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NEW APPROACH TO SOLVING KANT'S FIRST ANTINOMY

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ABSTRACT

In this paper, the Kantian antinomy about the border of space is considered. A new physical hypothesis about the dependence of the speed of light and Planck's constant on the global distribution of matter in the Universe is discussed. It is shown that within the framework of this hypothesis, we can take a new view to the matter of the border of space. It is shown that all the properties of space and time are inextricably connected with the laws of motion of bodies. It is shown that if the laws of motion degenerate, then space and time will lose physical meaning. The hypothesis about the border of space is discussed, near which space loses all its properties. The hypothesis of the existence of Chaos outside the Universe and the border of space between the Universe and Chaos is also discussed. In the author's opinion, such a cosmological hypothesis does not contain internal contradictions and naturally solves the problem of the antinomy of the infinite-finite world. The purpose of the article is also to draw both the modern researchers and philosophers to discuss the idea of Chaos outside the Universe and the relationship of Chaos and our space. Young scientists and students can also use this paper for educational purposes.

Keywords: Kant's first antinomy, chaos, universe, space, time, border of the universe.

INTRODUCTION AND DISCUSSION

At one time Kant's assertion that antinomy is the necessary state of mind made a revolution in philosophy. This undermined the foundations of metaphysics that explored the original nature of reality, the world and the being as such and forbade thinking that two contradictory judgments can be true simultaneously. Kant's doctrine of the antinomy of reason put the problem of contradiction at the forefront of science and philosophy, going beyond the boundaries of philosophy and moving on to other aspects of human life.

Since that, much time has passed and the Kantian antinomies continue to worry thinkers. They are trying to better understand the essence of the contradictions contained in antinomies as well as to reconcile these contradictions.

Kant believed that space and time are infinite but in a sense they are finite. He believed that the space-time world is neither infinite nor finite because true infinity has nothing to do with either space or time. Moore (1988) explains these beliefs in his work 'Aspects of the infinite in Kant'. He notes that there are philosophers who are trying to give new characteristics of infinity. Moore identifies two clusters of concepts. Within the first cluster we find: boundlessness, endlessness, unlimitedness, unsurveyability, immeasurability, eternity. Within the second cluster we find: completeness, wholeness, absoluteness, perfection, universality, self-sufficiency, autonomy, creativity, freedom. The concepts in the first cluster are more negative. They convey a sense of potentiality and suggest an infinity that lies without. The concepts in the second cluster can be called positive. They convey a sense of actuality and suggest the infinite that lies within. The concepts can be labeled as 'mathematical' and 'metaphysical', respectively (Moore, 1988).

According to Kant's opinion, our initial ideas about space and time are partly products of understanding and imagination. Our thought can be distracted from everything that fills space and time but can never be distracted from the very space and time itself. We can say that space and time are an inherent property of the mind, in the sense that the mind cannot represent objects outside the space-time framework. On the other hand, space-time is some external given for the mind and in this sense, the properties of space and time do not depend on the mind. Roche (2018) agrees with the latest interpretation and claims that its version is true-like to understand the first among the others available at the moment. He states and explains that Kant's transcendental deduction includes the representations of space and time as deterministic,

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enduring particulars, the unity of which is both given and synthetically produced (Roche, 2018).

According to Kant, we see all things in space and perceive them in time, but we cannot see space and feel time ‘in pure form’, regardless of their content. Every perception assumes the concepts of space and time, that is, their existence a priori. If we did not have these a priori concepts, then sensory perception would not have been possible at all. Our perception arises through a priori concepts of space and time. These are not images related to external objects because there is no thing called time, as there is no thing called space. Time and space are not objects of perception but forms of perception of objects, instinctive skills inherent in the thinking subject.

Kant considered the first two antinomies in order to show that the illusion can give rise to an error when a transcendent-realistic point of view is admitted. Each of the conflicts focuses on the connection between what is considered as a reasonable object and space and time. The first antinomies lead to arguments in favor of the finiteness of the world in space and time against those, which are for its infinity. According to Kant, conflicts are unsolvable if to adopt the viewpoint of transcendental realism. Thus, Kant's solution is based on the view that only when realizing the transcendental ideality of space and time we can unravel the various methodological requirements that lead to an apparently insoluble conflict (Grier, 2006).

Teachers also explore the concept of the infinite and the finite. They draw on Kant's first antinomy in ‘education as the unity of the infinite and finite’. Infinity of personality means a connection with all people, objects, nature, and cosmos. In this sense, the person becomes, as it were, equal to God. If you approach this idea more realistically, it means ‘potential infinity’. At the same time, a person is understood as being unlimitedly open for establishing arbitrary connections with the entire surrounding infinite world, for including it in this world. However, infinity is only the most common sign of personality. One can distinguish infinite subsets from infinite sets. Good and evil are infinite. However, a man cannot be regarded as a personality who is only open to evil. On the one hand, society prohibits evil. However there is a moral imperative that motivates a person to choose good. Only another infinity can resist evil: the person itself (Novikova, 1988).

Not all thinkers accept Kant's ideas. The Russian religious philosopher Pavel Florensky disagreed with him in many respects. He reproached Kant for the vagueness and inconsistency of his attitude to the concept of actual infinity. Florensky (1909) believed that any theoretical thinking is antinomical in its structure, no matter how it tries to get rid of inherent internal contradictions. He called the Kantian system to be a genius but a genius in guile. Kant's phenomena are phenomena in which nothing is. His intelligible noumenon is not comprehended by the mind and incomprehensible at all. His pure intuition, space and time – they are cannot be contemplated purely (Florensky, 1909).

Science develops, new physical theories and hypotheses appear that can help us to answer many difficult questions of cosmology, astrophysics, and also provide ‘mental food’ for philosophers. In the opinion of the author of this paper, one of such hypotheses proposed by the Russian physicist Vasily Yanchilin allows us to take a fresh look at Kant's first antinomy about the infinity and finiteness of the world, and also answer the question of the origin of uncertainty in the microcosm.

First, let us recall some of the paradoxes of quantum mechanics and the controversies that they aroused in their time among well-known scientists, including Albert Einstein and Niels Bohr.

The Uncertainty Principle and Nonlocality

The basis of quantum mechanics is Heisenberg’s uncertainty principle that expresses the fundamental limit of the possibility of simultaneous measurement of the position of a particle and its momentum. It is impossible to measure the velocity of a particle and its momentum at the same time. The uncertainty relation has the form of the following inequality: $\Delta x \cdot \Delta p_x \geq \hbar/2$, Δx is the uncertainty in measuring the particle's coordinate, Δp_x is the uncertainty in measuring its momentum along the x-axis, $\hbar$ stands for Planck's constant.

It follows from this relation that the more precisely one quantity is measured, the less accurately we can determine the second one. However, it was unclear for a long time what the uncertainty relation expresses: the objective uncertainty in a particle's motion or the fundamental impossibility of obtaining complete information about a particle's motion.

As is known, there are two interpretations of the uncertainty principle and quantum mechanics. These are the statistical interpretation (Einstein adhered to it) and the Copenhagen interpretation (Bohr followed it). According to the statistical interpretation, a particle has exact coordinates and momentum. However, we cannot accurately predetermine them. Thus, the uncertainty principle reflects our ignorance but not an objective reality. In this sense, according to Einstein and his followers, quantum mechanics is incomplete. According to the Copenhagen interpretation, only the probability of finding a particle in one or another position can be determined.

According to the Copenhagen interpretation, the uncertainty principle reflects the objective state of things in the microcosm. From this radical (for that time) viewpoint, a quantum object is present at every point of a particular region with a certain probability. This means that any subatomic particle, being indivisible by its nature, occupies some volume of space and can therefore exhibit the properties of a wave. The probability of a particle's location is determined by its complex wave psi-function squared $|\Psi(x,y,z)|^2$.

Despite the fact that Einstein did not accept quantum mechanics until the end of his life, nevertheless, he did a lot to develop this complex and most ‘strange’ area of physics. Proceeding from a quantum particle’s property to be simultaneously at all points of a certain region, he came to the possibility of the existence of nonlocality, which he called ‘spooky action at a distance’. He set out his conclusions in 1927, at the 5th Solvay Congress in Brussels (Einstein, 1928). Einstein was a supporter of the statistical interpretation of quantum mechanics because he believed that ‘God does not play dice’.

To prove the truth of his position, he carefully analyzed the Copenhagen interpretation in order to find contradictions in it. He reasoned as follows. Let us assume that an electron occupies a certain region of space, being simultaneously at all points. This means that if we manage to catch it at some particular point, then the entire wave that occupies this volume will collapse into a point. This will happen specifically at the point where we can detect the electron. The entire volume occupied by the electron will disappear; the particle will focus at a single point. This phenomenon logically leads to the existence of instantaneous action at a distance that is nonlocality (Einstein, 1928). Einstein came to this conclusion but did not believe in it. Therefore, he believed that there is no uncertainty in a quantum particle’s motion and the psi-function determines not the probability of finding a particle at a particular point but our ignorance. Einstein believed that there may be some hidden parameters that we do not know about. This can mean that quantum mechanics as a science is not complete.

To refute the uncertainty principle that underlies quantum mechanics, Einstein devised various thought experiments. In his opinion, these experiments must convince his opponents, including Niels Bohr, that there is no uncertainty. Einstein was so captured by the desire to convince his colleagues that he was thinking about the problem all the time. Participants of the 5th Solvay Congress were living at the same hotel and meeting together during eating. By breakfast, Einstein was bringing a new food as a ‘dessert’ for the mind in the form of a task that was supposed to undermine the quantum mechanics. Einstein not only gave the task, he also explained to colleagues the essence of the contradiction discovered by him. Then Bohr, Heisenberg, and Pauli discussed the thought experiment and always found a mistake in it. Einstein, after listening to their arguments, was forced to agree with them. However, he still remained an opponent of quantum mechanics and began immediately to think about the following experiment that should destroy this new field of science because it did not fit into the framework of common sense. However, opponents also solved this next problem, justifying their conclusions. Einstein again was forced to agree with them.

One of the most famous experiments proposed by Einstein to refute the uncertainty principle and quantum mechanics is the Einstein-Podolsky-Rosen experiment. He invented it in 1935 together with other scientists, Podolsky and Rosen. This experiment clearly demonstrated the nonlocality of quantum mechanics. Let us describe only the essence of this experiment.

Let two protons, which are in interaction with each other, fly apart in opposite directions. The further they fly, the less will be the interaction between them. When the distance between protons becomes very large, their interaction can be neglected. Quantum mechanics makes it possible to calculate only the probability, in which directions the particles will fly. However, if it is possible to detect a proton flying, for example, in the northern direction, then the second proton will necessarily fly to the south. This follows from the law of conservation of momentum. Based on common sense and statistical interpretation, it can be assumed that the second proton immediately flew in the south direction. We found out about this when we captured the first proton. According to the Copenhagen interpretation, the second proton began to move to the south only after we caught the first proton.

Einstein did not accept the Copenhagen interpretation because he refused to believe in the possibility of instantaneous action at a distance. He believed that the second proton immediately began to move in the south direction. Since quantum mechanics could not predict in advance such a motion of a proton, it means that quantum mechanics does not give a complete description of reality.

This experiment thrilled Bohr the most. For a long time he thought about how to object to Einstein and he wrote an article in defense of quantum mechanics from accusations of incompleteness. However, this article did not convince Einstein. Moreover, Bohr even lost some of his supporters, for example, Louis de Broglie. The famous philosopher Karl Popper wrote about this situation in his book ‘Quantum theory and schism in physics’ (Popper, 2000).

Physicists were divided into two camps. Representatives of the first camp supported Einstein, considering quantum mechanics incomplete and rejecting nonlocality. Representatives of the second camp could not explain nonlocality. However, they were sure of the truth and completeness of quantum mechanics.

Even if the Einstein-Podolsky-Rosen experiment was carried out, it would still be a matter of doubt for scientists. This experiment is of interest only as a mental one. Analyzing it, we can come to the following conclusion: quantum mechanics is incomplete or nonlocal, and the third one is not given. In any case, Einstein's followers will interpret it within the framework of classical physics and he will say that the particles immediately after the collision already had certain momentum and energies. Bohr's position seems absurd to him. Conversely, Bohr's followers will argue that the particles received certain momentum only at the time of the measurement done on one of them.

Gradually a way out of the impasse was found. First, David Bohm suggested measuring not the momentum of the particle but the projection of its spin (Bohm, 1952). Then in 1969, Abner Shimoni modified Bohm's experiment so that it was easier to conduct. Shimoni proposed measuring the polarization of two photons emitted by one atom (Shimony, 1988). A series of such experiments was carried out in the 1970s and the 1980s. The most famous was the experiment conducted by Dalibar and Roger of the Optical Institute of the University of Paris in 1982 (Shimony, 1988). These scientists were Einstein's supporters and wanted to prove that there is no spooky action at a distance in nature, but their experiment proved the opposite. The measured polarization of individual groups of photons, at first glance, changed randomly. However, when the results of two series of experiments were compared, a very strong correlation between them was found, much stronger than could be explained by any local realistic theory with hidden parameters. The spooky action at a distance, which Einstein did not want to believe, turned out to be real.

Quantum mechanics continues to excite minds of physicists and philosophers. One of the most important questions that remains unanswered until now is from where the uncertainty appeared in the microcosm. This issue has a profound significance for science. If an answer is received, many quantum mechanical phenomena will find a natural explanation. We will come closer to understanding the structure of the world. This will also give us a clue for understanding and answering Kant's first antinomy, and possibly other antinomies.

It is possible that such a clue is contained in the new theory created by the physicist Vasily Yanchilin. His theory combines quantum mechanics and gravity, and allows us to construct a consistent cosmological model that naturally solves Kant's first antinomy. Let us try to understand the theory that perhaps will give answers to fundamental philosophical contradictions existing in science during the last centuries.

New Look at the Origin of Quantum Uncertainty in the Microcosm

In 2000, Vasily Yanchilin published a paper, in which he wrote two basic formulas for fundamental physical constants: the speed of light and Planck's constant (Yanchilin, 2000). The first formula relates the speed of light to the gravitational potential of the entire Universe as follows:

$$c^2 + \Phi = 0 \qquad (1)$$

In this formula, c is the speed of light, Φ is the gravitational potential of the Universe created by all the stars, galaxies, and the rest of matter of the Universe. The potential Φ is normalized to tend to zero at a sufficiently large distance from all the massive objects of the Universe. Formula (1) illuminates that the speed of light is determined by the Universe itself, by the matter that fills the Universe. Formula (1) is discussed in detail in (Yanchilin, 2018).

The following second formula couples Planck's constant h with the gravitational potential of the Universe Φ:

$$h^2\Phi = \text{const} \qquad (2)$$

It is worse noting that formulas (1) and (2) are very simple. Therefore, they can be readily grasped by a wide audience from mature and young researchers to undergraduate and graduate students. Let us consider what consequences follow from formulas (1) and (2).

In order to better understand the meaning of formula (1), let us consider how the gravitational potential Φ varies within the Universe. This potential can be different in different places of space. Near a heavy space object, for instance, a star or a planet, the gravitational potential increases. Any massive object slightly increases the value of the gravitational potential of the Universe in the surrounding space around itself. What will be a consequence of such a small difference in the value of the gravitational potential? It follows from formula (1) that the speed of light will increase in this case. Thus, the speed of light is not a constant value because it depends on the place in the Universe.

To better understand the physical meaning of formula (1), let us conduct the following thought experiment. We begin to remove gradually the stars from the Universe to infinity. So, the number of stars in our Universe will gradually decrease. How will this affect our Universe and us? First, we will not notice anything. We will not even notice several missing stars and even entire galaxies. The Universe also will not noticeably change if it loses several of its objects. However, if the number of stars and galaxies of the Universe will continue to decrease, then the world will gradually begin to change. According to formula (1), the gravitational potential of the Universe will begin to decrease when stars are disappearing. The fewer the stars remain in the Universe, the lower the value of the gravitational potential Φ and consequently, the smaller the speed of light can be recorded because its magnitude depends on the gravitational potential. Planck's constant will increase by any decrease in the gravitational potential Φ defined by expression (2) (Yanchilina, 2003).

In order to understand what will happen to the Universe in this case let us recall what happens to the particles in the microcosm and how their behavior depends on Planck's constant. There is an uncertainty in the motion of elementary particles and this uncertainty is characterized by the magnitude of Planck’s constant. If in our world Planck's constant was zero, then our world would be classical and the particles would not exhibit wave properties.

Planck's constant, according to formula (2), will increase as the gravitational potential decrease and it will tend to infinity in almost empty space. This means that not only particles of the microcosm, but also macro objects will begin to exhibit wave properties. Macro objects will begin to exhibit wave properties as the number of stars of the Universe decreases. When all the stars disappear, macro objects will begin to have an uncertainty in their motion and behave like quantum objects.

Chaos as the Opposition to Cosmos

Planck’s constant determines the size of an atom. An increase in Planck’s constant will lead to an increase in the sizes of all the atoms. This, in turn, will lead to an increase in sizes of macroscopic bodies because they consist of atoms.

The decay rate of radioactive nuclei will increase with a significant increase in Planck’s constant. Some of them, namely the unstable radioactive nuclei may explode. Other atoms that are stable under normal conditions will become radioactive and begin to decay. Uncertainty, which now manifests itself only in the microcosm, will begin to penetrate into the world of large bodies. Not only atoms and subatomic particles but also molecules and clusters of molecules will begin to exhibit quantum properties. The more is the value of Planck's constant, the more the uncertainty in motion is expected. This is not only in the microcosm. This uncertainty will manifest itself in the macrocosm. The Universe will become a quantum system.

Atoms and atomic nuclei can decay into elementary particles. All material objects, including clocks and rulers, will decay into elementary particles. The world will turn into an unbalanced mess from elementary particles that will move with undetermined speeds and in uncertain directions. It is impossible to create any physical reference frame under such conditions. In a completely empty space (with the gravitational potential of the Universe tending to zero) concepts of distance and time will lose physical meanings. This state of space can be called Chaos. The quantum uncertainty in the microcosm is a remnant of the original Chaos limited by the gravitational impact of all the stars and galaxies of the Universe. In such a space, an ordered movement is impossible. It is not possible to use any standards for measuring time or distance.

So, in Chaos, the meaning of the meter and the second (distance and time, respectively) is lost. All rulers and clocks will collapse, all physical standards of distance and time will cease to exist. Nothing can be measured. There is no certainty in the movement of bodies. The laws of motion of test bodies are also indeterminate. The notion of a frame of reference loses its physical meaning. Therefore, the concepts of space and time will lose physical meanings. Directions will lose their meanings. This means that one cannot point to something and even show in which direction our Universe is located. The comparative characteristics, such as "closer or farther", "faster or slower", "sooner or later," will also lose their sense. The world will become radically different from our Universe.

Figuratively speaking, the world will collapse and turn into Chaos. It can be noted that ancient thinkers used the concept of Chaos. The ancient Greek philosopher Aristotle called Chaos ‘place, space’. He believed that all things must be in something (Cherniss, 1964). Our Universe must have its container. However, later this word ceased to be actively used. ‘Chaos’ usually means other phenomena. The very concept of the receptacle of the Universe has almost lost its meaning. Formulas (1) and (2) gave a revival to the ancient concept. If we remove all matter from the Universe, there will not be a usual space, with which we are familiar. A completely empty space is Chaos.

Now imagine that we are moving in the direction of the edge of the Universe. In this case Planck's constant will increase; the uncertainty in the microcosm will also increase. Gradually, as we approach the edge of the Universe, to the boundary where $\Phi = 0$, the uncertainty in motion will be so high that space will collapse and become Chaos.

We were born and live in space and time and perceive them for granted, natural, eternal. We cannot even imagine what could be instead of them. What kind of world is this without space and time? Why do we have such terrible difficulties in trying to imagine a different world? The reason is that we live in space and time with certain properties. We did not have the experience of getting into another world with other spatial, temporal or some other characteristics. That is why thinkers and scientists, starting to talk about the boundary of space, came to a contradiction. They, reasoning on the usual categories, represented the boundary as it were inside space. Here there is the border and a space with approximately the same properties on both sides of the border. So, they came to a contradiction.

The boundary of space must mean a real separation of different worlds. In our space, bodies can move and clocks show time. If bodies cannot move and time cannot be determined in any way, then it is impossible to determine properties of space-time. This means a lack of space and time. This means Chaos (Yanchilin, 2013).

One Cannot Step the Same Universe twice

In terms of assuming the existence of Chaos outside the Universe, all the properties of space-time are the result of the interaction of material objects in it. According to Einstein's formula, anybody has the following rest energy: $E_0 = mc^2$. This energy is huge. Why does a body have such energy? There is no answer to this question. From a new point of view, the cause of energy is its gravitational interaction with other bodies of the Universe: $E_0 = mc^2 = -m\Phi$. Outside the gravitational field of the Universe, a body will not have energy because $\Phi = 0$. Without having energy, the body cannot interact with other bodies. It will become a thing in itself in the full sense of the word. The body will become unobservable and therefore its existence will lose its physical meaning. Therefore, the body can exist only by interacting with other bodies that is only within the Universe.

Let us take a macroscopic body. It moves along a certain trajectory representing a continuous line. Why does the macroscopic body move only along a continuous trajectory? Why is its path not torn? Why does the body suddenly not leave its continuous line of travel and find itself in an arbitrary place? What reason limits the choice in its movement? The reason is the whole matter of the Universe. It is this matter that limits the magnitude of Planck's constant, and only therefore the body moves along a certain trajectory.

When moving away from all the masses of the Universe, Planck's constant will increase because of the decrease in the absolute magnitude of the gravitational potential, and the laws of motion will become less definite. The properties of space-time will gradually degenerate. The ultimate degree of degenerate space-time is Chaos.

In our space-time, any ‘point’ is comparable to a very small body, the size of which can be neglected. The concept of a point or location in Chaos lose its physical meaning because of the unlimited increase in Planck’s constant and hence the uncertainty in a particle’s motion. The concepts of distance and time (closer – farther or earlier – later) make sense only for bodies which motion obeys certain laws. Therefore, in Chaos, the concepts of distance and time lose physical meaning.

Thus, on the one hand, Chaos exists outside time and outside space. On the other hand, it is the natural container for our Universe. Space and time appear as the result of the appearance of the gravitational field of the Universe. Physical bodies can move along their trajectories due to the enormous gravitational potential of the Universe, which limits the influence of Chaos. Thanks to this limitation, Chaos is transformed into the space and time (Yanchilin, 2003).

One of the properties of our space is direction. In our world, we can indicate directions. We can move in one direction, in the other direction or in the opposite direction. We can just show it by a pointer. All these directions are possible because in our space there is a global Order. Outside the Universe, there are no directions because all directions are equally probable in Chaos.

The other characteristic property of our space is that it has an entrance but does not have an exit. Let us try to understand this better. When we are inside the Universe, we can move in any direction and reach its boundary. If we involve mathematics and physics, we can even estimate the distance to this boundary. Suppose that an object is outside this boundary. Will it be able to get back into the Universe? No, it will not because outside the Universe the concept of direction loses its physical sense. For this object, the Universe will be in an indefinite direction and at an undefined distance. The Universe for it will become a thing in itself. We can say that the Universe will disappear for this object. Thus, there is an exit from the Universe, but there is no entrance to it. This shows the asymmetry of the Universe’s boundary. Paraphrasing Heraclitus, who once said that one cannot step into the same river twice, we can say that one cannot step into the same Universe twice.

Material Cause of Order

Why is there global Order in the world? Why are there very similar phenomena in different galaxies? Why do the same laws as in the near-Earth space operate in those galaxies? Sometimes you can hear such an answer: because the same laws operate throughout the Universe. Can the laws of nature be the cause of order in nature? As a rule, laws are mathematical formulas that describe certain phenomena in the world. Laws reflect Order. However, they cannot be the cause of this Order. The laws of nature are a description of nature. As a rule, laws of nature described by a man do not represent an accurate description. It is Order that exists in the Universe that allows a person to introduce various laws to describe this Order. Order exists really. We observe it in nature. Laws are an abstraction created by man. Laws are a consequence of Order and not its root cause. We observe Order in the world. This means that the cause for Order should also be material and observable.

From the new point of view, the cause of Order in the world is the stars and other objects that fill the Universe. If matter in the Universe was relatively small, then all bodies would move in an arbitrary way. If matter was completely absent in the Universe, then all test bodies would be smeared across the entire space. Stars and other matter restrain bodies from arbitrariness in motion and restrain their smearing in space. All the matter of the Universe creates Order in the Universe and therefore, this Order is almost the same for any corners of the Universe.

Austrian physicist Ernst Mach did not believe in the existence of absolute space and assert that fixed stars should influence the motion of bodies (Mach, 2017). Albert Einstein was sympathetic to this hypothesis. He was fully convinced of the truth of this hypothesis called the principle by him. Einstein tried to implement Mach's principle in his general relativity. Nevertheless, after he finished the construction of his theory of gravitation, it turned out that it does not satisfy Mach’s principle. According to general relativity, masses only slightly bend the space-time. This means that there is no global dependence on all the matter of the Universe and the laws of motion.

Yanchilin’s theory embodied Mach's principle and shows that empty space without stars cannot exist. Such a space will become Chaos. It is assumed that the stars create the framework of the world that preserves its integrity due to the presence of the stars. As a result, the laws of nature can operate in the same way everywhere. We called this framework Order. Order is an opposition to Chaos.

The use of quantum mechanics will fill Mach’s principle with new content. According to formula (2), the magnitude of Planck’s constant is determined by the fixed stars representing all the masses of the Universe. If the mass of the Universe were greater, Planck's constant would be smaller, and vice versa. In this case, if we began to remove stars from the Universe, Planck's constant would grow and grow, tending to infinity in the limit. Accordingly, the uncertainty in the motion of particles will unlimitedly increase. Eventually, all macroscopic bodies will break up into elementary particles. All our clocks and rulers, with which we can conduct measurements in space, will break up into elementary particles. It will be impossible to measure time or distance. There will not even be any sense in talking about their existence.

The Boundary of Space and the Solution of the First Kantian Antinomy

According to modern observations, the Universe is not an infinite formation. It consists of a very large but still finite number of galaxies, lonely stars, planetary-like objects, and other matter. From the new viewpoint, all this cumulative matter of the Universe determines the most important constant values that characterize our world, including the speed of light and Planck's constant. In a broad sense, our Universe can be called Order or Cosmos. In our world, Order reigns in physical and natural science laws. The same laws of nature operate on the Earth, the Sun, other stars, and even distant galaxies.

The finite Universe has boundaries. These boundaries do not represent boundaries in the conventional sense, when one area abruptly ends and another one begins, and these two areas are protected from each other, for example, by a wall. The boundary of the Universe has a long continuation, gradually shifting from the material world of stars, galaxies, and other space matter to a space with degenerate properties called Chaos. At a certain area of our world there is no usual Universe because there is no Chaos yet. This is the area, on which space, time, physical laws, and all the material things collapse. It is difficult to say how long this area lasts because the concepts of distances and time intervals disappear in it.

Is the notion of infinity applicable to Chaos? If by this concept we mean boundless, endless, inexhaustible objects and phenomena, for which it is impossible to specify boundaries and quantitative measures, then the concept of Chaos is quite suitable for this term. In this understanding, Chaos is an infinity that does not have boundaries and holds our finite Universe. The finite in the infinite is the Universe in boundless Chaos. There is no contradiction in such a world view. Contradictions disappear by themselves. There is a harmonious world, in which there is an interpenetration of the infinite and finite. Chaos is not only a container for the Universe that symbolizes the Order. Chaos penetrates into it, fills it with itself. Filling the Universe, Chaos makes our world as it is. He makes the microcosm filled with the uncertainty of quantum particles. Due to the presence of Chaos in the microcosm, such quantum paradoxes as wave-particle dualism, the passage of subatomic particles through two or more holes simultaneously, quantum nonlocality (which Einstein called spooky action at a distance) are clearly explained. The concept of Chaos not only solves Kant's first antinomy about the simultaneous finiteness and infinity of our world. This concept provides a natural explanation for many ‘breaking logic of common sense’ phenomena of our world.

Ancient thinkers believing in Chaos were close to the truth. The old paradigms return incarnating into new paradigms that do not contradict with the previous concepts but only enrich them with new ideas showing the modern development of thought.

The ancient concept of Chaos is reborn anew. A new revival is given to it by physics. Attempts are also made to explain with the help of this concept even such a phenomenon as human consciousness (Yanchilina, 2018). Presumably, philosophers will also turn their attention to the new concept of Chaos as a degenerate space and will study this phenomenon taking into account all the achievements of the philosophical science that have occurred in the last centuries and decades.

CONCLUSION

When we try to imagine the boundary of space, we imagine this boundary within space and therefore, we come to a contradiction. In our imagination, space extends beyond its boundary and this convinces us that space cannot have a boundary. Thus, even without knowing anything about the Universe on a large scale, we conclude that space does not and cannot have boundaries. This conclusion is not based on observations but follows from the most general ideas about space. It is easy to understand that this conclusion is based on analogy: we transfer the known properties of space to the boundary of space. What if the properties of space do not remain unchanged but will gradually change as we approach the boundary of space? It is possible that in this case the idea of space boundary will no longer be contradictory. We can formulate this approach differently. If we want to assume the existence of boundary in space, then to avoid an obvious contradiction, we must also assume that the properties of space must radically change near the boundary. If space really does have boundary, then the contradiction that arises with an attempt to imagine it, testifies to the incompleteness of our knowledge. We do not know what the properties of the space near its boundary can be. We unconsciously assume that near its border, the space will be similar to what we observe in the world around us and we come to a contradiction only for this reason. In this paper, a fundamentally new approach to the boundary of space was considered. We discussed the hypothesis that all properties of space are determined by the global distribution of matter in the Universe and depend on the gravitational potential of the Universe. In this case, as follows from formulas (1) and (2), when approaching the boundary of space, the speed of light will tend to zero and Planck's constant will increase indefinitely. As a result, all the laws of motion will gradually degenerate due to the growth of quantum uncertainty. Therefore, near the border, space and time will lose all their properties and cease to exist. This represents a fundamentally new approach to the solution of the Kantian antinomy.

REFERENCES

Bohm, D. 1952. Quantum theory. Prentice-Hall. Ch. 22.16.

Cherniss, HF. 1964. Aristotle's criticism of presocratic philosophy. Octagon Books. pp144.

Einstein, A. 1928. Electrons et photons. Rapports et discussions du cinquieme Conseil de physique – Bruxelles du 24 au 29 octobre 1927 sous les auspices de Institut International de physique Solvay. 253-256.

Florenski, P. 1909. Kant’s cosmological antinomies. Bogoslovski Vestnik. 1:596-626. In Russian.

Grier, M. 2006. The logic of illusion and the antinomies. In Graham Bird (ed.), Blackwell, Oxford. 192-207.

Mach, E. 2017. The science of mechanics: A critical and historical account of its development (Classic Reprint). Forgotten Books. (Chapter II. VI). Newton's views of time, space and motion.

Moore, AW. 1988. Aspects of the infinite in Kant. Mind: New Series. Published by the Oxford University Press on behalf of the Mind Association. 97(386):205-223.

Novikova, LI. and Sokolovsky, MV. 1998. Educational space as an open system. Obshchestvennyiye Nauki i Sovremennost. 1:133-143. (In Russian).

Popper, K. 2000. Quantum Physics and schizm in Physics. Routledge. 102-103.

Roche, AF. 2018. Kant’s transcendental deduction and the unity of space and time. Kantian Review. 23(1):41-64. DOI: https://doi.org/10.1017/S1369415417000371

Shimony, A. 1988. The reality of the quantum world. Scientific American. 258(1):46-53.

Yanchilin, VL. 2000. Gravitation and quantum mechanics. Novosibirsk State University. pp12.

Yanchilin, VL. 2003. The Quantum theory of gravitation. Editorial URSS, Moscow. pp248.

Yanchilin, VL. 2013. World in Chaos. Mir Izmerenii, 3(1):49-54. (In Russian).

Yanchilin, VL. 2018. The light formula and its consequences. Canadian Journal of Pure and Applied Sciences. 12(1):4457-4463.

Yanchilina, FS. 2003. Beyond the stars. What is outside the Universe? Editorial URSS. pp120. (In Russian).

Yanchilina, FS. 2018. Development of the concept of Chaos and its influence on the formation of consciousness. Canadian Journal of Pure and Applied Sciences. 12(1):4451-4455.

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