Models of the Universe: Ontological and Physical Problems

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The primary target of this paper is a philosophical analysis of modern models of the universe in cosmology. Understanding the existence of being is directly related to understanding both the world and oneself. An important characteristic of ontology is time, matter, space which forms the ontological horizon of presence. Ontology tries to describe the fundamental principles of our universe in a comprehensive and consistent way, but the more the system includes different levels and objects, the more difficult it is to make an ontological description, especially when it comes to the structure of the universe. Cosmology historically develops in the bosom of ontological discourse, as it tries to describe the fundamental structure, nature, and dynamics of the universe. In this paper, we identify the concept of the Bipolar Universe. According to this model, two mirror-symmetric parallel universes were formed during the Big Bang. Within the framework of this concept, the problem of baryogenesis is solved. It is possible to allow some interaction between two parallel universes, for example, the correlation of the motion of matter and solve the monopole problem. The article describes the hypothesis of the existence of mirror matter. The formation of ideas about the structure of our world articulates the ontological question of what reality is and what its metaphysical essence is. Three important ontological categories: time, space, and matter, form the ontological basis of the structure of our universe.

Keywords: ontology, reality structure, cosmology, bipolar universe, parallel worlds, baryogenesis

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Introduction

Ontological questions have a long tradition in the history of philosophy, which begins with the first schools of natural philosophy. The problem of existence, the structure of being are classic philosophical problems. How to explore everything that exists? How to systematize it? How to think about the world as a whole? How to structure and describe it? Martin Heidegger's work "Being and Time" departs from the traditional ontology, because Heidegger tries to answer the question: "What does be?" Its fundamental ontology is fundamental to traditional ontology in the sense that it relates to what necessarily implies any understanding of essences, namely, our understanding of why essences are essences (Heidegger, 2008). Being can be seen as presence, as a special type of existence of man and the world. Heidegger argues that the ability of presence to discover and understand being is that presence itself exists between being involved in the world because one belongs to the world and projecting oneself into that world. That is, the understanding of the being of being is directly related to the understanding of both the world and oneself. Another important characteristic of Heidegger's ontology is time, which forms the ontological horizon of presence. Since people project themselves and reality in time and are doomed to die, time is the catalyst that forces man to raise the question of existence. Heidegger's concept tries to describe the fundamental principles of our universe. Bazuluk takes Heidegger's concept to a new level, considering existence as a discrete-continuous environment ("continuity of matter"), in which essences express themselves. For Martin Heidegger, an important characteristic of ontology is the category of "nothing" – the absence, non-existence of a particular being or being in general. Its initial position is as follows: it is necessary to enter the extremes of existence – to Nothing. Heidegger's Nothing has a contradictory uncertain status: "Nothing" is non-existent, "Nothing" is a fundamental experience. Nothing in itself implies the complete absence of differences, a person must "look into the eyes of its radiant chaos" (Bazaluk, 2005: 50). Why the chaos? Unlike Martin Heidegger, for Oleg Bazaluk the world is a complex universe, space. "There is no emptiness in the universe," says Oleg Bazaluk. But sooner or later, it will reveal its meaning because it is based on quantum processes, the understanding of which has already come close to modern physics" (Bazaluk, 2005: 7).

Modern cosmology, which originated in the depths of philosophical discourse, opens the amazing horizons of our universe against the background of discoveries in modern science. The search for the standard of describing the world as an exhaustive theoretical model of different levels of existence is a research activity that promises unprecedented models of reality. The ultimate goal of ontology is to describe and present all things in the world in a comprehensive and consistent way so that fundamental knowledge will be clearly articulated for different semantic systems and cognitive agents, natural or artificial. This approach to ontology is used as a methodological basis in computer science. There, the ontology acts as a formalized representation of knowledge about a particular subject area. This subject area can be, for example, the environment, the world. This description is made in such a way as to be suitable for automated processing. The more the system includes different levels and objects, the more difficult it is to make an ontological description, the more it is about the structure of the whole. Cosmology historically develops in the bosom of ontological discourse, as it tries to describe the fundamental structure, nature, and dynamics of the universe. How did it form, what is its structure, how will the universe evolve? What is the large-scale structure of the universe?

The universe contains organized structures on various scales, from small systems, planets, planetary systems to galaxies and galaxies. When moving to scales less than 100 Mpc, a clear cell structure is revealed, with "emptiness" – entrances, followed by clusters of galaxies, local groups of galaxies, the next level (scale 5-200 kpc) – a huge variety of different objects. How and why these organized structures were formed, what is the role of dark matter and energy, and how different objects interact – the answers to these questions are the main areas of research in modern cosmology (Vladlenova & Bazaluk, 2013).

There is a modern cosmological model ΛCDM, which models our universe and is the Standard Model of high-yield cosmology, because it is generally consistent with the observed phenomena and theoretical positions of modern science, although it has several scientific problems that need to be addressed. The cosmological theory of the Big Bang describes the development of the universe from the beginning – the early stage of evolution from an extremely high and hot state 13.8 billion years ago. Observations confirm the presence of relic radiation, which has survived from the earliest times of the universe (Dodelson & Schmidt, 2020).

This cosmological theory is consistent with observational facts, which fits into the general scientific theoretical construction, although it has several unresolved issues.

1. The problem of baryogenesis. The concept of the Bipolar Universe

Baryogenesis is a process that began after the birth of the universe. After birth, the universe contained different parts of matter and antimatter (Vladlenova & Bazaluk, 2013). In our universe, matter prevails over antimatter. We do not know why this is so. The standard model of elementary particle physics describes the microworld. The theory of Einstein describes the macroworld. These theories cannot explain the problem. Antimatter consists of particles that have the same mass as their counterparts in the matter, but electric charge and quantum numbers with the opposite sign (Battiston et al., 2021).

According to the general theory of relativity, any form of matter is combined with space-time to create a geometry that causes gravity. CPT symmetry demonstrates that antimatter obeys the same laws of physics as "ordinary" matter, and therefore responds to gravity as ordinary matter. There are several scientific hypotheses that try to explain the baryon asymmetry of the universe. According to this model, two mirror-symmetric parallel universes were formed during the Big Bang. That is, we have two universes formed during the Big Bang, one of which we live in – consists of matter, and the other world – of antimatter, where time flows in the opposite direction, which does not contradict modern physical ideas about time (Boyle et al., 2018). That is, the Big Bang became a point of symmetry, on different sides of which the universe and the anti-universe catered in time. In principle, the universe of antimatter should be similar to our world. In this model, it is not entirely clear how these two worlds interact through the point of singularity. Do they exist separately, or does some interaction occur? Was the foundation of particles/antiparticles in the days of the early universe through cosmic strings – topological defects in space-time? Difficulties arise due to incomprehensible processes at the point of singularity, which modern science cannot describe due to the extreme phenomena that occurred there. These gaps are trying to close in the quantum theory of gravitation, which is not yet a developed scientific theory. We have quantum physics, which describes the microworld, and general relativity, which describes the macroworld, but at the point of singularity, there are processes related to topological effects that require a theory that describes spatiotemporal and quantum effects simultaneously. There have been attempts to quantify gravity, which has led to even more confusing models of the universe, multidimensional dimensions, and infinite numbers of universes that have no experimental basis (Parikh et al., 2021).

These attempts have given rise to concepts such as supersymmetry and supergravity, superstrings, superbrains, the fifth force, the graviphoton, and so on. Maybe there is no point of singularity at all, but instead, there is a large magnet, where one universe consists of matter and the other – antimatter, and the universes repel each other as opposed to each other by opposite magnetic poles.

No matter how original the cosmological model is, it must explain observational phenomena and solve scientific problems. For example, the essence of dark energy is also the subject of controversy. It is known that it is very evenly distributed in space, has the ability of gravitational repulsion instead of gravitational attraction, low density, and does not interact in any noticeable way with ordinary matter using known fundamental types of interaction, except gravity. In dark energy, the density is the same, almost does not change over time in all reference frames, does not accumulate in space, and is distributed evenly over it (Particle Data Group et al., 2020). In the concept of mirror particles, dark energy is simply understood as the energy of a vacuum leftover from a spontaneous violation of mirror symmetry. There is also a hypothesis that there is no dark energy at all, and the accelerated expansion of the universe is due to unknown properties of gravitational forces, which begin to appear at distances of the order of the visible part of the universe (Boyle et al., 2018; Bian et al., 2018). Dark energy does behave like an antigravity force; its nature and origin remain unknown. It is unclear why dark energy began to dominate the rate of expansion of the universe at some point in time, billions of years after the Big Bang. The existence of dark energy, in any form, is necessary to reconcile the measured geometry of space with the total amount of matter in the universe. Based on astronomical studies of Planck's satellite, 68.3% of dark energy, 26.8% of dark matter, and 4.9% of ordinary matter were detected. Some researchers believe that the accelerated expansion of the universe is an illusion caused by the relative movement of us to the rest of the universe (Dodelson & Schmidt, 2020). As a result, observers in a galaxy like our Milky Way may experience accelerated expansion inside, and this is a local effect that gives the false impression that the entire space has recently entered an acceleration phase. However, the scientific community does not support such ideas. Let us compare the bipolar structure of the universe with a large magnet that has two poles (two universes) between which there is a magnetic-dipole interaction – a dipolar connection. We can allow some interaction between two parallel universes, such as the correlation of motion, flow and mixing particles, etc. It remains to determine the point of the singularity, whether it is needed at all, whether it can be avoided? It is possible that magnetic fields begin to form as a result of processes at the point of singularity in the early universe. Can this model explain the problem of dark energy? Perhaps between two universes, exist force of repulsion act between two magnets with different poles. Researchers led by Federica Govoni have discovered a large area of the magnetic field: 10 million light-years of magnetized space – a large "magnetized filament" in the study of the magnetic field between clusters of galaxies Abell 399 and Abell 401 (Govoni et al., 2019). It is not clear what its existence is connected with; where did these huge magnetic fields come from? We can assume that cosmic magnetism is from the birth of the universe, in which case it must be everywhere, including in voids. If so, magnetism exists along with gravity, can be the force that forms the large-scale structure of space.

2. Monopole problem. The universe is like a big magnet and relative information

Another cosmological problem is the search for a monopole. Can the model of the Bipolar Universe explain the problem of monopole? It is still unclear why it was not found. The field of the magnet is created by molecular currents, which are formed under the influence of electric charges, so the poles of the magnet cannot be separated; they are not independent entities, but only the two ends of the magnetic dipole. Theoretically, a monopole should exist. Some mechanism leads to the almost complete disappearance of the monopole. Astronomers are trying to explain this with the theory of inflation. The universe was expanding with acceleration, thereby "diluting the density" of the monopole to an acceptable level. It also solves other mysterious properties of the universe, such as the horizon problem. However, the theory of inflation has shortcomings, which are due to untested forecasts and a lack of serious empirical support. For example, Karsten Jedamzik and Levon Pogosian note that weak magnetic fields in the early universe would have led to faster space expansion than what is observed today (Jedamzik & Pogosian, 2019).

Among the unsolved problems of modern cosmology is the problem of the existence of the "Axis of Evil," the so-called anomaly in astronomical observations of the cosmic microwave background (Dodelson & Schmidt, 2020). This is a hypothetical long-range area – the "axis" of the world, around which the orientation of the entire structure of the universe. In the work of Lior Shamir, it is assumed that the observation can be explained by the hypothesis that the early universe revolved around its axis (Shamir, 2020). Based on the Bipolar Universe model, this axis can also be the axis of rotation of interconnected universes. Another cosmological problem that may be the result of a correlation with the Anti-Universe is related to the horizon of the universe because it is unclear why our universe is so homogeneous that even some large parts of the sky with cosmic microwave radiation more than 13 billion light-years away, are consistent with both the motion and orientation of the solar system. Is this observation a confirmation of the correlation of the two universes? Is there an interaction between me and my anti-Self in the Anti-Universe? There are also many philosophical questions related to ontological and existential issues. Do I even exist in the Anti-Universe? In addition, does my anti-self in the Anti-Universe write an anti-article about the philosophical problems of cosmology? Fundamental philosophical questions about freedom, determinism, and freedom, which are already emerging at a new level, are also relevant. Are my actions consistent with my anti-self? For example, research in cognitive science confirms the thesis that signals in the brain appear before a person realizes his actions or choices. Maybe we are seeing a subtle correlation of two different people from two universes. Is there a correlation between my actions and my counterpart, the Milky Way galaxy, and its anti-galaxy?

Carlo Rovelli uses the analogy of a magnet to explain the concept of "relative information": "in any magnet, the two ends have opposite polarity. To know one means to know another (Rovelli, 2015). We can say that each end "has information" about the other. There is nothing strange about it; this is just a way of saying that there is a necessary relationship between the polarities of the two ends. We say that there is "relative information" between two systems when the state of one is limited by the state of the other. "Thus, he deduces, different physical systems have information about each other, and such "relative information" is ubiquitous: "the color of light carries information about the object because the world is a connected tangle of interacting events, it is teeming with relative information". Thus, when this information is carefully processed by our brain, according to Carlo Rovelli, it is encoded in language and acquires the semantic weight that we usually attribute to the concept of information. However, the foundations of semantics are in the physical sphere, not the mental sphere, because the physical world is a closely connected network of relative information, where the state of each reflects the state of the other. "We understand physical, chemical, biological, social, political, astrophysical and cosmological systems in terms of these networks of relationships, not in terms of individual behavior. Relative physical information is a powerful basic concept for describing the world. For Rovelli, science is a continuous process of exploring new possible worldviews through "scientific revolt," which is always based on previous knowledge, but at the same time constantly questions the aspects of this acquired knowledge (Rovelli, 2015).

3. Theory of the Digital Universe

Another hypothesis about the structure of our universe looks even more fantastic. There is an idea that our universe is the result of a large computer – the Theory of the Digital Universe. However, who wrote this computer program? Luciano Floridi develops "information structural realism," which considers the world as a system consisting of information objects that dynamically interact with each other (Floridi, 2009). Such information objects should be understood as opportunities. The universe is computing. These information models of the universe do not explain the incompatibility with the existence of some continuous properties of physical symmetries, such as rotational and translational symmetry of space, Lorentz symmetry, and electroweak symmetry, which are central to existing physical theory. Proponents of digital physics argue that continuous symmetries are only convenient approximations of discrete reality. For example, although we assume that the Planck length is the minimum possible unit of length, on a smaller scale, the space is quantized (Vladlenova & Bazaluk, 2013). The hypothesis of the existence of mirror matter. There is a hypothesis about the existence of a hypothetical mirror form of matter. As the name implies, mirror matter is mainly a spatial reflection of ordinary matter. Particles of matter can be both lefts- and right-handed, so if an ordinary particle of matter was "left-handed," its mirror particle would be "right-handed" but absolutely identical in all other respects. In the theory of mirror matter, every ordinary particle of matter has a mirror particle that doubles the number of particles in the universe. Our universe is mostly "left-handed" because it is dominated by left-wing particles. There are three important symmetries: charge conjugation (C), spatial parity (P), and symmetry with respect to time (T). Charge conjugation (C-invariance) means the replacement of the signs of electric charges of all particles of the physical system by opposite ones. P-symmetry means the symmetry of the equations of motion with respect to the change of the coordinate signs of all particles. In relation to this operation, symmetric electromagnetic, strong, and, according to the general theory of relativity, gravitational interactions. T-symmetry ("symmetry with respect to the circulation of time") is the symmetry of equations describing the laws of physics with respect to the operation of replacing time t by -t. The reversibility of time reflects the nature of changes in physical quantities and physical processes in the formal change of the direction of time to the opposite (Vladlenova & Bazaluk, 2013).

4. The mirror particles

The hypothesis of the existence of mirror matter tries to explain why our universe consists of "left-handed" particles; the presence of mirror particles would restore the symmetry of the universe. Some scientists identify antimatter and mirror particles. Nevertheless, antimatter interacts very strongly with ordinary matter in the process of annihilation, at the same time; mirror matter will interact very weakly with ordinary matter. For this reason, some physicists suggest that mirror particles may be candidates for dark matter (Foot & Mitra, 2003). In this case, it is unclear why there are more mirror particles in our universe than ordinary matter. The usual baryon substance in our universe is a paltry 5%. It is believed that it is very difficult to "see the light" from mirror matter. Mirror particles interact with each other in the same way as ordinary ones; it is believed that they can be detected by photon-mirror photon mixing, for example, in experiments of direct detection of dark matter. They can also interact with ordinary matter by gravity. Robert Foote believes that planets, comets, and even atmospheric fireballs are made from mirror matter (Foot & Mitra, 2003).

Such fantastic assumptions can be continued: about the mirror – spaces, extraterrestrial civilizations, galaxies, universes. Mirror particles can interact with each other, but w our ordinary particles can interact only by gravity because gravity is the only universal force acting between any. What types of matter. There is speculation that dark matter, or perhaps part of it, may be a mirror image. Indeed, it interacts gravitationally with visible matter, but at the same time, we do not see it. However, the concept of mirror matter must explain observational phenomena. The formation of ideas about the structure of our world articulates the ontological question of what reality is and what its metaphysical essence is. Three important ontological categories: time, space, and matter form the ontological basis of the structure of our universe. The most significant example of an ontology is the attempt to form a model of the universe that requires the definition of different categories, the search for an understanding of how they fit together in the broadest possible context: the universe and perhaps even the Multiverse. When we ask deep questions, "What is the nature of the universe? What is existence? What is the structure of the universe? What principles govern the properties of things? "– we ask essentially ontological questions. What is the semantics of the possible and impossible world? The systematic use of the idea of other universes has raised the question of cross-identification; that is, the principles that determine whether a person from this universe will be identical to a person from a parallel world. Can a person exist in several possible situations? In "Two dogmas of Empiricism," Willard Van Orman Quine argues that the totality of our knowledge or beliefs, from the most important questions from geography and history to the deepest laws of atomic physics or even pure mathematics and logic, is an artificial fabric that "reflects experience only at the edges" (Quine, 1951).

Conclusions

That is, science is a field of research where boundary conditions are studied. Conflict with experience on the periphery causes restructuring in the inner part of the field. Reassessment of some statements entails reassessment of others because of their logical relationships – logical laws, which, in turn, are certain elements of the field. After overestimating one statement, we must overestimate some others in terms of a logical connection. However, the general field is so uncertain of its boundary conditions, of experience, that there is great freedom of choice as to which statements to re-evaluate in the light of any particular opposite experience. Quine emphasizes a pragmatic approach in choosing one or another ontological picture, which is formed on the principles of relativity, our knowledge of objects described in the language of one theory can be considered only in the language of another theory, which should be considered in relation to the language of the next theory, and so on. Thus, the methodological principle emerges, which consists in the absolutization of relativity and conditionality of the content of knowledge. Unlike Quine, Karl Popper advocated critical rationalism and realism (Quine, 1951; Popper, 1963). He postulated that truth is objective, although knowledge is plausible and can be prone to error, so we must constantly review, clarify and verify. The validity of scientific knowledge arises from the fact that we are able to critically examine it.

The structure of reality is quite complex, especially when we try to "comprehend" it on the scale of the universe. There are many different methodological approaches to its study, but the general strategy is built around realism and relativism. According to Hammersley, the solution is to take an intermediate position between them, which he calls subtle realism (Hammersley, 2004). Ontological issues, or the "study of being," articulate the existence of what actually exists in the world, about which people can gain knowledge. Ontology helps researchers recognize how confident they can be in the nature and existence of the objects they are exploring. From the standpoint of subtle realism, phenomena are independent, but knowledge about them is always constructed by the researcher and does not follow from sensory impressions. In contrast to relativism, subtle realism argues that there is a single reality, not several realities that correspond to different perspectives, and that one can gain knowledge about the phenomena that make up this reality.

We have no experience of working with other universes, and we have no conclusive evidence that they exist at all. Despite the fascinating models of the structure of cosmological reality, to will win that science that conforms to the principle of simplicity relies on observations, can be tested experimentally, and make accurate predictions.

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