication of the fourth cosmological antinomy of Kant, in fact, refines the scheme of constituting of the very human cognitive faculties. Namely, this antinomy in its logical performance by reason, manifests the process of mediation between the sensible and intelligible worlds, performed by a human subject in virtue of that this subject is itself a complex of the physico-biological and intellectual-spiritual, so that the mediation between the sensible and intelligible worlds happens within this human subject. Thus the structural similarity in the constitution of humanity and the universe is revealed: it can be formulated as that there is a common underlying principle (*logos*) which lies in their foundation and the content of this principle is that there is the ontological difference (*diaphora*) between the sensible and intelligible in both the universe and humanity.

An interesting feature of modern cosmology, which is not a philosophical discipline, is that it reveals the unity of the human reason with respect to two realms in the created being. This unity is reveled through the transformation of the first Kantian antinomy (on the temporal beginning or eternity of the universe), into the fourth one (on the ultimate foundation of the world), the transformation through which the problem of the underlying foundations of the contingent facticity of the world is explicated in a new way. This fact demonstrates that cosmology is imbued with anthropology in the sense that its transcendental consciousness reveals the antinomial difficulties arising as soon as the understanding transcends the boundaries of experience and endeavors to speculate on the foundations of its own facticity. Taking this into account, cosmology can be seen not only as a natural science, but also as a human science, which narrates no so much about the external world, but rather about humanity and its place in the universe.[19]

The presence of antinomies in the cosmological discourse, where one attempts to speculate on the creation of the universe out of nothing in a theological sense, points to the fundamental *difference* in the contingent creation between the intelligible and sensible realms. It makes possible for us to guess whether this tendency of a split in theory between empirical realities and their conceptual images, if taken in its extreme, will always lead a scientist to the detection of the ultimate frontier in attempting to synthesize the variety of physical experience in a single principle of unity, namely to the unbridgeable ontological *diaphora* in the created domain. The mediation between intelligible and sensible, which is performed by a philosophizing cosmologists, and which is theologically justifiable, reflects the unification of the *divisions* in creation (that, is the division between intelligible and sensible realms) which take place not ontologically, but on the level of cognition.

The antinomial structure of the proposition about the causation between the intelligible quantum universe and the visible, combined together with our analysis of the intelligible

ontology of the quantum realm with an imaginary time, leads us finally to the conclusion that that quantum cosmology is dealing with *differentiation* in the contingent creation, that is, with the basic *diaphora* in creation, rather than with *creatio ex nihilo* in a theological sense. However, since the presence of the *difference* between the intelligible and sensible reflects a general tendency and specific feature of all scientific attempts, which try to provide the genesis of the attributes of the empirical universe in a single unified theory, it becomes evident that these scientific models are not theologically irrelevant in what concerns their particular schemes which allow one to detect the presence of the *diaphora* as a constitutive element of *creatio ex nihilo*.

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1 See, for example, Athanasius of Alexandria, *Contra Gentiles* 8, 34, 38, 40.

2 This issue was a matter of interesting discussions in the papers of J. A. Wheeler in 1960-80s. The full bibliography can be found in his (Wheeler 1994, 351-4).

3 "Dust" stands here for the uniform distribution of clusters of galaxies, which are treated as noninteracting particles (similar to the concept of the ideal gas).

4 The bibliography on inflationary cosmology is vast, so that the reader, for example, can refer to a recent book (Weinberg, 2008).

5 A simple model of what has been said in the text can be found for example, in the papers (Gunzig et al., 1998, 2000).

6 See (Tryon 1988). A detailed analysis of this model can be found in (Isham, 1988).

7 E. Mc. Mullin points out that the position of Newton was a departure from the medieval Aristotelians who were not inclined to separate creation of matter and time (McMullin 1988, p. 44).

8 There exist some models which attempt to model the pre-Big Bang state of the universe.

9 Many leading cosmologists argue that the global initial conditions do not provide much use for conclusions about the visible universe. See, e.g. (Barrow, 1993; 1999, p. 26).

10 By leaving aside all technicalities in this trick one must be said, however that the idea to geometrize time dates back to the developments of special relativity, where the unification of space and time in one complex was achieved through the concept of the *interval* between two events, which is usually treated as a metric, that is the device which allows one to measure distances between any events in space time, which is named as Minkowski space. The idea of geometrization of time was not received positively among philosophers: it is enough to invoke the name of A. Bergson, who in his famous book (Bergson, 1999) argued that this approach is philosophically damaging for taking into account various aspect of the reality of time.

11 See details in (Hawking, Penrose, 1996, pp. 84-86).

12 See e.g. a good review paper of (Coule 2000). In this paper the healthy criticism of the creationist pretensions of quantum cosmology is developed. The author rightly affirms that the issues of "creation" is overstated in quantum cosmology and its aim is to provide "quantum determination of the cosmological state" rather than to claim the "creation".

13 J. Horgan in chapter 4 of his book (Horgan,1996) discusses the implication of Hawking's cosmological model in the context of his claims about the end of physics as soon as the ultimate theory of everything will be built. Horgan accepts a view that cosmology in the form as it is developed by theoretical physicists like Hawking, departs from any experimental base (in comparison with astronomy for example). He calls this cosmology *ironic* rather than scientific, making a conclusion that the trend it takes in its extreme speculation provides not an end of science as ultimate knowledge of everything, but rather the "epitaph" for cosmology itself, as a scientific discipline.

14 Damascius offered an interesting geometrical analogy in explaining the nature of empirical time as the radiance which circles around the intelligible center, the unity of all time, which preserves the order of time in the empirical world. See (Sambursky, Pines, 1961, pp. 64-93).
Intelligible time in this picture is the cause of the coherent continuity of the temporal flow. This makes the empirical time united with the intelligible one as the radii are united in the center of a circle. Damascius argues then that the whole time exists at once as all radii exist at once at the center of a circle. He then draws a conclusion that the whole time exists simultaneously in the same way as the whole space of the cosmos (it is interesting that this intuition is very similar to the spatialization of time as is often done in the context of the relativity theory).
The Hawking model with imaginary time offers something similar, for its finite universe covers the whole span of all possible real times in a single space-like structure, whose existence, according to Hawking, is not in the flux of time, it rather represents a hidden form of time, its encapsulated form.

15 The physical and mathematical problems which arise in this matching are discussed in Ch. 7 of (Hawking, Penrose 1996).

16 See papers of (Tegmark 2008) and (McCabe 2004-2005).

17 The idea that humanity acts as a mediator between divisions in creation was developed by Maximus the Confessor. See in this respect books (Thunberg1995), (Tollefsen, 2008).

18 See his *The Divine Names*, 5,8; *The Celestial Hierarchies*, 4,3,1.

19 This point was advocated in (Nesteruk, 2011).

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Проблема сотворения мира в современной космологии и метаморфоза кантовских антиномий

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В статье проводится философский анализ известной в космологии попытки моделировать сотворение вселенной из ничего. Модель квантовой космологии Хоукинга с мнимым временем анализируется в соотношении с идеями неоплатоников и представителей патристики. Анализ показывает, что современная космология представляет собой уникальный случай продемонстрировать трансформацию антиномической трудности, возникающей при попытке установить конечность вселенной во времени (первая антиномия Канта), в антиномию, сходную с четвертой кантовской антиномией об абсолютно необходимом существе. Сделан вывод, что космология не может моделировать творение мира из ничего, однако она позволяет уточнить и эксплицировать далее структурный элемент богословски понимаемого сотворенного мира, а именно онтологическое различие между областью умопостигаемых форм и областью видимых вещей. Делается также вывод о том, что космологические модели позволяют эксплицировать эпистемологические ограничения, возникающие при попытке смоделировать творение мира из ничего.

Ключевые слова: антиномии, богословие, вечность, время, вселенная, космология, пространство, различие, творение.