

# Dark energy as the information field of the universe

A I Bogomolov<sup>1</sup>

<sup>1</sup> Department of Mathematics, Financial University under the Government of the Russian Federation, 49 Leningradsky Prospekt, 125993, Moscow, Russia

E-mail: aibogomolov@fa.ru

**Abstract.** Using modern theories of the origin and expansion of the Universe, recent discoveries in astronomy and quantum physics, the article proposes the hypothesis to add to attributes of the nascent universe such as "space" and "time" of the attribute "information," which finds its embodiment from a physical point of view in the form dark energy. With the development of the Universe, the volume of information grows and, accordingly, the mass of dark energy increases, turning into an information field or noosphere, which provides for the expansion of the Universe. An analogy is made between the Big Bang and the expansion of the Universe in the process of its evolution, due to the increase in the amount of dark energy and between the birth of Man from singularity (egg) and the growth of his information and knowledge in the process of his life.

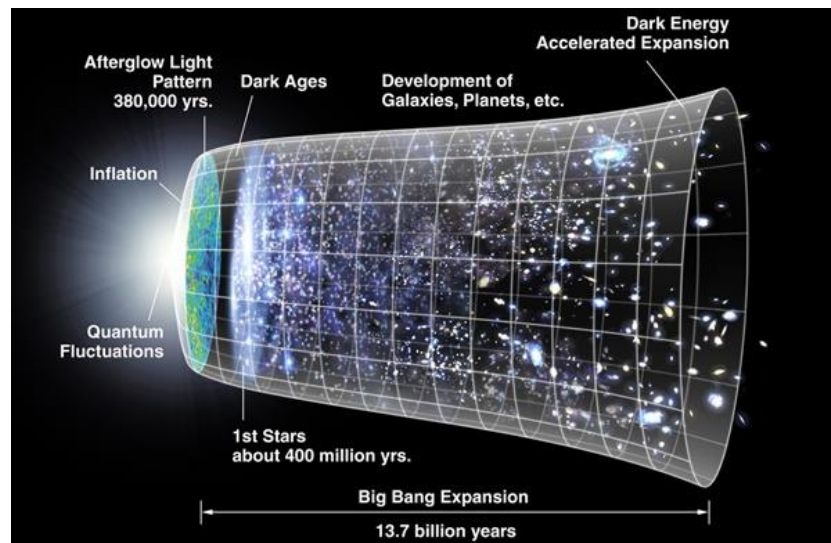
## 1. Introduction

We live in a universe that is expanding and evolving. But once the Universe, as most scientists and religious thinkers believe, the Universe did not exist and it arose from something or was created. Theories of the origin of the Universe in various religious movements agree that it was created as a result of a conscious and spiritualized action by God or the Creator. The main difference between scientific and religious ideas about the origin of the Universe lies, first of all, in terminology. In scientific theories, instead of the term "creation", the term "origin" is used, instead of the term "Creator", the term "Nature", etc. However, many similarities can be found between scientific and religious theories of the origin of the universe.

There are many scientific theories of the origin of the Universe, but most scientists abandoned the idea of an infinite and timeless Universe in the 20th century. The most developed, widespread and supported by circumstantial evidence obtained recently as a result of new astronomical and cosmological discoveries is the Big Bang theory. According to this theory, the Universe was born as a result of the Big Bang of a certain singularity (point), which has a structure and content about which we know nothing, except that the laws of physics we know did not work in it. The cause of the explosion that occurred about 13.8 billion years ago, probably, we will never know. After the Big Bang, time appeared, space, which began to expand, and matter in the form of elementary particles, which later formed various elements (matter).

The main and fundamental disadvantage of the Big Bang theory is the impossibility of explaining the cause of the explosion and the mechanisms of the emergence of space-time-matter. Also, the Big Bang theory has difficulties when trying to describe the behavior of the universe in terms of quantum mechanics. The scattered smallest elements laid the foundation for the world that we know today. After the Big Bang, the universe began to expand and is still expanding (figure 1).





**Figure 1.** Expansion of the Universe its evolution  
(figures are taken from open sources).

It is believed that since the moment of the Big Bang, such attributes of the Universe as space, time, matter have emerged. Modern science increasingly recognizes that information is one of the attributes of the Universe along with its other attributes: matter, space and time [2,3]. It is logical to assume that along with the development of matter and the space-time continuum, the development of information also occurred, that is, its accumulation and the complication of the forms of its implementation. A lot of scientific works are devoted to the concept and definition of information, for example, works [4,5].

What is information? The creator of cybernetics N. Wiener wrote about this: "Information is information, not matter and not energy" [6].

The modern level of scientific knowledge more and more makes it possible to link the progressive development of matter with reflection processes and with the accumulation of structural information. Information, as a measure of the orderliness of material structures and their interaction, is an objective participant at all stages of the organization of matter. Information participated in the processes of self-organization of matter, contributing to the emergence of life. The most important epistemological problem is understanding the place and role of information in the universe and human life.

## 2. Materials and methods

The concept of a field in physics is no less important than the concept of matter. This concept is used in many other areas of knowledge: cosmogony, astrophysics, quantum physics, biology, etc. The concept of "field" applies to information as well. Information field theory (IFT) uses approaches and methods developed for quantum field theory and is used, in particular, for the reconstruction of signals from space. Applying IFT algorithms to astronomical datasets ensures highly accurate images of the universe and makes it easier to find faint statistical signals from the Big Bang. The IFT math uses Bayesian probability concepts.

Close to the concept of the information field of the Universe is the concept of "noosphere" (the sphere of the mind) or the thinking field created by the consciousness of people. The concept and the term "noosphere" were introduced in 1927 by the professor of mathematics at the Sorbonne Edouard Leroy and Pierre Teilhard de Chardin (geologist, paleontologist, Catholic philosopher). They took the teaching of Vladimir Ivanovich Vernadsky (1863-1945) about the evolution of the natural environment under the influence of the biosphere and man [8,9] as the basis for their concept of the thinking field.

The emergence of the sphere of reason, as the authors of this concept believe, should be attributed to the very beginning of the emergence of the Universe, long before the appearance of "Homo sapiens" - Homo sapiens. Therefore, the development of the noosphere and the Universe is inextricably linked and

interdependent and knowing the laws of the development of the Universe, one can also learn the laws of the development of the noosphere.

Despite the infinite variety of forms of organization of matter, there is a scientific hypothesis, confirmed by many observations, that in the structure and development of the Universe, at all levels of its organization, from elementary particles to galaxy clusters, there is an infinite nesting of matter (fractal principle). According to the fractal principle, the systems of each new level repeat the forms of organization of the previous level. Living organisms, including humans, have a hierarchical structure and consist of various associations of cells, which, in turn, are created from associations of various chemical compounds, those, in turn, from associations of various molecules and so on down to the most elementary particles - quarks ...

It follows from the fractal principle that living beings, including humans at the lowest level of their organization, have structures that include the most initial "bricks" from which the Universe began to be created. This is directly related to the noosphere, if we assume that the information field arose simultaneously with the formation of matter (substance).

Living organisms have evolved and one of the peaks of evolution was "Homo sapiens" - a reasonable man who began to create a social hierarchy: clans, then tribes, states, connections of states. The pinnacle of evolution has become humanity, whose technologies have reached a level where we can talk about its transition to the stage of an information society. The information field generated by the development of human society (noosphere) consists of the noosphere of individual people, organized into a network hierarchical system, which develops together with the development of the Universe.

Of interest is the question, what is the carrier of the information field of mankind (noosphere)? For example, we know that different elementary particles are carriers of different fields. So, the carriers of the electromagnetic field are photons, the gravitational field - gravitons (so far, they exist only in theory), the forces of nuclear interaction of a particle - gluons, etc. The state of these elementary particles is characterized by their energy, and energy, as we know, is characterized by mass. Thus, even electromagnetic fields have a mass, which in space manifests itself in the interaction of stars within galaxies.

Does the information field (noosphere) of an individual have a lot? Some scientists set up experiments in order to measure, for example, the mass (weight) of a human soul [10]. For a number of reasons, these studies do not meet the criteria for a scientific experiment and did not find support in the scientific community. Nevertheless, attempts to measure the weight of information continue to take place, as well as attempts to understand or explain what information itself is and how it is related to the origin and evolution of the Universe.

Correlating the development of the Universe with the development of the noosphere, one can draw attention to one and the same feature of their evolution: both the noosphere and the Universe are expanding.

The expansion of the Universe, discovered by astronomers, is an established scientific fact and according to Hubble's law, the further from us a space object, the greater its removal rate. The scattering of galaxies is explained by the general theory of relativity based on the total density of all forms of energy in our Universe. At the same time, it became necessary to include invisible dark matter into the mathematical model of the expansion of the Universe, which makes up to 27% of the total mass of the energy of the Universe and dark energy - 68% (mass-energy of ordinary matter is only 5%).

Dark matter participates in the gravitational interaction of space objects in the same way as ordinary matter. It is based on elementary particles that have not yet been discovered by science and about the properties of which one can only hypothesize. According to calculations, the mass-energy of dark matter in our solar system is approximately equal to the mass of ordinary matter. It is believed that it accumulates inside the sun and planets and participates in the formation of neutrinos.

Dark energy has stranger properties and it is she who is responsible for the accelerated expansion of the universe. To explain the expansion of the Universe, it must have anti-gravitational properties and its quantity must constantly increase [12]. Unlike dark matter, it should be evenly spread throughout the entire universe. These properties of dark energy sharply distinguish it from ordinary matter. It is no exaggeration to say that dark energy is the main mystery of cosmology and fundamental physics.

Theories of the origin and development of the Universe, denying the presence of dark energy, are also of certain scientific interest, but they are more in conflict with astronomical observations and are no longer substantiated from a theoretical point of view [13].

These theories include string theory, put forward in the 80s of the last century by scientists Steinhardt-Türk and Baum-Frampton [14]. According to this theory, elementary particles are vibrations of certain strings, the frequency of which determines the amount of energy, and hence the mass of these particles. Strings are not matter, which means that the entire Universe is a set of oscillatory processes, from which one or another of its components (elementary particles, atoms, planets, stars, etc.) are distinguished.

The quantum nature of dark energy raises the question of the Observer, which is also a part of it. In particular, Professor Lawrence Krauss [15], arguing on this topic, comes to the conclusion that observation of dark energy "can shorten the lifetime of the entire Universe." This assumption is based on the quantum Zeno effect - the quantum paradox, which is that the presence of an observer always affects the observed quantum processes.

If we assume that dark energy is the information field of the Universe (noosphere), then the statement of Lawrence Krauss is consistent with this thesis, because the noosphere is formed from "thought-images" generated by humanity and any thought associated with observing Nature, to one degree or another affects the general noosphere.

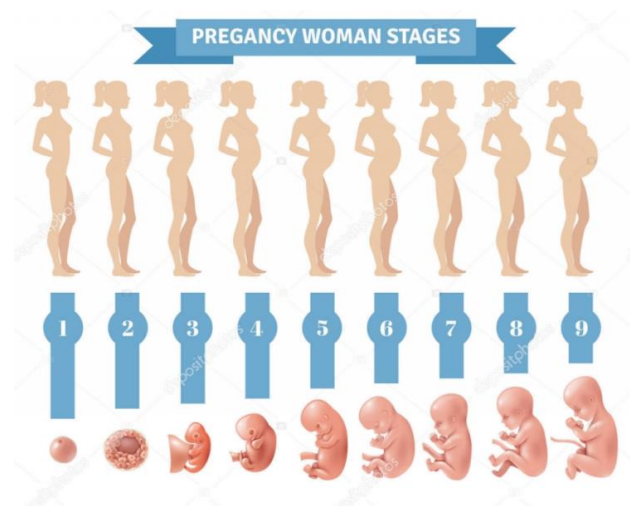
Observing dark energy (information field of the Universe), we form "thoughts-images" in it, which will directly affect it, changing the space-time-matter of the Universe and the material world in which we live. On the other hand, the information field of the Universe (noosphere - dark energy), as a set of "thoughts of images" accumulated over the entire history of mankind, interacting with our "thoughts-images" affects the present and future of each individual person and all mankind as a whole.

### 3. Results

The existence of the information field of the Universe can be indirectly confirmed by observations of black holes and modern theoretical models of their behavior. Black holes absorb everything that falls into their sphere of attraction, even quanta of electromagnetic radiation. Nevertheless, theoretical physicist Stephen Hawking [16] believes that although black holes can really completely destroy the entire essence of an object, they cannot completely destroy information about the object, since information is fundamentally different from matter.

The accelerated expansion of the Universe since the Big Bang and the complication of its structure can be explained by an increase in the "mass" of dark energy, and this suggests an analogy with an increase in the rate of creation and accumulation of information volumes by mankind. Back in April 1982 (!) Academician MA Markov reported at the Presidium of the USSR Academy of Sciences: "... The information field of the Universe is layered and structurally resembles a "matryoshka", and each layer is connected hierarchically with higher layers, up to the Absolute, and apart from the bank of information, it is also a regulator of the beginning in the destinies of people and humanity" [17].

Simultaneously with the growth of the "mass" of dark energy (the mass of the information field or noosphere), there is a process of increasing entropy of the Universe, which will ultimately lead to its thermal death. Likewise, in the process of life of an individual (which is also a kind of the Universe), along with an increase in his knowledge and volume of information, his aging (entropy growth) occurs, which also ends in death. The analogy between the big Universe and Man does not end there. You can find other similar characteristics and processes. For example, some scientists find similarities in the structure of galactic networks and neural networks in the human brain. By analogy with the birth of the Universe from a microscopic point the birth of a person also resembles the Big Bang of a certain singularity (the size of an egg cell is approximately 0.1–0.15 microns), figure 2 [18].

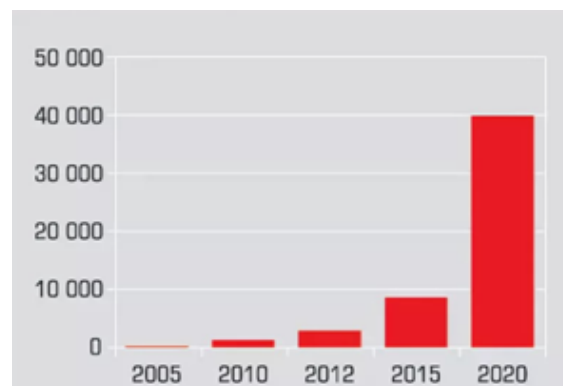


**Figure 2.** Human embryo development [18].

Living systems, including humans, as well as the Universe, are constantly in a state of thermodynamic disequilibrium. According to the principle of stable disequilibrium of living systems by E. Bauer [19], living systems perform work against the expected equilibrium due to their free energy.

Later, E. Bauer's theory was fully confirmed by the works of I. Prigogine, G. Haken and R. Thom [20]. The Universe acts similarly, which in this respect resembles a living organism.

The rate of growth of knowledge and volumes of information created during the evolution of mankind are very similar to the rate of growth of the "mass" of the dark energy of the Universe. The study estimated the volume of generated data in 2012 at 2.8 zettabytes and predicts an increase of up to 40 zettabytes by 2020. The birth and development of the Internet also marked the beginning of a new type of space, where information and information are stored in its in homogeneities (nodes) and knowledge. The accumulation of information in the process of life not only in an individual, but also in society in the evolutionary process of its development, the transformation of information into knowledge, has been characterized by an explosive character in the last 100 years, figure. 3 [19].



**Figure 3.** Global Digital Data Growth Dynamics [19].

In the Universe, the nodes where knowledge and information are generated and stored are also planetary systems inhabited by living beings, separated by huge distances, but having the ability, at least in principle, to exchange knowledge and information. This suggests an analogy between the increase in information in the noosphere and the increase in dark energy in the Cosmos. The special properties of dark energy, the peculiarities of its growth with the development of the Universe, allow it to claim the role of cosmic information or the noosphere.

It is difficult or impossible to say what humanity will look like in, say, 100 or 200 years from now. However, one can probably agree with KE Tsiolkovsky that sooner or later mankind will move into the "ray form" of its existence and will be distributed in this form throughout the Universe [21].

If this is so, then it should be assumed that already now the informational essence of each person individually, of all mankind as a whole and the informational essence of other inhabited worlds are already in the informational field of the Universe - the noosphere. The transition to the "ray form" or noosphere will occur at some stage in the development of mankind. By the way, this may serve as an explanation why we have not yet met with brothers in mind. Due to the exponential growth of knowledge, intelligent civilizations do not reach the stage of building interstellar ships and interstellar travel. Even earlier, they master knowledge from the cosmic noosphere and pass into the ray form, becoming practically gods. The same awaits for humanity, unless it destroys itself earlier. In the ray form, it is possible to control matter, transforming it into various forms. Perhaps the results of these transformations by intelligent entities are reflected in the phenomena that we call UFOs. Otherwise, from the point of view of today's science, the appearance, appearance and behavior of UFOs cannot be explained.

Philosophical understanding of the concept of noosphere leads to the conclusion, which was formulated by Georg Hegel, "Everything that is real is reasonable, everything that is rational is real." technologies and a radical revision of the tasks and way of life of society, placing at the forefront not material, but spiritual values.

#### 4. Conclusion and outputs

Let us formulate general conclusions that suggest themselves from the material presented above:

1. The informational stage of human development leads to revolutionary changes in the life of society and individuals, puts the production of information and knowledge at the forefront, and in the epistemological terms, the study of the "information field" itself.
2. Philosophical understanding of virtual reality leads to the conclusion, which was formulated by Georg Hegel, "Everything that is real is rational, everything that is rational is real."
3. From a natural science point of view, "virtual reality" is an "information field" that has its own structure and is in interaction with the human world and the world of things created by him.
4. The concept of "noosphere" is, as a result of its historical and semantic development, the most convenient and promising term for understanding and researching the information field and socio-economic processes of society development.
5. Dark energy can pretend to be the physical basis of the noosphere.

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